MISSISSIPPI STATE WILDLIFE ACTION PLAN 2015-2025

MISSISSIPPI Museum of Natural Science

Coordinated by the Mississippi Department of Wildlife, Fisheries, and Parks
On behalf of the State of Mississippi • October 2015 • Updated July 2016

Mississippi Department of Wildlife, Fisheries and Parks Mission:

The *mission* of the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) is to conserve and enhance Mississippi wildlife, fisheries, and parks, provide quality outdoor recreation, and engage the public in natural resource conservation.

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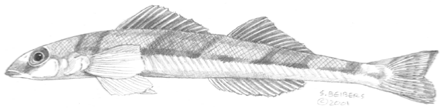
Mississippi
State Wildlife Action Plan

2015 – 2025



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MISSISSIPPI STATE WILDLIFE ACTION PLAN 2015 - 2025

EXECUTIVE SUMMARY

Introduction

This Mississippi State Wildlife Action Plan (SWAP) is the ten-year comprehensive update to the 2005 Comprehensive Wildlife Conservation Strategy (CWCS, hereafter SWAP). The original plan serves as the foundation for this revision, and marked a major milestone in conservation planning in the U.S. It was the first time each state wildlife agency led a collaborative effort to design a conservation "blueprint" for all wildlife species in their jurisdiction. To accomplish this, each state worked with partners and experts to identify species of greatest conservation need (SGCN), described their habitats, and key threats, and recommended conservation actions necessary to prevent more species from becoming threatened or endangered, to spur recovery, and to keep common species common.

This nationwide planning initiative began in 2001 when Congress created the State Wildlife Grants (SWG) program and the related Wildlife Conservation and Restoration Program (WCRP). In order to make the best use of federal funds from the WCRP and SWG program, Congress mandated each state and territory to develop a plan and identified eight required elements to be addressed. With an overarching goal to provide a guide to effective and efficient long-term conservation of biodiversity, Congress directed states to identify and focus on SGCN yet address the full array of wildlife and wildlife-related issues.

Over the past decade, Mississippi's first SWAP has served as a guide to investments of over $7.5 million in federal SWG funds that has been matched with over $5 million in non-federal funds for additional research, monitoring, and survey work focused on SGCN as well as on-the-ground implementation of conservation actions identified in the original plan. Mississippi's SWAP is also the state-wide reference for conservation activities recommended to improve biodiversity and provides an overarching vision for how fish and wildlife habitats should be protected. Developed by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) through its Mississippi Museum of Natural Science (MMNS) Conservation Biology Staff, this plan has been used extensively by public and private resource managers, land planners, decision-makers, landowners, and others as a resource for the past ten years.

To update the SWAP, MDWFP enlisted the help of several individuals, organizations, agencies and academia. MDWFP approached this comprehensive vision in a similar manner to the original plan development. A SWAP Coordinator organized all aspects of the development of this strategy in conjunction with an in-house Technical Committee composed of MDWFP wildlife, fisheries, and museum biologists, an Expert Team of scientists from around the state and region, a Steering Committee of MDWFP management and a large working stakeholder group of Advisors. This update was strengthened greatly by the input, participation and feedback of stakeholders across the state.

MDWFP's objective for this comprehensive update is to provide an even more useful resource while continuing to meet the original purpose and eight elements set forth by Congress, as summarized below:

State Wildlife Action Plan Eight Required Elements

The following is a list of the eight elements required by Congress and how the State of Mississippi, through MDWFP and its many collaborators approached each element to create this update.

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.

The MNHP operates under the auspices of the MDWFP through the MMNS bureau. It maintains a database of approximately 400 species of animals in Mississippi including vertebrates and 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. There are approximately 1,500 known species of animals in Mississippi which can be tracked by the MNHP, including all of the representatives of the groups gastropoda (snails); bivalvia (mussels); malacostraca (amphipods, crawfish, shrimp, isopods); arachnida (spiders, mites, ticks); insects; fish (including the cephalaspidomorphi - jawless fish/lampreys) and the osteichthyes (bony fish); amphibians (frogs and salamanders); reptiles (lizards, snakes, turtles, alligators); birds; and mammals. MDWFP maintains a database on occurrence localities, population status, and habitat conditions for tracked species and is focused upon species known or suspected to occur in low numbers (called Animals of Special Concern).

During the development of the original SWAP, the Animals of Special Concern list was evaluated by scientists with expertise relative to those species. For the 2015 revision, the original list was reviewed and updated by MDWFP's Technical Committee and Expert Advisors. A total of 20 species were added (1 mussel, 2 crustaceans, 1 arachnid, 9 insects, 2 fishes, 2 amphibians, 1 reptile, 1 bird, 1 mammal), 10 species were removed (2 mussels, 3 crustaceans, 2 amphibians, 3 birds), and the Tier assignments were changed for 12 species (5 Tier assignments were lowered, 7 Tier assignments were raised). For the 2015 plan an effort was made to include those arthropods that were of regional or national concern. Of the 20 species added, 11 were arthropod species.

Mississippi's 2015 SWAP lists 310 SGCN including: 49 mussels, 32 crustaceans, 1 arachnid (new category), 10 insects (new category), 76 fish, 19 amphibians, 36 reptiles, 69 birds, and 18 mammals.

Scientists with knowledge of these declining species were also enlisted to identify SGCN habitat preferences, the greatest stressors facing these species and potential conservation actions needed to abate those problems or "threats". Mississippi SGCN were assigned a Tier ranking based on their degree of imperilment (Tier 1 – immediate needs, Tier 2 – conservation action, Tier 3 – planning or management needs, Tier 4 – extirpated or historical occurrence). Some animal groups were not included in this revised plan such as gastropods, marine fish and marine invertebrates which were deemed insufficiently well-known to warrant a status evaluation comparable to that of the other species groups. 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.

The need to identify marine fishes and invertebrates that qualify for SGCN status was discussed at the 2015 SWAP planning meeting held at the Sandhill Crane National Wildlife Refuge in Jackson County. A working group comprised of biologists from MDWFP, Mississippi Department of Marine Resources, Gulf Coast Research Laboratory and the Mississippi Chapter of the Nature Conservancy was established to collect, compile, and analyze relevant data. There are no published sources available on the current status or taxonomy of terrestrial gastropods in Mississippi and to our knowledge no experts on terrestrial Mississippi snails. There are no published checklists on aquatic gastropods in Mississippi and the taxonomy of aquatic snails, particularly the pleurocerids, is in a state of flux. Researchers in Alabama, North Carolina, and the Smithsonian are currently attempting to establish a stable taxonomy for this group. Once that is accomplished, we may be able to identify species and evaluate their status within the state.

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

The 159 ecological community types used in the MNHP were combined into 15 broad habitat types and 63 subtypes for the purposes of the original SWAP. To improve the utility of these descriptions for the reader, the MDWFP Technical Team re-organized the habitat descriptions by the four ecoregions in Mississippi (Upper East Gulf Coastal Plain, East Gulf Coastal Plain, Mississippi River Alluvial Plain and Northern Gulf of Mexico) for this update. Bailey/U.S. Forest Service Ecological Units modified by The Nature Conservancy as ecoregions continue to serve as the ecological platform Mississippi's plan. This approach allows Mississippi's SWAP to be "rolled-up" with surrounding states into a national synopsis that will demonstrates to Congress and the public that all states have conducted a coordinated, scientifically rigid account of the nation's "at risk" wildlife and their habitat.

In addition to a more detailed range map and summary of the condition of each habitat sub-type in Mississippi, each habitat section includes a list of the SGCN associated with that type and a list of threats/stressors and recommended conservation actions.

MDWFP added a new chapter on Conservation Opportunity Areas (COAs) - large, loosely defined, geographic areas within the state that have been identified as priority areas for management. They may contain priority habitats or SGCN or may represent areas that have unique habitats (e.g. prairies) within them but they are composed of many different habitats. They may have been chosen because they have a wide range of SGCN, or because they contain areas that are particularly important to one SGCN. These priority areas, while important, should not exclude work in other areas of the state. The COAs were chosen to give a direction for making the most of limited resources. COAs will allow conservation actions to benefit a wider range of species or priority habitats and can be a guide to organizations looking to focus on important areas as well as an opportunity to develop partnerships.

Five areas were chosen as initial COAs for Mississippi. The Northeast COA incorporates the Tombigbee River and Black Prairie area. The Southeast COA covers the Pascagoula River and its tributaries, as well as coastal areas in Jackson County. The Pearl River/Strong River COA extends from Jackson to the coast and incorporates the Jourdan River and coastal areas of Hancock County. The Jackson Prairie COA includes most of the Bienville National Forest and surrounding areas. The South Delta COA lies in the MSRAP ecoregion, north of Vicksburg.

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.

Stresses are some attribute of an ecosystem that is impaired either directly or indirectly by humans. A stress is a symptom that results from a threat. A threat is the activity or processes that have caused or may be causing the destruction, degradation, and/or impairment of an ecosystem. Direct threats are sources of stress. Threats may be historic, current, or potential.

In a nationwide effort to unify classifications of stresses and conservation actions within each SWAP, Mississippi adopted the recommendations in A Standard Lexicon for Biodiversity Conservation: *Unified Classifications of Threats and Actions* (Salafsky et. al., 2008) which classifies 11 major threat categories:

Standard Threat Categories used in Mississippi's SWAP

1. Residential/commercial development
2. Agriculture/aquaculture
3. Energy production/mining
4. Transportation and service corridors
5. Biological resource use
6. Human intrusions and disturbance
7. Natural system modifications
8. Invasive and other problematic species and genes
9. Pollution
10. Geological events
11. Climate change and severe weather

To help further define threats 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 identification of priority conservation actions. From these rankings, a new section and discussion on the impact of major statewide threats (invasive species, urban sprawl, energy development, altered fire regime, climate change) to SGCN was developed for this updated SWAP.

Notably, Mississippi's landscape has changed dramatically since European settlement. There are almost no places left that have not been affected by man. Urbanization, oil and gas exploration, 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 habitat restoration, conservation and protection plans benefit fish and wildlife, particularly those SGCN.

Survey and research needs were updated from the original plan based on progress made over the past decade. These recommendations focus on individual species, assemblages and habitats.

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

Conservation actions are interventions or priorities that should be undertaken by resource managers or others to reach conservation goals. Associating SGCN to their habitats guided the original process of prioritizing conservation actions to be taken on a landscape scale for assemblages of SGCN.

Like the classifications of threats, MDWFP adopted and employed the following seven categories of conservation actions in the Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions.

Standard Conservation Actions used in Mississippi's SWAP

1. Land/water protection
2. Land/water management
3. Species management
4. Education/awareness
5. Law/policy
6. Livelihood, economic and other incentives
7. External capacity building

For each threat linked to habitat subtypes for Mississippi's SGCN, we assigned appropriate conservation actions consistent with the standards. For the newly added discussion on the impact of major statewide threats (invasive species, urban sprawl, energy development, altered fire regime, climate change), we included a list of conservation actions tailored to address these key threats. For example, for invasive species such as cogongrass, fire ants, wild hogs and fungal pathogens that are discussed in more detail, we recommend specific conservation actions under the standard categories.

Example of conservation actions that should be applied to address invasive species include:

Conservation Action 2: Land and Water Management

- Increase early detection and response to presence of invasive species.
- Coordinate with other agencies, NGO's, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.
- Investigate development of more effective, lower cost control methods.

Conservation Action 4: Education and Awareness

- Increase educational awareness of invasive species and their control.
- Promote the use of native species for landscaping and wildlife habitat.

Conservation Action 5: Law and Policy

- Encourage regulatory response to importation of non-native invasive species.
- Encourage increased control of the transport and release of live non-native wildlife and plants.

Conservation Action 6: Livelihood, Economic and Other Incentives

- Identify sources of funding for long term control efforts: private and public sources of funding.
- Develop technical assistance, incentive, and cost sharing programs to prevent invasions, control or eradicate existing invasive species, and restore natural disturbance regimes on private lands.

Conservation Action 7 External Capacity Building

- Forming and facilitating partnerships, alliances and networks with local, state and federal agencies, Landscape Conservation Cooperatives, Joint Ventures, non-government organizations (The Nature Conservancy, The Audubon Society, Land Trusts, Mississippi Wildlife Federation, National Wildlife Federation, etc.);
- Providing input to state, regional, and national organizations to help fight invasive species.

-Excerpted from *Salafsky et. al. (2008)*

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 the SWAP has been and will continue to be accomplished by the MNHP 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 SWAP is implemented and actions performed should provide initial indications of effectiveness of the SWAP. 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 SWAP continues to be "stepped down" into more detailed species, habitat or community specific conservation plans, additional 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 has been a key undertaking of MDWFP through the SWG program and will continue under this second iteration.

Numerous programs, projects and plans to monitor species, habitat, communities and conservation actions exist that are being used to monitor the SWAP. Although MDWFP through MNHP 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 SWAP implementation, it is essential that the efforts of all stakeholders continue to be identified, coordinated and included.

Survey and monitoring work recommended in the 2005 SWAP and accomplished with SWG funding in Mississippi over the past ten years has resulted in the downgrading of ranks for 13 SGCN, in the determination that listing is not necessary for 19 species and the rediscovery of two species thought to be extirpated from the state (Ironcolor Shiner and Rock Bass).

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

In accordance with MDWFP original plan, this document represents the first comprehensive revision of the SWAP. MDWFP, through its MNHP, intends to complete an interim five-year review for certain species

and habitats. For Mississippi's SWAP to meet its intended goal to improve biodiversity in the state, we must consider the SWAP a living document and process, and 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 these planned updates, MDWFP will continue to enlist the assistance of the SWAP Advisors and committees in the review process. The continued engagement of outside advisors and experts will allow the MDWFP SWAP Technical Committee to collaborate with conservation partners and interested stakeholders in the future plan iterations that should result in better implementation of conservation actions, and ultimately improved health of species of concern and their habitats.

This review process will be synchronized with our agency'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 SWAP-related activities.

New data on species and habitats will continue to be incorporated into the MNHP database regularly. The SWG Coordinator and Technical Committee are responsible for implementing the annual review and evaluation of the SWAP and will report annually to the MDWFP Executive Director as part of the SWG program.

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 document was accomplished in coordination with several public wildlife agencies, universities, conservation organizations and land managers in Mississippi and in the Southeast U.S. This coordination was ensured by inclusion of representatives of these agencies and organizations serving as Advisors, through individual 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 the SWAP where possible. Other interested parties also contributed to the process through comments via the MDWFP website.

There is one Native American tribe listed on the federal register in Mississippi -- the Mississippi Band of Choctaw Indians. They own and manage almost 29,000 acres in several counties primarily in east-central Mississippi. The tribal biologist participated in activities related to the revisions, including webinars and email correspondence. Collaboration with bordering states and other State Wildlife Action Plan coordinators occurred primarily during national and regional meetings hosted by the Association of Fish and Wildlife Agencies (AFWA).

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

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 of Greatest Conservation Need (SGCN) that Congress has indicated such programs and projects are intended to emphasize.

For this comprehensive ten-year update, our stakeholder and public outreach efforts included many approaches. Representatives from natural resources agencies, conservation organizations, agriculture and forest products industries, technical experts, conservation educators and academics as well as individuals and MDWFP district and other staff were invited via email or personal contact to participate in both the original plan development and in the review and update. During the revision process, these stakeholders communicated primarily via email, and through individual and small group meetings and submitted comments through the SWAP page on the MDWFP website. In addition to the assistance solicited from members of the Advisors, Expert Team and Technical and Steering Committees, public and stakeholder input was invited through:

1. A Mississippi SWAP page on the MDWFP **website**
2. A **press release** announcing the SWAP update and changes, which resulted in interviews and subsequent articles in statewide print media.
3. Guest appearances on the live Mississippi Public Broadcasting Creature Comforts **radio show**.
4. A **meeting** of coastal stakeholders.
5. A public **webinar** was to review the draft plan, discuss the revision process, and invite comments.

This comprehensive SWAP is a refinement and update of the significant information, analyses and recommendations on all habitat types and the critical species that use them. It is important to note that this SWAP 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 opportunity areas for our state in conjunction with our stakeholders.

The SWAP was never intended to be a plan for MDWFP, 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.

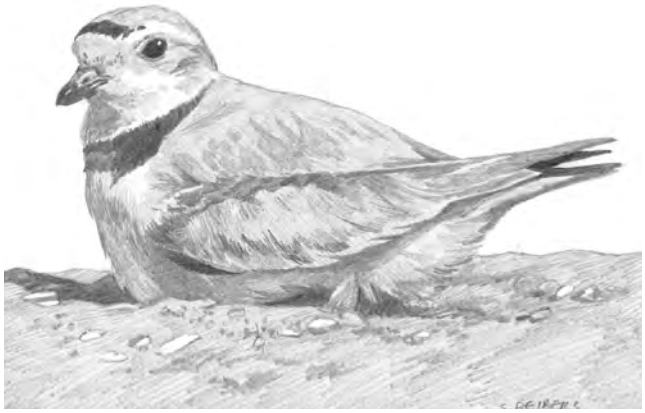
Changes to the 2015 SWAP

MDWFP is pleased to provide this comprehensive SWAP update. We have implemented several changes and enhancements to the SWAP as recommended by the Association of Fish and Wildlife Agencies in their Best *Practices for State Wildlife Actions Plans* (2011) including:

- Species of Greatest Conservation Need (SGCN) have been updated and arthropods were added to the list
- Habitat types and subtypes organized by ecoregions
- Stressors and conservation actions have been standardized in accordance with *A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions* (Salafsky et. al., 2008)
- Threats and recommended conservation actions have been updated for each habitat type
- Statewide threats are discussed in more detail
- Research and survey needs have been updated based on the investigations over the past 10 years
- A new section on Conservation Opportunity Areas in Mississippi has been added

- Habitat maps are refined and more detailed
- A discussion the potential impacts of climate change on priority species and habitats is included
- A list of reference sites in Mississippi for habitats has been added

This document represents the summation 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 MDWFP and its partners, and the conservation planning efforts of many other organizations and agencies. We hope you find it to be a useful guide to fish and wildlife conservation in Mississippi.



CHAPTER 1

INTRODUCTION AND PURPOSE OF THE MISSISSIPPI STATE WILDLIFE ACTION PLAN

History of SWAP

This *Mississippi State Wildlife Action Plan* (2015) or SWAP is a comprehensive update to the *Mississippi Comprehensive Wildlife Conservation Strategy* (CWCS) published by the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) in 2005. The development of the original CWCS (hereafter referred to as SWAP) was a major milestone in conservation planning for Mississippi and the nation. It marked the first time in US history that each state and territory wildlife agency and the broader conservation community cooperated in the design of a conservation "blueprint" for all wildlife species. Each state had for the first time identified species and habitats in greatest conservation need, key threats, and conservation actions necessary to prevent endangered species listings and spur recovery. From 2005 to 2015, these state "blueprints" have served as a collective guide and reference for conservation actions and a vision for how our lands, waters, fish and wildlife should be protected for the future. They have been used extensively by public and private resource managers, land planners, decision-makers, landowners and others as a resource.

Goal: Conservation of Mississippi's Biodiversity

The overarching goal of this comprehensive update of Mississippi's SWAP 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, the lead agency MDWFP embarked on a multi-year, dynamic process to first develop a foundational conservation strategy in 2005 as directed by Congress, and then to refine it through this update. By state statute MDWFP is charged with conserving, developing, and protecting Mississippi's natural resource and providing outdoor recreational opportunities. In developing this 2015 SWAP, MDWFP coordinated the update through its Conservation Biology Section housed at the Mississippi Museum of Natural Science

(MMNS) and enlisted the help of many other resource agencies, technical experts, volunteers, staff and partners.

State Wildlife Action Plan Eight Required Elements and Location in MS SWAP

This national planning effort was inspired by the nationwide Teaming with Wildlife Coalition. Since the early 1990s, the 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). In order to make the best use of federal funds from the WCRP and SWG program, Congress mandated each state and territory to develop a SWAP. Congress identified eight required elements to be addressed in each state's wildlife action plan, and directed that the plans must identify and be focused on the species in greatest need of conservation yet address the full array of wildlife and wildlife-related issues. A list of the chapters and Appendices in this 2015 Mississippi SWAP where each of the following elements is addressed is identified below.

Required Element 1: Species - 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. (Chapter 2,3,5 and Appendices III, VI, VII, X)

Required Element 2: Habitats - Descriptions of extent and condition of habitats and community types essential to conservation of species identified in (1). (Chapter 2,5,6 and Appendices VI, VIII, IX, X)

Required Element 3: Threats - 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. (Chapters 4,5,6,7 and Appendix V)

Required Element 4: Conservation Actions - Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions. (Chapters 4,5,6,7 and Appendix XI)

Required Element 5: Monitoring Species and Effectiveness - 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. (Chapter 7 and Appendix XI)

Required Element 6: Review and Revision - Descriptions of procedures to review the plan at intervals not to exceed ten years. (Chapter 8)

Required Element 7: Partnerships with Land Management Agencies and Tribes - 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 (Chapter 2 or Appendix II)

Required Element 8: Public Participation - 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 (Chapter 2 and Appendix IV)

Development of the Comprehensive Ten Year Update

Required Element 5 above mandates that each state complete a comprehensive update of SWAP at least every ten years. To aid each state and territory in achieving a meaningful review and revision of their SWAP, the Association of Fish and Wildlife Agencies (AFWA) provided *Best Practices for State Wildlife Action Plans* (2011) as voluntary guidance that should result in greater consistency and standardization of SWAPs across the county. AFWA has encouraged the use of these Best Practices to improve efforts to measure success in conserving targeted species and natural communities, to better track progress on population recovery and habitat goals, and to foster more collaboration across state lines (**http://teaming.com/news/now-available-best-practices-state-wildlife-action-plans-swaps**).Where possible, MDWFP has adopted these Best Practices in this revised plan.

To meet the requirements set forth by Congress and develop a useful resource, MDWFP began the update process in the same manner as the development of the original plan. Our objectives from the beginning have been to base the SWAP 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 plan assesses the extent and condition of habitats required by these species, as well as existing and potential threats and conservation opportunities for these habitats. It describes research and survey needs as well as monitoring needs, and provides a method for MDWFP and its partners to review and revise the Action Plan every ten years. A broad set of recommended conservation actions that may be applied locally and statewide to achieve the ultimate goal of protecting and improving Mississippi's diversity of native species and habitats are included. Through the new Conservation Opportunity Areas, this plan identifies geographic regions in Mississippi 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, organizations 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 biodiversity guide for the entire state, MDWFP invited a broad cross section of stakeholders to serve on its original Advisory Committee to help develop and review the 2005 plan. From the beginning a Technical Committee of MDWFP wildlife, fisheries and museum biologists worked with other scientists around the state and region with expertise on species of greatest conservation need and their habitats to help compile and synthesize the data for review and input and coordinated their efforts with the Advisory Committee. After the 2005 Mississippi plan was approved by Congress, it didn't collect dust on the shelf. The Technical Committee and experts continued to collaborate to update and refine the species list, habitat descriptions based on the findings of research, survey and monitoring. An internal Steering Committee of agency managers ensured the process followed Congressional guidelines and continues to meet the eight elements required by law. Plan updates were posted on the MDWFP website for public review and input.

Through this new plan, MDWFP strived to improve the efficiency and effectiveness for all users. The 2005 SWAP plan is the foundation for this update, and many of species, threats, recommended conservation actions and research and survey needs are the same. Significant progress has also occurred over the past 10 years in the conservation and our understanding of fish and wildlife species and their needs.

Mississippi's Wildlife Action Plan in Action

From 2001 - 2015, over $1 billion has been allocated to state wildlife agencies across the US using a formula based on population and land area to the SWG program. During that period, MDWFP has received almost $7.5 million in federal SWG funding that has been matched with over $5 million in non-federal funds for developing and implementing programs that benefit species of greatest conservation need and their habitats in Mississippi as recommended in Mississippi's SWAP. In addition to informing SWG investments across the state, the SWAP has served as a strategic guide and reference for natural resource managers, as a basis for other state and federal grant funds for wildlife conservation and as a foundation for more detailed resource planning. It has been a useful tool for implementation of conservation actions locally, and has helped address gaps in research, survey and monitoring of species and habitats.

The following are just a few examples of how the 2005 Mississippi SWAP continues to be used by MDWFP and its partners across the state to achieve better results in efforts to protect and conserve fish and wildlife habitat.

Other planning efforts

The 2005 SWAP served as a guide and resource for other strategic conservation planning, such as:

• MS Forest Legacy Program - Descriptions of forested habitats and species of greatest conservation need dependent on those habitats served as the basis for the 2007 Forest Legacy Program Assessment of Need (Mississippi Forestry Commission/USDA Forest Service) which is the guiding plan for Forest Legacy Program investments. (**http://www.mfc.ms.gov/forest-legacy.php**)
• MS Forest Assessment and Resource Strategy (2010) – Threats and conservation actions from the 2005 SWAP served as foundation for many recommendations for forest conservation, protection and restoration in this statewide forest action plan (Mississippi Forestry Commission/USDA Forest Service) (**http://www.mfc.ms.gov/pdf/Forest_Assessment/MS_Assessment_Resource_Strategy_2010.pdf**)
• Technical resource for ongoing federal and state planning efforts such as the RESTORE Act and post Deepwater Horizon Gulf ecosystem recovery planning by the Mississippi Department of Environmental Quality and the federal RESTORE Council, Partners in Flight priorities, Landscape Conservation Cooperatives, migratory bird Joint Venture planning, Mississippi Bat Working Group.
• The original plan was instrumental in the development of Audubon Mississippi's Waterbirds on Working Lands in Mississippi report (**http://hogisland.audubon.org/sites/default/files/documents/waterbirds_on_working_lands_in_mississippi_jan_2007.pdf**).
• Southeast Aquatic Habitat Plan (Southeast Aquatic Resources Partnership) (**http://southeastaquatics.net/resources/sarps-special-reports/the-southeast-aquatic-habitat-plan-sahp/southeast-aquatic-habitat-plan-sahp-1/view**)
• Southeastern Coastal Plain Aquifer System
• Lower Mississippi Valley Joint Venture
• East Gulf Coastal Plain Joint Venture
• Technical resource for mitigation bank across the state

Grants and proposals for implementing conservation actions

Priority species and actions to address identified threats described in the 2005 SWAP have been the basis for many successful government and non-government conservation grants in Mississippi including:

- Endangered Species Grants (USFWS)
- State Wildlife Grants Programs (led by MDWFP)
- Partners for Fish and Wildlife (USFWS/Partners)
- Landowner Incentive Program (MDWFP)
- North American Wetlands Conservation Act (USFWS/partners)
- National Fish and Wildlife Foundation (private/public partnerships)
- Farm Bill programs (USDA) such as EQIP (Environmental Quality Improvement Program)
- State Acres for Wildlife/Conservation Reserve Program (USDA) for black belt prairie, black bear habitat, bobwhite quail habitat

Blueprint for survey, research and monitoring of species and habitats of concern

The 2005 SWAP identified priority survey, research and monitoring needs for SGCN that has been followed and implemented by MDWFP with funding from SWG and other sources for over a decade. Survey and monitoring work from SWG funding in Mississippi has resulted in the downgrading of ranks for 13 species of greatest conservation need, in the determination that listing is not necessary for 19 species and the rediscovery of two species thought to be extirpated from the state (Ironcolor Shiner and Rock Bass). Below is a comprehensive list of the SWG investments through 2014 driven by the SWAP since the beginning of the program in Mississippi.

Table 1.1 State Wildlife Grant Program Investments in Mississippi

STATE WILDLIFE GRANT #	YEAR	STATE WILDLIFE GRANT INVESTMENTS IN MISSISSIPPI (2003 -2014)
T-1	2/11/2003	Paddlefish population and movement assessment on Tennessee-Tombigbee Waterway
T-2	2/1/2003	Population assessment of Gulf Coast Strain Walleye in Tennessee-Tombigbee Waterway
T-3	6/5/2003	Black Bear Population Assessment; Black Bear Movement Assessment; Black Bear Translocation; Natural Heritage Database Digitization; Tilapia (potential threat to SGCN) Dispersal Mechanisms in Mississippi; Conservation Strategy Planning; SGCN Surveys: SGCN Bats, Alligator Gar, SGCN Fishes in Tennessee-Tombigbee Waterway
T-4	2/1/2004	Gulf Coast Strain Walleye Hatchery Facility Construction
T-5	1/1/2005	Natural Heritage Database Management, Conservation Strategy and Development; SGCN Surveys: Glass Lizard, Black Pine Snake; Biological Collections Curation
T-6	1/1/2007	State Comprehensive Wildlife Conservation Strategy Development; State Comprehensive Wildlife Conservation Strategy Implementation; SGCN Population Genetics: Starhead Topminnow, Western Starhead Topminnow; SGCN Surveys: Spotted Skunk, Long-Tailed Weasel; Biological Collections Curation
T-7-HM	1/1/2008	Habitat Characteristics and Reproductive Biology of SGCN Saltmarsh Topminnow
T-8-1-R	1/8/2008	State Comprehensive Conservation Strategy Planning; State Comprehensive Conservation Strategy Implementation; State Comprehensive Wildlife Conservation Strategy Coordination; Population Structure and Feeding Habits of SGCN Alabama Shad; SGCN Surveys: Swallow-Tailed Kite, Oldfield Mouse, Eastern Spotted Skunk; SGCN Surveys on State-Owned Lands; Biological Collections Curation
T-9-R	7/1/2009	State Comprehensive Wildlife Conservation Strategy Development; State Comprehensive Wildlife Conservation Strategy Implementation; SGCN Surveys: Spotted Skunk, Long-Tailed Weasel; Biological Collections Curation
T-10-R	1/1/2009	Cogongrass Control in SGCN Habitats; Incorporation of GIS and Remote Sensing Into State Comprehensive Wildlife Conservation Strategy
T-11-P	7/1/2009	State Comprehensive Wildlife Conservation Strategy Revision
T-12-R	1/1/2009	SGCN Yazoo Darter Population Status, Habitat Use and Reproductive Biology
T-13-R	1/1/2010	Continued Investigation of GIS and Remote Sensing Applications to the State Comprehensive Wildlife Conservation Strategy
T-14	7/1/2010	State Comprehensive Wildlife Conservation Strategy Development; State Comprehensive Wildlife Conservation Strategy Implementation; SGCN Bat Surveys on State-Owned Lands; Gopher Tortoise Relocation; Biological Collections Curation; SGCN Surveys: Bald Eagle, Gopher Tortoise, Oldfield Mouse, Webster's Salamander, SGCN Shore Birds, Nightjar, Frecklebelly Madtom, Pearl Darter, Alabama Shad, Southern Redbelly Dace, Piebald Madtom, Diamondback Terrapin, Alabama Red-belly Turtle
T-15-R	1/1/2010	Monitoring of SGCN Swallow-Tailed Kite Pre-Migration Roosts
T-16	4/15/2011	Black Bear Population Assessment; Black Bear Movement Assessment; Black Bear Translocation; Paddlefish Rearing, Stocking and Monitoring; Whitenose Syndrome in SGCN Bats Monitoring and Testing; SGCN Surveys: Ironcolor Shiner, Piebald Madtom, Gopher Tortoise, Webster's Salamander, Spotted Skunk, Oldfield Mouse, SGCN Crayfishes, SGCN Mussels, Hellbender, SGCN Shore Birds; Biological Collections Curation

STATE WILDLIFE GRANT #	YEAR	STATE WILDLIFE GRANT INVESTMENTS IN MISSISSIPPI (2003 -2014)
T-17	10/1/2012	Black Bear Population Assessment; Black Bear Movement Assessment; Black Bear Translocation; Paddlefish Rearing, Stocking and Monitoring; Whitenose Syndrome in SGCN Bats Monitoring and Testing; SGCN Surveys: Ironcolor Shiner, Piebald Madtom, Gopher Tortoise, Webster's Salamander, Spotted Skunk, Oldfield Mouse, SGCN Crayfishes, SGCN Mussels, Hellbender, SGCN Shore Birds; Biological Collections Curation
T-18	10/1/2013	Black Bear Population Assessment; Black Bear Movement Assessment; Black Bear Translocation; Paddlefish Rearing, Stocking and Monitoring; Whitenose Syndrome in SGCN Bats Monitoring and Testing; SGCN Surveys: Ironcolor Shiner, Gopher Tortoise, Webster's Salamander, Spotted Skunk, Oldfield Mouse, SGCN Crayfishes, SGCN Mussels, Hellbender, SGCN Shore Birds; Biological Collections Curation

Improved coordination with other agencies/partners/resource managers

• Well described habitats and identification of suites of species of concern and recommended conservation actions have helped MDWFP managers and other agency, non-profits, and other partners focus their limited funds for conservation of species.
• Used as reference and guide for baseline documents for conservation easements and other best practices on private lands across Mississippi and in establishment of mitigation banks.

Changes to the 2015 SWAP

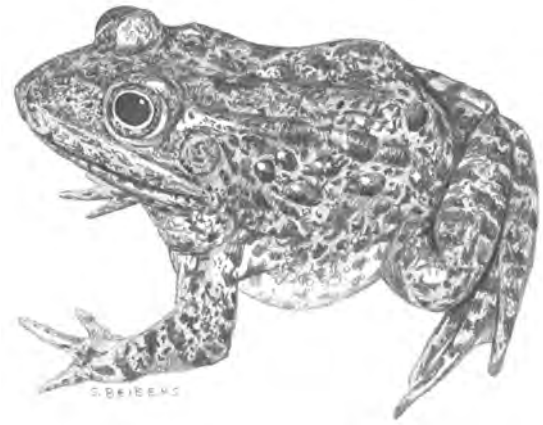
MDWFP is pleased to provide this comprehensive SWAP update for the entire state to improve the usefulness of this Plan as a resource and a means for conserving biodiversity. We have implemented several changes and enhancements to the SWAP as recommended by Teaming with Wildlife Committee in their voluntary *Best Practices for State Wildlife Actions Plans* (2011) including:

• Species of Greatest Conservation Need (SGCN) have been updated and arthropods were added to the list
• Habitat types and subtypes organized by ecoregions
• Stressors and conservation actions have been standardized in accordance with *A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions* (Salafsky et. al., 2008)
• Threats and recommended conservation actions have been updated for each habitat type
• Statewide threats are discussed in more detail
• Research and survey needs have been updated based on the investigations over the past 10 years
• A new section on Conservation Opportunity Areas in Mississippi has been added
• Habitat maps are refined and more detailed
• A discussion the potential impacts of climate change on priority species and habitats is included
• A list of reference sites in Mississippi for habitats is included in the Appendix

This document represents the summation 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 MDWFP and its partners, and the conservation planning efforts of many other organizations and agencies. We hope you find it to be a useful guide to fish and wildlife conservation in Mississippi.

CHAPTER 2

APPROACH AND METHODS



Organizational Structure

The primary responsibility for developing the Mississippi State Wildlife Action Plan (SWAP) was given to the Mississippi Museum of Natural Science (MMNS) which functions as the MDWFP's non-game wildlife program and includes the Mississippi Natural Heritage Program (MNHP). Over the past four years the MDWFP Conservation Resources Management Biologist, Kathy Shelton managed all aspects of the Action Plan development in concert with a contract Coordinator, Elizabeth Rooks-Barber. Similar to the process used to develop the original SWAP, three committees (Technical and Steering Committees and Advisors)) and a group of wildlife experts (Expert Advisors) were established to guide this effort and revision the Action Plan for the state of Mississippi. For a full list of committee members and advisors, see Appendix II. Each committee is described below.

The **2015 SWAP Technical Committee** was composed of MDWFP's 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 three years, and significant correspondence and work occurred between meetings. They also coordinated their efforts with an **Expert Advisors Team** composed of scientists in the state and region with expertise on the Species of Greatest Conservation Need (SGCN), and who provided additional input on species, habitats, threats and conservation actions. These experts also gave feedback individually to members of the Technical Committee on an as needed basis.

A **Steering Committee** composed of MDWFP management (wildlife, fisheries, and museum administrators) and the SWAP 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 communicated on an as needed basis through email, phone, or in person.

Stakeholder and Public Input

Representatives from 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 were invited via email or personal contact to participate in the original plan development and in the review and update of the Mississippi SWAP. During the revision of the SWAP, these stakeholders communicated primarily via email, and through individual and small group meetings and submitted comments through the SWAP page on the MDWFP website. Their role was to provide input and advice during the development of the strategy, recommend existing plans or strategies for incorporation, and to review and comment on drafts of the strategy prior to submission. In August 2015 a stakeholder meeting was held in the Mississippi Gulf Coast region with coastal and marine scientists and other interested parties and a statewide public webinar was conducted in cooperation with the Mississippi State University Cooperative Extension to review the draft SWAP update and seek input. During this meeting and webinar, SWAP Coordinators and Technical Committee members 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, as well as changes from the 2005 plan. Several stakeholders provided comments which were considered by the Technical Committee and incorporated into this revised plan. In addition to the assistance solicited from members of the Advisors, Expert Team and Technical and Steering Committees, public input has been sought in other capacities since the beginning of Mississippi's planning process and included:

1. A Mississippi SWAP page on the MDWFP **website** was developed in July 2015 (http://www.mdwfp.com/seek-study/state-wildlife-action-plan.aspx) and was used to post updated plan elements after review by Advisors, Technical and/or Steering Committees. The website was the primary method of providing SWAP revisions to the public and stakeholders for additional review and comments and included a direct link to email for feedback. The site will remain active as the 2015 SWAP is implemented and additional planning iterations are developed.

2. A press release announcing the SWAP update and changes to the SGCN list was sent to all press outlets in Mississippi on July 20, 2015. This release contained the website, email address and contact information for the Mississippi SWAP Coordinator. This resulted in several contacts from the public offering to assist in the revisions and implementation of the plan. The release was also included in the MDWFP Newsletter on August 6, 2015.

3. The **press release** above resulted in an interview and subsequent article published in the *McComb Enterprise-Journal* on July 26, 2015. The Associated Press ran this article which appeared in several state newspapers (e.g. *The Clarion Ledger,* GulfLive.com, Digital World News, *Jackson Sun Times*) on July 28, 2015. In addition, links to the articles and the website were posted on the social media site Facebook. See Appendix IV for press releases and articles.

4. Mississippi's SWAP Coordinator Kathy Shelton was a guest on the Mississippi Public Broadcasting Creature Comforts **radio show** on August 6, 2015 and discussed the importance of the SWAP as well as changes to the plan and the scheduled public webinar.

5. A **meeting** of coastal stakeholders was held on August 10, 2015 at the Sandhill Crane National Wildlife Refuge. A total of 19 people from 12 agencies or organizations attended. Many participants were involved in the original 2005 plan development.

6. With assistance from Mississippi State University (MSU) Extension Service, a public **webinar** was conducted on August 19, 2015 to review the draft plan, discuss the revision process, and invite comments. A total of 33 registrants from 17 Agencies or organizations participated in the webinar. The webinar was also recorded and posted on the MSU Distance Learning website for later viewing.

7. Collaboration with bordering states and other State Wildlife Action Plan coordinators occurred primarily during national and regional meetings hosted by the Association of Fish and Wildlife Agencies (AFWA). National SWAP meetings were held at the National Conservation Training Center in Shepherdstown, WV in June of 2013 and St. Louis, Missouri in July 2014. MDWFP Coordinators actively participated in all national meetings and collaborated with other southeastern states through the Southeastern Association of Fish and Wildlife Agencies (SEAFWA) Wildlife Diversity Committee. Coordinators attended the Wildlife Diversity Program Managers meeting held in Live Oak, Florida in January 2014 as well as the 2015 Wildlife and Sportfish Restoration Region 4 Federal Aid Meeting in Gatlinburg, TN in May. Mississippi Action Plan coordinators corresponded with other state coordinators between meetings via e-mail and telephone. A summary of public and stakeholder comments and how MDWFP addressed them is in Appendix IV.

Coordination with Other Agencies

Development of this document was accomplished in coordination with several public wildlife agencies, universities, conservation organizations and land managers in Mississippi and in the Southeast U.S. This coordination was ensured by inclusion of representatives of these agencies and organizations serving as Advisors, through individual 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 the SWAP where possible. Other interested parties also contributed to the process through comments via the MDWFP website.

Element seven mandated by Congress in the development of each state's SWAP requires the lead agency 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 one Native American tribe listed on the federal register in Mississippi -- the Mississippi Band of Choctaw Indians. They own and manage almost 29,000 acres in several counties primarily in east-central Mississippi. The tribal biologist participated in activities related to the revisions, including webinars and email correspondence.

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

Selection and Revision of Species of Greatest Conservation Need (SGCN)

The revision of the SGCN list for the 2015 SWAP involved reviewing and updating the information used to develop the original list in 2005. New information gathered on species was considered as well as any changes in State or Global ranks (according to NatureServe that assigns range wide or global status and status within the state based - http://explorer.natureserve.org/nsranks.htm), federal or state threatened or endangered status, etc. Experts throughout the state and region were consulted during this evaluation of the original list. This evaluation of the original list resulted in the addition or removal of several species and changes as follows.

The 2005 SGCN list did not include tracked gastropods and insects, marine fish and marine invertebrates which were deemed insufficiently well-known to warrant status evaluation. For the 2015 revision, certain insect species were included if it there was sufficient evidence for concern. A total of 20 species were added (1 mussel, 2 crustaceans, 1 arachnid, 9 insects, 2 amphibians, 5 reptiles, 1 mammal), species were removed (2 mussels, 3 crustaceans, 2 amphibians, 2 birds), and the Tier assignments were changed for 12 bird species (5 Tier assignments were lowered, 7 Tier assignments were raised). Note that a four-tiered approach was developed by Mississippi's 2005 SWAP Technical Committee to determine where Mississippi's SGCN rank within the list and as an aid in evaluation of the relative conservation priority of each species. This priority approach was also designed to aid in determination of the most critical habitats (in terms of importance to SGCN) in the state and to assist in ranking of conservation approaches in the future. Because there is no national standardized method for states to follow in prioritization of the relative conservation need of SGCN, the Technical Committee selected a set of criteria that can be applied objectively across the entire range of animal taxa included in this report. More information on ranks, tiers and the process of selecting SGCN can be found in Chapter 3.

Threats and Conservation Actions

The third element required by Congress in the development of the SWAP involves the description of problems that 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. *The Best Practices for State Wildlife Action Plans* (2012) recommends using the definitions and hierarchy found in the Salafsky et al. (2008) paper entitled *A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions.* Creating consistency across state plans will make multi-state cooperation and projects easier to design by identifying shared threats and actions across states. The Technical Committee completed a comparison of threats from the 2005 plan and updated all SGCN and habitat threats using the new definitions. 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 identification of priority conservation actions. More information on threats and conservation actions can be found in Chapter 4.

Classifying Wildlife Habitats in Mississippi

Element two requires each state to produce "descriptions of locations and relative condition of key habitats and ecological community types essential to conservation of species identified as SGCN". To originally address this element, experts used the survey (Appendix III) to identify and note the relative significance of the habitats and ecological communities for potential SGCN. Associating SGCN with 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.

The Mississippi Natural Heritage Program (MNHP) *Ecological Community List* was simplified and incorporated within the SWAP to expedite the process of associating SGCN with their habitats and communities. The MNHP 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 system for all types of wetlands found throughout the United States including 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 MNHP 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 X for information on interpreting those ranks).

For the purposes of this plan, the 159 ecological community types used in the MNHP were combined into 15 broad habitat types and 63 subtypes. The following table lists the habitats which are generally organized on the basis of land type, vegetation and the availability of moisture (by ecoregion).

To aid the reader, a table providing a crosswalk of the MNHP ecological community types with the SWAP habitat types and subtypes is included in Appendix VIII. We have also added Appendix IX with a list of reference sites in Mississippi for each habitat subtype to this updated plan.

See Chapter 5 for general descriptions of conditions for habitat types and subtypes located within the four ecoregions of Mississippi.

Table 2.1 Wildlife Habitat Types and Subtypes in Each Ecoregion of Mississippi

HABITAT TYPE/SUBTYPE NAME	ECOREGIONS*			
	NGM	EGCP	UEGCP	MSRAP
Xeric-Mesic Upland Forests/Woodlands		●		●
Xeric Hardwood Forests		●	●	
Xeric Longleaf Pine Forests		●		
Xeric-Mesic Hardwood Forests		●	●	
Xeric-Mesic Shortleaf/Loblolly Pine Forests		●	●	
Mesic Upland Forests		●	●	
Southern Mixed Hardwood Forests		●	●	
Mesic Longleaf Pine Savanna/Forests		●		
Loess Hardwood Forests			●	
Lower Slope/High Terrace Hardwood Forests		●	●	
Rock Outcrops and Caves		●	●	
Rock Outcrops		●	●	
Caves		●	●	
Bottomland Hardwood Forests		●	●	●
Bottomland Hardwood Forests		●	●	●
Swamp Forests		●	●	●
Bald Cypress/Gum Swamp Forests		●	●	●
Small Stream Swamp Forests		●	●	
Riverfront Forests/Herblands/Sandbars		●	●	●
Cottonwood/Black Willow/River Birch Woodlands		●	●	●
Sandbars		●	●	●
Wet Pine Savannas/Flatwoods		●		
Wet Pine Savannas		●		
Slash Pine Flatwoods		●		
Pitcherplant Bogs		●		
Prairies		●	●	
Northeast Prairie/Cedar Glades			●	
Jackson Prairie		●	●	
Inland Freshwater Marshes		●	●	●
Freshwater Marshes		●	●	●
Lacustrine (Lentic) Communities		●	●	●
Oxbow Lakes		●	●	●
Reservoirs		●	●	
Ephemeral (Temporary) Ponds		●	●	●
Beaver Ponds		●	●	●

HABITAT TYPE/SUBTYPE NAME	ECOREGIONS*			
	NGM	EGCP	UEGCP	MSRAP
Upland Maritime and Estuarine Fringe Habitats	●			
Barrier Island Uplands	●			
Barrier Island Wetlands	●			
Barrier Island Beaches	●			
Mainland Beaches	●			
Shell Middens and Estuarine Shrublands	●			
Maritime Woodlands	●			
Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)	●			
Estuarine Bays, Lakes and Tidal Streams	●			
Estuarine Marshes	●			
Salt Pannes	●			
Seagrass Beds	●			
Mollusk Reefs	●			
Mississippi Sound	●			
Barrier Island Passes	●			
Marine Habitats (Outside Barrier Islands)	●			
Marine Habitats (Smooth Bottoms)	●			
Hard Bottoms and Oceanic Reefs	●			
Artificial Habitats	●	●	●	●
Urban and Suburban Lands	●	●	●	●
Buildings, Bridges, Overpasses, etc.	●	●	●	●
Utility Right-of-ways	●	●	●	●
Hay and Pasture Lands		●	●	●
Pine Plantations		●	●	
Shrublands		●	●	●
Row Crops		●	●	●
Artificial Ponds		●	●	●
Man-made Beaches	●			
Artificial Reefs	●			

HABITAT TYPE/SUBTYPE NAME	ECOREGIONS*			
	NGM	EGCP	UEGCP	MSRAP
Streams (Lotic Communities)	●	●	●	●
Mississippi River				●
Mississippi Alluvial Plain (MAP)				●
Upper Coastal Plain, Yazoo Drainage			●	
Northeast Hills, Tennessee River Drainage			●	
Tombigbee Drainage			●	
Lower Mississippi North Drainage (LMND) Hatchie and Wolf Systems			●	
Upper Coastal Plain, Pearl River Drainage			●	
Lower Coastal Plain, Pearl River Drainage	●	●		●
Big Black River Drainage			●	
Pascagoula Drainage	●	●	●	
Coastal Rivers Drainage	●	●	●	
Lake Ponchartrain Drainage		●		
Lower Mississippi South Drainage		●		

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

Selected References for Chapter 2

Association of Fish and Wildlife Agencies, Teaming with Wildlife Committee, State Wildlife Action Plan (SWAP) Best Practices Working Group. 2012. Best Practices for State Wildlife Action Plans – Voluntary Guidance to States for Revision and Implementation. Washington (DC): Association of Fish and Wildlife Agencies. 80 pp.

Mississippi Natural Heritage Program. 2005. Ecological Community List. Museum of Natural Science, Mississippi Department of Wildlife, Fisheries, & Parks. Jackson, Mississippi.

Salafsky, N., D. Salzer, A.J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S.H.M. Butchart, B. Collen, L.L. Master, S. O'Connor, and D. Wilkie. 2008. A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions. Conservation Biology 22:897-911.

CHAPTER 3

SELECTING AND PRIORITIZING MISSISSPPI'S SPECIES OF GREATEST CONSERVATION NEED

The MNHP operates under the auspices of the MDWFP through the MMNS bureau. It maintains a database of approximately 400 species of animals in Mississippi. This includes vertebrates and 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.

There are approximately 1500 known species of animals in Mississippi which can be tracked by the MNHP, including all of the representatives of the groups gastropoda (snails); bivalvia (mussels); malacostraca (amphipods, crayfish, shrimp, isopods); arachnida (spiders, mites, ticks); insects; fish (including the cephalaspidomorphi - jawless fish/lampreys) and the osteichthyes (bony fish); amphibians (frogs and salamanders); reptiles (lizards, snakes, turtles, alligators); birds; and mammals. Tracking entails maintaining a database on occurrence localities, population status, and habitat conditions for tracked species. Many of the animals in the groups listed above are common, however, and are not tracked. Tracking is focused upon species known or suspected to occur in low numbers (S1 through S3 including the borderline ranking of S3S4; See definitions below). These are designated as *Species of Special Concern*. There are 389 special concern animals, which include 8 gastropods, 49 bivalves, 37 crayfish and shrimp, 1 arachnid, 69 insects, 1 lamprey, 76 fish, 21 amphibians, 37 reptiles, 72 birds, and 18 mammals.

In preparation for the original 2005 SWAP and to develop the original SGCN list, the *Animals of Special Concern* list was evaluated by the SWAP Technical Committee and our Expert Team consisting of 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 original survey was sent to 81 individuals around the state and region, and 46 responded by completing 1,004 surveys. For species that were considered for addition in the current revision, a similar survey was conducted to gather consistent data about each new species.

The original 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 of the vertebrates, mussels and crayfish. From that survey and review process, the 2005 SGCN list was developed for the purposes of Mississippi's SWAP. For the 2015 SWAP revision, the original list was reviewed and updated. Any changes in State or Federal status were updated. The MDWFP Technical Committee and Expert Team reviewed the status of each species and made changes as needed. A total of 20 species were added (1 mussel, 2 crustaceans, 1 arachnid, 10 insects, 2 fishes, 2 amphibians, 1 reptile, 1 bird, 1 mammal), 10 species were removed (2 mussels, 3 crustaceans, 2 amphibians, 3 birds), and the Tier assignments were changed for 12 species (5 Tier assignments were lowered, 7 Tier assignments were raised). For the 2015 plan an effort was made to include those arthropods that were of regional or national concern. Of the 20 species added, 11 were arthropod species. There are a total of 310 species on the 2015 SGCN list: 49 mussels, 32 crustaceans, 1 arachnid, 10 insects, 76 fishes, 19 amphibians, 36 reptiles, 69 birds, and 18 mammals.

The SGCN list, which can be found at the end of this chapter, includes:

- Those species listed by state or federal statute as threatened or endangered.
- Species tracked by the Mississippi Natural Heritage Program, which includes species ranked as S1 (critically imperiled), S2 (imperiled) or (S3) vulnerable.
- Those species with low population density, low reproductive potential and/or 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 MNHP's list of *Animals of Special Concern* were excluded from selection as SGCN. 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 the Mississippi SGCN list as individual species, we elected to include, as groups, lists of pelagic birds and migratory songbirds and shorebirds. These bird species (listed in Appendix VII) migrate through or are rare visitors to Mississippi. Also, individual migratory songbird species which breed in Mississippi, but which weren't considered of sufficient 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.

Definition Of Ranks For Animals Of Special Concern (Used To Develop The SGCN List)

HERITAGE RANKS: The MNHP uses the Heritage ranking system developed by The Nature Conservancy (http://explorer.natureserve.org/nsranks.htm). Each species is assigned a **GRANK** representing its range wide or global status and an **SRANK** representing its status in the state. A guide to ranking criteria and symbols follows:

S1 Critically imperiled in Mississippi because of extreme rarity (5 or fewer occurrences or very few remainingindividuals or acres of habitat) or because of some factor(s) making it vulnerable to extirpation.
S2 Imperiled in Mississippi because of rarity (6 to 20 occurrences) or because of some factor(s) making it vulnerable to extirpation.
S3 Rare or uncommon in Mississippi (21-100 occurrences).
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 US)
SA Accidental: accidental or casual in the state (i.e. infrequent and far outside usual range).
SNA Not Applicable: A conservation status rank is not applicable because the species is not a suitable target for conservation activities
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: Eighty-five 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 US 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 the following categories in environmental planning.

PS **POPULATION SEGMENT / DISTINCT POPULATION SEGMENT.** The species or subspecies is listed in a portion of the population or range. The Distinct Population Segment is described geographically instead of biologically

Prioritization of Mississippi's Species of Greatest Conservation Need

A four-tiered approach was developed by the 2005 SWAP Technical Committee to determine where Mississippi's SGCN rank within the list and as an aid in evaluation of the relative conservation priority of each species. Because there is no national standardized method for states to follow in prioritization of the relative conservation need of SGCN, the Technical Committee selected a set 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).

The Technical Committee elected to evaluate species based on seven relatively objective criteria that can be broadly applied. The 2005 ranking system described below is a matrix of seven criteria (designated as A-G, described below) under which each species would receive a score between one (1) and three (3) for all criteria except for C which would score one (1) to four (4) and E which would receive a score of zero (0) or one (1).

Description of Each Criterion Used to Prioritize SGCN

A) Nationwide Conservation Priority Rank (www.natureserve.org)
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 MNHP 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.

B) Eligibility of Species to Receive Other Sources of Federal Aid Funding
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 original Technical Committee chose to follow an evaluation method that several states used 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. For example 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.

C) Percent of Population Size or Geographic Range within Mississippi
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 species' geographic range. Because population size is unknown for most species, the geographic range is used as a surrogate for population size.

D) Trend in Population Size
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 population 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.

E) Quantity/Quality of Existing Data Available to Support Designation as a SGCN
Federal and state listed species and candidate species have been identified as those species at greatest risk of endangerment through a formal public process. The rationale for this criterion is to separate those species which have been previously identified as a species of conservation concern through other established processes from those species which are regionally endemic, but appear to have stable or secure populations. A species already listed as federally or state endangered would get a score of 1. All other species would receive 0.

F) Summary of Knowledge Level of Species
Through the survey, 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.

G) Statewide Conservation Priority Rank (MNHP)
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).

Description of Tiers for SGCN

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

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 SGCN in the event that taxa may be rediscovered, reintroduced from populations existing outside the state, or are discovered to be regular, non-accidental components of the Mississippi's fauna.

Table 3.1: Mississippi Species of Greatest Conservation Need (2015)

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
MUSSELS							
UNIONIDAE	1	*Actinonaias ligamentina*	Mucket	G5	S1		LE
UNIONIDAE	3	*Anodonta hartfieldorum*	Cypress Floater	G4	S3S4		
UNIONIDAE	2	*Anodontoides radiatus*	Rayed Creekshell	G3	S2		
UNIONIDAE	3	*Arcidens confragosus*	Rock Pocketbook	G4	S2S3		
UNIONIDAE	1	*Cyclonaias tuberculata*	Purple Wartyback	G5	S1		LE
UNIONIDAE	4	*Cyprogenia aberti*	Western Fanshell	G2	SH		
UNIONIDAE	2	*Ellipsaria lineolata*	Butterfly	G4	S2S3		
UNIONIDAE	1	*Elliptio arca*	Alabama Spike	G3Q	S1S2		
UNIONIDAE	1	*Elliptio arctata*	Delicate Spike	G3G4	S1		LE
UNIONIDAE	1	*Elliptio dilatata*	Spike	G5	S1		LE
UNIONIDAE	1	*Epioblasma brevidens*	Cumberlandian Combshell	G1	S1	LE,XN	LE
UNIONIDAE	1	*Epioblasma penita*	Southern Combshell	G1	S1	LE	LE
UNIONIDAE	1	*Epioblasma triquetra*	Snuffbox	G3	S1	LE	LE
UNIONIDAE	1	*Hamiota perovalis*	Orange-nacre Mucket	G2	S1	LT	LE
UNIONIDAE	2	*Lampsilis cardium*	Plain Pocketbook	G5	S3		
UNIONIDAE	1	*Lampsilis hydiana*	Louisiana Fatmucket	G4	S2?		
UNIONIDAE	3	*Lampsilis siliquoidea*	Fatmucket	G5	S3		
UNIONIDAE	2	*Lampsilis straminea straminea*	Rough Fatmucket	G5T3	S3		
UNIONIDAE	3	*Lasmigona complanata*	White Heelslpitter	G5	S3		
UNIONIDAE	1	*Lasmigonia alabamensis*	Alabama Heelsplitter	G3	S2		
UNIONIDAE	1	*Ligumia recta*	Black Sandshell	G4G5	S1		
UNIONIDAE	1	*Medionidus acutissimus*	Alabama Moccasinshell	G2	S1	LT	LE
UNIONIDAE	1	*Obovaria jacksoniana*	Southern Hickorynut	G2	S1		
UNIONIDAE	1	*Obovaria subrotunda*	Round Hickorynut	G4	S2		
UNIONIDAE	1	*Obovaria unicolor*	Alabama Hickorynut	G3	S1S2		
UNIONIDAE	1	*Plethobasus cyphyus*	Sheepnose	G3	S1	LE	LE
UNIONIDAE	2	*Pleurobema beadleianum*	Mississippi Pigtoe	G2G3	S3?		
UNIONIDAE	4	*Pleurobema curtum*	Black Clubshell	G1	SX	LE	LE
UNIONIDAE	1	*Pleurobema decisum*	Southern Clubshell	G2	S1	LE	LE
UNIONIDAE	4	*Pleurobema marshalli*	Flat Pigtoe	GH	SX	LE	LE
UNIONIDAE	1	*Pleurobema perovatum*	Ovate Clubshell	G1	S1	LE	LE

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
UNIONIDAE	1	*Pleurobema rubrum*	Pyramid Pigtoe	G2	S1		LE
UNIONIDAE	4	*Pleurobema taitianum*	Heavy Pigtoe	G1	SX	LE	LE
UNIONIDAE	1	*Pleuronaia barnesiana*	Tennessee Pigtoe	G2G3	S1		
UNIONIDAE	1	*Pleuronaia dolabelloides*	Slabside Pearlymussel	G2	S1	LE	LE
UNIONIDAE	3	*Potamilus alatus*	Pink Heelsplitter	G5	S2		
UNIONIDAE	1	*Potamilus capax*	Fat Pocketbook	G1	S1	LE	LE
UNIONIDAE	1	*Potamilus inflatus*	Inflated Heelsplitter	G1G2Q	SH	LT	LE
UNIONIDAE	3	*Ptychobranchus fasciolaris*	Kidneyshell	G4G5	S1		LE
UNIONIDAE	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot	G3T3	S1	LT	LE
UNIONIDAE	4	*Quadrula metanevra*	Monkeyface	G4	SX		LE
UNIONIDAE	2	*Quadrula nodulata*	Wartyback	G4	S3		
UNIONIDAE	2	*Quadrula rumphiana*	Ridged Mapleleaf	G3	S2		
UNIONIDAE	4	*Quadrula stapes*	Stirrupshell	GH	SX	LE	LE
UNIONIDAE	1	*Strophitus connasaugaensis*	Alabama Creekmussel	G3	S1		
UNIONIDAE	2	*Strophitus subvexus*	Southern Creekmussel	G3	S2		
UNIONIDAE	2	*Strophitus undulatus*	Squawfoot	G5	S1		
UNIONIDAE	3	*Truncilla truncata*	Deertoe	G5	S3		
UNIONIDAE	2	*Uniomerus declivis*	Tapered Pondhorn	G5	S2S3		
CRUSTACEANS							
CAMBARIDAE	2	*Cambarellus diminutus*	Least Crayfish	G3	S2		
CAMBARIDAE	2	*Cambarellus lesliei*	Angular Dwarf Crayfish	G3	S2		
CAMBARIDAE	3	*Cambarus girardianus*	Tanback Crayfish	G5	S2		
CAMBARIDAE	3	*Cambarus rustififormis*	Depression Crayfish	G5	S1		
CAMBARIDAE	1	*Fallicambarus burrisi*	Burris' Burrowing Crayfish	G3	S2		
CAMBARIDAE	2	*Fallicambarus byersi*	Lavender Burrowing Crayfish	G4	S3		
CAMBARIDAE	1	*Fallicambarus danielae*	Speckled Burrowing Crayfish	G2	S2		
CAMBARIDAE	1	*Fallicambarus gordoni*	Camp Shelby Burrowing Crayfish	G1	S1	C	LE
CAMBARIDAE	1	*Hobbseus attenuatus*	Pearl Rivulet Crayfish	G2	S2		
CAMBARIDAE	1	*Hobbseus cristatus*	Crested Rivulet Crayfish	G3	S2?		
CAMBARIDAE	1	*Hobbseus orconectoides*	Oktibbeha Rivulet Crayfish	G3	S1		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
CAMBARIDAE	1	*Hobbseus petilus*	Tombigbee Rivulet Crayfish	G2	S2		
CAMBARIDAE	2	*Hobbseus prominens*	Prominence Rivulet Crayfish	G4G5	S2?		
CAMBARIDAE	1	*Hobbseus valleculus*	Choctaw Rivulet Crayfish	G1	S1		
CAMBARIDAE	1	*Hobbseus yalobushensis*	Yalobusha Rivulet Crayfish	G3	S2		
CAMBARIDAE	2	*Orconectes etnieri*	Ets Crayfish	G4G5	S3?		
CAMBARIDAE	1	*Orconectes hartfieldi*	Yazoo Crayfish	G2	S2		
CAMBARIDAE	2	*Orconectes jonesi*	Sucarnoochee River Crayfish	G3	S3		
CAMBARIDAE	1	*Orconectes mississippiensis*	Mississippi Crayfish	G2G3	S2S3		
CAMBARIDAE	3	*Orconectes spinosus*	Coosa River Crayfish	G4	S1		
CAMBARIDAE	3	*Orconectes validus*	Powerful Crayfish	G5	S1		
CAMBARIDAE	3	*Orconectes wrightii*	Hardin Crayfish	G2	S1		
CAMBARIDAE	2	*Procambarus ablusus*	Hatchie River Crayfish	G4	S3		
CAMBARIDAE	1	*Procambarus barbiger*	Jackson Prairie Crayfish	G2	S2		
CAMBARIDAE	2	*Procambarus bivittatus*	Ribbon Crayfish	G4	S3		
CAMBARIDAE	1	*Procambarus fitzpatricki*	Spiny-tailed Crayfish	G2	S2		
CAMBARIDAE	2	*Procambarus hagenianus vesticeps*	Egyptian Crayfish	G3T3	S3S4		
CAMBARIDAE	1	*Procambarus lagniappe*	Lagniappe Crayfish	G2	S1		
CAMBARIDAE	2	*Procambarus lecontei*	Mobile Crayfish	G3G4	S2		
CAMBARIDAE	1	*Procambarus lylei*	Shutispear Crayfish	G2	S2		
CAMBARIDAE	2	*Procambarus penni*	Pearl Blackwater Crayfish	G3	S3		
CAMBARIDAE	3	*Procambarus shermani*	Gulf Crayfish	G4	S?		
ARACHNIDS							
IXODIDAE	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick	G2G3	S1		
INSECTS							
ACRIDIDAE	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper	G5	S1		
HISTERIDAE	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle	G2G3	S1		
STAPHYLINIDAE	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle	G2	S1		
SCARABAEIDAE	1	*Aphodius troglodytes*	Coprophagous Beetle	GNR	S1		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
SCARABAEIDAE	1	*Onthophagus polyphemi sparsisetosus*	A Copraphagous Beetle	G2G3T2	S1S2		
FORMICIDAE	1	*Pogonomyrmex badius*	Florida Harvester Ant	G5	S2		
NYMPHALIDAE	1	*Neonympha mitchelli mitchelli*	Mitchell's Satyr	G2T2	S1	LE	
ASILIDAE	1	*Machimus polyphemi*	A Robber Fly	G2	S1		
ANTHOMYIIDAE	1	*Eutrichota gopheri*	A Copraphagous Fly	G2G3	S2		
GRYLLOTALPIDAE	4	*Gryllotalpa major*	Prairie Mole Cricket	G3	SH		
FISHES							
PETROMYZONTIDAE	2	*Ichthyomyzon castaneus*	Chestnut Lamprey	G4	S2S3		
ACIPENSERIDAE	1	*Acipenser oxrinchus desotoi*	Gulf Sturgeon	G3T2	S1	LT	LE
ACIPENSERIDAE	1	*Scaphirhynchus albus*	Pallid Sturgeon	G1	S1	LE	LE
ACIPENSERIDAE	1	*Scaphirhynchus platorynchus*	Shovelnose Sturgeon	G4	S3?	LT	LE
ACIPENSERIDAE	1	*Scaphirhynchus suttkusi*	Alabama Sturgeon	G1	SH	LE	LE
POLYODONTIDAE	3	*Polyodon spathula*	Paddlefish	G4	S3		
LEPISOSTEIDAE	3	*Atractosteus spatula*	Alligator Gar	G3G4	S2		
CLUPEIDAE	1	*Alosa alabamae*	Alabama Shad	G3	S1	C	
CYPRINIDAE	3	*Clinostomus funduloides*	Rosyside Dace	G5	S2		
CYPRINIDAE	2	*Cyprinella callistia*	Alabama Shiner	G5	S2		
CYPRINIDAE	2	*Cyprinella galactura*	Whitetail Shiner	G5	S1		
CYPRINIDAE	3	*Cyprinella spiloptera*	Spotfin Shiner	G5	S2		
CYPRINIDAE	2	*Cyprinella whipplei*	Steelcolor Shiner	G5	S3		
CYPRINIDAE	3	*Lythrurus fasciolaris*	Rosefin Shiner	G5	S2S3		
CYPRINIDAE	4	*Macrhybopsis gelida*	Sturgeon Chub	G3	SH		
CYPRINIDAE	4	*Macrhybopsis meeki*	Sicklefin Chub	G3	SH		
CYPRINIDAE	2	*Notropis amnis*	Pallid Shiner	G4	S3		
CYPRINIDAE	2	*Notropis boops*	Bigeye Shiner	G5	S1		LE
CYPRINIDAE	2	*Notropis candidus*	Silverside Shiner	G4	S2		
CYPRINIDAE	1	*Notropis chalybaeus*	Ironcolor Shiner	G4	S1		LE
CYPRINIDAE	2	*Notropis edwardraneyi*	Fluvial Shiner	G4	S1		
CYPRINIDAE	1	*Notropis melanostomus*	Blackmouth Shiner	G2	S1S2		
CYPRINIDAE	2	*Notropis micropteryx*	Highland Shiner	G5	S2		
CYPRINIDAE	3	*Notropis sabinae*	Sabine Shiner	G3	S3		
CYPRINIDAE	2	*Phenacobius mirabilis*	Suckermouth Minnow	G5	S1		LE

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
CYPRINIDAE	2	*Phoxinus erythrogaster*	Southern Redbelly Dace	G5	S2		LE
CYPRINIDAE	4	*Platygobio gracilis*	Flathead Chub	G5	SH		
CYPRINIDAE	2	*Pteronotropis welaka*	Bluenose Shiner	G3G4	S3		
CYPRINIDAE	2	*Rhinichthys atratulus*	Blacknose Dace	G5	S1		
CATOSTOMIDAE	2	*Cycleptus elongatus*	Blue Sucker	G3G4	S3		
CATOSTOMIDAE	2	*Cycleptus meridionalis*	Southern Blue Sucker	G3G4	S3		
CATOSTOMIDAE	3	*Hypentelium etowanum*	Alabama Hog Sucker	G5	S3		
CATOSTOMIDAE	3	*Ictiobus niger*	Black Buffalo	G5	S3		
CATOSTOMIDAE	2	*Moxostoma anisurum*	Silver Redhorse	G5	S1		
CATOSTOMIDAE	2	*Moxostoma carinatum*	River Redhorse	G4	S3		
CATOSTOMIDAE	2	*Moxostoma duquesnei*	Black Redhorse	G5	S1		
CATOSTOMIDAE	3	*Moxostoma erythrurum*	Golden Redhorse	G5	S3		
CATOSTOMIDAE	2	*Moxostoma macrolepidotum*	Shorthead Redhorse	G5	S1		
ICTALURIDAE	4	*Noturus exilis*	Slender Madtom	G5	SH		LE
ICTALURIDAE	2	*Noturus flavus*	Stonecat	G5	S1		
ICTALURIDAE	1	*Noturus gladiator*	Piebald Madtom	G3	S1		LE
ICTALURIDAE	1	*Noturus munitus*	Frecklebelly Madtom	G3	S2		LE
FUNDULIDAE	2	*Fundulus dispar*	Northern Starhead Topminnow	G4	S3		
FUNDULIDAE	2	*Fundulus euryzonus*	Broadstripe Topminnow	G2	S2		
FUNDULIDAE	2	*Fundulus jenkinsi*	Saltmarsh Topminnow	G2	S3	C	
FUNDULIDAE	4	*Leptolucania ommata*	Pygmy Killifish	G5	SH		
POECILIIDAE	3	*Heterandria formosa*	Least Killifish	G5	S3		
COTTIDAE	2	*Cottus carolinae*	Banded Sculpin	G5	S1		
CENTRARCHIDAE	1	*Ambloplites rupestris*	Rock Bass	G5	S1		
CENTRARCHIDAE	3	*Enneacanthus gloriosus*	Bluespotted Sunfish	G5	S3		
MORONIDAE	2	*Monrone saxatilis*	Striped Bass	G5	S1		
PERCIDAE	4	*Ammocrypta clara*	Western Sand Darter	G3	SH		
PERCIDAE	2	*Ammocrypta meridiana*	Southern Sand Darter	G4	S3		
PERCIDAE	2	*Crystallaria asprella*	Crystal Darter	G3	S1		LE
PERCIDAE	3	*Etheostoma asprigene*	Mud Darter	G4G5	S3		
PERCIDAE	2	*Etheostoma blennioides*	Greenside Darter	G5	S1		LE
PERCIDAE	2	*Etheostoma duryi*	Black Darter	G4	S1		
PERCIDAE	3	*Etheostoma flabellare*	Fantail Darter	G5	S2		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
PERCIDAE	2	*Etheostoma kennicotti*	Stripetail Darter	G4G5	S2		
PERCIDAE	2	*Etheostoma lachneri*	Tombigbee Darter	G4	S3		
PERCIDAE	2	*Etheostoma nigripinne*	Blackfin Darter	G4	S2		
PERCIDAE	1	*Etheostoma raneyi*	Yazoo Darter	G2	S2		
PERCIDAE	1	*Etheostoma rubrum*	Bayou Darter	G1	S1	LT	LE
PERCIDAE	3	*Etheostoma rufilineatum*	Redline Darter	G5	S2		
PERCIDAE	3	*Etheostoma rupestre*	Rock Darter	G4	S3		
PERCIDAE	1	*Etheostoma zonifer*	Backwater Darter	G3G4	S1		
PERCIDAE	2	*Etheostoma zonistium*	Bandfin Darter	G4G5	S2		
PERCIDAE	1	*Percina aurora*	Pearl Darter	G1	S1	C	LE
PERCIDAE	2	*Percina evides*	Gilt Darter	G4	S1		
PERCIDAE	3	*Percina kathae*	Mobile Logperch	G4	S3		
PERCIDAE	1	*Percina lenticula*	Freckled Darter	G2	S2		
PERCIDAE	2	*Percina phoxocephala*	Slenderhead Darter	G5	S1		LE
PERCIDAE	1	*Percina tanasi*	Snail Darter	G2G3		LT	
PERCIDAE	3	*Sander canadense*	Sauger	G5	S3		
PERCIDAE	3	*Sander vitreum*	Walleye	G5	S2?		
PERCIDAE	2	*Sander sp1*	Southern Walleye	G3	S1S2		
AMPHIBIANS							
CRYPTOBRANCHIDAE	1	*Cryptobranchus alleganiensis*	Hellbender	G3G4	S1	(PS)	LE
AMPHIUMIDAE	1	*Amphiuma pholeter*	One-toed Amphiuma	G3	S1		LE
AMBYSTOMATIDAE	3	*Ambystoma texanum*	Small-mouthed Salamander	G5	S3		
AMBYSTOMATIDAE	4	*Ambystoma tigrinum*	Tiger Salamander	G5	SH	(PS)	
PLETHODONTIDAE	2	*Aneides aeneus*	Green Salamander	G3G4	S1		LE
PLETHODONTIDAE	2	*Desmognathus cf. auriculatus*	A Southern Dusky Salamander	G4?	S2S3		
PLETHODONTIDAE	2	*Eurycea lucifuga*	Cave Salamander	G5	S1		LE
PLETHODONTIDAE	2	*Gyrinophilus porphyriticus*	Spring Salamander	G5	S1		LE
PLETHODONTIDAE	2	*Hemidactylium scutatum*	Four-Toed Salamander	G5	S2S3		
PLETHODONTIDAE	2	*Plethodon ventralis*	Southern Zigzag Salamander	G4	S2		
PLETHODONTIDAE	2	*Plethodon websteri*	Webster's Salamander	G3G4	S2		
PLETHODONTIDAE	2	*Pseudotriton montanus*	Mud Salamander	G5	S2		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
PLETHODONTIDAE	3	*Pseudotriton ruber*	Red Salamander	G5	S3		
HYLIDAE	3	*Pseudacris brachyphona*	Mountain Chorus Frog	G5	S3		
HYLIDAE	2	*Pseudacris ornata*	Ornate Chorus Frog	G5	S1		
RANIDAE	2	*Lithobates areolatus*	Crawfish Frog	G4	S2		
RANIDAE	1	*Lithobates heckscheri*	River Frog	G5	S1		
RANIDAE	3	*Lithobates palustris*	Pickerel Frog	G5	S3		
RANIDAE	1	*Lithobates sevosus*	Dusky Gopher Frog	G1	S1	LE	LE
REPTILES							
CHELYDRIDAE	2	*Macrochelys temminckii*	Alligator Snapping Turtle	G3G4	S3		
EMYDIDAE	3	*Deirochelys reticularia miaria*	Western Chicken Turtle	G5T5	S3?		
EMYDIDAE	2	*Graptemys flavimaculata*	Yellow-Blotched Map Turtle	G2	S2	LT	LE
EMYDIDAE	2	*Graptemys gibbonsi*	Pascagoula Map Turtle	G2G3	S2		
EMYDIDAE	2	*Graptemys nigrinoda*	Black-knobbed Map Turtle	G3	S2		LE
EMYDIDAE	2	*Graptemys oculifera*	Ringed Map Turtle	G2	S2	LT	LE
EMYDIDAE	2	*Graptemys pearlensis*	Pearl River Map Turtle	G2G3	S2		
EMYDIDAE	2	*Graptemys pulchra*	Alabama Map Turtle	G4	S2?		
EMYDIDAE	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin	G4T3	S2		
EMYDIDAE	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle	G1	S1	LE	LE
TESTUDINIDAE	2	*Gopherus polyphemus*	Gopher Tortoise	G3	S2	PS:LT	LE
CHELONIIDAE	2	*Caretta caretta*	Loggerhead Sea Turtle	G3	S1B,SNA	LT	LE
CHELONIIDAE	3	*Chelonia mydas*	Green Sea Turtle	G3	SNA	LE,LT	LE
CHELONIIDAE	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle	G3	SNA	LE	LE
CHELONIIDAE	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle	G1	S1N	LE	LE
DERMOCHELYIDAE	3	*Dermochelys coriacea*	Leatherback Sea Turtle	G2	SNA	LE	LE
SCINCIDAE	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink	G5T5	S2S3		
ANGUIDAE	2	*Ophisaurus attenuatus*	Slender Glass Lizard	G5	S2S3		
ANGUIDAE	1	*Ophisaurus mimicus*	Mimic Glass Lizard	G3	SH		
COLUBRIDAE	4	*Drymarchon couperi*	Eastern Indigo Snake	G3	SX	LT	LE
COLUBRIDAE	2	*Farancia erytrogramma*	Rainbow Snake	G5	S2		LE
COLUBRIDAE	4	*Heterodon simus*	Southern Hognose Snake	G2	SX		LE

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
COLUBRIDAE	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake	G5T5	S3S4		
COLUBRIDAE	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake	G5T5	S3?		
COLUBRIDAE	3	*Lampropeltis getula nigra*	Black Kingsnake	G5T5	S3		
COLUBRIDAE	2	*Lampropeltis triangulum syspila*	Red Milk Snake	G5T5	S3		
COLUBRIDAE	3	*Masticophis flagellum*	Eastern Coachwhip	G5	S3S4		
COLUBRIDAE	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake	G4T3	S2		
COLUBRIDAE	2	*Pituophis melanoleucus lodingi*	Black Pine Snake	GT24T3	S2	LT	LE
COLUBRIDAE	3	*Pituophis melanoleucus melanoleucus*	Northern Pine Snake	G4T4	SR		
COLUBRIDAE	2	*Regina rigida deltae*	Delta Crayfish Snake	G5T-3T4Q	S2		
COLUBRIDAE	3	*Regina rigida sinicola*	Gulf Crayfish Snake	G5T5	S3?		
COLUBRIDAE	2	*Regina septemvittata*	Queen Snake	G5	S2S3		
COLUBRIDAE	1	*Rhadinaea flavilata*	Pine Woods Snake	G4	S2S3		
VIPERIDAE	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake	G4	S3S4		
ELAPIDAE	2	*Micrurus fulvius*	Eastern Coral Snake	G5	S3S4		
BIRDS							
ANATIDAE	2	*Anas fulvigula*	Mottled Duck	G4	S2B, S4N		
ANATIDAE	3	*Aythya affinis*	Lesser Scaup	G5	S4N		
ODONTOPHORIDAE	3	*Colinus virginianus*	Northern Bobwhite	G5	S3S4	(PS)	
CICONIIDAE	2	*Mycteria americana*	Wood Stork	G4	S2N	PS:LT	LE
ANHINGIDAE	3	*Anhinga anhinga*	Anhinga	G5	S3B,S1N		
PELECANIDAE	3	*Pelecanus occidentalis*	Brown Pelican	G4	S1N		
ARDEIDAE	3	*Botaurus lentiginosus*	American Bittern	G4	S3N		
ARDEIDAE	2	*Egretta caerulea*	Little Blue Heron	G5	S2B, S2N		
ARDEIDAE	2	*Egretta rufescens*	Reddish Egret	G4	S2N		
ARDEIDAE	3	*Egretta thula*	Snowy Egret	G5	S4B,S1N		
ARDEIDAE	3	*Egretta tricolor*	Tricolored Heron	G5	S2B, S1N		
ARDEIDAE	3	*Ixobrychus exilis*	Least Bittern	G5	S3B		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
ARDEIDAE	3	*Nyctanassa violacea*	Yellow-crowned Night-Heron	G5	S3B,S1N		
ARDEIDAE	3	*Nycticorax nycticorax*	Black-crowned Night-Heron	G5	S3B,S4N		
THRESKIORNITHIDAE	2	*Eudocimus albus*	White Ibis	G5	S2B, S3N		
PANDIONIDAE	3	*Pandion haliaetus*	Osprey	G5	S3B, S1S2N		
ACCIPITRIDAE	2	*Aquila chrysaetos*	Golden Eagle	G5	S1N		
ACCIPITRIDAE	1	*Elanoides forficatus*	Swallow-tailed Kite	G5	S2B		LE
FALCONIDAE	3	*Falco peregrinus*	Peregrine Falcon	G4	S1N		LE
ACCIPITRIDAE	2	*Haliaeetus leucocephalus*	Bald Eagle	G4	S2B, S2N		
RALLIDAE	1	*Coturnicops noveboracensis*	Yellow Rail	G4	S2N		
RALLIDAE	1	*Laterallus jamaicensis*	Black Rail	G4	S2N		
RALLIDAE	3	*Porphyrio martinicus*	Purple Gallinule	G5	S3B		
RALLIDAE	1	*Rallus elegans*	King Rail	G4G5	S3		
GRUIDAE	1	*Grus canadensis pulla*	Mississippi Sandhill Crane	G5T1	S1	LE	LE
HAEMATOPODIDAE	1	*Haematopus palliatus*	American Oystercatcher	G5	S1		
CHARADRIIDAE	2	*Charadrius melodus*	Piping Plover	G3	S2N	LE, LT	LE
CHARADRIIDAE	1	*Charadrius nivosus*	Southeastern Snowy Plover	G4T3Q	S2		LE
CHARADRIIDAE	1	*Charadrius wilsonia*	Wilson's Plover	G5	S1		
SCOLOPACIDAE	3	*Calidris alpina*	Dunlin	G5	S4N		
SCOLOPACIDAE	2	*Calidris canutus*	Red Knot	G5	S2N	LT	
SCOLOPACIDAE	3	*Calidris mauri*	Western Sandpiper	G5	S4N		
SCOLOPACIDAE	2	*Limosa fedoa*	Marbled Godwit	G5	S2N		
SCOLOPACIDAE	3	*Scolopax minor*	American Woodcock	G5	S3B? S4N		
LARIDAE	2	*Gelochelidon nilotica*	Gull-billed Tern	G5	S1B, S3S4N		
LARIDAE	2	*Rynchops niger*	Black Skimmer	G5	S2B, S3N		
LARIDAE	2	*Sternula antillarum*	Least Tern	G4	S3B, S3N	PS:LE	

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
LARIDAE	2	*Sternula antillarum athalassos*	Interior Least Tern	G4T2Q	S2B	PS:LE	LE
LARIDAE	2	*Thalasseus maximus*	Royal Tern	G5	S1B,S4N		
LARIDAE	2	*Thalasseus sandvicensis*	Sandwich Tern	G5	S1B, S4N		
COLUMBIDAE	2	*Columbina passerina*	Common Ground-Dove	G5	S1S2		
TYTONIDAE	3	*Tyto alba*	Barn Owl	G5	S3		
STRIGIDAE	2	*Asio flammeus*	Short-eared Owl	G5	S3N		
CAPRIMULGIDAE	3	*Antrostomus carolinensis*	Chuck-will's-widow	G5	S4B		
PICIDAE	4	*Campephilus principalis*	Ivory-billed Woodpecker	GH	SX	LE	LE
PICIDAE	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker	G5	S4S5		
PICIDAE	2	*Picoides borealis*	Red-cockaded Woodpecker	G3	S1	LE	LE
FALCONIDAE	1	*Falco sparverius paulus*	Southeastern American Kestrel	G5T4	S3B,		
CANIIDAE	3	*Lanius ludovicianus*	Loggerhead Shrike	G4	S4		
SITTIDAE	3	*Sitta pusilla*	Brown-headed Nuthatch	G5	S4B		
TROGLODYTIDAE	1	*Thryomanes bewickii*	Bewick's Wren	G5	S2B, S3N		LE
TURDIDAE	3	*Hylocichla mustelina*	Wood Thrush	G5	S5B		
PARULIDAE	3	*Geothlypis formosus*	Kentucky Warbler	G5	S5B		
PARULIDAE	3	*Helmitheros vermivorus*	Worm-eating Warbler	G5	S3B		
PARULIDAE	2	*Limnothlypis swainsonii*	Swainson's Warbler	G4	S3,S4B		
PARULIDAE	3	*Parkesia motacilla*	Louisiana Waterthrush	G5	S3B		
PARULIDAE	3	*Protonotaria citrea*	Prothonotary Warbler	G5	S5B		
PARULIDAE	2	*Setophaga cerulea*	Cerulean Warbler	G4	S2B		
PARULIDAE	3	*Setophaga discolor*	Prairie Warbler	G5	S5B		
PARULIDAE	4	*Vermivora bachmanii*	Bachman's Warbler	GH	SXB	LE	LE
EMBERIZIDAE	2	*Ammodramus henslowii*	Henslow's Sparrow	G4	S3N		
EMBERIZIDAE	2	*Ammodramus leconteii*	Le Conte's Sparrow	G4	S3N		
EMBERIZIDAE	2	*Ammodramus maritimus*	Seaside Sparrow	G4	S3	(PS)	
EMBERIZIDAE	2	*Ammodramus nelsoni*	Nelson's Sparrow	G5	S3N		
EMBERIZIDAE	2	*Ammodramus savannarum*	Grasshopper Sparrow	G5	S3B, S3N	(PS)	
EMBERIZIDAE	2	*Peucaea aestivalis*	Bachman's Sparrow	G3	S3B, S3S4N		

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
CARDINALIDAE	2	*Passerina ciris*	Painted Bunting	G5	S3S4B		
CARDINALIDAE	3	*Piranga olivacea*	Scarlet Tanager	G5	S2?B		
ICTERIDAE	2	*Euphagus carolinus*	Rusty Blackbird	G5	S2		
MAMMALS							
VESPERTILIONIDAE	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat	G3G4	S3		
VESPERTILIONIDAE	4	*Lasionycteris noctivagans*	Silver-haired Bat	G5	SA?		
VESPERTILIONIDAE	2	*Lasiurus cinereus*	Hoary Bat	G5	S3	(PS)	
VESPERTILIONIDAE	2	*Lasiurus intermedius*	Northern Yellow Bat	G4G5	SH		
VESPERTILIONIDAE	2	*Myotis austroriparius*	Southeastern Myotis	G3G4	S3		
VESPERTILIONIDAE	2	*Myotis grisescens*	Gray Bat	G3	S1	LE	LE
VESPERTILIONIDAE	2	*Myotis lucifugus*	Little Brown Bat	G5	SH		
VESPERTILIONIDAE	2	*Myotis septentrionalis*	Northern Long-eared Bat	G1G2	S1N	LT	
VESPERTILIONIDAE	2	*Myotis sodalis*	Indiana Bat	G2	S1B	LE	LE
FELIDAE	4	*Puma concolor coryi*	Florida Panther	G5T1	SX	LE	LE
MUSTELIDAE	3	*Mustela frenata*	Long-tailed Weasel	G5	S2?		
MEPHITIDAE	1	*Spilogale putorius*	Eastern Spotted Skunk	G5	S1		
URSIDAE	2	*Ursus americanus*	Black Bear	G5	S1	(PS)	LE
URSIDAE	1	*Ursus americanus luteolus*	Louisiana Black Bear	G5T2	S1	LT	LE
SCIURIDAE	3	*Sciurus niger bachmani*	Upland Fox Squirrel	G5	S3S4?		
DIPODIDAE	2	*Zapus hudsonius*	Meadow Jumping Mouse	G5	S1	(PS)	
CRICETIDAE	2	*Peromyscus polionotus*	Oldfield Mouse	G5	S2	(PS)	
TRICHECHIDAE	2	*Trichechus manatus*	Manatee	G2	S1N	LE	LE

Table 3.2 Changes from the Mississippi 2005 SGCN List.
The following table lists items that were added, removed, or otherwise changed from the 2005 SGCN list.

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	CHANGE FROM 2005 VERSION
MUSSELS				
UNIONIDAE	3	*Anodonta hartfieldorum*	Cypress Floater	Added
UNIONIDAE	3	*Arcidens confragosus*	Rock Pocketbook	Tier changed from 2
UNIONIDAE	4	*Mediondus mcglameriae*	Tombigbee Moccasinshell	Removed
UNIONIDAE	1	*Potamilus inflatus*	Inflated Heelsplitter	Tier change from 4
UNIONIDAE	2	*Uniomerus caroliniana*	Florida Pondhorn	Removed
CRUSTACEANS				
CAMBARIDAE	3	*Cambarus rusticiformis*	Depression Crayfish	Added
CAMBARIDAE	3	*Orconectes wrightii*	Hardin Crayfish	Added
CAMBARIDAE	1	*Procambarus cometes*	Mississippi Flatwoods Crayfish	Removed*
CAMBARIDAE	1	*Procambarus connus*	Carrollton Crayfish	Removed*
CAMBARIDAE	1	*Procambarus pogum*	Bearded Red Crayfish	Removed*
ARACHNIDS				
IXODIDAE	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick	Added
INSECTS				
HISTERIDAE	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper	Added
HISTERIDAE	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle	Added
STAPHYLINIDAE	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle	Added
SCARABAEIDAE	1	*Aphodius troglodytes*	A Coprophagous Beetle	Added
SCARABAEIDAE	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle	Added
FORMICIDAE	1	*Pogonomyrmex badius*	Florida Harvester Ant	Added
NYMPHALIDAE	1	*Neonympha mitchelli mitchelli*	Mitchell's Satyr	Added
ASILIDAE	1	*Machimus polyphemi*	A Robber Fly	Added
ANTHOMYIIDAE	1	*Eutrichota gopheri*	A Coprophagous Fly	Added
GRYLLOTALPIDAE	4	*Gryllotalpa major*	Prairie Mole Cricket	Added
FISHES				
ACIPENSERIDAE	1	*Scaphirhynchus platorynchus*	Shovelnose Sturgeon	Added
CENTRARCHIDAE	1	*Ambloplites rupestris*	Rock Bass	Tier changed from 4
PERCIDAE	2	*Crystallaria asprella*	Crystal Darter	Tier changed from 1
PERCIDAE	1	*Percina tanasi*	Snail Darter	Added
AMPHIBIANS				
BUFONIDAE	3	*Incilius valliceps*	Gulf Coast Toad	Removed

FAMILY	TIER	SCIENTIFIC NAME	COMMON NAME	CHANGE FROM 2005 VERSION
PLETHODONTIDAE	2	*Desmognathus cf. auriculatus*	A Southern Dusky Salamander	Added
PLETHODONTIDAE	4	*Plethodon ainsworthi*	Bay Springs Salamander	Removed
RANIDAE	3	*Lithobates palustris*	Pickerel Frog	Added
REPTILES				
EMYDIDAE	2	*Graptemys pearlensis*	Pearl River Map Turtle	Added
EMYDIDAE	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle	Tier changed from 1
COLUBRIDAE	2	*Pituophis melanoleucus lodingi*	Black Pine Snake	Tier changed from 1
BIRDS				
ACCIPITRIDAE	1	*Elanoides forficatus*	Swallow-tailed Kite	Tier changed from 2
FALCONIDAE	3	*Falco peregrinus*	Peregrine Falcon	Added
ANATIDAE	3	*Anas acuta*	Northern Pintail	Removed
ANATIDAE	3	*Anas rubripes*	American Black Duck	Removed
RALLIDAE	1	*Coturnicops noveboracensis*	Yellow Rail	Tier changed from 2
RALLIDAE	1	*Rallus elegans*	King Rail	Tier changed from 2
PELECANIDAE	3	*Pelecanus erythrorhynchos*	American White Pelican	Removed
PELECANIDAE	3	*Pelecanus occidentalis*	Brown Pelican	Tier changed from 2
MAMMALS				
MEPHITIDAE	1	*Spilogale putorius*	Eastern Spotted Skunk	Tier changed from 2
SCIURIDAE	3	*Sciurus niger bachmani*	Upland Fox Squirrel	Added
VESPERTILIONIDAE	2	*Myotis austroriparius*	Southeastern Myotis	Tier changed from 1
VESPERTILIONIDAE	2	*Myotis sodalis*	Indiana Bat	Tier changed from 4

* Combined with *Procambarus hagenianus vesticeps*

Arthropods and the Mississippi State Wildlife Action Plan

Of the 68 arthropods tracked in the Mississippi NHP (MNHP) database, 11 were added as SGCN with this most recent revision. The priority conservation actions outlined in the 2015 SWAP are mostly habitat based and would offer direct or indirect benefits to many arthropods even if the actions are not specifically targeted towards arthropod conservation (Krotzer et al 2008). It is noted, however in Bried and Mazzancaco (2010) that management actions for invertebrates may be very different from those of plants or vertebrate species, with some species of invertebrates requiring more targeted conservation actions.

Table 3.3 Arthropod species tracked by MNHP and number of arthropod species on 2015 SGCN list.

ORDER	# OF MNHP TRACKED SPECIES	# of MS SGCN
Ixodida – Mites and ticks	1	1
Coleoptera - Beetles	10	4
Diptera - True Flies	2	2
Hymenoptera - Ants, Bees, and Wasps	1	1
Lepidoptera - Butterflies and Moths	6	1
Odonata - Dragonflies	43	0
Orthoptera - Grasshoppers and Crickets	2	2
Plecoptera - Stoneflies	2	0
Trichoptera - Caddis Flies	1	0
Total	**68**	**11**

For those arthropods species tracked by MNHP, many have sparse records. Oftentimes these records were collected years or decades ago. It is apparent that additional monitoring is needed (which may require collaboration with outside parties) to adequately assess and track the state's insect populations. For example, in The Odonata of Mississippi (Krotzer et al 2008), it is noted that dragonflies have been historically under-collected in Mississippi. Of the 144 dragonfly species documented in The Odonata of Mississippi, 43 were recommended by the authors for inclusion as SGCN, along with proposed state ranks and Tiers (following 2005 SWAP criteria).

Pollinators in Mississippi

Pollinators are vitally important to the persistence and relative abundance of plant species and are often considered to have high economic value (Losey and Vaughn 2006). Pollination provides benefits to the pollinator in the form of pollen or nectar, and to the plant in the form of reproductive services. Many of the arthropod species in Mississippi are pollinators including bees, beetles, butterflies, moths, and flies. Declines in pollinator populations have been documented in many areas of the United States.

These declines in pollinators can be traced back to the same sources of stress experienced by many other SGCN. Intensive agricultural practices, such as the use of certain pesticides, are considered a high threat to many insect species. The same pesticides that kill harmful pest insects also kill the useful pollinators. Habitat loss and degradation also have impacts on pollinator populations. Prairies, grasslands, and freshwater marshlands can support large numbers of native bees, butterflies and other pollinators. When these habitats are lost or degraded pollinator populations are impacted. For instance, the Monarch butterfly populations have become an important issue in conservation across North America because of declines seen over the last decade. Mississippi is within the migration pathway of the Monarch, although monitoring data in the state is scarce. Their decline is attributed to the loss of the native milkweed species which the butterfly larvae use almost exclusively for food.

Declines in the Monarch butterfly, and in other pollinator species, have led many states to identify pollinator species as Species of Greatest Conservation Need in their SWAP. Currently, there are no pollinator species listed as SGCN in Mississippi. The distribution and abundance of many pollinator species within the state are poorly known. To date, only a few studies have focused on the distribution, species composition, or abundance of pollinators in Mississippi.

Since the current status of pollinator species in Mississippi is largely unknown, surveys should be conducted to determine species composition of important pollinator groups. Current distribution of bumblebees (*Bombus spp.*) and other key pollinator species or groups should be a priority. Species composition and distribution in the state should be determined through literature searches, entomology collection surveys, and field surveys.

Conservation Actions

Pollinators and the State Wildlife Action Plans, Voluntary Guidance for State Wildlife Agencies lists several steps to better incorporate pollinator conservation into Wildlife Action Plans. The following actions would be of benefit to pollinators in Mississippi, even if pollinators are not specifically included in the state's list of SGCN: (1) Highlight and recognize pollinator species already included in the Plan; (2) Highlight and recognize key pollinator habitats already included in the Plan; (3) Conduct a status review for one or more pollinator groups; (4) Identify and prioritize habitat conservation activities that also benefit pollinators; (5) Promote the restoration of pollinator habitats in agricultural landscapes; and (6) Develop and implement community outreach programs.

Monitoring/Surveys

Baseline - Pollinator species composition surveys should be incorporated into faunal surveys of habitats defined as important. Important pollinator composition (i.e. bumblebee species, Monarch butterflies) should be documented in habitats characterized by high diversity of flowering plants.

Restoration - If possible pollinator species composition and abundance should be assessed before and after any restoration activities on priority habitats.

Surveys - Because of the importance of bumblebees as pollinators, and because of declines in bumblebee populations in other states, efforts should be made to document distribution, species composition, and abundance of bumblebees throughout the state.

Habitat Improvement

Providing and improving habitat for pollinators and other insects should be made a priority in agricultural, suburban, and urban landscapes. Encouraging a diversity of native flowers will supply nectar and pollen essential to a variety of insects. Limiting the use of herbicides and pesticides to areas and/or times when flowers are not blooming can help to offset impacts to insects. Broadcast applications of non-selective herbicides can indiscriminately reduce available plants for use by pollinators. Avoid broadcast spraying if possible and use targeted backpack spraying for selective control.

Creating a mosaic of patches with treated and untreated areas will allow for recolonization of treated areas over time and will allow for suitable habitat to remain available. Use of fire is a good tool that can benefit pollinators, however there must be unburned areas nearby to aid in the recovery of insect populations (Black et al. 2007).

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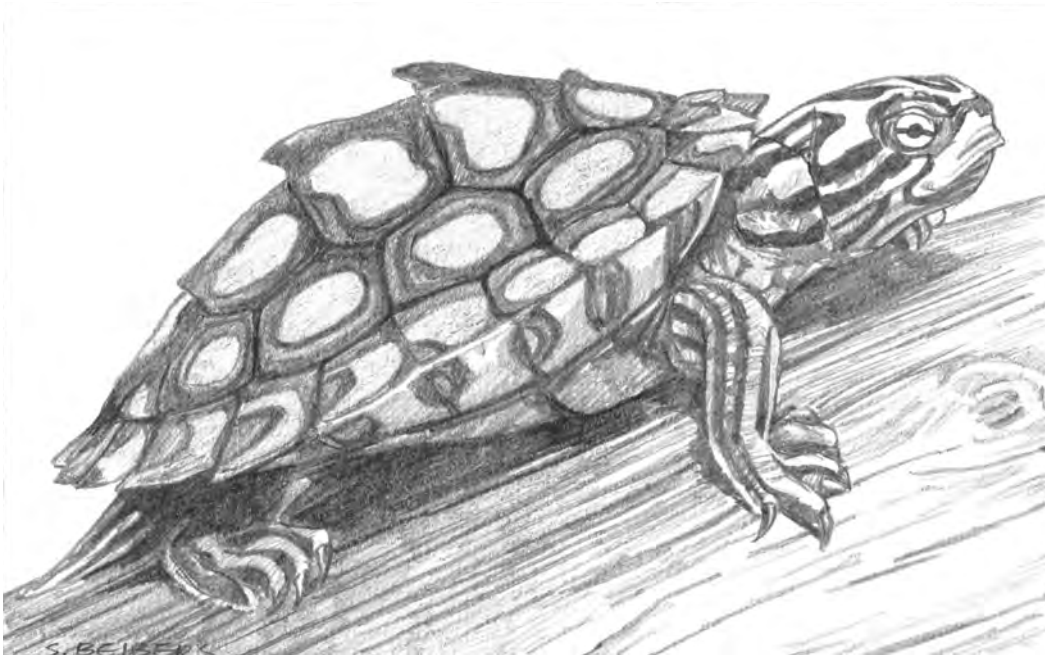
CHAPTER 4

STRESSES, THREATS AND PRIORITY CONSERVATION ACTIONS FOR MISSISSIPPI'S SGCN AND THEIR HABITATS



The third element required by Congress in the development of this Action Plan involves the description of problems that 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. Stresses are some attribute of an ecosystem that is impaired either directly or indirectly by humans. A stress is a symptom that results from a threat. A threat is the activity or processes that have caused or may be causing the "destruction, degradation, and/or impairment" of an ecosystem. Direct threats are sources of stress. *The Best Practices for State Wildlife Action Plans* (2012) recommends using the definitions and hierarchy found in the Salafsky et al. (2008) paper: *A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions*. Creating consistency across state plans will make multi-state cooperation and projects easier to design by identifying shared threats and actions across states. The MDWFP SWAP Technical Committee completed a comparison of threats from the 2005 plan and updated all SGCN and habitat threats using the new definitions.

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 identification of priority conservation actions. The assignment of ranks to these threats, while subjective, is an attempt to identify the magnitude of the threat. As additional planning and analysis of priority conservation actions are 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 no places remaining that have not been affected by humans. Urbanization, proliferation of highways, agriculture, fencing, dams and stream channelization, commercial forestry and many other actions have modified wildlife and fisheries habitat. 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 develop plans on how best to implement management practices that benefit Mississippi's native fish and wildlife, particularly SGCN. Some 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 along with the scale it is conducted at determines if it has a significant negative, neutral, or positive impact 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 requiring these habitats.

Threat Categories

The following is a list and description of the general threat categories used for Mississippi's SWAP taken from Salafsky et al. (2008):

1. Residential and Commercial Development
Threats from human settlements or other nonagricultural land uses with a substantial footprint

- 1.1. Housing and Urban Areas
  Human cities, towns, and settlements including non-housing development typically integrated with housing
- 1.2. Commercial and Industrial Areas
  Factories and other commercial centers
- 1.3. Tourism and Recreation Areas
  Tourism and recreation sites with a substantial footprint

2. Agriculture and Aquaculture
Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture

- 2.1. Annual and Perennial Non-timber Crops
  Crops planted for food, fodder, fiber, fuel, and other uses
- 2.2. Wood and Pulp Plantations
  Stands of trees planted for timber or fiber outside of natural forests, often with non-native (or off-site) species
- 2.3. Livestock Farming and Ranching
  Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)
- 2.4. Marine and Freshwater Aquaculture
  Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild

3. Energy Production and Mining
Threats from production of non-biological resources

- 3.1. Oil and Gas Drilling
  Exploring for, developing, and producing petroleum and other liquid hydrocarbons
- 3.2. Mining and Quarrying
  Exploring for, developing, and producing minerals and rocks
- 3.3. Renewable Energy
  Exploring, developing, and producing renewable energy

4. Transportation and Service Corridors
Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality

- 4.1. Road and Railroads
  Surface transportation on roadways and dedicated tracks
- 4.2. Utility and Service Lines
  Transport of energy and resources
- 4.3. Shipping Lanes
  Transport on and in freshwater and ocean waterways
- 4.4. Flight Paths
  Air and space transport

5. Biological Resource Use
Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species

- 5.1. Hunting and Collecting of Terrestrial Animals
  Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/ persecution reasons; includes accidental mortality/bycatch

5.2. Gathering Terrestrial Plants
Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons

5.3. Logging and Wood Harvesting
Harvesting trees and other woody vegetation for timber, fiber, or fuel

5.4. Fishing and Harvesting Aquatic Resources
Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch

6. Human Intrusions and Disturbance
Threats from human activities that alter, destroy, and disturb habitats and species associated with non-consumptive uses of biological resources

6.1. Recreational Activities
People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons

6.2. War, Civil Unrest and Military Exercises
Actions by formal or paramilitary forces without a permanent footprint

6.3. Work and Other Activities
People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research

7. Natural Systems Modifications
Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare

7.1. Fire and Fire Suppression
Suppression or increase in fire frequency and/or intensity outside of its natural range of variation

7.2. Dams and Water Management/Use
Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities

7.3. Other Ecosystem Modifications
Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare

8. Invasive and Other Problematic Species and Genes
Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread, and/or increase in abundance

8.1. Invasive Non-Native/Alien Species
Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities

8.2. Problematic Native Species
Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become out-of-balance or released directly or indirectly due to human activities

8.3. Introduced Genetic Material
Human altered or transported organisms or genes

9. Pollution

Threats from introduction of exotic and/or excess materials or energy from point and non-point sources

- 9.1 Household Sewage and Urban Waster Water
  Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments
- 9.2 Industrial and Military Effluents
  Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments
- 9.3 Agriculture and Forestry Effluents
  Water-borne pollutants from agricultural, silvicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments, including the effects of these pollutants on the site where they are applied
- 9.4 Garbage and Solid Wastes
  Rubbish and other solid materials including those that entangle wildlife
- 9.5 Air-borne Pollutants
  Atmospheric pollutants from point and non-point sources
- 9.6 Excess Energy
  Inputs of heat, sound, or light that disturb wildlife or ecosystems

10. Geologic Events

Threats from catastrophic geological events

- 10.1 Volcanoes
  Volcanic events
- 10.2 Earthquakes/tsunamis
  Earthquakes and associated events
- 10.3 Avalanches/landslides
  Avalanches or landslides

11. Climate Change and Severe Weather

Long-term climatic changes and other severe climatic or weather events outside the natural range of variation that could negatively affect a vulnerable species or habitat

- 11.1 Habitat Shifting and Alteration
  Major changes in habitat composition and location
- 11.2 Droughts
  Periods in which rainfall falls below the normal range of variation
- 11.3 Temperature Extremes
  Periods in which temperatures exceed or go below the normal range of variation
- 11.4 Storms and Flooding
  Extreme precipitation and/or wind events or major shifts in seasonality of storms

PRIORITY CONSERVATION ACTIONS

For each threat identified as important to priority habitat types and subtypes for SGCN, the Expert Team 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. As with the threats, Mississippi has adopted the Conservation Actions recommended by Salafsky (2008). Conservation actions are interventions or priorities undertaken by staff and/or partners to reach objectives and ultimately conservation goals. A list of priority conservation actions recommended for each habitat subtype and associated SGCN is included in Chapter IV.

The following is a list and description of the general conservation action categories used for Mississippi's Wildlife Action Plan taken from Salafsky et al. (2008):

1. Land and water protection
Actions to identify, establish, or expand parks and other legally protected areas, and to protect resource rights

- 1.1 Site/area protection
  Establishing or protecting public or private parks, reserves, and other areas
- 1.2 Resource and habitat protection
  Establishing protection or easements of some specific aspect of the resource on public or private lands

2. Land and water management
Actions directed at conserving or restoring sites, habitats and the wider environment

- 2.1 Site/area management
  Management of protected areas and other resource lands for conservation
- 2.2 Invasive/problematic species control
  Eradicating, controlling, and/or preventing invasive and/or other problematic plants, animals, and pathogens
- 2.3 Habitat and natural process restoration
  Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution

3. Species management
Actions directed at managing or restoring species, focused on the species of concern itself

- 3.1 Species management
  Managing specific plant and animal populations of concern
- 3.2 Species recovery
  Manipulating, enhancing, or restoring specific plant and animal populations, vaccination programs
- 3.3 Species reintroduction
  Reintroducing species to places where they formally occurred or benign introductions
- 3.4 *ex situ* conservation
  Protecting biodiversity out of its native habitats (i.e. captive breeding programs)

4. Education and awareness

Actions directed at people to improve understanding and skills, and influence behavior

- 4.1 Formal education
  Enhancing knowledge and skills of students in a formal degree program
- 4.2 Training
  Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs
- 4.3 Awareness and communications
  Raising environmental awareness and providing information through various media outlets

5. Law and policy

Actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards

- 5.1 Legislation
  Making, implementing, changing, influencing, or providing input into formal government sector legislation or policies at all levels; international, national, state/provincial, local, tribal species protection laws, hunting bans
- 5.2 Policies and regulations
  Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws at all levels: international, national, state/provincial, local/community, tribal
- 5.3 Private sector standards and codes
  Setting, implementing, changing, influencing, or providing input into voluntary standards and professional codes that govern private sector practice
- 5.4 Compliance and enforcement
  Monitoring and enforcing compliance with laws, policies, regulations, and standards and codes at all levels

6. Livelihood, economic and other incentives

Actions to use economic and other incentives to influence behavior

- 6.1 Linked enterprises and livelihood alternatives
  Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors and attitudes
- 6.2 Substitution
  Promoting alternative products and services that substitute for environmentally damaging ones
- 6.3 Market forces
  Using market mechanisms to change behaviors and attitudes
- 6.4 Conservation payments
  Using direct or indirect payments to change behaviors and attitudes
- 6.5 Non-monetary values
  Using intangible values to change behaviors and attitudes

7. External capacity building

Actions to build the infrastructure to do better conservation

- 7.1 Institutional and civil society development
  Creating or providing nonfinancial support and capacity building for nonprofits, government agencies, communities, and for-profits
- 7.2 Alliance and partnership development
  Forming and facilitating partnerships, alliances, and networks of organizations
- 7.3 Conservation finance
  Raising and providing funds for conservation work

MAJOR THREATS AFFECTING MISSISSIPPI HABITATS AND RECOMMENDED ACTIONS

Major Threats to Mississippi Habitats

- Invasive species
- Development
- Altered fire regimen
- Climate change

Of the threats identified in Salafsky (2008), several affect multiple habitats throughout the state. Number one among them is the presence of nonnative/alien species, both plant and animal. Of 106 total sub-habitat types, this threat is listed in 86, and most are ranked as a high importance threat. Development, both urban/suburban and industrial, was also identified a significant threat, affecting well over half the sub-habitats. Energy development has become a threat in many states and although it is still new in Mississippi, it is poised to cause issues in the near future. Combined with roads/railways and utility/service lines, development affects just about every habitat in Mississippi. Other threats may be more regional, such as the altered fire regimes in the East Gulf Coastal Plain and Upper East Gulf Coastal Plain ecoregions. The intergovernmental Panel on Climate Change (IPCC) has identified climate change and various impacts associated with climate change as threats and the United States Fish and Wildlife Service has instructed that all SWAP documents address these threats. A threat associated with climate change is sea level rise, which would have the greatest impact on Mississippi's Northern Gulf of Mexico Ecoregion. However, according to the IPCC, impacts could potentially affect the entire state. The following table shows the number of threats and ranks listed in each habitat type.

Invasive Species

Invasive species can be either non-native species introduced through some human interaction, or native species that have invaded an area due to lack of proper management. They are all organisms that are capable of negatively affecting the native biota of an area, directly and/or through modification of the habitat itself. Invasive species can include fungi (e.g., chestnut blight, *Pseudogymnoascus destructans*) and various microorganisms (laurel wilt), as well as plants and animals. Generally, most species categorized as invasives arrived here with human assistance, sometimes on purpose. European Starlings were intentionally introduced in the 1890s; Kudzu was originally introduced as an ornamental plant, then used as erosion control. Other species found their way into the Southeast US on their own. Red imported fire ants first showed up in the Mobile, Alabama, area sometime during the 1930s or 40s.

Although the exact mode of introduction is unknown, like many invasives, it most likely arrived as a stowaway in material imported from South America. Japanese stiltgrass and cogongrass, both highly invasive weeds, arrived as packing material around shipments of a more desirable commodity. Many exotic species have become established via release of animals purchased in the pet trade (such as Burmese pythons in southeastern Florida, and numerous non-native fishes), and of plants purchased in the horticultural trade (e.g., Chinese privet, Chinese tallow tree, cogongrass). There are species that had many modes of introduction: cogongrass was used as packing material, imported for the plant trade, and brought in to use as a cattle forage.

Table 4.1 Total Threats Ranked for Each Sub-Habitat Type, According to Salafsky et al. (2008).

	Salafsky Classification	Salafsky Classification	High	Med	Low	Total
1	Residential and commercial development	1.1 Housing and urban areas	12	37	17	66
		1.2 Commercial and industrial areas	7	10	32	49
		1.3 Tourism and recreation areas	6	9	12	27
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops	28	13	13	54
		2.2 Wood and pulp plantations	27	8	5	40
		2.3 Livestock farming and ranching	8	15	18	41
		2.4 Marine and freshwater aquaculture	0	0	0	0
3	Energy production and mining	3.1 Oil and gas drilling	13	4	3	20
		3.2 Mining and quarrying	16	10	13	39
		3.3 Renewable energy	0	0	0	0
4	Transportation and service corridors	4.1 Roads and railways	17	13	23	53
		4.2 Utility and service lines	9	0	0	9
		4.3 Shipping lanes	1	1	0	2
		4.4 Flight paths	0	0	0	0
5	Biological resource use	5.1 Hunting and collecting terrestrial animals	1	4	0	5
		5.2 Gathering terrestrial plants	0	2	3	5
		5.3 Logging and wood harvesting	28	9	8	45
		5.4 Fishing and harvesting aquatic resources	11	9	5	25
6	Human intrusions and disturbance	6.1 Recreational activities	21	11	38	70
		6.2 War, civil unrest and military exercises	0	0	0	0
7	Natural system modifications	7.1 Fire and fire suppression	22	1	2	25
		7.2 Dams and water management/use	51	3	2	56
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species	64	7	14	85
		8.2 Problematic native species	2	2	0	4
		8.3 Introduced genetic material	0	0	0	0
9	Pollution	9.1 Household sewage and urban waste water	11	11	1	23
		9.2 Industrial and military effluents	7	9	1	17
		9.3 Agricultural and forestry effluents	12	20	8	40
		9.4 Garbage and solid wastes	4	9	5	18
		9.5 Air-borne pollutants	0	0	3	3
		9.6 Excess energy	0	0	0	0
10	Geologic events	10.1 Volcanoes	0	0	0	0
		10.2 Earthquakes/tsunamis	0	0	0	0
		10.3 Avalanches/landslides	0	0	0	0
11	Climate change and severe weather	11.1 Habitat shifting and alteration	15	0	0	15
		11.2 Droughts	0	0	0	0
		11.3 Temperature extremes	0	0	0	0
		11.4 Storms and flooding	0	0	0	0

Some species, like the Mediterranean gecko and greenhouse frog, are relatively innocuous and present no known significant harm to native animals/plants/habitats. Others pose significant threats. Species such as wild hogs, escaped from captivity or were, and still are, deliberately introduced for "hunting" opportunities. This practice has serious negative consequences for Mississippi's native habitats and agricultural enterprises.

Invasive species are most likely to invade when habitats have been disturbed, due to natural perturbations such as fire, hurricanes, or tornadoes or anthropogenic disturbances such as land-clearing, timber harvest, or development. Some invasive species are able to invade intact natural habitats. There are invasive species, like fire ants and Japanese honeysuckle, that have the potential to occur statewide, and in many different habitats. Others may be limited to a certain region of the state, or a particular habitat, such as Chinese privet only occurring in mesic sites.

Impact of Invasive Species in Mississippi

It would be a monumental task to compile a complete list of non-native invasive species currently in Mississippi with invasives running the gamut from fungi to large mammals. The MNHP lists over 600 non-native plants introduced to Mississippi (See Appendix V). Some of those considered the worst invasive weeds include alligatorweed, Chinese tallow tree, Chinese privet, cogongrass, kudzu and water hyacinth. Some of most problematic invasive animals in Mississippi include the fire ant, wild hogs, nutria, Asian carp, tilapia, spotted wing drosophila, and zebra mussels. In marine systems along Mississippi shores, Australian spotted jellyfish and lionfish warrant concern. For other invasives, like the emerald ash borer, they haven't arrived yet, but inevitably will find their way here. For most invasive species, there is no 'magic bullet' to achieve satisfactory control. It is preferable to prevent invasives from arriving to begin with. Once established it may be impossible eradicate them without causing unacceptable harm to native ecosystems. Just a few of the worst invasives in Mississippi and their impacts on native habitats and species are discussed below.

Most Mississippians have inadvertently stepped in a fire ant mound and felt the painful consequences. What most people probably do not understand is the impact this nearly ubiquitous species might have on other organisms in terrestrial habitats throughout the state. These impacts likely have profound ramifications throughout many terrestrial ecosystems. Fire ants have negatively affected gopher tortoises, northern bobwhite, Florida harvester ants, and other Mississippi SGCN. Efforts to eradicate them through aerial application of poison bait has deleterious consequences on native species of ants and the fire ants bounce back faster than native species. It is important to note that fire ants flourish in forests—such as longleaf pine—where a relatively low stocking density of trees permits ample sunlight to reach the forest floor, facilitating growth of herbaceous plants necessary for species such as tortoises and many game species. Fire ants also flourish in disturbed areas, such as wildlife food plots and along road margins. The same conditions targeted as desirable by wildlife managers in the longleaf/open pine ecosystem actually facilitate fire ant presence. The benefits of management techniques must be weighed against the deleterious effects of disturbance.

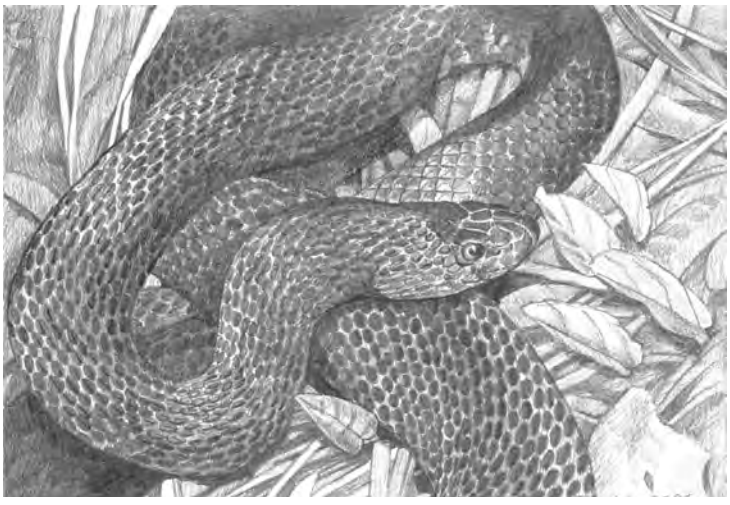
Wild hogs (also referred to as wild pigs, wild boar or feral swine) are a non-native invasive species that poses a serious risk to Mississippi's natural resources. While the introduction of wild hogs to Mississippi can be attributed in part to escaped livestock, the majority almost certainly come from animals released into the wild for the purpose of hunting. Besides damage to agriculture and forest resources, hogs can be substantial predators of ground nesting birds and turtles (eggs and hatchlings), small mammals, salamanders, frogs, crabs, mussels, snakes, and a host of other species. Damage to native plant communities caused by rooting, wallowing and trampling can have severe long term effects on native wildlife habitat. Because of the low mortality rate and high reproductive potential this species can be difficult to eradicate. Most non-lethal means will be cost prohibitive in the long term, leaving lethal methods as the best option. Hunting and trapping is the most practical and widely used option. In an effort to

control the spread, it is now illegal in Mississippi to move wild hogs, except for the purposes of slaughter. Cogongrass, like fire ants, arrived on the shores of the US through the Port of Mobile. This is not yet common throughout Mississippi, but most in the southern part of the state are all too familiar with it. It can establish itself throughout Mississippi, by seed or vegetatively, if not controlled. It grows in allelopathic monocultures and out-competes native herbaceous flora, and can even damage tree roots. A fire tolerant species, it burns very hot, and may even kill trees like longleaf pine that are generally fire tolerant. This is a species with direct, species by species impacts, and indirect impacts due to its alteration of entire habitats. Like other invasive species, it thrives in the same open forest conditions wildlife managers seek to achieve in longleaf forests, and to a lesser degree in other habitats. It easily establishes itself in disturbed areas. Once established it is very difficult to eradicate and requires multiple treatments and long-term vigilance.

Of emerging concern is the abundance of fungal pathogens affecting species in many states. *Psuedogymnoascus destructans* (Pd), the fungus that causes White Nose Syndrome (WNS) in bats have devastated cave dwelling bat populations in the Eastern United States, many of which as listed as SGCN in Mississippi. In the winter of 2013-2014, low levels of the fungus were found at 4 locations in Mississippi. Continued monitoring of bat hibernacula in Mississippi will be critical in catching the disease early and helping to stop its spread throughout the state.

The Chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), is an aquatic pathogen that seems to be focused in amphibians. The fungus has been identified in numerous frog and salamander species through the world, and may be responsible for the greatest loss of biodiversity of amphibian species. Amphibians imported for bait, or captured from the wild and released in new locations is one of the primary means of spread with Bd. Increased regulations concerning the importation of amphibians, for bait or the pet trade, should be explored to help control the spread of the fungus. In addition, education and communication should stress the dangers of releasing captured amphibians into new locations to help prevent spread.

Snake Fungal Disease (SFD) is a newly emerging disease impacting certain snake populations. Reports of snakes with fungal infections were recorded prior to 2006, the last few years has seen a great increase in the number of snakes submitted for testing. The fungus *Ophidiomyces ophiodiicola* (Oo) is associated with SFD but hasn't been definitely linked to the disease. Due to the cryptic nature of snakes, population-level impacts of the disease are not yet widely known and are difficult to assess. In the southeast, Tennessee and Florida have confirmed cases of SFD. To date, SFD has not been found in snakes in Mississippi. Increased monitoring of snake species and a standardized method to reports suspected cases in Mississippi is needed.



Conservation Actions to address invasive species include:

Conservation Action 2: Land and Water Management

- Increase early detection and response to presence of invasive species.
- Coordinate with other agencies, NGO's, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.
- Investigate development of more effective, lower cost control methods.

Conservation Action 4: Education and Awareness

- Increase educational awareness of invasive species and their control.
- Promote the use of native species for landscaping and wildlife habitat.

Conservation Action 5: Law and Policy

- Encourage regulatory and legislative response to importation of non-native invasive species.
- Encourage increased control of the transport and release of live non-native wildlife and plants.

Conservation Action 6: Livelihood, Economic and Other Incentives

- Identify sources of funding for long term control efforts: private and public sources of funding.
- Develop technical assistance, incentive, and cost sharing programs to prevent invasions, control or eradicate existing invasive species, and restore natural disturbance regimes on private lands.

Conservation Action 7 External Capacity Building

- Forming and facilitating partnerships, alliances and networks with Local, State and Federal Agencies, through LCCs, and Joint Ventures, NGO's (The Nature Conservancy, The Audubon Society, Land Trusts, Mississippi Wildlife Federation, National Wildlife Federation, etc.) and private landowners; Providing input to state, regional, and national organizations to help fight invasive species.

DEVELOPMENT

According to the US Census Bureau, from 2000 to 2010 Mississippi's population increased by almost 5%. That increase is expected to continue, with an expected population by 2030 of over 3 million people. That increase will bring a rise in demand for housing and services, putting even more pressure on Mississippi's natural areas. The technical committee identified the threat of both urban/suburban and industrial development as threats to over half the 106 sub-habitat types listed. Add to that the threat from second homes/vacation homes, roadways and associated management, utility rights of way, and energy development and just about every habitat in Mississippi is under threat from some type of development. The following chart shows the development threats that are affecting Mississippi's habitats.

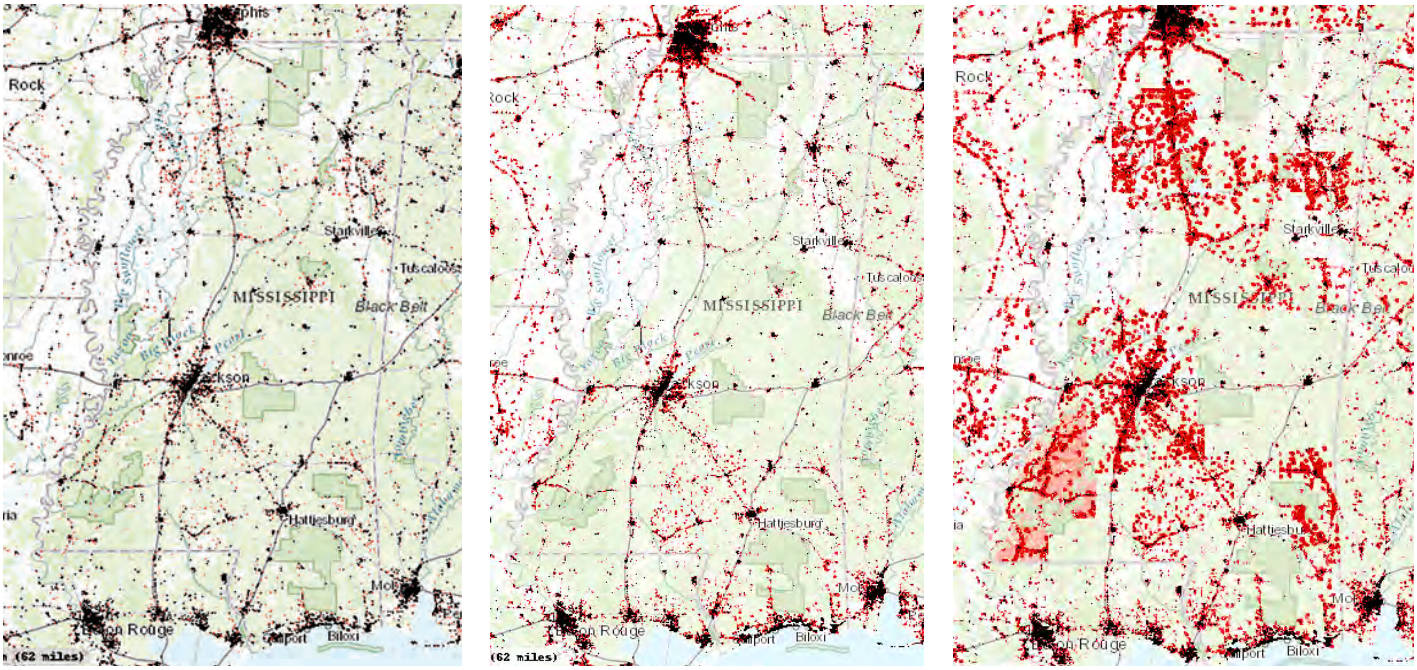
Table 4.2 Development Threats Ranked for Each Sub-Habitat Type, According to Salafsky et al. (2008).

	Salafsky Classification	Salafsky Classification	High	Med	Low	Total
1	Transportation	1.2 Commercial and industrial areas	7	10	32	49
		1.3 Tourism and recreation areas	6	9	12	27
3	Energy production and mining	3.1 Oil and gas drilling	13	4	3	20
		3.2 Mining and quarrying	16	10	13	39
		3.3 Renewable energy	0	0	0	0
4	Transportation and Service Corridors	4.1 roads and railroads	17	13	23	53
		4.2 utility and service lines	9	0	0	9
		4.3 shipping lanes	8	15	18	41
		4.4 Marine and freshwater aquaculture	0	0	0	0

Urban Sprawl

Urban sprawl is defined as the spreading of development (homes, businesses and associated infrastructure) from cities into nearby undeveloped areas. These areas are characterized by a mix of homes and small businesses within a matrix of forests and agricultural lands. While this sprawl connects urban habitats, it fragments natural areas and could negatively impact natural benefits such as water quality and wildlife resources. Significant urbanization along the Gulf Coast could inhibit the inland migration of coastal wetland habitats and species should sea levels rise (Feagin et al. 2010, Thorne et al. 2012, and Terando et al. 2014).

In addition to the direct impacts of a fragmented landscape, management actions will also be hindered in the urban/wildland interface. Perhaps the best example of this conflict is the use of prescribed fire, such as in longleaf pine ecosystems. Smoke management is just one factor affecting the use of fire near urban areas. Keeping people and property safe is the number one concern during a prescribed burn. Destruction of property from escaped fire or smoke causing an accident will make the public less accepting of prescribed fire as a management tool.



2020 2060 2100

Figure 4.1 Projected Urban Growth in Mississippi from 2020 through 2100. From Belyea and Ternado. 2012.

Studies have shown that when a population reaches 45 people per square mile (psm) the probability of a forest functioning properly decreases to 50%. At 150 psm the probability is 0. In Mississippi, parts of several counties reach or exceed this level already (Harrison, Jackson, Hinds, and Lee counties). The most rapid population growth in Mississippi is expected to be near major urban areas (Mississippi Forestry Commission 2007). Growth is expected to be highest around Jackson, the Desoto County/Memphis area, and from Hattiesburg south to the coast (See Figure 4.1). The fragmentation caused by this growth will reduce biological diversity in these areas, and impact the sustainable production of wildlife by reducing the size of available forests and creating areas incapable of supporting diverse ecological communities.

Energy Development

Since the discovery of gas and oil in 1903, Mississippi has produced significant quantities of hydrocarbon resources. In 2011, the U.S. Department of Energy ranked Mississippi as 14th in the nation in crude oil production with over 24 million barrels produced yearly. There are over 3,000 producing wells in Mississippi and over 32,000 wells on file. (See Figure 4.2) Although Mississippi is a natural gas-producing state, much more natural gas is consumed in Mississippi than is produced. However, Mississippi has more natural gas flowing both into and out of the state than any other state and is fourth in miles of interstate natural gas pipelines.

A surface coal mine, located in Choctaw County, Mississippi, is among the largest lignite coal mines in the United States. Approval to operate Mississippi's second coal mine to supply a new coal-fired generating station in Kemper County was given in 2012. The mine is scheduled to begin producing coal in 2015, and when it reaches full production it will be the largest mine in the state (US Energy Information Administration USEIA). A single large reactor at Entergy's Grand Gulf Nuclear Power Station produces nearly 20% of state's total electricity and all of the state's nuclear power. A recently completed power upgrade project makes Grand Gulf the largest single reactor in the United States in capacity at 1,443 megawatts.

The state's primary renewable resource is biomass, consisting mostly of wood and wood products. Mississippi generated 2.7% of its electricity from renewable energy resources during 2014, with wood and wood waste accounting for almost all of the state's renewable electricity generation.

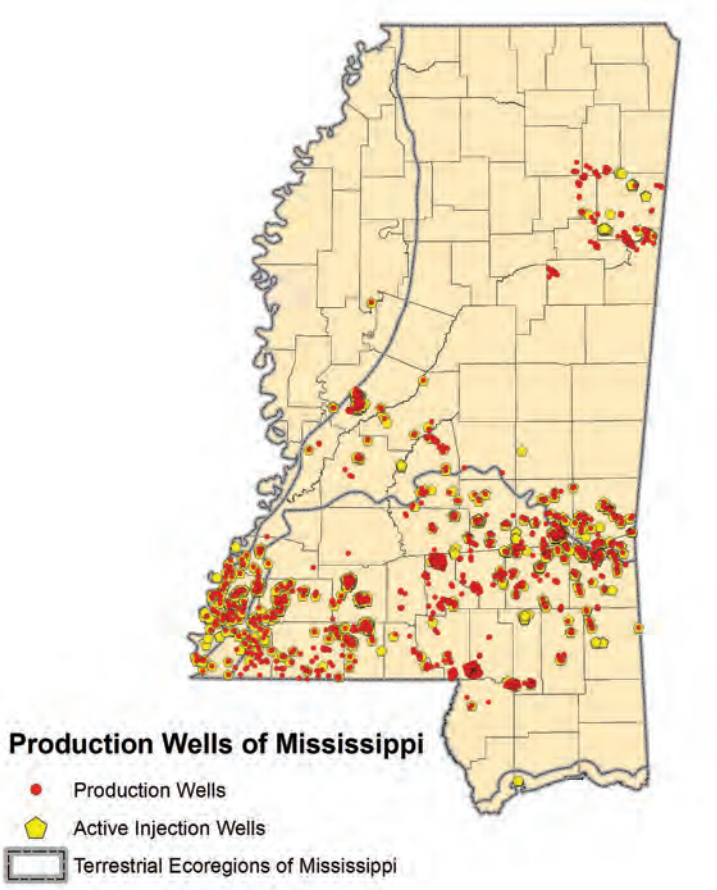


Figure 4.2 Active oil and gas wells currently operating in Mississippi.

Alternative and more-renewable forms of energy are pursued as demands for energy increase. The ability to harness energy from alternative sources (e.g. sun, wind, water, biofuel, geothermal sources) can be appealing because it reduces reliance on limited fossil fuel resources. As landscapes become altered to meet changing energy strategies, habitats could become increasingly fragmented or lost. This is a cause for concern as habitat loss and fragmentation are commonly recognized as factors contributing to species declines.

In 2012, The Mississippi River Alluvial Plain (MSRAP) ecoregion was ranked among the top five ecoregions in the United States with the greatest potential for energy development. The MSRAP was ranked fourth in potential for unconventional oil and gas, and fifth in potential for biofuels. While these forms of energy acquisition are not readily associated with direct mortality (as is the case with wind energy developments), they do still have implications for species conservation. Aside from the previously discussed consequences to habitat, impacts identified in a thorough literature review include: altered space-use patterns (e.g. avoidance, disrupted migration, etc.), decreased survival, altered reproduction, and decreased species richness, diversity, and abundance.

Although ecoregions in Mississippi were not ranked as having the greatest potential for geothermal and solar energy developments, these developments have been proposed within the state. Impacts from geothermal and solar energy developments have not been thoroughly assessed in the scientific literature. Additional research is required to understand the potential risks they impose on wildlife.

Conservation Actions to Address Development

As the state's population continues to grow, it will be paramount that smart growth planning takes place to ensure the future of Mississippi's habitats and wildlife. The need to pursue more renewable forms of energy is recognized, but "green energy" has the potential to function as a wildlife stressor. As such, requirements to better understand and mitigate the impacts of future energy developments are needed.

Conservation Actions following Salafsky et al. (2008) that should be applied to address urban and energy development include:

Conservation Action 1 Land/Water Protection

- Work with existing and new partners and stakeholders (LCC's, Joint Ventures, National Fish and Wildlife Foundation, non-government organizations, Audubon Society, etc.) to identify areas that should be protected from future development; encourage good land conservation practices, including Priority Conservation
- Actions from specific habitats, at local levels.
- Encourage comprehensive planning that incorporates land use planning and clearly defines high-priority areas for conservation and restoration, along with areas for development. Encourage land use planners to incorporate wildlife friendly designs in new projects (i.e. wildlife under or overpasses along roadways, bat friendly bridges).
- Promote construction of renewable energy structures within landscapes of low value to wildlife (i.e. placing solar or wind farms on existing disturbed and/or developed lands).

Conservation Action 2 Land/Water Management

- Encourage the use of compatible biofuel production practices, including reduced chemical use, avoidance of monocultures and potentially invasive plant species, and ecologically-informed timing of harvest.

Conservation Action 3 Species Management

- Focus on enhancing or restoring populations in other areas to better withstand land use changes from development.
- Conduct studies to investigate and characterize the potential risks imposed on wildlife as a consequence of energy development (wind farm effects on bats and birds, affects of solar farms on the landscape).

Conservation Action 4 Education and Awareness

- Enhancing knowledge and information exchange through the use of workshops, training courses, or manuals.
- Raise awareness of issues through media sources.

Conservation Action 5 Law and Policy

- Develop or help implement regulations or voluntary standards to protect habitats and wildlife.
- Participate in pre-development assessments in order to 1) outline the potential risks imposed on wildlife, and 2) present mitigation strategies to, and suggest best management practices for, energy development operations.
- Provide input into voluntary standards that govern private practice.

Conservation Action 7 External Capacity Building

- Forming and facilitating partnerships, alliances and networks with Local, State and Federal Agencies, and through existing and new partners such as LCCs, Joint Ventures, and non-government organizations.

ALTERED FIRE REGIME

Fire was an important ecological disturbance that historically shaped many of Mississippi's habitats. Systems such as longleaf pine forests and tallgrass prairies were likely driven by relatively frequent fires. Many other systems, except those prone to frequent flooding or substantial moisture retention, had varying incidences of fire events where topographic position, moisture regime and gradient, and subsequent plant community composition would have influenced fire behavior and effects during any given fire event. Historical evidence shows that fire was a common disturbance regime prior to human settlement, although the frequency and extent of naturally ignited fires varied across land regions. It is presumed that lightning strikes during relatively dry periods were the predominant source of ignition. As human settlement occurred, fire was influenced by anthropogenic forces. At first, human-ignited fires supplemented the incidences of natural fires. The earliest inhabitants utilized fire to manipulate local landscapes to increase or attract game they hunted and to clear areas for agricultural production for subsistence. European settlers continued to use fire to manipulate land and likely increased the scale of deliberate fires to shape land use for subsistence practices of the time. Over time, changes in land use and management, human population growth and infrastructure development, societal perceptions, and changes in native vegetation composition have resulted in largely fire excluded landscapes where fire once drove many important ecosystem processes. In modern landscapes, it is difficult to replicate extent, timing, and frequency of natural fire regimes. As such, prescribed fire (fire set intentionally under prescribed conditions to meet particular management objectives) must be used as feasible to approximate natural fires and manage habitats for specific wildlife benefits. Altered fire regimes, including season and frequency of burns, ranked as a threat to 25 of the 66 terrestrial habitats in MS.

Plant and Animal Response to Fire

Altered fire regimes lead to a change in habitat composition and structure. As a result, different wildlife species respond in a positive, neutral, or negative manner depending on their habitat requirements. Plants have adaptations to avoiding or promoting fire in the form of leaf litter characteristics (e.g. dry quickly), chemical composition (e.g. volatile oils), physiological traits (e.g. bark thickness, propensity to resprout), and reproductive characteristics (e.g. germination enhanced by exposure to heat or bare soil). Many plants that are adapted to promote fire show positive responses to fire events, although plants vary in their adaptation to the frequency, timing, and severity of fires. Large-scale fire exclusion has led to a shift in many plant communities toward more fire-avoiding plants and a reduction in fire-promoting plants. As a result, wildlife

adapted to fire-maintained communities, particularly habitat specialists such as gopher tortoise, black pine snake, or harvester ants, often exhibit population declines or other negative responses as a result of changing plant community composition and structure associated with altered fire regime or fire exclusion.

Potential Threats and Stresses Associated with Altered Fire Regime

Fire Exclusion

Direct exclusion of fire from habitats that were historically fire-dependent results in changes in habitat composition and structure. In general, coverage of shrubs and trees becomes more prevalent, and the ground is heavily shaded and covered in leaf litter when fire is excluded. As a result, ground-layer herbaceous vegetation is often suppressed. Wildlife species that were adapted to habitats shaped by fire are subsequently affected in varying degrees relative to their dependence upon specialized habitat features created by fires. Certain plants may be eliminated or greatly reduced in distribution and abundance due to fire exclusion. Fire exclusion can increase fuel loads within these systems such that if fires are reintroduced after a long period of exclusion, fire intensity and severity may be much greater than if these sites burned more frequently. While periods of fire exclusion may have historically manifested itself in nature (sometimes resulting in massive stand replacement fires), it is difficult to recreate such conditions in the context of modern safety standards for the use of prescribed fire. Conversely, shifts in prevalent plant communities toward fire-avoiding vegetation may result in inability to reintroduce fire due to insufficient fuel without other means to significantly manipulate vegetation back to fire-promoting species. Reintroducing prescribed fires to previously fire-excluded habitats requires careful planning and implementation, and, if necessary, other methods, to develop suitable conditions for future fire management (e.g. mechanical or selective herbicide treatments).

Inappropriate Season and Frequency of Fire

Modern applications of prescribed fire have tended toward "dormant" season burning from late autumn to early spring (October through March). During this time, there is an abundance of dead, readily combustible surface fuels and relative humidity is often low, favoring rapid and efficient rate of fire spread. Soil and ground-layer (fuel) moisture levels are also typically high during this time, which may protect certain perennial plants from fire damage or completely exclude fire from some habitat types. Burning during this time of year avoids disturbance during prime reproductive seasons for many high profile wildlife species (e.g. nesting birds, deer fawns), but it might have negative effects on other wildlife (e.g. herpetofauna). Burning under these moist ground-layer conditions are generally favorable for fuel reduction treatments to slowly reduce heavy fuel loads that may lead to catastrophic fire or tree mortality in forested systems.

The use of prescribed fire during the "growing" season from late spring to early autumn (April through September) has seen increasing interest. Relative humidity and fuel moisture (outside of prolonged dry weather periods) are higher, thereby decreasing flame height and slowing the rate of fire spread and making fire containment potentially easier. The extent of fuel consumption also tends to be less complete, potentially adding to post-fire habitat diversity. Perhaps the greatest disadvantages to growing season burning are higher ambient temperatures are more physically taxing on burn crews and increased smoke volume due to greater fuel moisture that might exacerbate smoke management problems in some areas. Although growing season burning presents certain challenges and disadvantages, applying fire outside of traditional seasons has some advantages. Some plants may be dependent on fire applied outside of winter and spring seasons to persist because of reproductive adaptations or suppression of other plant competitors. These fires may more closely mimic historic, natural fire regimes when natural ignition was more likely to occur, and hence create specific habitat composition and structure that many wildlife species

were adapted to. From a fire implementation standpoint, extending burn seasons also provides the advantage of a longer window in which to utilize more available days when burning can be conducted within regulatory requirements (e.g. weather parameters, smoke management).

Some researchers suggest fire frequency may supersede season of fire in accomplishing particular objectives (e.g. suppression of brush, maintenance of desirable ground cover). Even in areas where fire is applied periodically, fire return intervals may be too long to achieve desired results relative to habitat composition and structure. Conversely, fire return intervals could be too frequent to achieve desired results. Although certain plants are adapted to fire, some may require a fire-free interval to reach maturity (e.g. fire-adapted oaks). This might be achieved in different ways, whether by complete or within-stand modifications to fire regime, as overall management objectives dictate.

Thus, in relation to both season and frequency, prescribed fire must be applied in a manner that produces the desired results for plant community and wildlife habitat management objectives. This requires planning, monitoring, and additional research to develop fire management strategies to accomplish objectives. Uniform prescriptions for fire application will not suffice; prescriptions must be tailored to individual site conditions and management objectives.

Firebreaks

Potential stressors associated with firebreaks include disking, pushing, or plowing firebreaks to expose mineral soil in order to contain prescribed fires or wildfires. On some sites, mechanical soil disturbance may introduce or promote establishment of invasive species. Additionally, artificially constructed firebreaks may be source of soil erosion and sedimentation in down-slope drainages. Other considerations include negative effects on residual vegetation (e.g. soil compaction, root damage) and creation of abrupt edge transitions along firebreaks. These effects must be considered and mitigated as best as possible. Although firebreaks are essential for the application of prescribed fire, best management practices to mitigate these effects may include establishing water bars and non-invasive cover crops to stabilize firebreaks, monitoring and treating invasive species, planning burn units to utilize natural or existing firebreaks to minimize soil disturbance, and utilizing other fire containment methods (e.g. wet lines) around sensitive areas.

Soil Effects

Fire effects on soil may be highly variable due to a combination of factors, but relatively low intensity fires in our region generally do not adversely affect soil chemical and physical properties. Potential negative effects on soil properties can be minimized by applying fire when there is adequate soil and surface litter moisture to prevent significant loss of soil humus. Nutrients such as potassium and phosphorus are recycled by burning plant materials, although some nitrogen may be lost to volatilization. Very intense fires may lead to modifications in soil structure that reduce soil porosity and impede infiltration of surface water. These negative impacts can be reduced by careful planning when reintroducing prescribed fires to previously fire-excluded habitats.

Water Quality

The effects of relatively low intensity fires on water quality are generally not adverse unless substantial erosion or nutrient leaching through run-off occurs. Potentially negative impacts can be reduced by careful planning when reintroducing prescribed fires to previously fire-excluded habitats. Other water quality concerns may be considered if fires remove vegetation that shades streams or pools, thereby increasing water temperature that could negatively or positively affect certain aquatic organisms. These may be considered sensitive habitats and warrant site-specific fire exclusion if necessary.

Air Quality
Smoke from fires are typically more of a human health, liability, or nuisance concern. As fire was a natural process in many systems, these effects should generally be neutral aside from human-related conflicts or exacerbations. Conducting prescribed burns within regulatory guidelines for smoke management can alleviate most air quality concerns.

Capacity Limitations
Application of prescribed fire is often dependent on the availability of qualified personnel to conduct prescribed burns. Furthermore, costs associated with prescribed burning may limit its use. These factors constrain private landowners in particular. There is a need to provide additional training to prescribed fire practitioners on application of prescribed fire for wildlife objectives. Furthermore, additional conservation funding should be considered for application of prescribed fire, particularly on private lands where prescribed burning is often conducted using independent contractors.

Conservation Actions to Address Fire Regimen

Much evidence exists indicating most systems in Mississippi had an incidence of fire history. It is difficult to replicate effects of natural fire processes, but wise use of prescribed fire can be used to approximate natural fires to manage plant communities and wildlife habitat. The exclusion of fire from fire-adapted systems is a habitat stressor, but other impacts associated with application of prescribed fire (e.g. establishing firebreaks, invasive species) may introduce other stressors. Research, planning, and monitoring are needed in determining suitable frequency and timing of fire in different habitat types. Application of prescribed fire must be balanced with safety and liability concerns and resource management objectives. All habitat patches cannot meet all the needs of all wildlife species, but microhabitat conditions within patches vary within fire-maintained habitat. Furthermore, microhabitat conditions can sometimes be planned and purposefully managed to meet critical resource needs if necessary (e.g. intentionally excluding fire from some areas for refugia).

Conservation Actions following Salafsky et al. (2008) that should be applied to address altered fire regimes include:

Conservation Action 1 Land/Water Protection

- Resource and Habitat Protection: Coordinate with other agencies, NGOs, conservation organizations to establish priority areas for prescribed burns.

Conservation Action 4 Education and Awareness

- Encourage the increased use and acceptance of prescribed fire through increased communications and partnerships.
- Provide prescribed fire training opportunities for private landowners. Focus on training landowners to achieve fire capacity and application at a large scale.
- Educate landowners, school-aged children/youth, adjacent residents, developers, and the general public about the crucial role of prescribed burning in the management of longleaf pine and other ecosystems.

Conservation Action 5 Law and Policy

- Support and advocate for the establishment or strengthening of laws, policies, budgets and regulations required to promote and apply prescribed fire in the state.
- Reduce regulatory burden on agencies and private landowners to facilitate active burning.

Conservation Action 6 Livelihood, Economic, and other Incentives

- Identify sources of funding to assist landowners in implementing prescribed burns (e.g. Fire on the Forty, EQIP- Farm Bill Program).

Conservation Action 7 External Capacity Building

- Establish prescribed burning cooperatives to assist in alleviating capacity issues.
- Collaborate with Mississippi prescribed Fire Council, Southern Fire Exchange, Joint Ventures, LCCs and other fire related councils and organizations to develop and disseminate prescribed fire information.
- Collaborate with non-profit organizations in the state (The Nature Conservancy, Audubon, etc) with established fire programs.
- Increase interagency coordination to address impediments to burning, such as inability to burn across jurisdictional boundaries, inability for NGOs to assist with public burning, agencies not recognizing other certifications.

Climate Change

Shifting trends in long-term weather patterns, and the associated ecological consequences of these trends, could increase the challenges and complexities of wildlife conservation, according to the IPCC. In recognition of these challenges, the US House of Representatives mandates inclusion of climate change strategies into SWAP documents. An Executive Order (Executive Order No. 13653) further mandates that federal agencies, including the United States Fish and Wildlife Service, plan and implement actions to enhance and improve the resilience of the nation's natural resources to changing environmental conditions. As such, conservation managers across the nation are tasked with 1) evaluating the current and projected climate-change-related threats to species, and 2) providing plans of action that would help monitor and potentially mitigate the risks of these threats. This chapter is an initial effort to integrate and implement climate change tactics into the Mississippi SWAP in order to 1) maintain adherence and consistency with current and future policies, and 2) secure associated funding opportunities that allow continual conservation of SGCN and their habitats.

Climate Change Patterns

According to the IPCC, the Earth's climate is changing. Detailed observational evidence indicates that, at the global level, temperatures and sea levels are rising at unprecedented rates. While specific impacts of climate change at the regional level remain uncertain, impacts could vary regionally and may come in the form of changes to air and water temperature, as well as changes in precipitation.

The IPCC developed a set of scenarios to represent the range of forces that might impact climate change. Four scenarios or "families" were developed (A1, A2, B1, B2) representing a wide range of future characteristics such as demographics, economics, and technology. The A1 scenario indicates rapid population and economic growth followed by rapid introductions of new and more efficient technologies. Scenario A1 had 3 categories or "groups" characterizing 3 alternative energy developments: A1F1 for fossil fuel intensive, A1B for balanced (not relying too heavily on any one energy source), and A1T for predominately non-fossil fuel. Scenario A2 is a very heterogeneous world with slower population growth than A1 and an emphasis on family values and local traditions. Scenario B1 involves rapidly increasing populations similar to A1 but with emphasis on clean technologies and B2 places an emphasis on local solutions to economic and environmental sustainability. Each of these scenarios is used to predict future greenhouse gas emissions, which in turn will drive changes to global climate factors.

Modeled predictions for anticipated changes ("projections") in Mississippi suggest an average increase in temperatures of at least 2 to 8°F by 2050. The number of days over 95°F would increase and the number of nights below 32°F would increase as well, especially in the northern region of the state. (Figure 4.3)

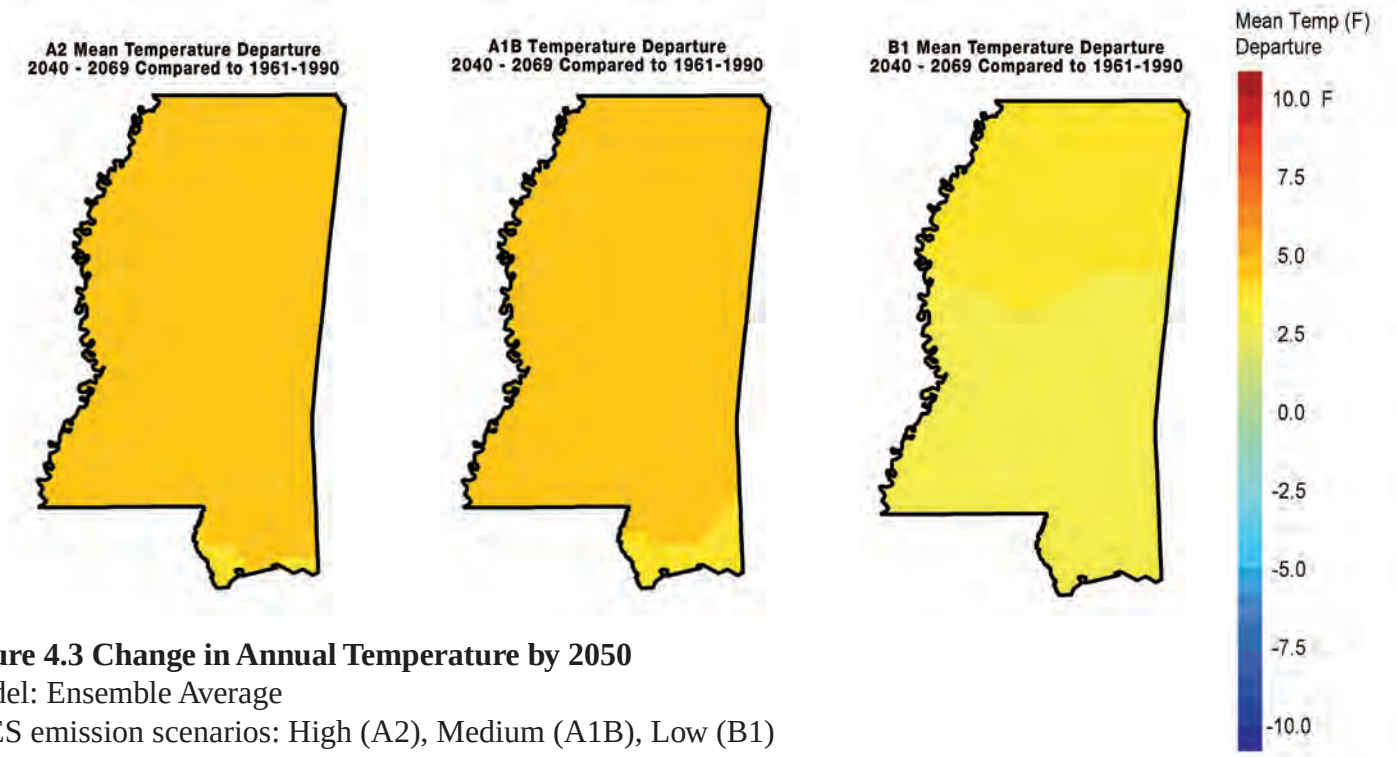


Figure 4.3 Change in Annual Temperature by 2050
Model: Ensemble Average
SRES emission scenarios: High (A2), Medium (A1B), Low (B1)

While projected changes in precipitation appear fairly minimal (Figure 4.4), consensus projections suggest that, over the next century, the Southeastern United States may experience a significant decrease in the availability of annual water due to increased evapo-transpiration (a result of higher temperatures). Figure 4.5

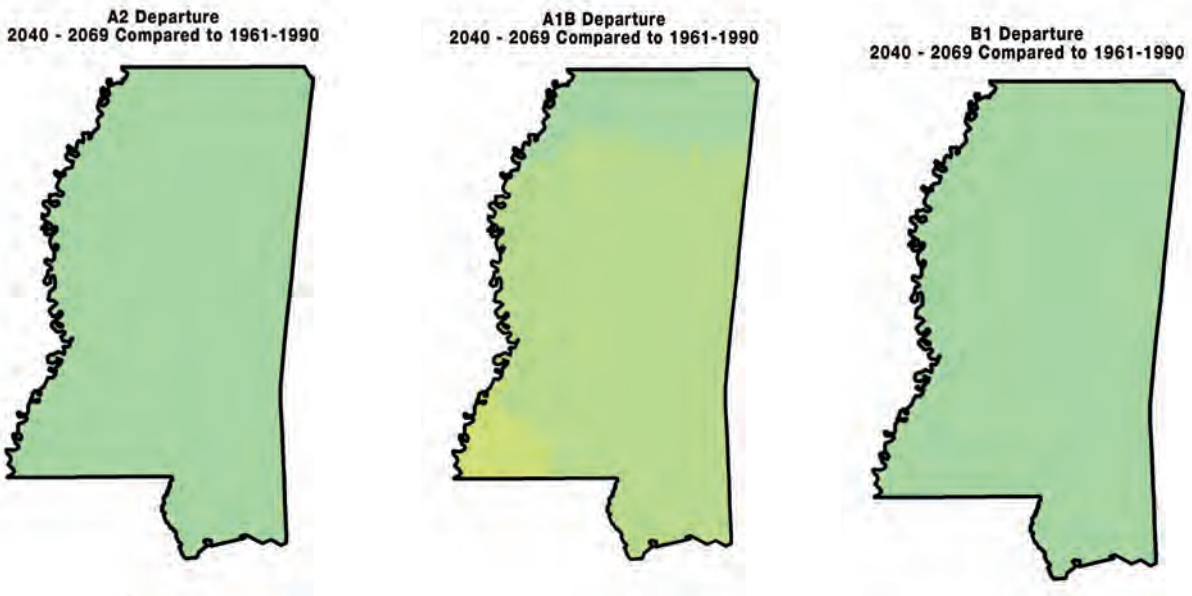


Figure 4.4 Change in Annual Precipitation by 2050
Model: Ensemble Average
SRES emission scenarios: High (A2), Medium (A1B), Low (B1)

This decrease in water availability could signify impacts to many mesic sites, along with wetlands, streams, and lakes. Drying of ephemeral wetlands and ponds could further endanger many sensitive species such as Dusky Gopher Frogs and other amphibians, which rely on appropriate hydroperiods to produce metamorphs

(Greenberg et al 2015). These potential changes can also affect waterfowl and wetland bird species by reducing the availability of wetland areas for these species. This would affect the ability of wetlands to provide important functions such as flood control, sediment capture, and groundwater recharge (NABCI 2010). Impacts of changing weather conditions will vary depending on the species. More mobile animals, like mammals or birds, will be able to shift their range accordingly. Less mobile species or habitat specialists may have no options for movement if changes in precipitation and temperature force the habitat to shift northward, as predicted in many models. Uncertainty about predicted changes leaves much debate about if species will be affected and to what extent. Lawler et al. (2010) predicted amphibian vulnerability to climate change at two greenhouse gas emission levels. The lower level shows little vulnerability of amphibians in the Southeast to climate changes. The higher level shows a low to moderate vulnerability.

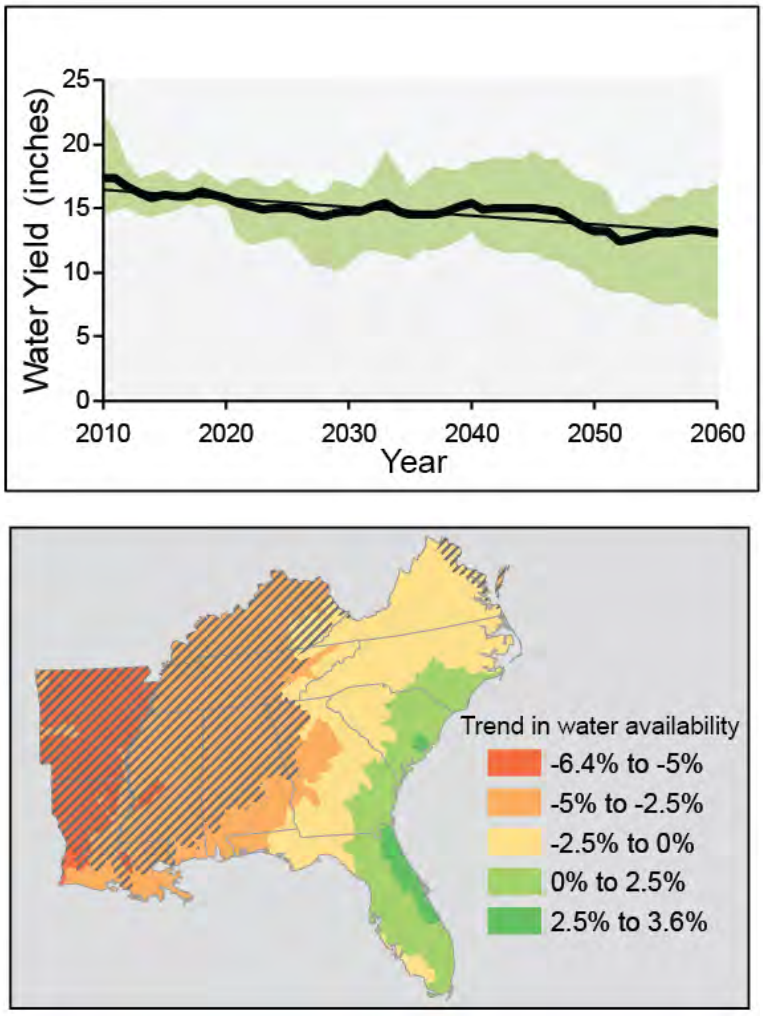
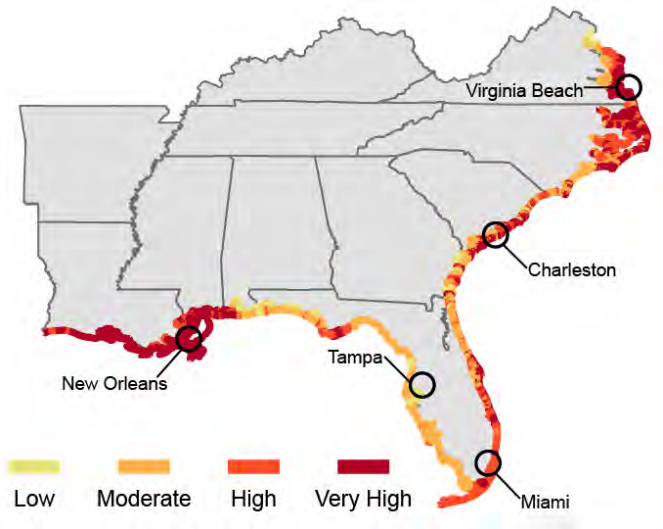


Figure 4.5 Top: Projected trend in Southeast-wide annual water yield (equivalent to water availability) due to climate change. The green area represents the range in predicted water yield from four climate model projections based on the A1B and B2 emissions scenarios. **Bottom: Spatial pattern of change in water yield for 2010-2060 (decadal trend relative to 2010).** The hatched areas are those where the predicted negative trend in water availability associated with the range of climate scenarios is statistically significant (with 95% confidence). As shown on the map, the western part of the Southeast region is expected to see the largest reductions in water availability. (Carter et al. 2014 adapted from Sun et al. 2013

Predicting coastal vulnerability to future changes is difficult due to the varying factors involved. In an effort to establish a standard method to predict coastal vulnerability to sea level rise, USGS developed a coastal vulnerability Index (CVI). Assessments involving the CVI of Mississippi's Gulf Coast indicate a very high vulnerability to rise in sea level and subsequent coastal alterations (Figure 4.6). These changes would likely be coupled with ecological consequences, initiating new and exacerbating present conservation issues (Hammar-Klose and Thieler 2001).

NABCI's 2010 State of the Birds report studied the relative vulnerability of birds to climate change. Ocean and Coastal birds showed the highest vulnerability among habitats found in Mississippi. Forest, wetland, and grassland bird species were not as vulnerable. Addressing other threats to these habitats would mitigate for impacts due to climate change. For these reasons, threats from climate change were limited to the Northern Gulf of Mexico ecoregion.

Figure 4.6 The map shows the relative risk that physical changes will occur as sea level rises. The Coastal Vulnerability Index used here is calculated based on tidal range, wave height, coastal slope, shoreline change, landform and processes, and historical rate of relative sea level rise. The approach combines a coastal system's susceptibility to change with its natural ability to adapt to changing environmental conditions, and yields a relative measure of the system's natural vulnerability to the effects of sea level rise. (Carter et al. 2014; data from Hammar-Klose and Thieler 2001)



Conservation Challenges: Ecological Consequences of Climate Change

Studies suggest that changes in climate can impact species and the habitats they use. For example, Schummer et. al. (2010) suggest that, "In migratory birds, evidence suggests northward latitudinal shifts in distribution during winter for a variety of species in North America." Battaglia et al. (2012) have identified that, in Mississippi, coastal habitats could be under threat from rising sea levels and increasing intensification of tropical storms. Such a scenario could create higher storm surges and threaten the existence of barrier islands, according to the authors.

Changes in species composition, richness, and relative abundance—as well as shifts in distribution—could accompany such shifts in environmental conditions and habitat. Some species, particularly those with specialized habitat requirements (e.g. shore birds like the Wilson's plover; wetland species like the mottled duck and the Mississippi gopher frog), may face extirpation if the unique habitats on which they rely disappear or become modified at a pace that surpasses the species' abilities to either disperse or adapt.

Altered environmental and seasonal conditions could also trigger a cascade of phenological changes, including changes in patterns and timing of species migrations, reproduction, and seasonally-dependent species interactions (Walther et al. 2002; McGowan et al. 2011; Austin and Rehfisch 2005). In changing

weather patterns, migration may increase the vulnerability of already at-risk species such as some shorebirds and waterfowl, which depend on weather cues for migration.

Under these new stresses addressed above, SGCN could become more susceptible to extirpation or extinction as a result of further exposure to current conservation issues including habitat loss/fragmentation, invasive species, and disease.

Conservation Actions to Address Climate Change

While it is clear that climate change would impact the flora and fauna of Mississippi, there is uncertainty surrounding the specific conservation issues that will result from climate change at the local, state, and regional levels. Due to these uncertainties, the Association of Fish and Wildlife Agencies (AFWA) suggests using adaptive management strategies to address conservation issues arising from climate change. Adaptive management strategies allow conservation efforts and associated decision-making processes to change through time based on best available knowledge (i.e. climate science data, continued monitoring, evaluation of success, etc.).

One way in which Mississippi can approach an adaptive climate change strategy is to first identify a prioritized target for conservation action. Potential targets include specific species (e.g. endangered species or SGCN), but may also include particular communities or ecosystems (e.g. wetlands) and/or ecological processes (e.g. water cycles).

To begin identifying priorities for targeted climate-change related action, an initial assessment of vulnerability should be undertaken. In other words, it should be determined whether species are likely to be either sensitive or resilient to the stressors likely to accompany, or be exacerbated by, climate change.

The International Union for the Conservation of Nature (IUCN) invited a group of experts from a broad range of taxonomic groups and regions to develop traits that make species susceptible to climate change (Foden et al. 2008). The list of over 90 traits were refined and put in five groups to evaluate species vulnerability to climate change:

- Does the species require a specialized habitat?
- Is the species only capable of tolerating narrow environmental thresholds, and are those thresholds likely to be exceeded as climate change progresses?
- Does the species rely on specific environmental cues for important phenological processes (i.e. rainfall or temp cues for migration, breeding, hibernation)?
- Does the species have a dependent interaction with another species which may be disrupted under climate change?
- What are the dispersal capabilities of the species?

Objectives of a vulnerability assessment include: 1) determining if a species or a particular group of species would be vulnerable to climate change, 2) describing how exposure to climate change might impact the species and/or its environment, and 3) evaluating the species ability to adapt or respond to the pressures of climate change. Once targeted species and/or environments have been identified, actual plans of action would then focus on implementing specific methods that would promote and/or enable species and ecosystems to be resilient to change.

The four Landscape Conservation Cooperatives (LCCs) that cover the Gulf of Mexico region (The Gulf Coast Prairie, Gulf Coastal Plains and Ozarks, South Atlantic, and Peninsular Florida), along with the Gulf of Mexico Alliance, released a Gulf Coast Vulnerability Assessment (GCVA) in 2015 (Watson et al. 2015). The goal of the GCVA is to enhance conservation and restoration planning and implementation by providing an understanding of the effects of climate change, sea level rise, and land use change on Gulf coastal ecosystems and the species that depend on them. The GCVA chose to focus on four ecosystems in the Gulf of Mexico region: Mangroves, Tidal Emergent Marsh, Oyster Reefs, and Barrier Islands. Eleven species associated with these ecosystems were assessed for their vulnerability to climate change. Those 11 species are the Roseate Spoonbill, Blue Crab, Clapper Rail, **Mottled Duck,** Spotted Seatrout, Eastern Oyster, **American Osytercatcher,** Red Drum, **Black Skimmer, Kemp's Ridley**, and the **Wilson's Plover**. Five of those species **(in bold)** are listed as SGCN in Mississippi.

In Mississippi, tidal emergent marsh was ranked as highly vulnerable to climate change, mostly from inundation due to sea level rise, fragmentation, and constraints on range shifts due to urbanization. The Mottled Duck, found along Mississippi's Gulf Coast in emergent marshes was found to be moderately vulnerable. Oyster reefs were found to be moderately vulnerable along the Mississippi, Alabama, and Florida Panhandle coast. The American Oystercatcher was found to be highly vulnerable in Mississippi due to a lack of areas to shift to and the extent of hardened shoreline in the area. Barrier Islands across the entire Mississippi Coast are considered highly vulnerable. The rate of sea level rise and anthropogenic factors will decide the rate of fragmentation or loss. Interruption of the sediment supply will affect the rate of loss unless nourishment projects are undertaken to prevent the islands from disappearing. Black Skimmers, Kemp's Ridley sea turtles and Wilson's Plovers were all ranked as highly vulnerable to climate change. Collaborations such as this should be initiated to explore vulnerability of other habitats and SGCN in Mississippi.

National Fish, Wildlife and Plants Climate Adaptation Partnership

The National Fish, Wildlife & Plants Climate Adaptation Strategy (NFWPCAS), developed in 2012 details seven goals to help fish, wildlife, and plants adapt to a changing climate, along with practical actions that can be accomplished, or at least initiated over 5 to 10 years. Those goals are:

1. Conserve habitat to support healthy wildlife populations and ecosystem functions.
2. Manage species and habitats to protect ecosystem functions and provide sustainable use in a changing climate.
3. Enhancing the capacity for effective management in a changing climate.
4. Support adaptive management through integrated observation and monitoring.
5. Increase knowledge and information on impacts and responses to a changing climate.
6. Increase awareness and motivate action to safeguard species in a changing climate.
7. Reduce non-climate stressors to help species and ecosystems adapt to a changing climate.

Conservation Actions following Salafsky et al. (2008) that should be applied to address climate change include:

Conservation Action 1 Land/Water Protection

- Using the methods outlined above, identify habitats and/or species that are 1) most vulnerable to climate change and 2) most resilient to change. Initiate vulnerability assessments on species and habitats across the state. As new data becomes available, update current vulnerability assessments.
- Working with stakeholders such as local, state, or federal agencies, LCCs, Joint Venture Partnerships, NGO's identify and conserve tracts of land that would maintain or restore habitat connectivity (i.e. corridors) and allow for the shifting range of habitats due to climate change.

Conservation Action 2 Land/Water Management

- Continue implementing actions that address or mitigate non-climate related stressors (i.e. habitat fragmentation/alteration/destruction, invasive species, disease, etc.) that may further increase species sensitivity to extinction or extirpation under climate change;

Conservation Action 3 Species Management

- Conduct status and trend monitoring projects to evaluate changes over time and space in wildlife and their associated habitats.
- Use vulnerability and risk assessments to identify species vulnerable to transition under climate change and develop management strategies for adaptation.

Conservation Action 4 Education and Awareness

- Increase awareness of potential impacts of climate change to garner support from landowners, conservation partners, and the general public.
- Inform stakeholders how species can adapt through effective conservation.

Conservation Action 6 Livelihood, Economic, and other Incentives

- Encourage the development of markets to address climate change (i.e mitigation, carbon trading) while facilitating adaptation.

Conservation Action 7 External Capacity Building

- Collaborate with other local, state and federal agencies, LCCs, Joint Venture partnerships, and NGO's develop conservation goals and landscape scale plans to sustain species and ecosystems.
- Foster collaboration among private landowners, local experts, and specialists to share resources and expertise that would not be available to many small landowners.

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CHAPTER 5

ECOREGIONS AND HABITATS OF MISSISSIPPI

Introduction

Mississippi's ecoregional designations were adopted by the SWAP Technical Committee from those of Bailey/ US Forest Service Ecological Units as modified in 1998 by The Nature Conservancy (TNC), because of their wide acceptance within the ecological community and their close association with the Partners in Flight regional plans (Figure 5.1). TNC defines 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." TNC developed an Ecoregional Plan for each of the four ecoregions included within Mississippi; these plans are major planning documents from which much of the information and recommendations in this strategy were drawn. Ecoregions that encompass Mississippi 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 Mississippi SGCN have been identified by ecoregion for planning purposes (see Chapter 2 for habitats in each ecoregion and Appendix VI for SGCN in each ecoregion). 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 2 – 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 SWAP.

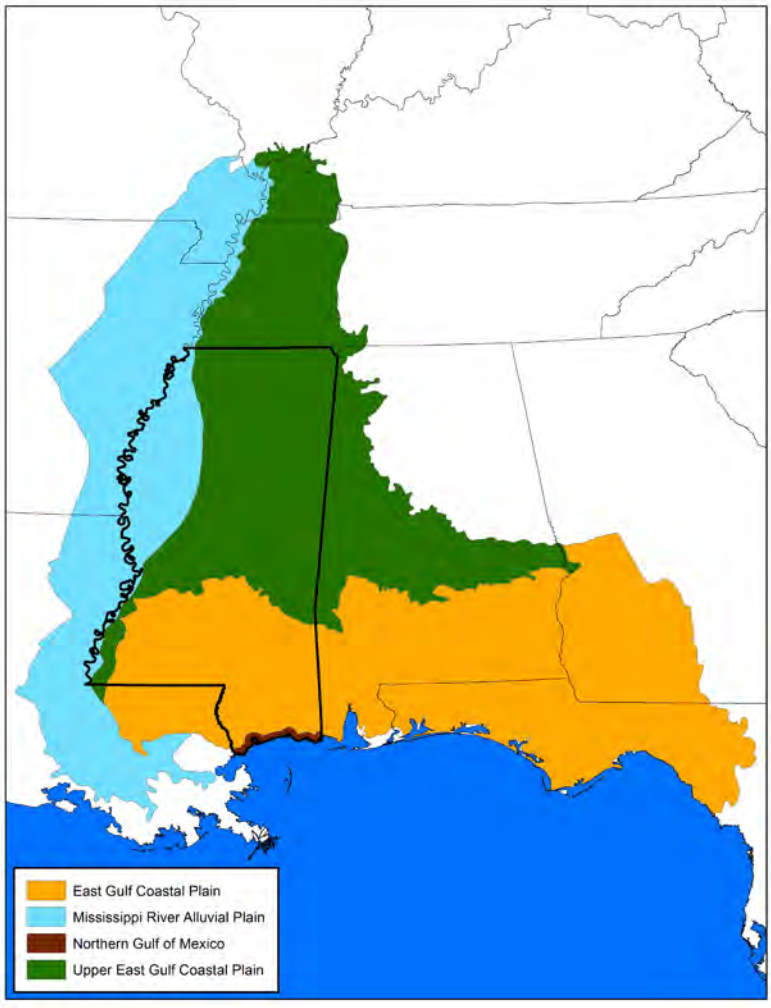

Figure 5.1 Ecoregions of Mississippi

A Guide to Using this Section

Chapter 5, Ecoregions and Habitats of Mississippi has been divided into ecoregions found within Mississippi. Each ecoregion contains all of Mississippi's major habitat types according to the ecoregion, or ecoregions, they are found in. While this format creates some duplication of habitat types similar to multiple ecoregions, it allows the user to find all the information from a particular ecoregion in one section. This also allows for similar habitats in different ecoregions to be discussed separately. For example, bottomland hardwood forests in the MSRAP may have different SGCN, than those found in the EGCP. This also creates duplication of Threats and Conservation Actions multiple times. In an effort to make each habitat or ecoregion a standalone document, we have listed all threats and action common to each habitat.

General Condition of Habitat Type: Discusses general changes in the habitat type relative to the best-known historic condition (e.g., gains or losses in land coverage). Also includes a map depicting coverage of habitat subtypes within each ecoregion.

Under each habitat type is a more detailed description of habitat subtypes identified. For each habitat subtype, this section will include:

Description of Subtype: Discusses geological features and biotic communities associated with the habitat subtype. Subtypes are defined by factors such as soil type, water availability, vegetation, water chemistry, region, and stream size. Included in this section are MNHP Ecological Communities and plant species associations.

Location, Size, Condition, and Conservation Status: This section contains an estimate of the size (acreage) of subtype in the state based on data from MARIS and the MNHP database. Descriptions of conditions were taken from MNHP data. The Conservation Status was taken from NatureServe's description of ecological communities and was included to indicate the rarity of subtypes.

Species of Greatest Conservation Need: The table presented lists SGCN associated with the habitat subtype. General taxonomic group, scientific name, common name, and tier-ranking are given for each SGCN included in the table.

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

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Hylocichla mestelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler

Threats to the community: A prioritized (high, medium, low) list of threats affecting each habitat subtype is listed, along with specific threats as warranted. Threats are described in more detail in Chapter 4.

THREATS

2. Mesic Upland Forests					
	CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	M	M	L
		1.2 Commercial and industrial areas		M	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops			L
		2.2 Wood and pulp plantations: Lack of BMP implementation, excessive herbicide use on site preparation	H	H	H
		2.3 Livestock farming and ranching	L		L
3	Energy production and mining	3.2 Mining and quarrying: Gravel/sand mining, lignite mining	M		
4	Transportation and service corridors	4.1 Roads and railways	L	H	
5	Biological resource use	5.3 Logging and wood harvesting: High grading timber stands	H	H	H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	
7	Natural system modifications	7.1 Fire and fire suppression: Altered fire regime including season and frequency of burns		H	
		7.2 Dams and water management/use: Operation of dams/ impoundments, groundwater withdrawal, headcutting, stream flow management			M
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Johnson grass, Chinese privet, fire ants, kudzu, bamboo, Chinese tallow, Japanese climbing fern	H	H	H

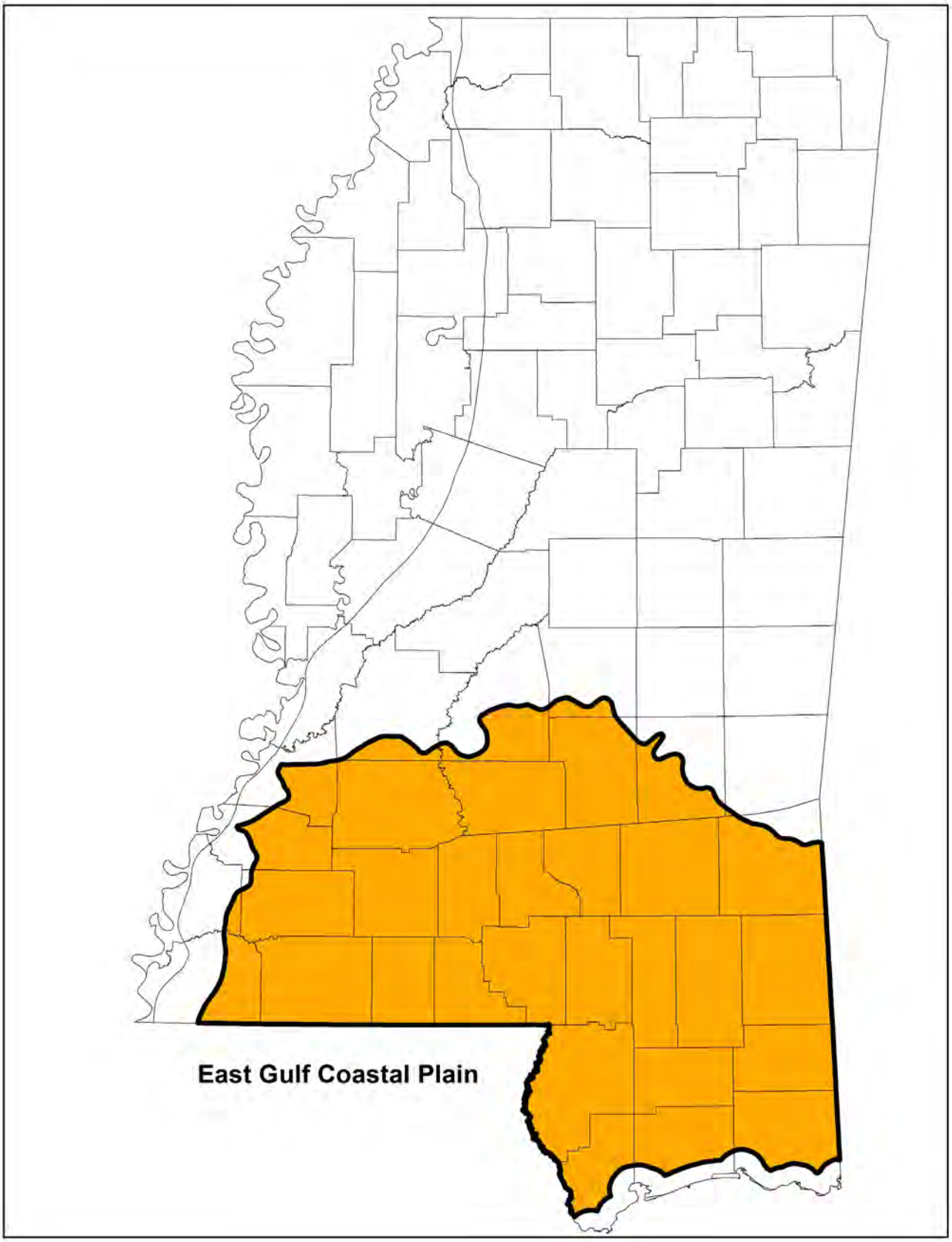

Figure 5.2 East Gulf CoastalPlain Ecoregion in Mississippi

A. 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 biologically one of the 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 both terrestrial and freshwater systems. Part of the reason for this is that the ecoregion has never been glaciated, giving ample time for the evolution of narrowly 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 plan. Inland, longleaf pine woodlands were until recently 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 freshwater aquatic and bottomland systems.

The freshwater systems of the EGCP are among the most biologically diverse at-risk resources in North America, particularly for fish and mussel species. Many of these species 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 bottomland hardwood forests, cypress-gum swamps, many lakes (oxbows and/or impoundments) 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. And generally where fire has not been excluded, prescribed fire is typically conducted during phenologically inappropriate seasons. 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.

EGCP Habitats:

1. Xeric-Mesic Upland Forests/Woodlands
   - 1.1. Xeric Hardwood Forests
   - 1.2. Xeric Longleaf Pine Forests
   - 1.3. Xeric-Mesic Hardwood Forests
   - 1.4. Xeric-Mesic Shortleaf/Loblolly Pine Forests
2. Mesic Upland Forests
   - 2.1. Southern Mixed Hardwood Forests
   - 2.2. Mesic Longleaf Pine Savanna/Forests
   - 2.3. Lower Slope/High Terrace Hardwood Forests
3. Rock Outcrops and Caves
   - 3.1. Rock Outcrops
   - 3.2. Caves
4. Bottomland Hardwood Forests
   - 4.1. Bottomland Hardwood Forests
5. Swamp Forests
   - 5.1. Bald Cypress/Gum Swamp Forests
   - 5.2. Small Stream Swamp Forests
6. Riverfront Forests/Herblands/Sandbars
   - 6.1. Cottonwood/Black Willow/River Birch Woodlands
   - 6.2. Sandbars
7. Wet Pine Savannas/Flatwoods/Bogs
   - 7.1. Wet Pine Savannas
   - 7.2. Slash Pine Flatwoods
   - 7.3. Pitcherplant Bogs
8. Inland Freshwater Marshes
   - 8.1. Freshwater Marshes
9. Lacustrine (Lentic) Communities
   - 9.1. Oxbow Lakes
   - 9.2. Reservoirs
   - 9.3. Ephemeral (Temporary) Ponds
   - 9.4. Beaver Ponds
10. Artificial Habitats
    - 10.1. Urban and Suburban Lands
    - 10.2. Buildings, Bridges, Overpasses Etc.
    - 10.3. Utility Right-of-ways
    - 10.4. Hay and Pasture Lands
    - 10.5. Pine Plantations
    - 10.6. Shrublands
    - 10.7. Row Crops
    - 10.8. Artificial Ponds

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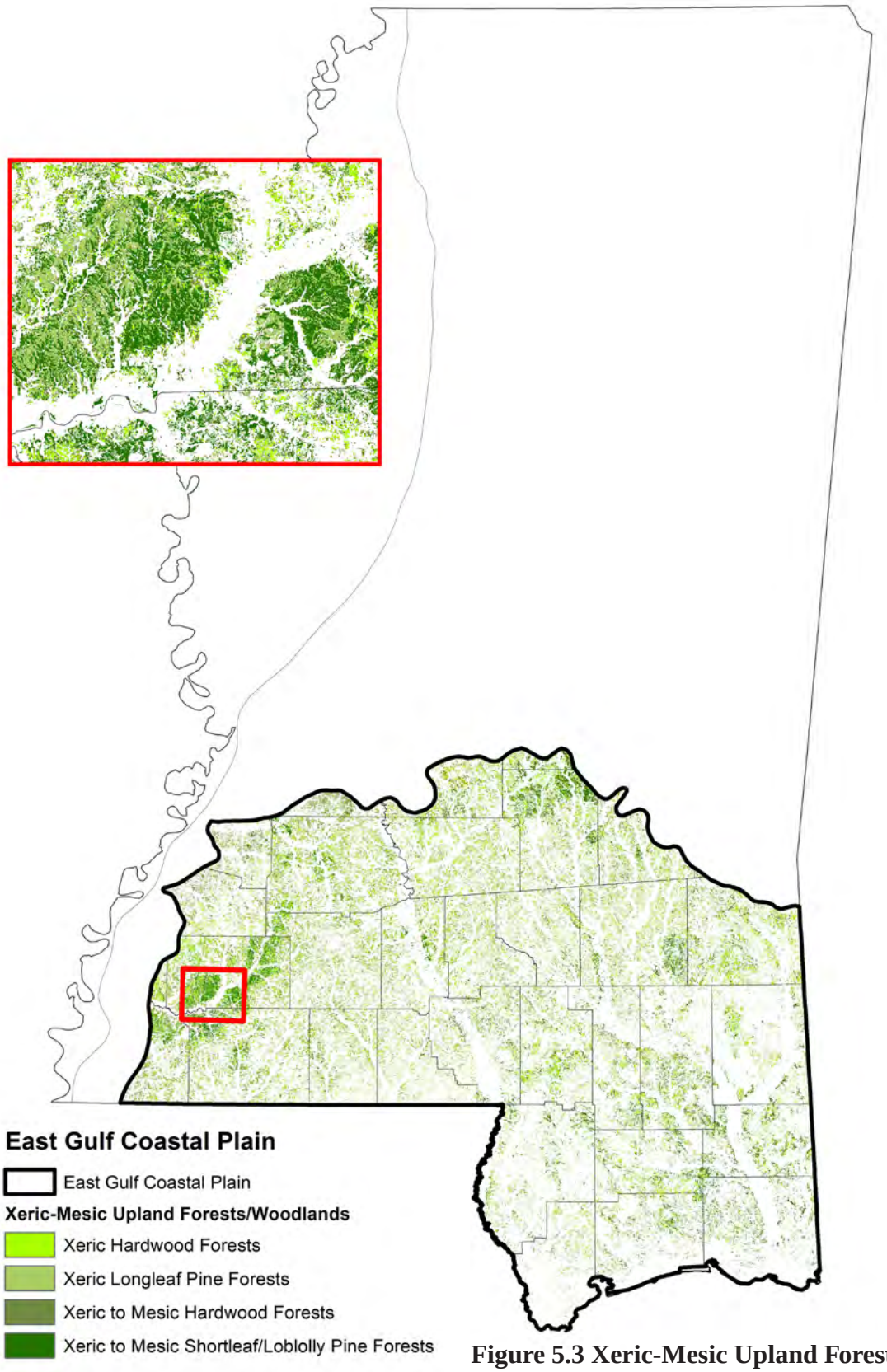

Figure 5.3 Xeric-Mesic Upland Forests/ Woodland Habitats In East Gulf Coastal Plain Ecoregion - with inset showing detail.

1. Xeric to Mesic (Dry to Moderately Moist)

Upland Forests/Woodlands

Xeric to mesic forests are often found on excessive to somewhat excessively well-drained soils, and include hardwood and pine forest associations. Mixed pine-hardwoods forests are classified by the more abundant canopy tree type. 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 in the EGCP: 1.1 Xeric Hardwood Forests, 1.2 Xeric Longleaf Pine Forests, 1.3 Xeric-Mesic Hardwood Forests and 1.4 Xeric-Mesic Shortleaf/Loblolly Pine Forests

GENERAL CONDITION

Although there are no estimates of the losses of Xeric to Mesic 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 forests were converted to agricultural croplands and pasture. The tracts 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.

Due to a history of pine monoculture and fire suppression, typical upland forests lack a diverse understory and exhibit very high stem densities. Upland forests of Mississippi benefit from prescribed burning. However, timberlands and protected forestlands, such as national wildlife refuges and lands adjacent to U.S. Army Corps of Engineers' reservoirs, are somewhat degraded due to limited exposure to fire, though continued efforts to increase application of prescribed burning on national forest lands may result in improved conditions.

Timing of prescribed burning is an important issue: to most closely approximate condition of the historic forests, burns should occur in late spring and early summer, when natural ignitions were most likely and when litter moisture was low enough to facilitate fire propagation.

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, conditions of these forests may improve.

1.1 Xeric Hardwood Forests

DESCRIPTION

The xeric hardwood subtype of the EGCP includes Turkey oak-sand post oak woodlands and xeric upper slope oak-hickory forests with mixed pine. These forests occupy dry upland slopes and ridge tops with nutrient poor soils of various textures.

Turkey oak-sand post oak woodlands are a highly altered longleaf pine community, from which the longleaf pines were harvested sometime in the past. This community occurs on sandy caps of hill crests or on thick deposits of sand in floodplain terraces. The groundcover may be patchy to very dense, with common longleaf pine association species: narrowleaf silkgrass, bearded skeletongrass, piedmont threeawn, and coastal plain dawnflower. Small regenerating longleaf pines may be found at the edges. Attempts to establish loblolly pine plantations were common in the past, but usually these failed and remaining trees are stunted. Mars Hill Sandhill in the De Soto National Forest, Perry County, has areas supporting this community.

Xeric oak-hickory forests/woodlands with pine are common in this ecoregion. It is a forest dominated by oaks (sand post, post, blackjack, and/or southern red oak), hickories (sand and/or mockernut hickory), and pines (shortleaf and/or loblolly pines). These communities are often found in the transition zone between upland longleaf forests and beech-magnolia ravine forests. Examples can be seen at the river bluffs of Pascagoula River and Ward Bayou Wildlife Management Areas in Jackson and George counties.

MNHP Ecological Community	Species Associations	MNHP Rank
Turkey oak - sand post oak woodland	*Quercus laevis - Quercus margarettae - Pityopsis graminifolia - Gymnopogon ambiguus - Aristida condensata - Stylisma patens*	S2
Xeric oak-hickory forest/ woodland with pine	*Quercus margarettae, Q. stellata, Q. marilandica, Q. falcata - Carya pallida, C. tomentosa - Pinus echinata*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

It is estimated that over **500,000 acres** of this subtype exists in the EGCP Ecoregion. Mesic hardwood and pine forests are situated below this community on mid-slopes. Stands of xeric hardwood forests are interspersed with agriculture and commercial timberlands, homesteads and urban centers.

Conversion of additional areas of xeric hardwood forests to pine plantations, sand pits, pastureland, urban and suburban development is a significant threat. Ridgetops are used for transportation corridors and the secondary development that is associated with roads. Xeric hardwood forests are highly fragmented and considered to be in poor condition due to complete exclusion of fire, which allows off-site bottomland species to invade uplands, altering forest composition.

Xeric 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 XERIC HARDWOOD FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Piranga olivacea*	Scarlet Tanager
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-Haired Bat
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Gopherus polyphemus*	Gopher tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	3	*Masticophis flagellum*	Eastern Coachwhip

1.2 Xeric Longleaf Pine Forests

DESCRIPTION

Longleaf pine forest historically covered most of the southern portion of the state, extending from slightly above today's I-20 corridor south to I-10. The area typically featured a rolling topography of very well drained soils. Nested within the piney woods were hillside seepage slopes of pitcherplants. Although xeric longleaf pine forests occur in several southern counties of the UEGCP, the subtype is only described in this ecoregion chapter. Threats, priority conservation actions, and SGCN are the same as those listed for EGCP longleaf pine forests. Xeric longleaf forests are presented in this subtype; longleaf savannas will be included in Habitat Type 7.

Sandhill longleaf pine, longleaf pine-saw palmetto forests, beach rosemary scrub and longleaf pine-blackjack oak are the ecological communities representing this subtype. They are found on mid and upper 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. 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 fire, which prevents excessive shrub encroachment.

Sandhill longleaf forests were once the most abundant of the sandhill communities. In this now rare community, widely scattered longleaf pines tower over a sparse subcanopy of turkey oak, sand post oak, and bluejack oak. Saw palmettos are also usually present. Scarlet calamint is often found in the shrub layer. Wiregrass, bluestems, legumes and sedges form patches in the herbaceous layer. The Little Florida area in the De Soto National Forestin Harrison County has examples of this habitat.

Longleaf-saw palmetto woodlands are typified by an open canopy of longleaf pines over a scattered saw palmetto shrub layer. The saw palmetto layer tends to be denser than that of the previous type. The soils are excessively well-drained, sugary, white sands. The saw palmetto shrub layer may become dense under a dormant season burning regime. This community may be seen at DeSoto National Forest's Harrison Experimental Forest Research Natural Area in Harrison County.

A rare community in this subtype, longleaf pine forests with beach rosemary (sand heath) are found in Greene and George Counties. In these communities, sparse longleaf pine trees shade an understory consisting mostly of beach rosemary. Due to its lack of fuel, this community rarely burns. The Nature Conservancy's Harvell and Pellerree Jackson Sandhills Preserve in George County is an example of this community.

Another pine sandhill community found in this region is longleaf pine-blackjack oak woodlands. In this habitat, the soil has a higher clay composition than that of the previous communities. The canopy of the woodland is open with scattered longleaf pine and large blackjack oaks. Sand post oak and bluejack oak are also usually present in the midstory. Other oaks such as turkey oak and post oak may also be present as well as other hardwoods. Threeawn grasses often dominate the groundcover. This community may be seen at the Jasper County Longleaf Pine Natural Area south of Bay Springs, MS.

MNHP Ecological Community	Species Associations	MNHP Rank
Sandhill longleaf forest	*Pinus palustris - Serenoa repens - Clinopodium coccineum - Quercus laevis*	S2
Longleaf pine - saw palmetto woodland	*Pinus palustris - Serenoa repens*	S1
Beach rosemary scrub	*Pinus palustris - Ceratiola ericoides*	SNA
Longleaf pine - blackjack oak forest	*Quercus marilandica - Q. margarettae - Q. incana - Pinus palustris - Aristida sp.*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The xeric 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 (habitat subtype 3.2) and habitats converted to other uses (plantations, suburban, industrial, fields and pasture, etc.). The size of the patches ranges from 500 to 1,000 acres. Little is known about the size of the area of the xeric longleaf pine forests subtype in the state, but it is estimated that the community has a total area of **300,000 acres**.

The upland sites that support this community have been used for road corridors, sand sources and homesites. Fire suppression and conversion to other land uses, including pine plantations, have caused serious qualitative and quantitative declines of this community. However, Little Florida Conservation Site on De Soto National Forest is in excellent condition, as are some other areas devoted to the protection of gopher tortoise.

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

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH XERIC LONGLEAF PINE FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Columbina passerina*	Common Ground-Dove
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Sitta pusilla*	Brown-headed Nuthatch
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Peromyscus polionotus*	OldField Mouse
	3	*Mustela frenata*	Long-tailed Weasel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake
	4	*Heterodon simus*	Southern Hognose Snake

1.3 Xeric to Mesic Hardwood and Hardwood/Pine Forests

DESCRIPTION

Neither a very wet or very dry habitat, moderately mesic habitats are often found in a narrow zone between upland forests and low-lying areas such as bottomland hardwood forests, ponds, etc. 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 and water oak are also common. Smaller or subcanopy trees and shrubs may include American beech, eastern hophornbeam, flowering dogwood, and sourwood. One community, the xeric-mesic mixed oak-pine forest, represents this subtype in the EGCP.

Xeric-mesic mixed oak-pine forests have a canopy consisting of nearly equal proportions of loblolly pine and hardwoods, including several oaks (white, southern red, water, and cherrybark oak) and sweetgum. This is usually a transitional forest between upland longleaf forests and lower slope mixed oak hardwoods. An example of this type is present at The Nature Conservancy's Red Creek Mitigation Bank in Jackson County.

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric - mesic mixed oak - pine forest	*Pinus taeda, P. echinata - Quercus alba, Q. falcata, Q. nigra, Q. pagoda - Liquidambar styraciflua*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Tracts of xeric-mesic hardwood forests 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 350,000 acres** of this forest subtype in the EGCP of Mississippi.

Many tracts containing this forest subtype have been converted to pine production. 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 XERIC-MESIC HARDWOOD AND HARDWOOD/PINE FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Dendroica discolor*	Prairie Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Scolopax minor*	American Woodcock
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake

1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests

DESCRIPTION

Shortleaf pine can be found on droughty ridge tops and occasionally in sandhills. Naturally occurring loblolly pine existed in pine and mixed hardwood-pine stands on moist upland flats, mid/lower slopes of drainage ways and high stream terraces in areas merging with longleaf pine region. 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. Two ecological communities are found in this subtype: xeric-mesic pine forests and lower slope pine forests.

Xeric-mesic pine forests form one of the largest communities in this subtype. Shortleaf and/or loblolly pine form the canopy, with some occasional oak and hickory trees. Flowering dogwood often dominates the midcanopy; sourwood and blackgum are also usually present. Longleaf woodoats sometimes becomes a dense groundcover, particularly in sunspots. Clarkco State Park in Clark County and Roosevelt State Park in Scott County are dominated by this habitat type.

Lower slope pine forests are a very abundant community in the EGCP. These forests consist of nearly pure stands of loblolly pines over a patchy groundcover of longleaf woodoats. Roosevelt State Park in Scott County has areas with examples of this community.

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric-mesic pine forest	*Pinus echinata - P. taeda - Cornus sp. - Toxicodendron tulipifera - Chasmanthium sessilifolium*	S4
Lower slope pine forest	*Pinus taeda - Chasmanthium sessiliflorum*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

In the southern region of the state, shortleaf pine forests are usually found in smaller patches on narrow ridgetops. The pine stands are often interspersed with pine plantations, cutover areas and hardwood stands. There are approximately **500,000 acres** of this subtype in the EGCP of Mississippi.

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.

Xeric-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 XERIC-MESIC SHORTLEAF/LOBLOLLY PINE FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	3	*Lithobates palustris*	Pickerel Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Sitta pusilla*	Brown-headed Nuthatch
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	3	*Masticophis flagellum*	Eastern Coachwhip

THREATS

1. Xeric-Mesic Upland Forests/Woodlands						
	CLASSIFICATION	**SUBCLASS**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric Longleaf Pine Forests**	**1.3 Xeric-Mesic Hardwood Forests**	**1.4 Xeric-Mesic Shortleaf/Loblolly Pine Forests**
1	Residential and commercial development	1.1 Housing and urban areas	H	H	M	M
		1.2 Commercial and industrial areas			L	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops	M	L		
		2.2 Wood and pulp plantations: Lack of BMP implementation, excessive herbicide use on site preparation	H	H	H	H
		2.3 Livestock farming and ranching		H	L	
3	Energy production and mining	3.1 Oil and gas drilling	M			
		3.2 Mining and quarrying	M	H		M
4	Transportation and service corridors	4.1 Roads and railways	H	H		M
		4.2 Utility and service lines: ROW management, non-selective herbicide use, non-native grass establishment	H	H		
5	Biological resource use	5.1 Hunting and collecting terrestrial animals: Intentional killing of snake species, especially the Eastern Diamondback Rattlesnake	M	M		
		5.3 Logging and wood harvesting: Highgrading timber stands	H	H		H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	L	
7	Natural system modifications	7.1 Fire and fire suppression	H	H	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Japanese climbing fern, Japanese Honeysuckle, St. Augustine grass, wild hogs, fire ants, Chinese privet, Chinese tallow	H	H	M	M
		8.2 Problematic native species: Armadillos, encroachment of native plant species due to altered fire regimes	H			

PRIORITY CONSERVATION ACTIONS

1. Xeric-Mesic Upland Forests/Woodlands					
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric Longleaf Pine Forests**	**1.3 Xeric-Mesic Hardwood Forests**	**1.4 Xeric-Mesic Shortleaf/Loblolly Pine Forests**
1.0 Land/Water Protection					
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X
2.0 Land/Water Management					
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Control exotic and invasive species (plant and animal).	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	
2.3 Habitat and natural process restoration	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Encourage restoration and improved management of altered/ degraded habitat when possible. (i.e. Encourage older age class pines for use as cavity trees by Red-cockaded woodpeckers)	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X		X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.	X	X	X	X
3.0 Species Management					
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	

1. Xeric-Mesic Upland Forests/Woodlands					
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric Longleaf Pine Forests**	**1.3 Xeric-Mesic Hardwood Forests**	**1.4 Xeric-Mesic Shortleaf/Loblolly Pine Forests**
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
	Initiate propagation program or establish next box program for selected SGCN. (i.e. Nest boxes for Red-cockaded woodpecker and Southeastern American kestrel)		X		X
3.3 Species reintroduction	Initiate propagation program or establish next box program for selected SGCN (i.e. Translocation of Red-cockaded Woodpecker)		X		X
3.4 Ex situ conservation	Initiate propagation program or establish next box program for selected SGCN(i.e. Translocation of Red-cockaded Woodpecker)		X		X
4.0 Education and Awareness					
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.2 Training	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
5.0 Law and Policy					
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X

1. Xeric-Mesic Upland Forests/Woodlands					
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric Longleaf Pine Forests**	**1.3 Xeric-Mesic Hardwood Forests**	**1.4 Xeric-Mesic Shortleaf/Loblolly Pine Forests**
5.2 Policies and regulations	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X		X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X		X	X
	Discourage incompatible recreational uses.	X	X	X	
	Improve enforcement of existing species protection regulations.	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
6.0 Livelihood, economic and other incentives					
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
7.0 External Capacity Building					
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X

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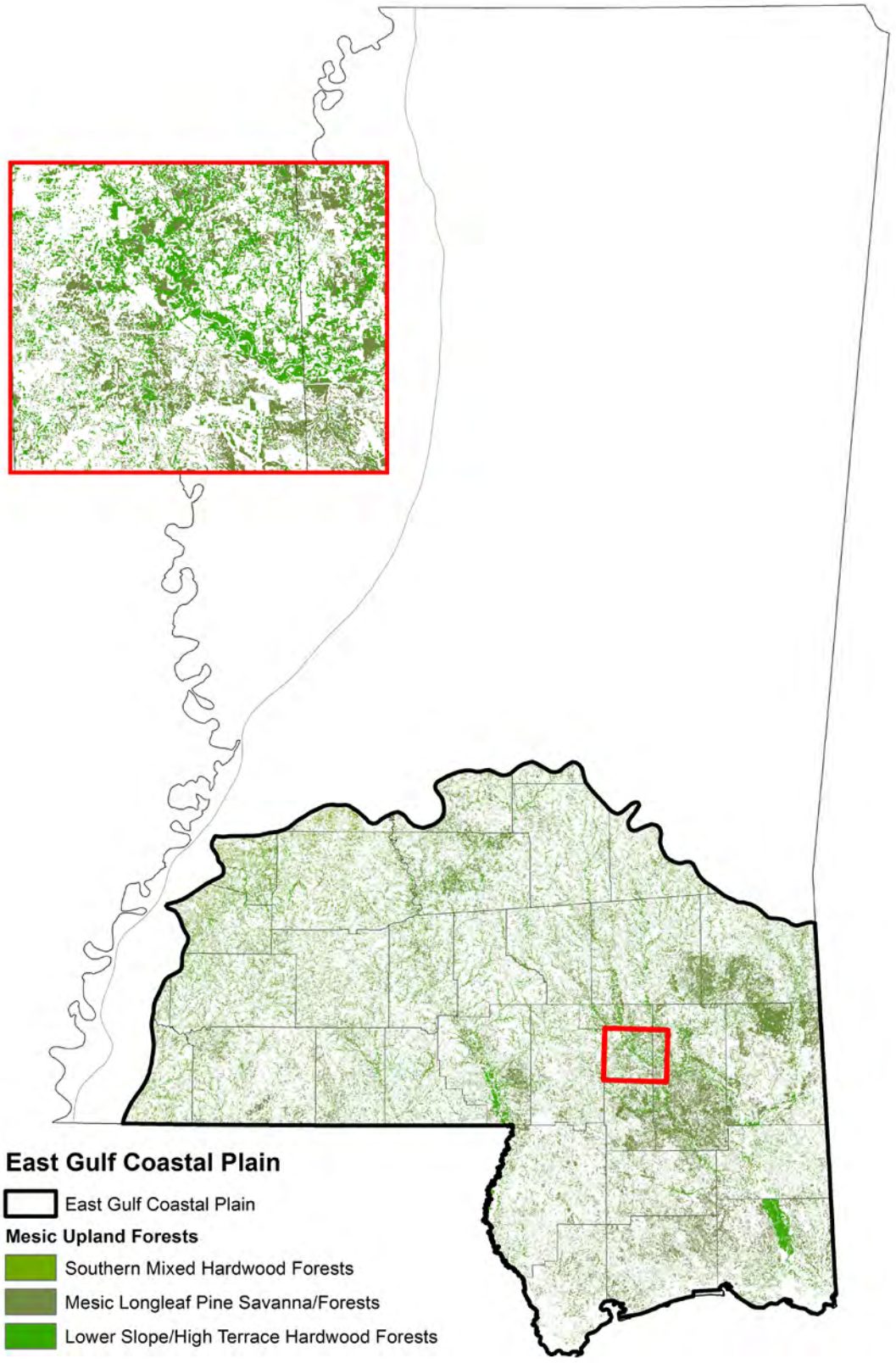

Figure 5.4 Mesic Upland Forest In The East Gulf Coastal Plain Ecoregion - with inset showing detail.

2. Mesic Upland Forests

Mesic upland forests are supported by soils that have higher moisture holding capacities than those of xeric to sub-xeric forest categories. Plant communities of mesic habitats include beech/magnolia forests, longleaf pine savannas, and lower slope/high terrace hardwoods. Hardwood forests in this type are often found on moist portions of upland habitats protected from fire (by slope) and high terraces or ridges of floodplains.

Included in these mesic forests are small seepage slopes or springs. 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. 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 three subtypes in the EGCP: 2.1 Southern Mixed Hardwood Forests, 2.2 Mesic Longleaf Pine Savanna/Forests, and 2.3 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.

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, many existing 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.

Forest management practices that prevent logging in streamside zones, designed to help improve water quality of streams, help conserve lower slope/high terrace hardwood forests. The expansion of terrace hardwoods onto slopes of the longleaf pine region is a modern condition resulting from the suppression of fire. Conditions described for xeric to sub-xeric hardwood forests also apply to these forest communities.

2.1 Southern Mixed Hardwood Forests

DESCRIPTION

In this ecoregion, southern mixed hardwood forests are usually found on the loamy soils in isolated coves, draws and on steeper terrain, in patches on national forest lands and on bluffs or upper terraces of major river systems. There are two ecological communities in this subtype: Beech-magnolia forests and wooded/spring seeps.

The Beech-Magnolia forest community occurs in transitional areas from upland longleaf pine hills to stream bottoms. American beech and magnolias are the dominant trees of the canopy, but this layer can be very diverse with several species of hardwoods and pines also occurring. Important trees of this community include American beech, southern magnolia, cucumber magnolia, swamp laurel oak, mockernut hickory, pignut hickory, swamp tupelo, white oak, tuliptree, sweetgum, cherrybark oak and spruce pine. Sub-canopy trees may include bigleaf magnolia, American hornbeam, sourwood, American holly and flowering dogwood. Six magnolia species may be encountered in this forest type: southern magnolia, sweetbay, pyramid magnolia, cucumber tree, bigleaf magnolia and rarely, umbrella magnolia. Florida anise, witch-hazel, wild azalea, farkleberry, Elliot's blueberry and giant cane are common understory constituents. This community represents the climax community of this ecoregion, if fire is removed from the landscape. Natural fire events are rare for this community, as the steep slope forms an effective fire break from fires that may start at the ridge tops. Excellent quality beech/magnolia bluff forests are found along the Pascagoula River bluffs of the Pascagoula and Ward Bayou Wildlife Management Areas in Jackson County.

Narrow wooded seeps or spring seeps can be found on the steep slopes of this community. Usually the soils of hardwood seeps are 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 that may be found in these seepage areas include giant cane, bristly stalked sedge, climbing hydrangea and roundleaf goldenrod. Wetland shrubs found clustered around seeps include Virginia sweetspire, poison sumac and possumhaw viburnum. Common trees are sweetbay, swamp tupelo, red maple and tuliptree.

MNHP Ecological Community	Species Associations	MNHP Rank
Beech - magnolia forest	*Fagus grandifolia - Magnolia grandiflora/M. macrophylla - Liriodendron tulipifera - Hamamelis virginiana - Phegopteris hexagonoptera*	S1
Wooded seep/spring seep/wet terrace	*Itea virginica - Magnolia virginiana - Nyssa biflora - Acer rubrum - Osmunda regalis/O. cinnamomea - Woodwardia areolata - Athyrium filix-femina*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Southern mixed hardwood forests cover over **500,000 acres** in isolated small to medium sized patches (100 to 1,000 acres) throughout the East Gulf Coastal Plain of Mississippi. The community occurs on isolated steep hilly areas or blufflands, protected coves and along mid and lower slopes of ravines, draws and river valleys. Due to extensive logging, this community has been lost at many sites, and may only support successional vegetation at others. Southern mixed hardwood forests require over 70 to 100 years to recover from disturbances.

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 SOUTHERN MIXED HARDWOOD FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Aquila chrysaetos*	Golden Eagle
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Seiurus motacilla*	Louisiana Waterthrush
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Spilogale putorius*	Eastern Spotted Skunk
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard

2.2 Mesic Longleaf Pine Savanna/Forests

DESCRIPTION

In Mississippi, 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 herbaceous plants.

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, swamp 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 bluestem, slender bluestem and wiregrass are especially important in mesic longleaf forests. Other prominent species are blue 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.

Six ecological communities are present in this subtype: longleaf pine clay savanna, longleaf pine clay glades, loamy hills longleaf-slash pine forests, xeric longleaf pine forests, fire suppressed longleaf pine forests and pine seeps. Longleaf pines dominate the canopy of all these communities. The prevailing groundcover has been used to separate the communities.

The diagnostic feature of longleaf pine clay savanna and glades is the presence of blue muhly, which forms the dominant groundcover under a sparse canopy of longleaf pines. These forests are found in upland areas that have loamy soils over clay or clay loam soils on a relatively level to gently sloping plain. These soils are moist, periodically wet, but droughty also. East Sandy Creek Natural Area of De Soto National Forest in Stone County is an example of this community type.

Loamy hills longleaf -slash pine forests were the historic vegetation that covered large areas of southern Mississippi. In literature, this community has also been known as “longleaf pine savanna.” All four common upland pine species can be found in this community. Towards the south part of the region, slash pine is more common with increases in other species going north through the region. Common associates are post oak, blackjack oak, southern red oak, mockernut hickory, white oak, red maple, sweetgum, water oak and upland laurel oak. Understory species include flowering dogwood and several species of holly and huckleberry. In these forests, little bluestem and slender bluestem grasses are the most obvious components of the herbaceous layer. This landscape consisted of rolling hills composed of a loamy mesic soil. Paul B. Johnson State Park in Forrest County has extensive areas of this community type.

The driest soils of this subtype are found in the xeric longleaf pine forest. In this community, little bluestem forms the majority of the groundcover, but various ironweeds and narrowleaf silkgrass are also usually present. The uplands surrounding the headwaters of Deep Creek, De Soto National Forest in Perry County, are composed of this community type.

In the absence of frequent burns, other pines, hardwood trees and shrubs rapidly move into these longleaf pine savannas. In just a few years, the midcanopy and shrub layers of this community can become thick and impenetrable, eliminating natural regeneration of the shade-intolerant longleaf seedlings. If left unaltered, this community succeeds to an oak-hickory-pine community on drier sites and to beech-magnolia in mesic areas.

Pine seeps have a similar composition to bog habitats described in habitat type 7.3 and a somewhat similar complement of ferns as found in hardwood seeps. The overstory typically includes slash pine but there may be a large presence of other swamp species such as sweetbay and swamp tupelo. The most obvious species present in the herbaceous layer is yellow trumpets (pitcherplant). Virginia chainfern and poison sumac are particularly common. Buttercup Flats Natural Area in Stone County within the De Soto National Forest has extensive pine seeps.

MNHP Ecological Community	Species Associations	MNHP Rank
Longleaf pine clay savanna (blue muhly)	*Pinus palustris - Muhlenbergia expansa - Dichanthelium longiligulatum - Bigelowia nudata - Aristida purpurascens*	S1
Longleaf pine clay glade (savanna)	*Pinus palustris - Muhlenbergia expansa - Dichanthelium longiligulatum - Bigelowia nudata - Aristida purpurascens*	S1
Loamy hills longleaf - slash pine forest	*Pinus palustris - Pinus elliottii - Schizachyrium scoparium - S. tenerum - Rhexia alifanus*	S3
Fire suppressed longleaf pine savanna	*Pinus palustris* - mixed hardwood midstory/understory	S4
Xeric longleaf pine forest	*Pinus palustris - Schizachyrium scoparium - Vernonia angustifolia - Pityopsis adenolepis*	SNA
Pine seepage slope	*Pinus palustris/ P. elliottii - Sarracenia alata* - Wetland herbaceous species	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 **800,000 acres** in the EGCP of Mississippi. 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.

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 forbaceous species and causes a reduction in forbaceous species 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, federal and state resource agencie and non-government partners 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.

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 MESIC LONGLEAF PINE SAVANNA/FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Ammodramus leconteii*	LeConte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Columbina passerine*	Common Ground Dove
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Sitta pusilla*	Brown-headed Nuthatch
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake

2.3 Lower Slope/High Terrace Hardwood Forests

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. 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.

Nine ecological communities comprise this subtype: Lower slope mixed hardwood forests, lower slope mixed hardwood—pine forests, mixed hardwoods forest - spruce pine, mesic calcareous bluff forests, mesic lowland hardwood forests, forested canebrakes and wooded seeps/spring seeps/wet terraces.

The most widespread communities in this subtype are the lower slope mixed hardwood forests and lower slope mixed hardwood—pine forest. In the former, white oak, water oak, cherrybark oak form the canopy. Other important canopy trees include swamp tupelo, mockernut hickory, american beech, tuliptree, and sweetgum. American hornbeam, red maple, and oak-leaf hydrangea are usually present in the midcanopy and shrub layer. The Long Branch Ravine Natural Area of the De Soto National Forest in Stone County has examples of this community type.

In the pine association type, swamp chestnut replaces cherrybark oak in the canopy. Usually loblolly pines and/or spruce pine occupy equal amounts of the canopy cover to the hardwood components. Other hardwood trees present in the canopy include swamp tupelo, tuliptree, and sweetgum. Eastern hophornbeam, parsley haw, and possumhaw holly are usually present in the midcanopy and shrub layers. This community is found at the Cedar Creek Bottom Natural Area of the Bienville National Forest in Jasper County.

Another mixed forest in this subtype is the mixed hardwoods forest with spruce pine. This community is found near the toe of slopes and into floodplains. Swamp laurel oak and water oak are important components of the canopy layer, as is spruce pine. Usually the understory is open in this forest. Sedges often form large patches in the herbaceous layer, but usually few species are present in this layer, and a thick leaf litter blocks most plant growth. Wyatt Hills in the De Soto National Forest in George County has areas with this community.

The rarest community in this subgroup is the mesic calcareous bluff forest. As its name implies, these forests are found over predominately calcareous soils derived from ancient marine deposits. The canopy is formed by mixed hardwoods, with white oak, Shumard oak, and white ash dominating. Usually southern sugar maple is present as an understory tree. Cat's Den Cave, a TNC holding in Smith County, has an extensive calcareous bluff forest.

Of historical significance are the Forested canebrakes of riverine areas of the state. Extensive, impenetrable giant cane thickets 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. Forested canebrakes are found in the floodplain of the Pearl River in Old River Wildlife Management Area in Pearl River County.

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 viburnum. Common trees are sweetbay, swamp tupelo, red maple and tuliptree.

MNHP Ecological Community	Species Associations	MNHP Rank
Lower slope mixed hardwood forest	*Quercus alba/Q. nigra/Q. pagoda* - mixed deciduous trees	S4
Lower slope mixed hardwood - pine forest	*Quercus alba/Q. nigra/Q. michauxii*- mixed deciduous trees - *Pinus taeda/P. glabra*	S4
Mixed hardwoods forest - spruce pine	*Quercus laurifolia/Q. nigra - Pinus glabra*	S3
Mesic calcareous bluff forest	*Quercus alba/Q. shumardii - Fraxinus americanus - Lithospermum tuberosum - Agrimonia pubescens*	S1
Forested canebrake	Mixed deciduous trees(open canopy) - *Arundinaria gigantean*	S1
Wooded seep/spring seep/wet terrace	*Alnus serrulata - Itea virginica - Magnolia virginiana/M. macrophylla - Osmunda regalis/O. cinnamomea - Woodwardia areolata - Athyrium filix - femina*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 **1,000,000 acres** of this subtype are estimated to occur in the EGCP of 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Hylocichla mestelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisiana Waterthrush
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat

THREATS

2. Mesic Upland Forests					
	CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	M	M	L
		1.2 Commercial and industrial areas		M	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops			L
		2.2 Wood and pulp plantations: Lack of BMP implementation, excessive herbicide use on site preparation	H	H	H
		2.3 Livestock farming and ranching	L		L
3	Energy production and mining	3.2 Mining and quarrying: Gravel/sand mining, lignite mining	M		
4	Transportation and service corridors	4.1 Roads and railways	L	H	
5	Biological resource use	5.3 Logging and wood harvesting: High grading timber stands	H	H	H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	
7	Natural system modifications	7.1 Fire and fire suppression: Altered fire regime including season and frequency of burns		H	
		7.2 Dams and water management/use: Operation of dams/ impoundments, groundwater withdrawal, headcutting, stream flow management			M
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Johnson grass, Chinese privet, fire ants, kudzu, bamboo, Chinese tallow, Japanese climbing fern	H	H	H

PRIORITY CONSERVATION ACTIONS

2. Mesic Upland Forests				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
2.2 Invasive/ problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
2.3 Habitat and natural process restoration	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Encourage restoration and improved management of altered/degraded habitat when possible (Encourage older age class pines for use as cavity trees by Red-cockaded Woodpeckers)	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X		X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by providing habitat corridors between disjunct populations or subpopulations.	X	X	X

2. Mesic Upland Forests				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
	Initiate propagation program or establish next box program for selected SGCN. (i.e. Nest boxes for Red-cockaded woodpecker and Southeastern American kestrel)		X	
3.3 Species reintroduction	Initiate propagation program or establish nest box program for selected SGCN (Red-cockaded Woodpecker, Mississippi Gopher Frog)		X	
3.4 Ex situ conservation	Initiate or continue propagation program or nest box program for selected SGCN (Mississippi Gopher Frog)		X	
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X

2. Mesic Upland Forests				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X	X
	Discourage incompatible recreational uses.	X	X	X
	Improve enforcement of existing species protection regulations.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

2. Mesic Upland Forests				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Mesic Longleaf Pine Savanna/Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

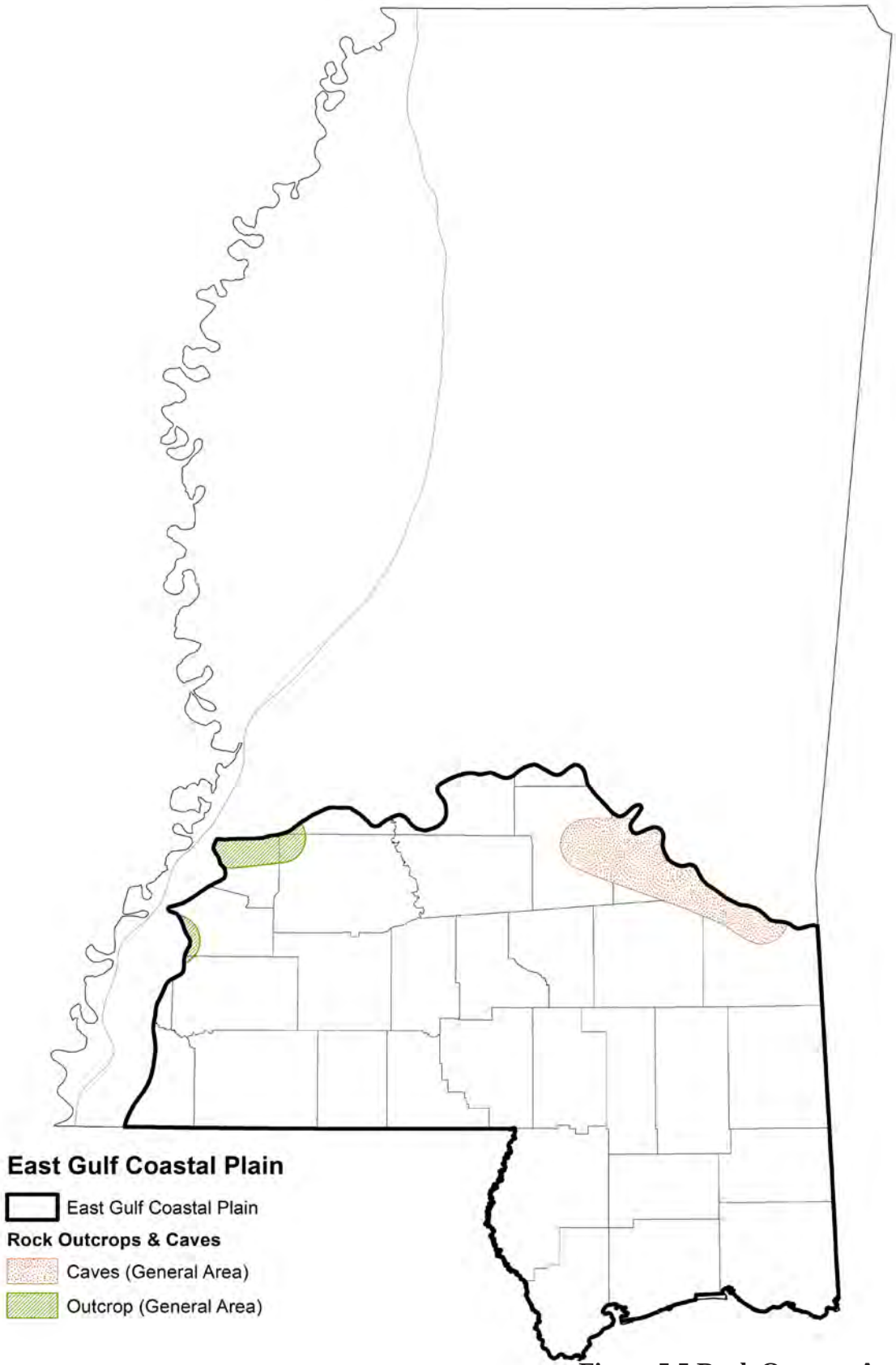

Figure 5.5 Rock Outcrop And Caves In East Gulf Coastal Plain Ecoregion

3. 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 in the EGCP: 3.1 Rock Outcrops and 3.2 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 (e.g. gating of caves, security from public intrusion) is limited. As a result, human disturbances such as noise, vandalism, and fires in caves are commonplace and detrimental to the species residing there. Natural disturbances, such as cave-ins can be 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.

3.1 Rock Outcrops

DESCRIPTION

Most of the EGCP is covered with deep soils originating from alluvial reworking of deposits of marine or older alluvial deposition. With the exception of gravel deposits (many of which originate from areas far beyond the boundaries of Mississippi), outcrops of rock at the surface are generally uncommon in most portions of this ecoregion. Rock outcrops provide essential habitat for a few species of rare salamanders, and may be facultatively important to others, probably by providing access to cool, moist, subterranean habitat, via cracks, fissures and solution channels to species which cannot dig deeply unaided, and which could not otherwise survive hot, dry summers.

Outcropping intermittently along the northern edge of this ecoregion are exposures of the Glendon and Marianna limestones of the Vicksburg Group (Oligocene), mainly where streams have downcut through younger overlying deposits. More generally distributed south of this zone are very disjunct sandstone/siltstone outcrops associated with the Catahoula Group (Miocene) in the more northerly portion of the ecoregion, and with the Hattiesburg and Pascagoula Formations (Miocene) farther south. They mainly occur along steep hill slopes, ravines or river channels where soils have eroded away, and in fact may be relatively soft when deeply buried, becoming hardened upon exposure subsequent to erosion. Outcrops of ironstone and ferruginous conglomerates are often associated with sandstone outcrops, and may also be of importance to certain species, such as plants and salamanders. Examples of rock outcrops can be found at The Nature Conservancy's Cat's Den Cave site in Smith County and, the Swaggert's Bluff area on U.S. Forest Service property in Smith County. Both are within the Vicksburg Group Glendon limestone. MDWFP's Calling Panther Lake property in Copiah County includes outcrops of Catahoula Sandstone.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Outcrop belts of formations which may include limestone, sandstone, siltstone, ironstone, and well-cemented conglomeratic gravel are mapped by the Office of Geology, Mississippi Department of Environmental Quality. But most of the actual outcrops remain unmapped, and as noted above there are comparatively few outcrops of surface rock in Mississippi, as the surface of the state is predominantly comprised of unconsolidated sediments.

Estimates of acreage for rock outcrops are not available.

Rock outcrops are **imperiled** in the state because of rarity and because of historic destruction by mining for building stone, for use in concrete manufacture (limestone and gravel), for production of agricultural lime, for road-building, and when inundated consequent to impoundment of streams. They are vulnerable to further decline from mining activity, and from conversion of outcrops and/or surrounding habitat to other uses (urban/suburban development, pasture, industrial forestry, highway construction).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ROCK OUTCROPS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylum scutatum*	Four-toed Salamander
	2	*Plethodon websteri*	Webster's Salamander
	3	*Lithobates palustris*	Pickerel Frog
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	3	*Mustela frenata*	Long-tailed Weasel

3.2 Caves

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. 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. In addition, Mississippi has many man-made caves and abandoned mines that function similarly to natural caves and are used by SGCN.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Caves within the EGCP are found very rarely in some sandstone and limestone formations. Of the 65 known cave locations in MS over 20 currently occur, or did occur, in the EGCP ecoregion of the state. Few have escaped damage from humans. In 1933, the Pitts Cave formations near Waynesboro were mentioned in an article in the Memphis, TN Commercial Appeal newspaper. When the exact location of the cave was published in local newspaper articles, the cave was heavily vandalized and filled with litter. Other caves, such as the West Quarry #1 cave have been destroyed by mining, farming or forestry operations.

In Mississippi, caves are usually associated with upland hardwood forests but can be found in other habitats. For caves to function as suitable habitats for wildlife species, provisions to prevent human disturbances such as noise, vandalism and camp fires are warranted. With the discovery of White Nose Syndrome, a disease decimating bat populations, the protection of caves is even more important. The fungus known to cause White Nose Syndrome can be transmitted through human activities. Additional monitoring of caves would help assess the quality of this habitat and its popularity to bat species. Mississippi has developed a White Nose Syndrome Response Plan in the event the disease moves into the state.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis lucifugus*	Little Brown Bat

THREATS

3.0 Rock Outcrops and Caves				
	CLASSIFICATION	SUBCLASS	3.1 Rock Outcrops	3.2 Caves
1	Residential and commercial development	1.1 Housing and urban areas	H	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops	M	L
		2.2 Wood and pulp plantations	H	L
		2.3 Livestock farming and ranching: Conversion to pasture	M	
3	Energy production and mining	3.2 Mining and quarrying: Gravel/sandstone/limestone mining	H	L
4	Transportation and service corridors	4.1 Roads and railways: Construction of roads/highways	H	
5	Biological resource use	5.1 Hunting and collecting terrestrial animals		M
6	Human intrusions and disturbance	6.1 Recreational activities: Hiking, climbing, cave exploration, camping	L	H
7	Natural system modifications	7.2 Dams and water management/use: Inundation from impooundments	H	L
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese Privet, White Nose Syndrome	H	H
9	Pollution	9.3 Agricultural and forestry effluents		L
		9.4 Garbage and solid wastes: litter		M

PRIORITY CONSERVATION ACTIONS

3. Rock Outcrops and Caves			
CLASSIFICATION	**CONSERVATION ACTION**	**3.1 Rock Outcrops**	**3.2 Caves**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.		X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X
	Continue to restrict/monitor scientific collection of SGCN.		X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training		X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X

3. Rock Outcrops and Caves			
CLASSIFICATION	**CONSERVATION ACTION**	**3.1 Rock Outcrops**	**3.2 Caves**
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.		X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X
	Develop/implement/continue recovery plans for individual SGCN.		X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.		X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.		X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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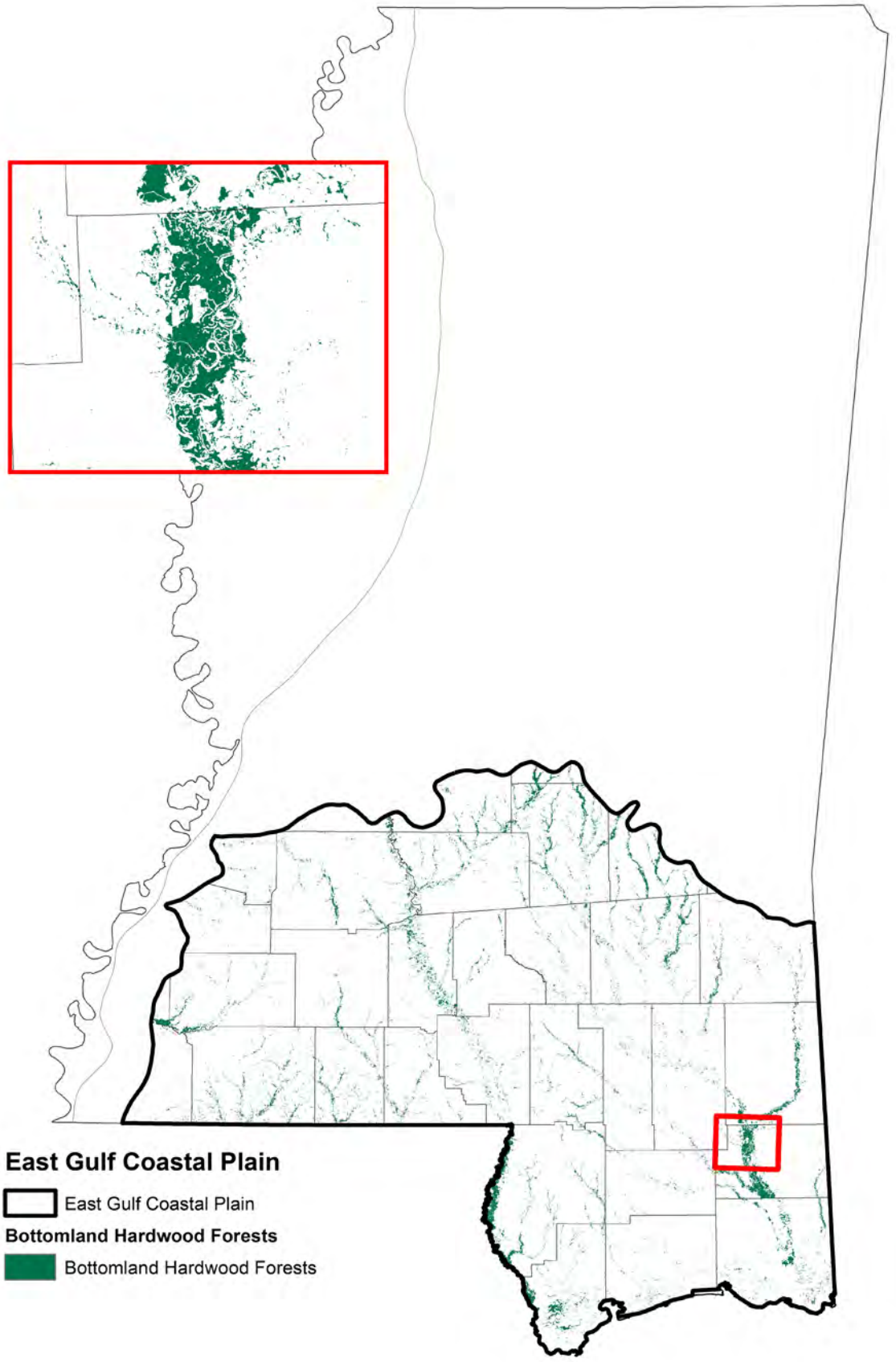

Figure 5.6 Bottomland Hardwood Forests In East Gulf Coastal Plain Ecoregion - with inset showing detail.

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 enriched by the influx of nutrients and sediments during floods.

This type includes one subtype in the EGCP: 4.1 Bottomland Hardwood Forests.

GENERAL CONDITION

Bottomland hardwood forests and swamps were once common in the Southeast. Statewide, 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.

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. Many existing bottomland hardwood forest have been highly degraded due to improper timber management resulting in altered species composition and forest structure. 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

DESCRIPTION

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 than other habitats. 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.

Seven ecological communities are represented in this ecoregion: Bottomland hardwood - pine forests, Oak - mixed hardwood ridge bottom forest, Wet hardwood bottom forests, Silver maple - mixed floodplain forest, Sugarberry - American elm - green ash bottomland forest, Diamondleaf oak - willow oak - water oak forest, and Sweetgum with mixed oak bottomland forests.

Bottomland hardwood - pine forests have a canopy dominated by swamp laurel oak, willow oak, water oak and loblolly pines. This community seldom has long durations of inundation by high water events. The canopy trees are often elevated above the floodplain, usually about one foot higher that the surrounding landscape. There is often a thick groundcover of leaf material, which prohibits the growth of herbaceous species. In areas that are scoured by seasonal high water events, a sparse herbaceous layer of grasses, sedges, and wildflowers can be found. Quarterliah Creek flood plain in Bienville National Forest in Jasper County is an example of this community.

Oak - mixed hardwood ridge bottom forests are found on mesic lowlands, second terraces and toe slopes. Infrequent flooding of short duration and loamy soils distinguish this habitat from other floodplain types. This community is usually found on terraces which were small levees created by ancient meander scrolls of the river. Water oak, cherrybark oak, white oak, and bitternut hickory all are common species in this habitat. Often thickets of pawpaw will also be present. Other common canopy trees include willow oak, swamp chestnut oak, sweetgum. Pineville Natural Area in Bienville National Forest in Smith County is an example of this community.

Wet hardwood bottom forests are dominated by canopy composed of tall overcup oak and water hickory. Other canopy trees that occur infrequently are sweetgum, water oak, willow oak and sugarberry. This forest type is found on the wettest sites and at the edges of swamp depressions and oxbow lakes. The canopy is dense, forming from 60 to 100 percent cover. Planertree is usually present as a thick midstory. The shrub layer is also usually thick and typically dominated by swamp privet, American snowbell, and common buttonbush. Pascagoula River Wildlife Management Area in Jackson and George Counties has the best example of this community in this ecoregion.

Silver maple-mixed floodplain forests are representative of early successional forests on alluvial wetlands and along oxbows. Silver maple and box elder are the most common trees present, although sycamore and water oak are often scattered through the forest. Ward Bayou Wildlife Management Area in Jackson County has examples of this community type.

Sugarberry-American elm-green ash bottomland forests occur on large river flood plains, especially along the batture lands of the Mississippi River. The tolerance of these species to long periods of inundation allows their dominance at these sites. Its position on the floodplain is on low terraces where annual flooding is regular and of moderate duration. Sugarberry and green ash, with additional common trees including boxelder, silver maple, sweetgum, and overcup oak, occur in this habitat. Trumpet creeper, Carolina

coralbead, and possumhaw are common understory constituents. Pascagoula Wildlife Management area in Jackson and George Counties also has areas with this community type.

Diamondleaf oak-willow oak-water oak forests are found on alluvial floodplains on poorly drained, flat sites. Red maple, green ash, Nuttall oak, sweetgum, water hickory, water locust and overcup oak are usually associates in the canopy of these forests. These areas are seasonally flooded, particularly in the early growing season. The Bienville National Forest includes this habitat, particularly in the Quaterliah Creek floodplain in Jasper County.

Sweetgum with mixed oak bottomland forests consist of a canopy of sweetgum, swamp chestnut oak, white oak, and cherrybark oak. Usually American elm is an important component of the midcanopy. Other canopy trees that may be present include: overcup oak, willow oak, water hickory, Nuttall oak, green ash, and bitternut hickory. Dwarf palmetto may form a dense shrub layer in this community type. The West Tallahalla Creek floodplain bordering Cat's Den Cave site in Smith County and the Pascagoula River Basin in George and Jackson counties are examples of this community.

MNHP Ecological Community	Species Associations	MNHP Rank
Bottomland hardwood - pine forest	*Quercus laurifolia/Q. phellos/Q. nigra - Pinus taeda*	S3
Oak - mixed hardwood ridge bottom forest	*Quercus nigra/Q. pagoda/Q. alba - Carya cordiformis - Asimina triloba*	S3
Wet hardwood bottom forest	*Quercus lyrata - Carya aquatica*	S3
Silver maple - mixed floodplain forest	*Acer saccharinum*-mixed hardwoods	S4
Diamondleaf oak - willow oak - water oak forest	*Quercus laurifolia - Q. phellos - Q. nigra*	S3
Sweetgum - mixed oak bottomland forest	*Liquidambar styraciflua - Ulmus americana - Quercus michauxii/Q. alba/Q. pagoda*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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; 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, with about **300,000 acres** in the EGCP ecoregion of the state. 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. Additionally, many existing forests have been negatively affected by improper timber management, including diameter-limit harvests and large (greater than 40 acre) clear cuts, resulting in altered species composition and poor forest structure with homogeneous canopy characteristics in reduced diversity of understory and herbaceous vegetation.

Due to drainage projects, 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 nature-based recreation such as fishing, hunting, wildlife viewing 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	2	*Mycteria americana*	Wood Stork
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Hylacichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red- headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisiana Waterthrush
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	4	*Lasionycteris noctivagans*	Silver-haired Bat

THREATS

4. Bottomland Hardwood Forests			
	CLASSIFICATION	**SUBCLASS**	**4.1 Bottomland Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	L
		1.3 Tourism and recreation areas	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops	H
		2.2 Wood and pulp plantations	H
		2.3 Livestock farming and ranching: Incompatible grazing practices	L
3	Energy production and mining	3.2 Mining and quarrying	H
4	Transportation and service corridors	4.1 Roads and railways	L
5	Biological resource use	5.2 Gathering terrestrial plants	L
		5.3 Logging and wood harvesting: Improper use of forestry BMPs	M
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L
7	Natural system modifications	7.2 Dams and Water Management/Use: Channel modification, ground and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese privet, Chinese tallow tree, Japanese climbing fern, bamboo, cogongrass, silktree, wild hogs	H
9	Pollution	9.1 Household sewage and urban waste water	M
		9.2 Industrial and military effluents	M
		9.3 Agricultural and forestry effluents	M
		9.4 Garbage and solid wastes	M

PRIORITY CONSERVATION ACTIONS

4. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**4.1 Bottomland Hardwood Forests**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Discourage incompatible recreational uses.	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/ roosting sites for bear, squirrel, bats, and cavity nesting birds	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X

4. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**4.1 Bottomland Hardwood Forests**
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Discourage incompatible recreational uses.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
	Encourage proper disposal and cleanup of waste and litter.	X
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Discourage incompatible recreational uses.	X
	Improve enforcement of existing species protection regulations.	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Encourage proper disposal and cleanup of waste and litter.	X

4. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**4.1 Bottomland Hardwood Forests**
6.0 Livelihood, economic and other incentives		
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
6.2 Substitution	Discourage incompatible recreational uses.	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

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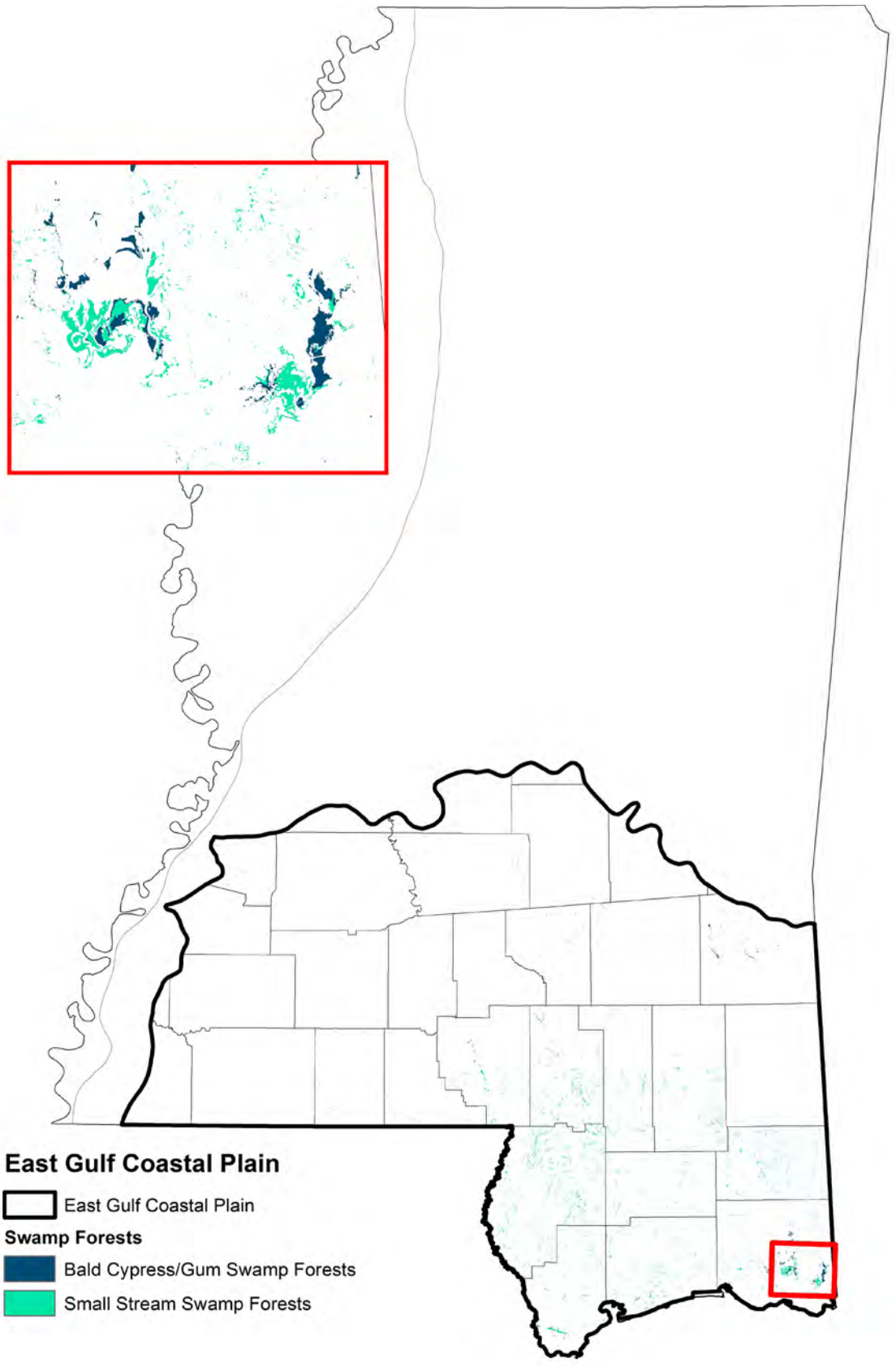
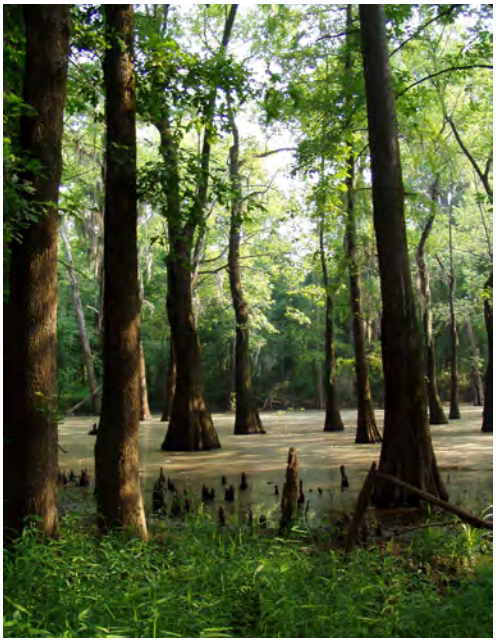


Figure 5.7 Swamp Forests In East Gulf Coastal Plain Ecoregion - with inset showing detail.

5. Swamp Forests



There are about 600,000 acres of swamp habitat in Mississippi, equivalent to about two percent of the state land area. 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, includes wet pond cypress depressions, white cedar swamps and bay swamp forests.

This type includes two subtypes in the EGCP: 5.1 Bald Cypress/Gum Swamp Forests and 5.2 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 coterminous 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. U.S. Forest Service inventories completed by the early 1990s 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 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 Mississippi River alluvial plain 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.

5.1 Bald Cypress/Gum Swamp Forests

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, swamp tupelo, water tupelo and other hardwood trees. Silver and red maple, persimmon, green ash, American hornbeam and water oak are occasional associates. Shrubs may include common 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.

Seven ecological communities are grouped into this general type: Bald cypress swamp, Bald cypress-water tupelo swamp, Tupelo swamp, Bald cypress-hardwood swamp forest, Bald cypress-black gum swamp, Wet pond cypress depression, and Buttonbush-swamp privet shrub wetlands.

Bald cypress swamps , bald cypress-water tupelo swamps, and tupelo swamps occupy semi-permanently flooded or seasonally flooded wetlands on landforms including back bays, depressions, oxbow lakes, and bottomland flats. Bald cypress and/or water tupelo dominate the canopy of these swamp habitats, and either can form pure stands. In the bald cypress-hardwood swamp forest type, bald cypress is present in the canopy, but other common woody species are water hickory, water elm, black willow, overcup oak, possumhaw holly, and American snowbell. Pascagoula River Wildlife Management Area in Jackson and George counties has areas with these habitats.

Bald cypress-swamp black gum swamp forests occur in less frequently flooded and shallower areas than the previous community types. Pascagoula River Wildlife Management Area in Jackson and George counties has examples of these habitats.

Wet pond cypress depressions are common habitat inclusions in the slash pine flatwoods of this ecoregion.

These are freshwater forested wetlands that have standing water for most if not all of the growing season. Nearly pure stands of pond cypress dominate a sparse canopy over a dense herbaceous layer. Lizard's tail and smooth sawgrass are the main components of this layer. Grand Bay National Estuarine Research Reserve in Jackson County has examples of this community.

Buttonbush - swamp privet shrub wetlands occupy intermittently exposed to semipermanently flooded lowland areas within and along the edges of creeks, rivers, sloughs, and oxbow lakes, often in zones surrounding deeper water. The lands remain flooded or generally saturated throughout the year. Though the conditions of this wetland habitat resemble those of swamps, the scarcity of swamp trees distinguishes this type. Fluctuating water levels cause herb density to vary widely in this ecological community. Common buttonbush is the indicator species for this habitat, while Virginia sweetspire and eastern swampprivet are less common. Old River Wildlife Management Area in Pearl River County has examples of this community type.

MNHP Ecological Community	Species Associations	MNHP Rank
Bald cypress swamp	*Taxodium distichum*	S3
Bald cypress - water tupelo swamp	*Taxodium distichum - Nyssa aquatic*	S3
Tupelo swamp	*Nyssa aquatic*	S3
Bald cypress - hardwood swamp forest	*Taxodium distichum - Carya aquatica -Quercus lyrata - Planera aquatic - Salix nigra*	S3
Bald cypress - black gum swamp	*Taxodium distichum/T. ascendens - Nyssa biflora*	
Wet pond cypress depression	*Taxodium ascendens - Saururus cernuus -Cladium mariscoides*	S2
Buttonbush - swamp privet shrub wetland	*Cephalanthus occidentalis - Forestiera acuminata-Itea virginica*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 also are situated in smaller backwater areas of creeks, where they occur adjacent to other bottomland hardwood forest types. About **10,000 acres** of this forest type is found in the EGCP ecoregion of Mississippi.

The annual losses of forested wetlands in Mississippi during the 1960s and 1970s 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
Birds	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
Fish	1	*Notropis melanostomus*	Blackmouth Shiner
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

5.2 Small Stream Swamp Forests

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 swamp tupelo. 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.

Six ecological communities comprise this habitat sub-type: Coastal plain small stream swamp forest, Bayhead forest, White cedar swamp forest, Bay swamp forest, Shrub bog, and Titi shrub thicket.

Coastal plain small stream swamp forests are alluvial swamps along small drainages. Their floodplains are often protected by a dense mat of interwoven tree roots, through which the braided streams flow. Sweetbay and water tupelo are the most common trees. Red maple, tuliptree and water oak are also common. The understory of these habitats remains open with regular fires, but quickly becomes choked by swamp titi, buckwheat tree, and large gallberry in the absence of fire. The ground cover is dominated by ferns, sedges, yellow-eyed grass, pipeworts and pitcherplants. The DeSoto National Forest has several areas exhibiting this habitat, particularly in the Deep Creek drainage.

Bay swamp forest and bayhead forests occupy semi-permanently saturated sandy or humic, acid soils. Species composition varies depending on moisture and soil characteristics. Pond cypress is the most common tree species in the bay forest swamp, but sweetbay, swamp tupelo and red maple are also usually present. Slash pine, sweetgum, tuliptree, swamp laurel oak and water oak are also common. Longleaf pine, spruce pine and American beech are occasionally encountered. There are often extensive thickets of shrubs and small trees including buckwheat tree, large gallberry, southern bayberry, American holly, azalea, blueberries, coastal doghobble and Florida anise. Bay forest 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 and liverworts. Waterwillow, switchcane, panic grass, cinnamon fern and netted chainfern are sprinkled throughout the community. Bay forest swamps are considered a late successional community which develops on histosols under conditions of infrequent fire.

Bayhead forests have a similar species composition to the bay forest swamp, and are distinguished by its proximal position on the headwaters of the streams. TNC's Red Creek Mitigation Bank in Jackson County has large areas exhibiting the bay forest swamp habitat. The DeSoto National Forest has several areas of bayhead forest habitat, particularly in the Deep Creek and Mars Hill Area in southeastern Perry County.

White cedar swamp forests are the rarest plant community of this subtype. It occurs along small blackwater streams. Atlantic white cedar is a prominent component of the canopy, which also includes sweetbay, swamp tupelo, slash pine and red maple. Usually buckwheat tree is the most conspicuous shrub present, but coastal sweetpepperbush, swamp titi, large gallberry and fetterbush are also present. Goldenclub is usually present in the stream corridor; other herbaceous plants present include cinnamon fern and royal fern. Without natural disturbances, this habitat succeeds to bay forest. Theodore Mars Wildlife Management Area in Pearl River County is an excellent example of this habitat.

Titi thickets can be created by logging small stream swamp forests and wet savannas. Exposing the lower shrub layer to sunlight allows 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. Swamp titi or buckwheat tree commonly dominate the community. Other shrubs that may be present are fetterbush, large gallberry, and bayberry, many of which will encroach into uplands if fire is not used. Greenbrier interlaces with the shrub to form an almost impenetrable thicket. Shrubby swamp trees that are normally sprinkled within the thickets include sweetbay, swamp tupelo, and slash pine. Normally the shrubs fully shade ground surfaces, limiting the development of an herbaceous layer. The few herbaceous species present are restricted to small patches in sunspots, and include sundews, pitcherplants, pipeworts, beaksedges and sphagnum. The Red Creek Mitigation Bank in Jackson County also has examples of this community.

Shrub bogs have species composition similar to the previous habitat, but include southern bayberry as an important component. This community is common in saturated ecotones (where two natural communities meet and integrate) along creeks within longleaf pine sandhills and flatwoods. The period of inundation for shrub bogs is longer than that of titi shrub thickets. It encroaches into savannas if fire is excluded. Railroad Creek Natural Area of DeSoto National Forest has a shrub bog of over 800 acres.

MNHP Ecological Community	Species Associations	MNHP Rank
Coastal plain small stream swamp forest	*Magnolia virginiana - Acer rubrum - Nyssa biflora -Pinus elliottii*	S3
Bayhead forest	*Taxodium ascendens - Nyssa biflora- Magnolia virginiana - Acer rubrum*	S3
White cedar swamp forest	*Chamaecyparis thyoides*	S1
Bay swamp forest	*Taxodium ascendens - Nyssa biflora - Magnolia virginiana - Acer rubrum*	S2
Shrub bog	*Cyrilla racemiflora - Cliftonia monophylla - Myrica heterophylla*	S2
Titi shrub thicket	*Cyrilla racemiflora - Cliftonia monophylla*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 due to its limited range. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Amphiuma pholeter*	One-toed Amphiuma
	1	*Lithobates heckscheri*	River Frog
	2	*Pseudotriton montanus*	Mud Salamander
Birds	1		Migrant Songbirds
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	3	*Hylacichla mustelina*	Wood Thrush
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
	3	*Scolopax minor*	American Woodcock
Fish	1	*Notropis melanostomus*	Blackmouth Shiner
	3	*Heterandria formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat

THREATS

5. Swamp Forests				
	CLASSIFICATION	**SUBCLASS**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
1	Residential and commercial development	1.1 Housing and urban areas		L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops		M
		2.2 Wood and pulp plantations		M
4	Transportation and service corridors	4.1 Roads and railways	L	M
5	Biological resource use	5.2 Gathering terrestrial plants	M	
		5.3 Logging and wood harvesting	H	M
6	Human intrusions and disturbance	6.1 Recreational activities	M	
7	Natural system modifications	7.1 Fire and fire suppression		H
		7.2 Dams and water management/use: Operation of dams/ impoundments, Channel modification, Groundwater and surface water withdrawal, headcutting	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species	H	H
9	Pollution	9.1 Household sewage and urban waste water		L
		9.3 Agricultural and forestry effluents	L	M

PRIORITY CONSERVATION ACTIONS

5. Swamp Forests			
CLASSIFICATION	**CONSERVATION ACTION**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

5. Swamp Forests			
CLASSIFICATION	**CONSERVATION ACTION**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communicationsa	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X
	Limit bulkheading along coastal drainages.		
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X

5. Swamp Forests			
CLASSIFICATION	**CONSERVATION ACTION**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

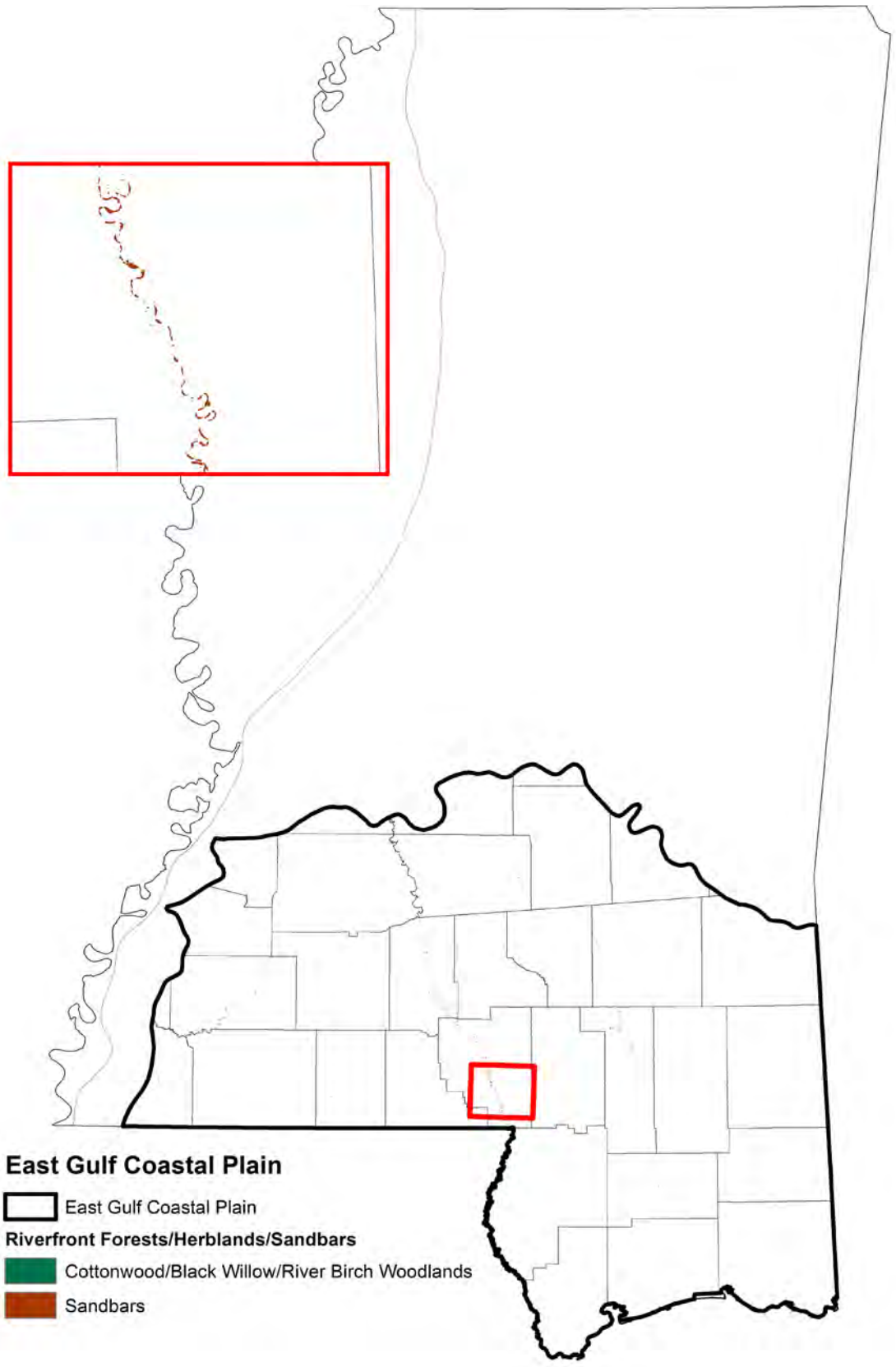


Figure 5.8 Riverfront Forest Herblands/Sandbars In East Gulf Coastal Plain Ecoregion - with inset showing detail.

6. 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 drier 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 in the EGCP: 6.1 Cottonwood/Black Willow/River Birch Woodlands, and 6.2 Sandbars.

GENERAL CONDITION

Dams, channelization, manmade levees and other modifications have restricted the extent of riverfront forests. The modified river environment has inhibited riverfront cottonwood and willow community regeneration.

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.

6.1 Cottonwood/Black Willow/River Birch Woodlands

DESCRIPTION

The riverfront forests may last for over 50 years before the canopy trees begin to senesce (age and decline). In time these forests gradually become more diverse in shrubs, vines and herbs. Four ecological communities have been combined into this subtype: Black willow riverfront pioneer forests, Eastern cottonwood-willow riverfront pioneer forests, River birch-sycamore riverfront forests, and Native vinelands.

Black willow riverfront pioneer forests are often composed of only black willow trees. This habitat is found on recently deposited ground in the large river floodplains. Shrubs and herbaceous plants are usually absent, but peppervine, hempvine, poison ivy, smartweed, smallspike false nettle, Virginia dayflower, and American pokesalad may occasionally be present. Examples of this community may be found along the Pascagoula River in the Pascagoula Wildlife Management Area in Jackson and George Counties and the Pearl River in Old River Wildlife Management Area in Pearl River County

Eastern cottonwood-willow riverfront pioneer forests occur along the banks of large rivers and on islands within the rivers. Red maple, green ash, river birch, water elm, American elm, sweetgum, red mulberry and silver maple may also be present in the canopy. American hornbeam, swamp dogwood and eastern swampprivet may be present in the subcanopy. The herb layer is usually sparse, but patches of Indian woodoats and switchgrass may be found. Both the Pascagoula River in the Pascagoula Wildlife Management Area in Jackson and George Counties and the Pearl River in Old River Wildlife Management Area in Pearl River County has areas of this community.

River birch-sycamore riverfront forests have a canopy dominated by river birch and sycamore. This habitat occurs primarily on levees along small rivers and streams. Other canopy associates include tuliptree, sweetgum, red maple, box elder, American elm, slippery elm, hackberry and various oaks. Examples of this community may be found along the Pascagoula River in the Pascagoula Wildlife Management Area in Jackson and George Counties and the Pearl River in Old River Wildlife Management Area in Pearl River County.

Native vinelands develop following disturbances to riverfront forests. The habitat is dominated by greenbrier, peppervine, American buckwheat vine and trumpet creeper. Smartweed, spikerushes, muscadine, poison ivy, and bayberry may also be present. The Pascagoula River Wildlife Management Area has areas with this community type.

MNHP Ecological Community	Species Associations	MNHP Rank
Black willow riverfront pioneer forest	*Salix nigra*	S3
Eastern cottonwood - willow riverfront pioneer forest	*Salix nigra - Populus deltoides*	S3
River birch - sycamore riverfront forest	*Betula nigra - Platanus occidentalis*	S3
Native vineland	*Smilax spp. - Campsis radicans - Ampelopsis arborea - Brunnichia ovata*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The cottonwood/black willow/river birch woodlands occur in smaller patches along 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. This subtype covers a relatively small area in the EGCP ecoregion of Mississippi.

This habitat subtype has declined in many areas because of because of stream alteration which affects hydrology and streambed stability. Dams and weirs can reduce scouring action which reduces areas available for establishment of cottonwood and black willow stands. Levees may cut off areas of a stream's floodplain from the natural flood regime causing this habitat to degrade or disappear over time. Channelization reduces the amount of this habitat directly by shortening the overall length of streams and by destabilizing the stream channel, increasing erosion. Instream erosion caused by headcutting, which can result from a variety of channel modifications, greatly destabilizes the streambed and reduces or degrades the amount of this habit type.

The cottonwood/black willow/river birch forest is **vulnerable** in the state due to altered hydrology, stream channel modification, and streambed destabilization.

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

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

6.2 Sandbars

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. Examples of this community may be found along the Pascagoula River in the Pascagoula River Wildlife Management Area in Jackson and George Counties and the Pearl River in Old River Wildlife Management Area in Pearl River County.

MNHP Ecological Community	Species Associations	MNHP Rank
Sand bar (exposed)	Various grasses - *Carex sp.* - *Salix interior*	S2

LOCATION, SIZE CONDITION AND CONSERVATION STATUS

Sandbars occur along most free flowing streams in Mississippi and in most watersheds where flow rates are sufficient to rework coarse sediments. Several thousand acres of sandbars 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.

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, Chinese tallow and other exotic weeds have invaded sandbar habitat, and this is a particularly severe problem in the south Mississippi.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
Reptiles	2	*Graptemys flavimaculata*	Yellow-blotched Map Turtle
	2	*Graptemys gibbonsi*	Pascagoula Map Turtle
	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle

THREATS

6. Riverfront Forests/Herblands/Sandbars				
	CLASSIFICATION	**SUBCLASS**	**6.1 Cottonwood/Black Willow/River Birch WoodlandsForests**	**6.2 Sandbars**
1	Residential and commercial development	1.1 Housing and urban areas	L	
		1.2 Commercial and industrial areas	M	M
		1.3 Tourism and recreation areas	L	H
2	Agriculture and aquaculture	2.3 Livestock farming and ranching: Incompatible grazing practices	L	
3	Energy production and mining	3.2 Mining and quarrying: Sand/gravel mining	M	H
5	Biological resource use	5.4 Fishing and harvesting aquatic resources: Alligator snapping turtle, Pascagoula map turtle, ringed map turtle, yellow-blotched map turtle, Pearl River map turtle	L	H
6	Human intrusions and disturbance	6.1 Recreational activities: off road vehicle use, boat wakes	H	H
7	Natural system modifications	7.2 Dams and water management/use: Operation of dams/ impoundments, Channel modification, Groundwater and surface water withdrawal	H	H
			L	H
			L	
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow tree, Chinese privet, bamboo, wild hogs, fire ants, Johnson grass, non-native pasture grasses	H	H
9	Pollution	9.4 Garbage and solid wastes: Opportunistic predators (i.e. raccoons, crows etc. attracted to trash)		M

PRIORITY CONSERVATION ACTIONS

6. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**CONSERVATION ACTION**	**6.1 Cottonwood/Black Willow/River Birch WoodlandsForests**	**6.2 Sandbars**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

6. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**CONSERVATION ACTION**	**6.1 Cottonwood/Black Willow/River Birch WoodlandsForests**	**6.2 Sandbars**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X

6. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**CONSERVATION ACTION**	**6.1 Cottonwood/Black Willow/River Birch WoodlandsForests**	**6.2 Sandbars**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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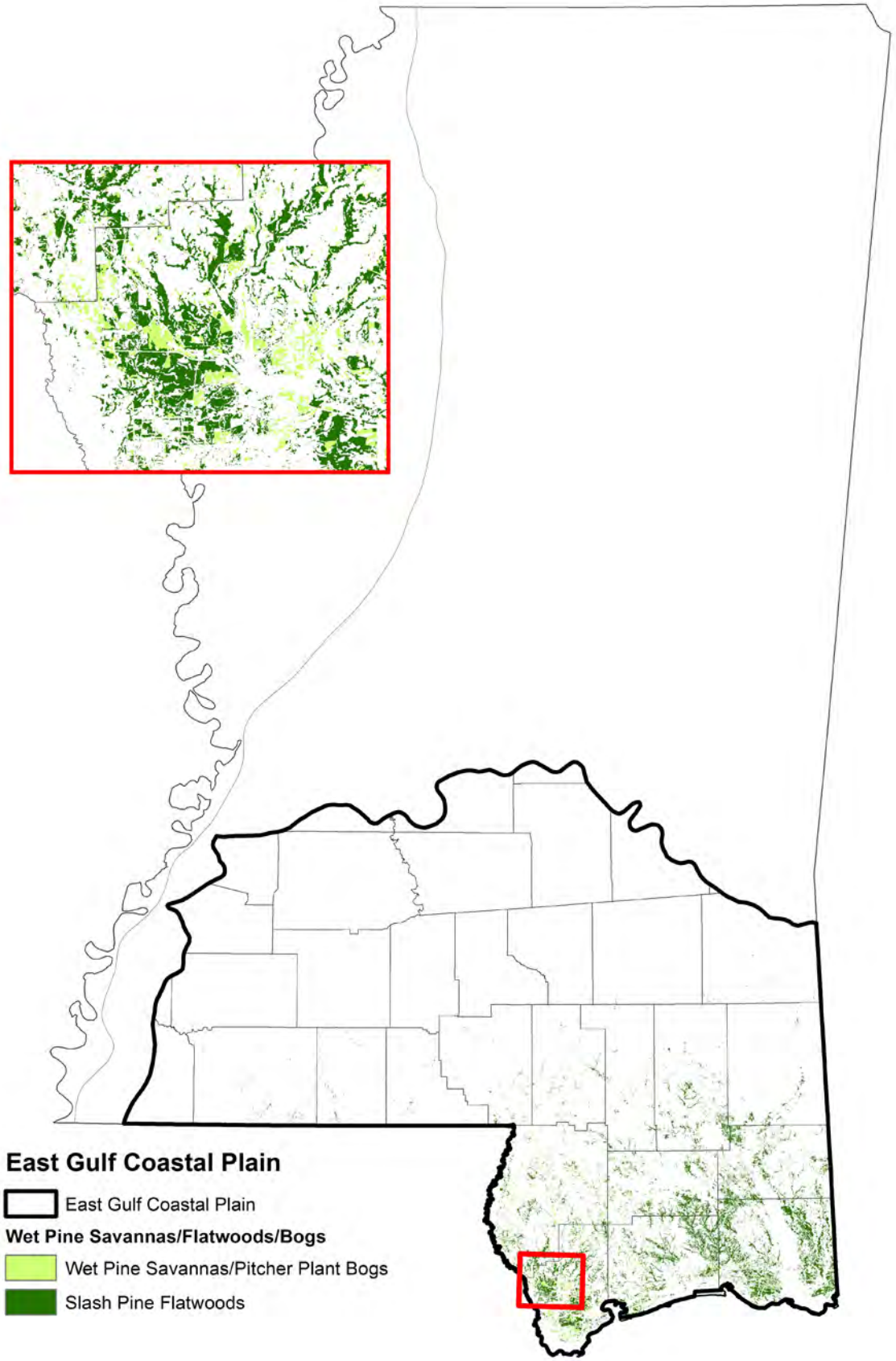

Figure 5.9 Wet Pine Savannas/Flatwoods/Bogs In East Gulf Coastal Plain Ecoregion - with inset showing detail.

7. Wet Pine Savannas / Flatwoods / Bogs

Coastal areas with very poor internal drainage form wet pine savannas and flatwoods. 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 create a surplus of moisture that gradually percolates through the soil profile. Nutrient-deficient soils develop on these wet flats because nutrients released by weathering are insufficient to replace those removed by leaching. Savannas are areas dominated by graminoids with scattered trees. The term flatwoods has been used to describe many different communities in the coastal plain. For this classification, flatwoods are coastal terrace forests of slash and longleaf pine with very little local topographic relief. This community is successional and can go many directions depending on fire, moisture conditions and man's activities. The canopy of these communities tends to be more closed than that of the wet pine savanna.

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 miles 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 three subtypes in the EGCP: 7.1 Wet Pine Savannas, 7.2 Slash Pine Flatwoods and 7.3 Pitcherplant Bogs.

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 in Jackson County 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.

The primary conditions adversely impacting these habitats are logging activities and the lack of burning. 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 (both natural and prescribed), which subsequently leads to dramatic increases in shrub growth. There has been a 97 percent loss of Gulf Coast pitcherplant bogs.

7.1 Wet Pine Savannas

DESCRIPTION

Two ecological communities are represented in this subtype: Wet slash (longleaf) pine savanna/forest/ flatwoods and Wet pine-pond cypress savannas. Both communities are found on Grand Bay National Esturine Research Reserve and Mississippi Sandhill Crane National Wildlife Refuge in Jackson County.

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. Longleaf pine and slash pine are sparsely scattered over an exceptionally diverse herbaceous ground cover 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 consists of forbs and ferns. Prominent groups of herbs include grasses, asters and sunflowers, sedges, pipeworts, pitcherplants, lilies, meadowbeauties, sundews and orchids. Common grasses include beaksedge, toothache grass, switchgrass and three-awn. Forbs include rayless goldenrod and one flowered honeycombhead.

Wet pine-pond cypress savannas occur in depressions of the wet slash pine flatwoods. Pond cypress is the most obvious component of the canopy, but slash pine, swamp tupelo, sweetbay, redbay, and red maple are also usually present. Wetland shrubs, including swamp titi and large gallberry, encroach into this habitat in the absence of fire. Herbaceous plants found in these savannas include royal fern, cinnamon fern, Virginia chain fern, pipeworts, and numerous grasses and sedges.

MNHP Ecological Community	Species Associations	MNHP Rank
Wet slash (longleaf) pine savanna/ forest/flatwoods	*Pinus palustris/P. elliottii - Ctenium aromaticum - Andropogon spp. - Cyrilla racemiflora - Arundinaria gigantean*	S2
Wet pine - pond cypress savanna	*Taxodium ascendens - Pinus elliottii - Woodwardia virginica*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 in Jackson County. Only a few other wet pine savanna habitats remain outside the refuge, such as the Lakeshore Savanna, in Jackson County, managed by The Nature Conservancy and the Grand Bay National Wildlife Refuge. Wet pine savannas cover approximately **40,000 acres** within the EGCP of 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 in Jackson County 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Pseudacris ornata*	Ornate Chorus Frog
	1	*Lithobates sevosus*	Dusky Gopher Frog
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Laterallus jamaicensis*	Black Rail
	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Scolopax minor*	American Woodcock
Crustaceans	1	*Fallicambarus burrisi*	Burris' Burrowing Crayfish
	1	*Fallicambarus danielae*	Speckled Burrowing Crayfish
	1	*Fallicambarus gordoni*	Camp Shelby Burrowing Crayfish
	1	*Procambarus fitzpatricki*	Spiny-tailed Crayfish
	2	*Fallicambarus byersi*	Lavender Burrowing Crayfish
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Regina rigida deltae*	Delta Crayfish Snake
	3	*Regina rigida sinicola*	Gulf Crayfish Snake

7.2 Slash Pine Flatwoods

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. Slash pine flatwoods/savanna with wiregrass is the only ecological community in this subtype. The Mississippi Sandhill Crane National Wildlife Refuge in Jackson County has examples of this community. 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 swamp 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 and season of fire determines the height and density of the shrub layer while soil type appears to influence the presence of buckwheat tree. If fire is excluded, the open, herbaceous character of the pitcherplant flat is lost and titi thickets, consisting of evergreen shrubs, become dominant.

MNHP Ecological Community	Species Associations	MNHP Rank
Slash pine flatwoods/savanna with wiregrass	*Pinus elliottii /P. palustris - Aristida beyrichiana*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 **250,000 acres** of this subtype in the EGCP of Mississippi.

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. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudotriton montanus*	Mud Salamander
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	3	*Antrostomus carolinensis*	Chuck-will's-widow
	3	*Dendroica discolor*	Prairie Warbler
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Scolopax minor*	American Woodcock
	3	*Sitta pusilla*	Brown-headed Nuthatch
Crustaceans	1	*Fallicambarus burrisi*	Burris' Burrowing Crayfish
	1	*Fallicambarus danielae*	Speckled Burrowing Crayfish
	1	*Fallicambarus gordoni*	Camp Shelby Burrowing Crayfish
	1	*Procambarus fitzpatricki*	Spiny-tailed Crayfish
	2	*Fallicambarus byersi*	Lavender Burrowing Crayfish
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	1	*Ophisaurus mimicus*	Mimic Glass Lizard
	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Regina rigida deltae*	Delta Crayfish Snake
	3	*Regina rigida sinicola*	Gulf Crayfish Snake
	4	*Heterodon simus*	Southern Hognose Snake

7.3 Pitcherplant Flat/Bogs

DESCRIPTION

Pitcherplant bogs are highly diverse, open herbaceous communities dominated by sedges, grasses, and asters. As its name implies, pitcherplants are one of the most visible components of the ground flora. In this community, the soil is composed of a layer of sand loam overlain by an accumulation of partially decomposed organic muck. Fire is an important factor in controlling the community composition. Exclusion of fire for three years or more allows the intrusion of grasses, woody species and clubmosses, with an accompanying decrease of sedges and pitcherplants.

Some of the more consistently represented species include plants from the aster, orchid, yellow-eyed grass, pitcherplant, sundew, pipewort and butterwort families. Yellow trumpet pitcherplant, ten-angle 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. Pitcherplant flats are open areas with an abundance of pitcherplants. In this community, the sandy loam soils have little or no accumulation of organic matter. Wet, acidic, anoxic conditions of the substrates prevent trees from encroaching, and the ones that do are often stunted. Buttercup Flats in the De Soto National Forest in Stone County is the best example of a pitcherplant flat community in Mississippi. The Mississippi Sandhill Crane National Wildlife Refuge in Jackson County has areas with pitcherplant bogs.

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). A large quaking bog is located near Larue in Jackson County within the De Soto National Forest.

MNHP Ecological Community	Species Associations	MNHP Rank
Pitcherplant flat/bog/wet savanna	*Sarracenia alata/S. psittacina - Rhynchospora spp. -Stokesia laevis - Lophiola aurea - Eriocaulon compressum*	S2
Quaking bog	*Lindera subcoriacea - Carex exilis - Sphagnum spp.*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Pitcherplant 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 **25,000 acres** of this habitat remaining in the EGCP of Mississippi.

There has been a 97 percent loss of pitcherplant 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 De Soto 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Ammodramus loconteii*	LeConte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Scolopax minor*	American Woodcock
Reptiles	2	*Regina rigida deltae*	Delta Crayfish Snake
	3	*Regina rigida sinicola*	Gulf Crayfish Snake

THREATS

7. Wet Pine Savannas/Flatwoods/Bogs					
	CLASSIFICATION	SUBCLASS	7.1 Wet Pine Savannas	7.2 slash Pine Flatwoods	7.3 Pitcherplant Bogs
1	Residential and commercial development	1.1 Housing and urban areas	H	H	H
		1.2 Commercial and industrial areas	H	H	M
2	Agriculture and aquaculture	2.2 Wood and pulp plantations: bedding	H	H	M
		2.3 Livestock farming and ranching	H	H	
4	Transportation and service corridors	4.1 Roads and railways	H	H	
		4.2 Utility and service lines	H		
5	Biological resource use	5.2 Gathering terrestrial plants			M
		5.3 Logging and wood harvesting	H	M	H
6	Human intrusions and disturbance	6.1 Recreational activities: off road vehicle use, boat wakes	M	M	
7	Natural system modifications	7.1 Fire and fire suppression: fire suppression, season of burn, changes to plant species composition	H	H	H
		7.2 Dams and water management/use: Operations of dams/ impoundments, headcutting, altered hydrology	H	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese tallow tree, cogongrass, wild hogs, fire ants.	H	H	H
		8.2 Problematic native species: encroachment of largeleaf gallberry, inkberry, swamp titi, buckwheat tree.	H	H	H

PRIORITY CONSERVATION ACTIONS

7. Wet Pine Savannas/Flatwoods/Bogs				
CLASSIFICATION	**CONSERVATION ACTION**	**7.1 Wet Pine Savannas**	**7.2 slash Pine Flatwoods**	**7.3 Pitcherplant Bogs**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
2.2 Invasive/ problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X

7. Wet Pine Savannas/Flatwoods/Bogs				
CLASSIFICATION	**CONSERVATION ACTION**	**7.1 Wet Pine Savannas**	**7.2 slash Pine Flatwoods**	**7.3 Pitcherplant Bogs**
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X

7. Wet Pine Savannas/Flatwoods/Bogs				
CLASSIFICATION	**CONSERVATION ACTION**	**7.1 Wet Pine Savannas**	**7.2 slash Pine Flatwoods**	**7.3 Pitcherplant Bogs**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Improve enforcement of existing species protection regulations.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

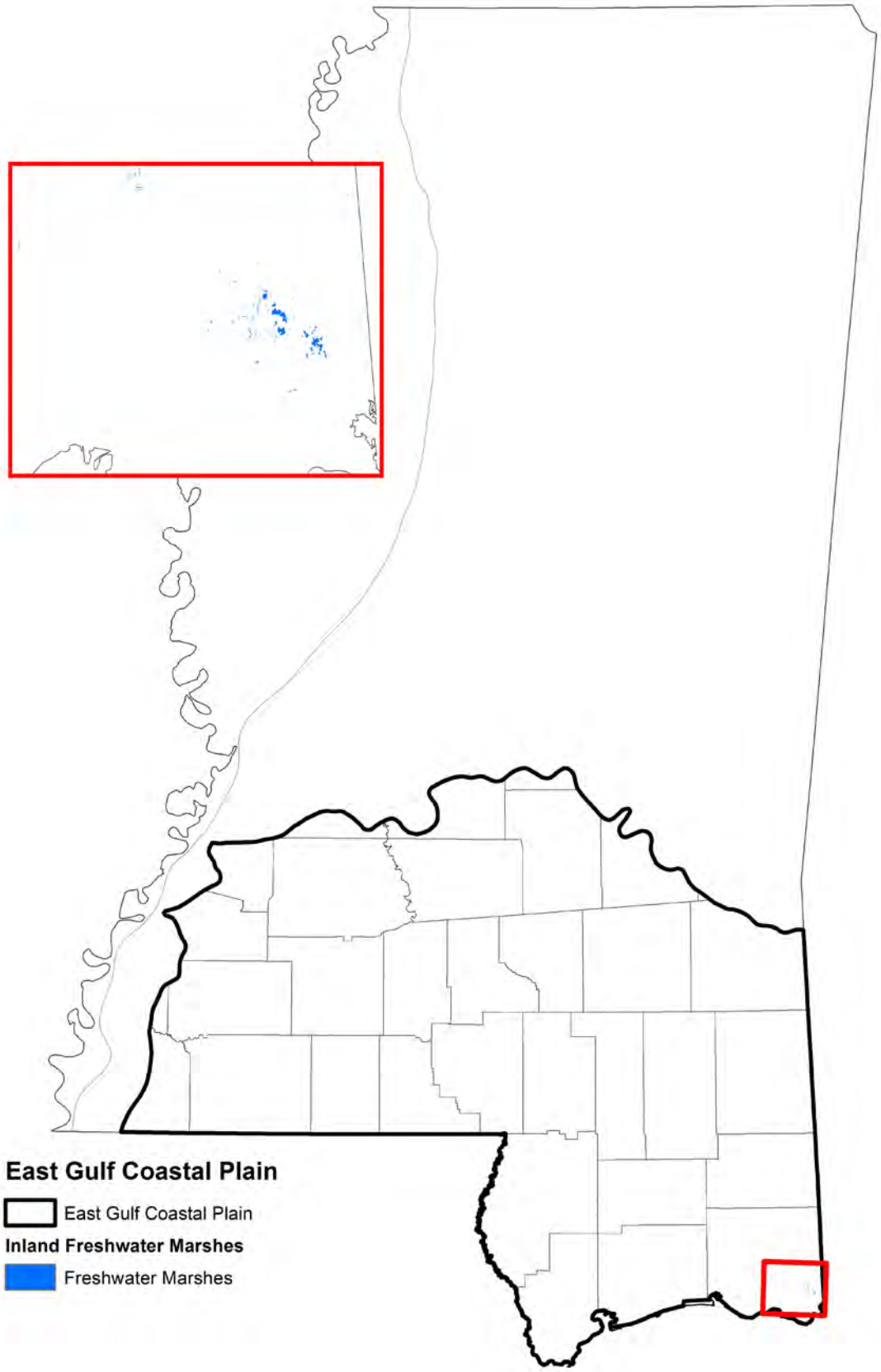

Figure 5.10 Inland Freshwater Marshes In East Gulf Coastal Plain Ecoregion - with inset showing detail.

8. 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 in the EGCP: 8.1 Freshwater Marshes.

GENERAL CONDITION

Mississippi experienced a 59 percent loss in wetlands from 1780s (9,872,000 acres) to the 1980s (4,067,000 acres) due to land use changes. In the 1780s wetlands comprised 32 percent of the area of Mississippi, but by the 1980s wetlands totaled only 13 percent of the area of Mississippi. 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 (now in the Agricultural Conservation Easement Program) have reduced the rate of marsh loss.

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. The MNHP identifies and inventories priority wetlands.

8.1 Freshwater Marshes

DESCRIPTION

The ecological community called “freshwater marsh” is an area of shallow water and mucky, saturated soils along the shoreline. It contains a variety of herbaceous plants, but reeds, bulrushes, flatsedges, ditch stonecrop, and lizard’s tail are characteristic species. Giant cutgrass, pickerel weed, cattail, rosemallow and primrose willow along with numerous other graminoids and herbs may also be present. Other typical species include valley redstem, cardinal flower, aquatic milkweed, jewelweed, common rush, climbing hempvine, redtop panicgrass, camphor pluchea, swamp smartweed, and waterpod. Okatibbee Lake, Lauderdale County, has areas of this community locate at the northern end of the lake.

As its name implies, semipermanently flooded marshes are seasonally inundated by high water events. This community is usually in the zone above the freshwater marsh, on broad flat areas of the alluvial plain. Oneflower false fiddleleaf, alligatorweed, and denseflower knotweed can form dense patches of vegetation. Many of the plants found in freshwater marshes may also be found in this zone. The northern end of Okatibbee Lake is also one of many areas with this community.

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. Three ecological communities are included in this subtype: Freshwater marsh, semipermanently flooded marshes, and white waterlily -jointed spikesedge herbaceous vegetation.

White waterlily-jointed spikesedge herbaceous vegetation is found in the wettest portion of freshwater marshes. In this zone of inundation, white waterlily, jointed spikesedge, and bulltongue arrowhead form dense colonies. The deeper zones also contain a variety of emergent aquatic plants such as pondweed, watershield, and American lotus; and floating plants like duckweed, watermeal and bladderwort. Coastal freshwater marshes contain a different mix of species than the northern types of this community; these species include 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. Paul B. Johnson State Park in Forrest County has areas of this community.

Throughout Mississippi, marsh has been created by water control structures (anthropogenic and natural, e.g. beavers), which manage stream discharges. Mudflats may also form along unimpounded streams during the late summer when water recedes from seasonally flooded riverine habitats. 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Freshwater marsh	*Juncus spp. - Scirpus spp. - Cyperus spp. -Penthorum sedoides - Saururus cernuus*	S3
Semipermanently flooded marsh	*Hydrolea uniflora - Alternanthera philoxeroides-Polygonum densiflorum*	S5
White waterlily - jointed spikesedge herbaceous vegetation	*Nymphoides odorata - Eleocharis equisetoides-Sagittaria lancifolia*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 EGCP but are more commonly found in lowlands and floodplains. They are adjacent to a variety of agricultural, forested and urban lands. There are approximately **5,000 acres** of freshwater marsh in the EGCP of Mississippi.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	2	*Anas fulvigula*	Mottled Duck
	2	*Asio flammeus*	Short-eared Owl
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Ixobrychus exilis*	Least Bittern
	3	*Nyticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Porphyrula martinica*	Purple Gallinule
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandria formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

THREATS

8. Inland Freshwater Marshes			
	CLASSIFICATION	**SUBCLASS**	**8.1 Freshwater Marshes**
1	Residential and commercial development	1.1 Housing and urban areas	M
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use	H
4	Transportation and service corridors	4.1 Roads and railways: Habitat fragmentation.	L
5	Biological resource use	5.3 Logging and wood harvesting	L
7	Natural system modifications	7.2 Dams and water management/use: Operation of dams/impoundments, channel modification, groundwater and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow, wild hogs, Japanese climbing fern, water hyacinth, woodrush flatsedge, giant salvinia, alligator weed, water lettuce, elephant ear, torpedo grass	H
9	Pollution	9.1 Household sewage and urban waste water	M
		9.2 Industrial and military effluents	M
		9.3 Agricultural and forestry effluents: nutrient runoff, spray drift	M

PRIORITY CONSERVATION ACTIONS

8. Inland Freshwater Marshes		
CLASSIFICATION	**CONSERVATION ACTION**	**8.1 Freshwater Marshes**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity: Maintain/encourage presence of beavers in natural areas to create/restore/maintain freshwater marshes.	X
	Encourage development of seasonal, semi-permanent, and permanent wetland infrastructure where appropriate.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage proper disposal and cleanup of waste and litter.	X

8. Inland Freshwater Marshes		
CLASSIFICATION	**CONSERVATION ACTION**	**8.1 Freshwater Marshes**
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X
	Limit bulkheading along coastal drainages.	
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Discourage incompatible recreational uses.	
	Improve enforcement of existing species protection regulations.	X
	Encourage proper disposal and cleanup of waste and litter.	X
6.0 Livelihood, economic and other incentives		
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

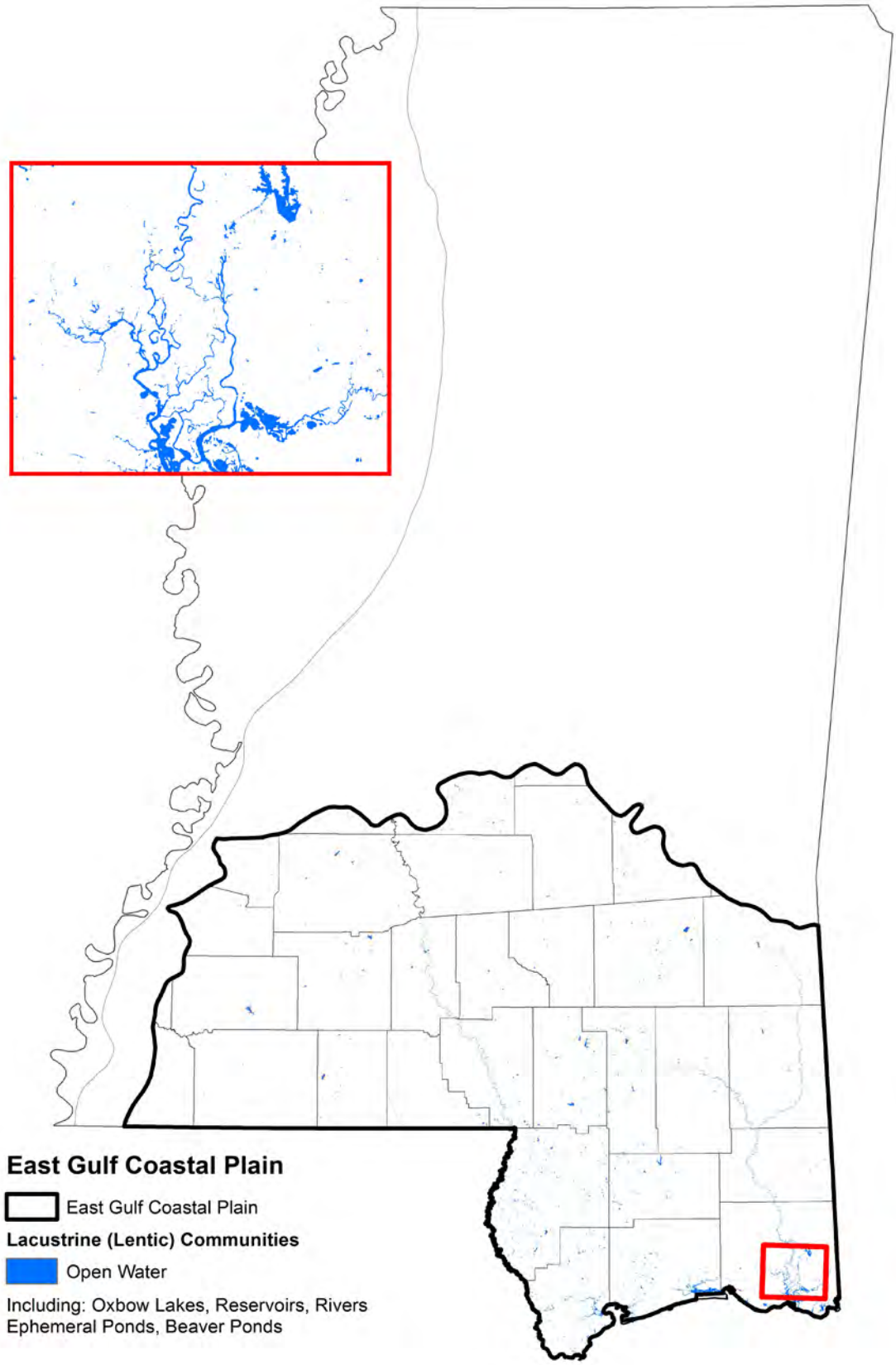

Figure 5.11 Lacustrine (Lentic) Communities In East Gulf Coastal Plain Ecoregion - with inset showing detail.

9. Lacustrine (Lentic) Communities

Lacustrine refers to standing water situated in depressions or dammed river channels. They are also referred to as lentic or standing water systems. These habitats consist of reservoirs, lakes, semi-permanent ponds, ephemeral ponds and beaver ponds. In 2015, the MDWFP's Fisheries Bureau reported that there were 83 publicly owned lakes and reservoirs in Mississippi totaling 173,123 acres. According to MDEQ, public and private reservoirs and ponds (greater than 25 acres) cover approximately 273,000 acres in the state.

This type includes four subtypes in the EGCP: 9.1 Oxbow Lakes, 9.2 Reservoirs, 9.3 Ephemeral (Temporary) Ponds and 9.4 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 Okatibbee Lake in Lauderdale County. 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. From 2006 to 2010, 58 percent of the fish kills investigated by MDEQ were associated with low dissolved oxygen resulting from natural processes, and 12 percent were associated with excess nutrients, sewage, spills. 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 (Silver carp and Bighead 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 when they are young and throughout the lifespan of filter feeders such as paddlefish, gizzard shad and threadfin shad.

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.

9.1 Oxbow Lakes

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 meander and cut off 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.

Oxbow lakes support a variety of fish, amphibians, reptiles, mammals, and wading and shorebirds. Although floodwater sometimes enters or inundates oxbow lakes and allows 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 water level fluctuations 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 the stream moves further away from an oxbow lake over time, the lake tends 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 and to support a fish assemblage composed of more fish-eating species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

There are 264 oxbow lakes recorded in Mississippi which total **55,644 acres**. Oxbows can be found on most small and medium sized creeks and rivers but are most common along the largest river systems. 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.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
Birds	1		Migrant Shorebirds
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*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	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
Crustaceans	3	*Procambarus shermani*	Gulf Crayfish
Fish	1	*Notropis chalybaeus*	Ironcolor Shiner
	1	*Notropis melanostomus*	Blackmouth Shiner
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Polyodon spathula*	Paddlefish
Mussels	3	*Potamilus hartfieldorum*	Cypress Pocketbook
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

9.2 Reservoirs

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

Flood control dams have been constructed on several large rivers and creeks in the state. Some reservoirs are relatively large, with the second largest in the state, Ross Barnett Reservoir, in the UEGCP, being 33,000 acres in size. Most managed reservoirs (E.g.Okatibbee Lake in Lauderdale County) are rimmed with publicly 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 **167,767 acres** of this subtype in Mississippi at conservation pool and 257,957 acres at flood pool. Examples of reservoirs in EGCP are the Bogue Homa in Jones County and Lake Okhissa in Franklin County.

Large, open water bodies often have significant problems with shoreline erosion. There is little opportunity for marsh plants to become established because wave action, shifting sediments, and fluctuating water levels prevent them from doing so, except in some of the most protected coves. Drawdown of flood control reservoirs leaves wide, unvegetated shorelines exposed and barren. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Haliaeetus leucocephalus*	Bald Eagle
	3	*Aythya affinis*	Lesser Scaup
	3	*Calidris alplina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Pandion haliaetus*	Osprey
Fish	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	3	*Polydon spathula*	Paddlefish
	3	*Sander vitreum*	Walleye
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

9.3 Ephemeral (Temporary) Ponds

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. There are ephemeral ponds located in the Mars Hill area of DeSoto National Forest.

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 Mississippi gopher frog. Grady ponds can be found on the north track of Old Fort Bayou, a TNC preserve in Jackson County.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 c**ritically 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
	3	*Lithobates palustris*	Pickerel Frog
	4	*Ambystoma tigrinum*	Tiger Salamander
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	3	*Caladris aplina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Porphyrula martinica*	Purple Gallinule
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	3	*Procambarus shermani*	Gulf Crayfish

9.4 Beaver Ponds

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 U.S., beavers can cause extensive damage to valuable timberland by flooding bottomland forests and eating tree seedlings. Control measures are often adopted to reduce the damage caused to forestlands and roads. However, landowners whose own interests are benefited by beaver may be reluctant to allow beavers to be removed from their lands. An example of a beaver pond can be found at the Clear Springs Recreational Area on the Homochitto National Forest in Franklin County.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. There are no accurate estimates of the extent of beaver ponds in the EGCP of 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 USDA Wildlife Services to prevent the increase of the beaver population on Mississippi creeks and rivers.

Beaver ponds, are **secure** in the state, although beaver control programs reduce the potential for an increase in the number of ponds.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BEAVER PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisiana Waterthrush
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	3	*Procambarus shermani*	Gulf Crayfish
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Fundulus euryzonus*	Broadstripe Topminnow
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandia formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

THREATS

9. Lacustrine (Lentic) Communities						
	CLASSIFICATION	**SUBCLASS**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
1	Residential and commercial development	1.1 Housing and urban areas	L	M	M	
		1.2 Commercial and industrial areas	L		L	
		1.3 Tourism and recreation areas	L	M	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide and herbicide use, spray drift, nutrient runoff, conversion to agriculture.	H	L	H	M
		2.2 Wood and pulp plantations: Improper use of BMPs.			H	
		2.3 Livestock farming and ranching: Animal waste runoff, bank damage from grazing animals.	L	L		M
3	Energy production and mining	3.2 Mining and quarrying: Sand/gravel mining.	L			
4	Transportation and service corridors	4.1 Roads and railways.	L		M	
5	Biological resource use	5.1 Hunting and collecting terrestrial animals: Beaver control programs.				H
		5.3 Logging and wood harvesting	L	L	H	
		5.4 Fishing and harvesting aquatic resources: Overharvest of alligator snapping turtle, alligator gar	M			
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L		M	
7	Natural system modifications	7.1 Fire and fire suppression: lack of control of shrubby vegetation			H	
		7.2 Dams and water management/use: Operation of dams/ impoundments, channel modification, groundwater and surface water withdrawal (oxbow lakes), altered hydrology (beaver ponds)	H	H	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Johnson grass, hydrilla, Chinese tallow, Chinese privet, alligator weed, silver carp, bighead carp, zebra mussel, giant salvinia, water lettuce, torpedo grass, water hyacinth, parrot feather watermilfoil, cogongrass (ephemeral ponds), apple snail, nutria, wild hogs	H	H	H	L
9	Pollution	9.1 Household sewage and urban waste water		M		
		9.3 Agricultural and forestry effluents	H	L	M	M

PRIORITY CONSERVATION ACTIONS

9. Lacustrine (Lentic) Communities					
CLASSIFICATION	**CONSERVATION ACTION**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
1.0 Land/Water Protection					
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X
2.0 Land/Water Management					
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	
	Discourage incompatible recreational uses.	X		X	
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.			X	
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity: Manage beaver populations in natural areas to create/restore/maintain beaver pond communities.	X	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.			X	
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X	X
3.0 Species Management					
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X	X	
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X

9. Lacustrine (Lentic) Communities					
CLASSIFICATION	**CONSERVATION ACTION**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
4.0 Education and Awareness					
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.			X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X		X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
5.0 Law and Policy					
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	

9. Lacustrine (Lentic) Communities					
CLASSIFICATION	**CONSERVATION ACTION**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	
	Improve enforcement of existing species protection regulations: Draft bait guidelines to prevent the use of non-native bait species, Encourage fish producers to raise and sell only certified triploid grass carp for biological plant control.	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
6.0 Livelihood, economic and other incentives					
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X		X	
6.2 Substitution	Discourage incompatible recreational uses.	X		X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
7.0 External Capacity Building					
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X

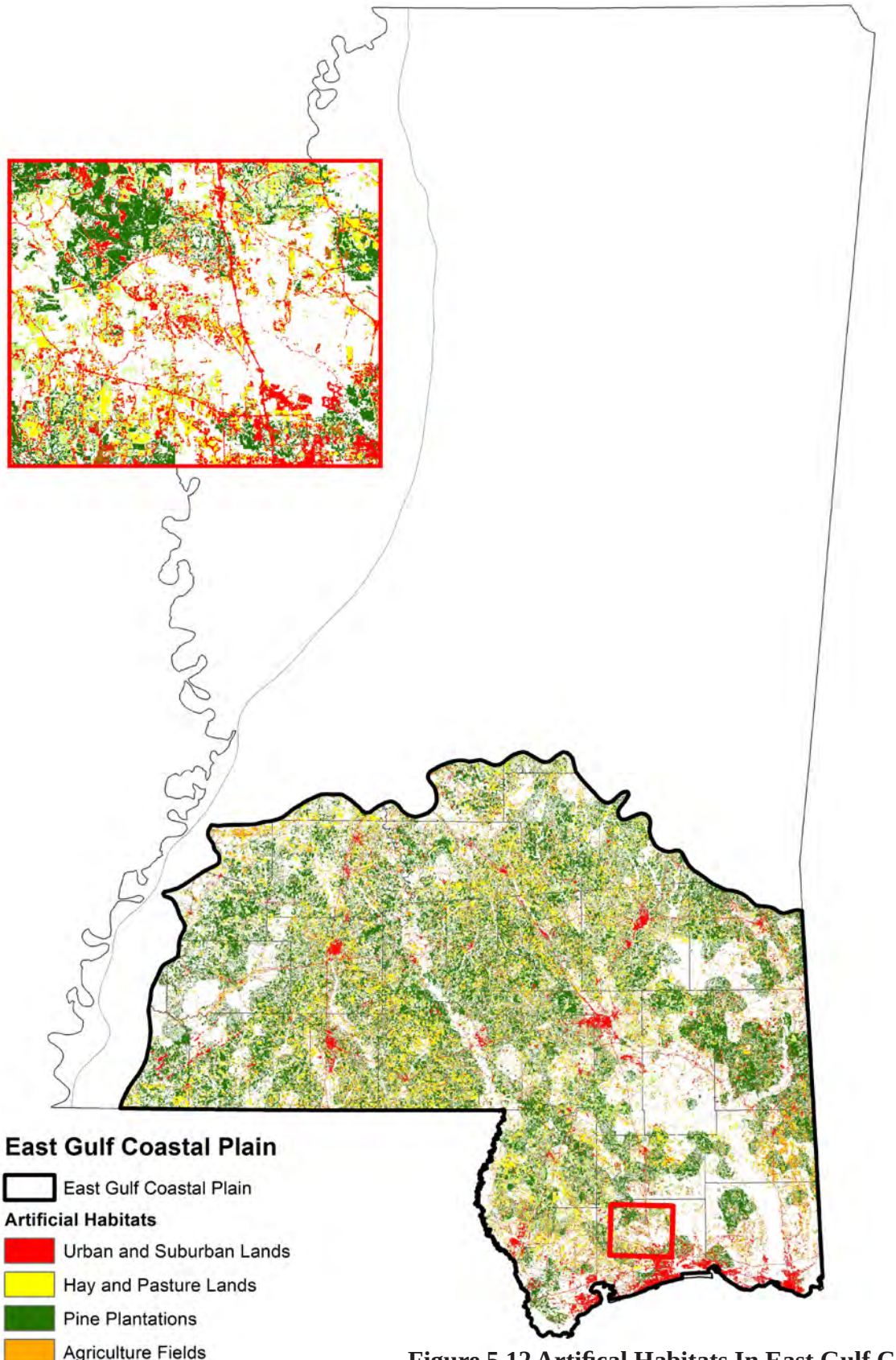

Figure 5.12 Artifical Habitats In East Gulf Coastal Plain Ecoregion - with inset showing detail.

10. Artificial Habitats

Artificial habitats are those that have been made or altered by humans in some way. While often considered degraded or disturbed, these habitats will be used by SGCN some species, most often birds and bats. These areas may contain some remnant of the original vegetation but are usually greatly altered, with many invasive or exotic species dominating. Small patches of less disturbed habitat may exist within larger disturbed areas that allows for many species to survive, and sometimes thrive.

This type includes eight subtypes in the EGCP: 10.1 Urban and Suburban Lands, 10.2 Buildings, Bridges, Overpasses, Etc., 10.3 Utility Right-of-ways, 10.4 Hay and Pasture Lands, 10.5 Pine Plantations, 10.6 Shrublands, 10.7 Row Crops, and 10.8 Artificial Ponds.

10.1 Urban and Suburban Lands

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; 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 increased erosion and a degradation of the water quality of streams below these areas. Vacant lots, landscaped yards, vegetable gardens, fruit orchards, and wooded areas along drainages provide some habitats beneficial to wildlife.

There are numerous native animals that spend part or all of their lives inside the city limits. Many programs, such as the National Wildlife Federation's Backyard Wildlife Habitat certification program, work to improve habitat quality in urban and suburban areas for wildlife. Habitat generalists, including birds like the mockingbird, house wren and mourning dove, and mammals such 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. Most rare species tend to avoid the urban areas, if possible, or are extirpated from developed areas due to deterioration of their habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Urban and suburban lands encompass one to two percent of the land area of Mississippi, over **600,000 acres** of land in the EGCP ecoregion. 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 of hardwood and pine forests and cutover areas, agriculture fields and wetlands along the creeks and rivers.

SGCN are rarely found in urban and suburban areas, partially due to the loss of habitat for these species. However, some species of wildlife (especially birds) have thrived in urban settings and may be more common than in pre-settlement 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Tyto alba*	Barn Owl
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
Reptiles	2	*Gopherus polyphemus*	Gopher Tortoise

10.2 Buildings, Bridges, Overpasses, Etc.

DESCRIPTION

Structures such as buildings, bridges, overpasses, and culverts can provide habitat for several bird and bat species. The structures can serve as nesting sites or as winter roosts. Properly designed bridges and culverts can mitigate loss of habitat for some bat species. For little to no costs, existing bridges can be modified to provide better roosting habitat for bats. 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 human disturbances from traffic and rebuilding efforts. Abandoned buildings, while commonly used as bat roosts, decay quickly and become unsuitable over time. As a result, bridges and buildings often do not provide a permanent roosting site for many bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

This habitat subtype is mostly concentrated in urban centers. Some are found in isolated areas such as bridges and culverts along major road systems, or abandoned homes in rural areas. There are thousands of buildings in the state. Acreage of this subtype is combined in that of urban and suburban lands type. Buildings are made of impervious materials and cause increased amounts 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, bridges, overpasses and culverts are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BUILDINGS, BRIDGES, OVERPASSES, ETC.

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	3	*Tyto alba*	Barn Owl
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

10.3 Utility Right-of-ways

DESCRIPTION

Utility Right-of-ways (ROWs) are corridors used for transmission lines or gas pipelines. In Eastern U.S. many are found in wooded areas. Impacts on surrounding ecosystems can be detrimental but properly managed ROWs can have positive aspects. ROWs can contain grass, shrub or wetland habitats, or a mixture of many habitats. Gas pipline ROWs usually involve much more impact on the environment, denuding most of the corridor, and the gas pipeline industry requires that herbaceous cover be maintained over shrub cover. The plant communities in which utility ROWs have had a positive effect are those that are graminoid or herbaceous species dominated or communities where fire played a factor in maintaining the community. Pitcherplant bogs/flats and inland freshwater marshes often form in low areas on the ROW corridors. The maintenance of the ROWs to minimize woody species also benefits prairie remnants and sandhill communities.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

ROWs are found throughout the state. Development of this subtype usually results in the loss of other more valuable wildlife habitat.

Utility ROWs are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UTILITY RIGHT-OF-WAYS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	2	*Ammondramus LeConteii*	LeConte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Columbina passerina*	Common Ground Dove
	3	*Colinus virginianus*	Northern Bobwhite
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	4	*Drymarchon couperi*	Eastern Indigo Snake

10.4 Hay and Pasture Lands

DESCRIPTION

A large percentage of the land surface area of Mississippi is in various states 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, and herbs. The land use/land cover estimates indicate that there are nearly 4 million acres of pasture/grassland. The amount of non-cultivated land has increased since 1982; conversely the acreage of cultivated land has decreased, due mainly to economic factors and 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.

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 non-native grass varieties, such as fescue and Bermuda grass. Unimproved pastures that are heavily grazed contain a variety of native and non-native grasses and weeds. Some weeds that are unpalatable will increase in grazed pastures. If left ungrazed or not managed by mowing, tillage, or prescribed burning, trees and shrubs quickly invade and form brushy thickets and eventually woodlands.

MNHP Ecological Community	Species Associations	MNHP Rank
Disturbed upland grassland (old field/pasture/mowed)	*Solidago canadensis - Symphyotrichum pilosum - Verbena brasiliensis*	S5
Mesic grassland (savanna) - mowed	*Savanna graminoids such as Dichanthelium, Schizachrium scoparium, and Aristida purpurascens*	SM
Disturbed wetland grassland (pasture/mowed)	*Paspalum sp - Panicum rigidulum - Rubus sp.*	S4?

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. In the EGCP ecoregion of Mississippi there are over **800,000 acres.** They often occur on less productive soils and steeper hill slopes. Pine and hardwood forests, pine plantations and cutover areas often adjoin this subtype.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Scolopax minor*	American Woodcock
	3	*Tyto alba*	Barn Owl
Crustaceans	1	*Procambarus barbiger*	Jackson Prairie Crayfish
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip

10.5 Pine Plantations

DESCRIPTION

Pine plantations of the EGCP occupy a wide range of topographic positions and soil types. Establishment of pine plantations is generally practiced in moderately well-drained, acidic to neutral soils. Pine plantation establishment is usually unsuccessful on sites where pine species are naturally absent or exhibit poor growth due to insufficient drainage, although techniques such as bedding have been used to overcome drainage limitations on some sites. Establishment of pine plantations can also be difficult on sites with excessively well drained soils. The majority of pine plantations in the EGCP are established in loblolly or slash pines. Shortleaf pine is also adapted to many sites across the region and may increase in acreage established on suitable sites due to higher value timber products (e.g. poles) and potential for mitigation of complete stand loss from fire in young plantations. However, when compared to the UEGCP ecoregion, there are likely many fewer sites where shortleaf pine could be considered the best-adapted pine species in the EGCP.
Pine plantations are typically established by planting seedlings grown in nurseries on a uniform spacing within and between rows of trees. Seedling density at planting is controlled by spacing, and this may vary depending on objectives of establishment. Much research and development has gone into producing "improved" loblolly and slash pine seedling stocks through various plant breeding or selection methods that favor timber production characteristics such as fast growth, desirable stem form, disease resistance, and site adaptability. Pine plantations are frequently planted for production of timber products or where a quickly established forest cover is desired (e.g. visual screening, soil stabilization, windbreaks, and other conservation-oriented uses), or for development into a more diverse, future forest type, or some combination of these and other objectives. Much of the acreage established in pine plantations is found on industrial and non-industrial private lands, although many publicly owned lands also establish pine plantations to meet various land use objectives.

Pine plantations are generally viewed as monotypic forests that lack structural (e.g. varied canopy layers) and compositional (e.g. variety of plants) habitat diversity. However, the extent to which a given pine plantation provides wildlife habitat value depends on its age, structure, composition, and management. These characteristics are largely a function of age of trees; silvicultural or other manipulative treatments; weather effects (e.g. storm damage); natural mortality caused by competition, insects, or diseases; and site-specific growing conditions (e.g. soil fertility, moisture, and site preparation prior to planting).

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric-mesic pine forest (plantation)	*Pinus (elliottii, taeda, echinata)*	SM
Mesic slash pine forest (plantation)	*Pinus (elliottii taeda)*	SM
Bottomland (wet) pine forest (plantation)	*Pinus (elliottii, taeda, echinata)*	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

In all upland regions of the state except the Mississippi River alluvial plain, parts of the loess hills and the Black belt regions, there has been significant conversion of forest and agricultural lands to pine plantations, which are estimated to cover almost 14 percent of the state (over 4 million acres). Over 2 million acres of pine plantations are estimated to be in the EGCP of Mississippi. 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, agricultural lands, urban/suburban areas, and many other habitat types. Most of these pine plantations are established to loblolly pine, but slash pine is also planted in more southern portions of the region. More landowners in the region are establishing longleaf pine as a result of conservation programs (e.g. Longleaf Pine Initiative), site and climate adaptations, and landowner objectives that favor longleaf pine establishment. However, longleaf pine plantations are not considered as part of the discussion of these artificial habitats.

Pine species may or may not be considered an off-site species for a given site. Pine may be suitable to the site, but establishing or converting other forest types to predominately monoculture forest stands simplifies habitats. Practices such as bedding to favor pine growth on wet sites negatively affect site hydrology. Furthermore, off-site pine species may be more susceptible to losses from disease or insect pests and extreme weather events (e.g. wind and drought).

Pine plantations will continue to be a part of modern landscapes, and although this habitat type may not be considered ideal wildlife habitat, there are stages in which different wildlife species utilize and sometimes thrive in these habitats. Silvicultural management activities (e.g. thinning and prescribed burning) that are part of normal production timber objectives can enhance habitat conditions for some wildlife species during the life of the stand. On sites better suited to longleaf pine, interim management of existing loblolly or slash pine stands can enhance some wildlife benefits until it is feasible to re-establish longleaf pine. Other management practices to enhance wildlife habitat in pine plantations may include decreasing planting densities, establishing or retaining desirable hardwood trees, and controlling invasive species.

Young pine plantations (0 to 5 years of age) usually provide short-term early successional habitat and are used by wildlife species associated with this early seral stage. During this time, other tree and shrub species may become established.

As young pine plantations progress from seedlings to saplings (5 to 12 years of age), canopy closure of pines usually occurs and the ground is almost completely shaded. As a result, herbaceous understory plant coverage is sparse, and the ground is covered with a substantial amount of leaf litter and other residue. Because it is difficult to manage young pine plantations with prescribed fire, other tree species that have become established often persist under the dominant pine canopy. Some songbirds that utilize closed-canopy forests find dense plantations suitable for various habitat requirements (e.g. feeding or nesting), and deer and turkey may use the heavy cover for concealment.

When pine plantations reach 12 to 25 years of age, trees are of a sufficient size to remove merchantable timber products such as pulp wood through thinning. This is often termed a mid-rotation age class because it is approximately half way through the life of the stand in the context of a timber production rotation that ends in complete harvest of the stand. Often a second thinning occurs after the initial thinning to utilize additional timber products and increase growing space for trees that will be left, although some stands may be completely harvested at this time if it meets certain timber production objectives. Thinning intensity and timing are primarily a function of land use objectives, tree growth rates, and timber market demand for specific products. Understory productivity increases as plantations are thinned to reduce stem and canopy density, although reduction in canopy density is only for a few years as residual tree crowns grow to occupy the open space. Hardwood species such as sweetgum formerly suppressed underneath the pine canopy may also be released and capture much of the sunlight that is allowed through the pine canopy. After thinning, prescribed fire can be introduced to increase herbaceous vegetation and reduce hardwood brush. If necessary, selective herbicide treatments may also be applied to control hardwood brush invasion and favor more herbaceous ground cover. These management practices can increase habitat diversity and in turn increase wildlife species diversity.

When pine plantations reach 25 year of age and older, stands are usually either harvested completely (clear cut) or a decision may be made to perpetuate the stand. Frequently, the rotation is started over by replanting pine. Perpetuating and maintaining the stand will mimic more of a natural pine or mixed pine-hardwood stand. Depending on land use objectives, perpetuated stands may be managed to maintain a relatively dominant pine component or allowed to revert to a climax forest type.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	2	*Columbina passerina*	Common Ground Dove
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Peucaea aestivalis*	Bachman's Sparrow
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Sitta pusilla*	Brown-headed Nuthatch
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake

10.6 Shrublands

DESCRIPTION

Shrublands are old fields or fallow lands that contain a variety of annual and perennial weeds, shrubs and/or young trees. Grasses such as broomsedge, 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. If fields and grassy openings are left untended over several years, many vines, shrubs and trees such as gallberry, possumhaw, eastern redcedar, Chinese privet, rattan-vine, persimmon, eastern baccharis, and various pines 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 scrub-shrub type is dominated by southern bayberry and blackberry shrubs. Other common components include red maple, inkberry, yaupon, various oak species and blueberries.

The wetland scrub-shrub community consists of mixed shrubs and young trees. Southern bayberry, yaupon, and large gallberry tend to form dense thickets. Other shrubs and small trees that may be present include red maple, hickory, blackgum, giant cane, buttonbush, planer tree, ash, possumhaw, Chinese privet, sugarberry and hawthorns. Vines may also be found in abundance; common vines include ladies' eardrops, grapes, trumpet creeper, peppervine, Japanese honeysuckle. These usually form in cutover coastal palustrine woodlands that are succeeding to pine woodlands; its vegetation is a result of management or modification of natural vegetation, or the lack of fire.

Herbaceous wetlands with shrubs, which are maintained by mowing, have bog herbaceous vegetation with associated shrubs such as titi and sweetbay saplings. This is another cutover coastal palustrine woodlands type, which succeeds to pine woodlands. In this community, the vegetation is a result of mowing or other similar modifications and the lack of fire.

The vegetation is deemed a forest once trees reach an average height of 15 feet tall. Trees that have wind dispersed seeds such as pine, sweetgum, ash, winged elm and red maple encroach into old-field openings. Hickories and oaks, which are dispersed by animals, are often prevalent.

The wetland scrub-shrub community consists of mixed shrubs and young trees. Southern bayberry, yaupon, and large gallberry tend to form dense thickets.

MNHP Ecological Community	Species Associations	MNHP Rank
Southern upland scrub - shrub	*Myrica cerifera - Rubus spp.*	S5
Mesic shrubland (old savanna) - logged	*Ilex glabra, I. coriacea - Ctenium aromaticum, Andropogon spp., Dichanthelium spp., Schizachrium scoparium, Aristida purpurascens*	SM
Wetland scrub - shrub	*Myrica cerifera - Ilex vomitoria - Ilex coriacea*	SM
Herbaceous wetland with shrubs (mowed)	*Bog herbaceous vegetation with Cyrilla racemiflora and Magnolia virginiana*	SM
Abandoned borrow pit vegetation	Herbs with scattered pine	SW
Cogongrass infestation	Monoculture of *Imperata cylindrica*	SW

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Shrublands include old fields and cutover areas dominated by young hardwoods or pines and shrub species released following canopy removal. 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. There are an estimated **2 million acres** in the EGCP of Mississippi.

The vegetation of this subtype is in transition as trees gain coverage and dominance of the stand. Succession of open shrubland or old fields can be set back with prescribed fire. Wildlife species that thrive in open shrubland habitats are usually common; however, some, including the gopher tortoise and Northern Bobwhite, 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 SHRUBLANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Columbina passerina*	Common Ground Dove
	2	*Passerina ciris*	Painted Bunting
	2	*Peucaea aestivalis*	Bachman's Sparrow
	3	*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*	Barn Owl
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake

10.7 Row Crops

DESCRIPTION

According to the National Agriculture Statistical Service, in 2011 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 U.S.D.A. Natural Resources Conservation Service estimates that 55 percent of Mississippi's farmland is cropland and produces such commodities as cereal, soybeans, cotton, vegetables and oil seed. Cereal crops include corn, sorghum, and winter wheat.

MNHP Ecological Community	Species Associations	MNHP Rank
Row crops	Monoculture plantings of species, particularly *Glycine max, Gossypium sp., Zea mays*	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 encompass approximately **50,000** acres in the EGCP ecoregion 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 habitat value of their fields by setting aside patches of unharvested crops for wildlife, or maintain fields in early succession by disking or prescribed burning fields to manage for northern bobwhite and mourning dove. Northern Bobwhite, which are in considerable decline, are dependent on the availability of ample cover and food (seeds and insects) resources from native grasses and forbs in agricultural landscapes. Agriculture fields surrounding the Mississippi Sandhill Crane National Wildlife Refuge in Jackson County 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 ROW CROPS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Tyto alba*	Barn Owl
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip

10.8 Artificial Ponds

DESCRIPTION

Throughout Mississippi there is an abundance of small impoundments built as borrow pits, flood control structures, recreational fishing ponds, farm ponds or catfish ponds. For the purposes of this document any manmade impoundment less than 50 acres is considered a pond. 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. 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 shorebirds 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

Mississippi has more than 160,000 small water bodies totaling more than **190,000 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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Mycteria americana*	Wood Stork
	3	Anhinga anhinga	Anhinga
	3	*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	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
Crustaceans	3	*Procambarus shermani*	Gulf Crayfish
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREAT

10. Artificial Habitats										
	CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
1	Residential and commercial development	1.1 Housing and urban areas				M	M	M	M	
		1.2 Commercial and industrial areas				L	L	L	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use, conventional tilling practices, sedimentation, erosion, excessive fertilization, lack of field borders/buffers.				H		L	H	M
		2.2 Wood and pulp plantations: Improper planting densities, diseases related to planting densities, herbicide use, offsite species plantings, improper silvicultural practices: thinning rotations, improper use of forestry BMPs				H		H		
		2.3 Livestock farming and ranching: Damage to bank vegetation due to livestock accessibility				M				M
4	Transportation and service corridors	4.1 Roads and railways: Incompatible bridge designs, timing of bridge maintenance, road construction/ maintenance	H	H		L		L		
		4.2 Utility and service lines: Indiscriminate use of herbicides			H					
5	Biological resource use	5.3 Logging and wood harvesting					H			
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	H					
7	Natural system modifications	7.1 Fire and fire suppression: encroachment of native plant species due to altered fire regimes				H		H		
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow, Chinese privet, fire ants, armadillos,wild hogs, Johnson grass, Japanese climbing fern, Japanese honeysuckle, kudzu, bamboo, Southern pine beetle			H	H	H	H		L
		8.2 Problematic native species: encroachment of native shrubs (yaupon, gallberry)				H	H	H		
9	Pollution	9.3 Agricultural and forestry effluents								M

PRIORITY CONSERVATION ACTIONS

10. Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
1.0 Land/Water Protection									
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	X		X	X
1.2 Resource and habitat protection		X	X		X	X		X	X
2.0 Land/Water Management									
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X		X	X	X	X	
	Discourage incompatible recreational uses.	X	X	X					
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/ eradicate such species when present.	X	X	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X						
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/ degraded habitat when possible: Preserve native vegetation when possible.	X	X	X	X	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X						X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X		X	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X			X	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.		X		X	X	X	X	X

10. Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
3.0 Species Management									
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take): encourage bat exclusion over removal/eradication.	X	X		X		X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.		X						
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X	X
4.0 Education and Awareness									
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X	X		
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.		X		X	X	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.		X	X					
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.		X						
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.				X	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.		X						
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	X	X	X	X

10. Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
5.0 Law and Policy									
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X		X	X	X	X	
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.								X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.				X	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X		X	X	X	X	
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X						X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.				X	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X	X		
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X			X	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.								X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X		X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X						X	X

10. Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
5.4 Compliance and enforcement	Discourage incompatible recreational uses.	X	X	X					
	Improve enforcement of existing speices protection regulations: Encourage fish producers only raise and sell certified triploid grass carp for biological plant control.		X	X	X	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.								
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	X	X	X	X
6.0 Livelihood, economic and other incentives									
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X						
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X					
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	X		X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X	X
7.0 External Capacity Building									
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X	X

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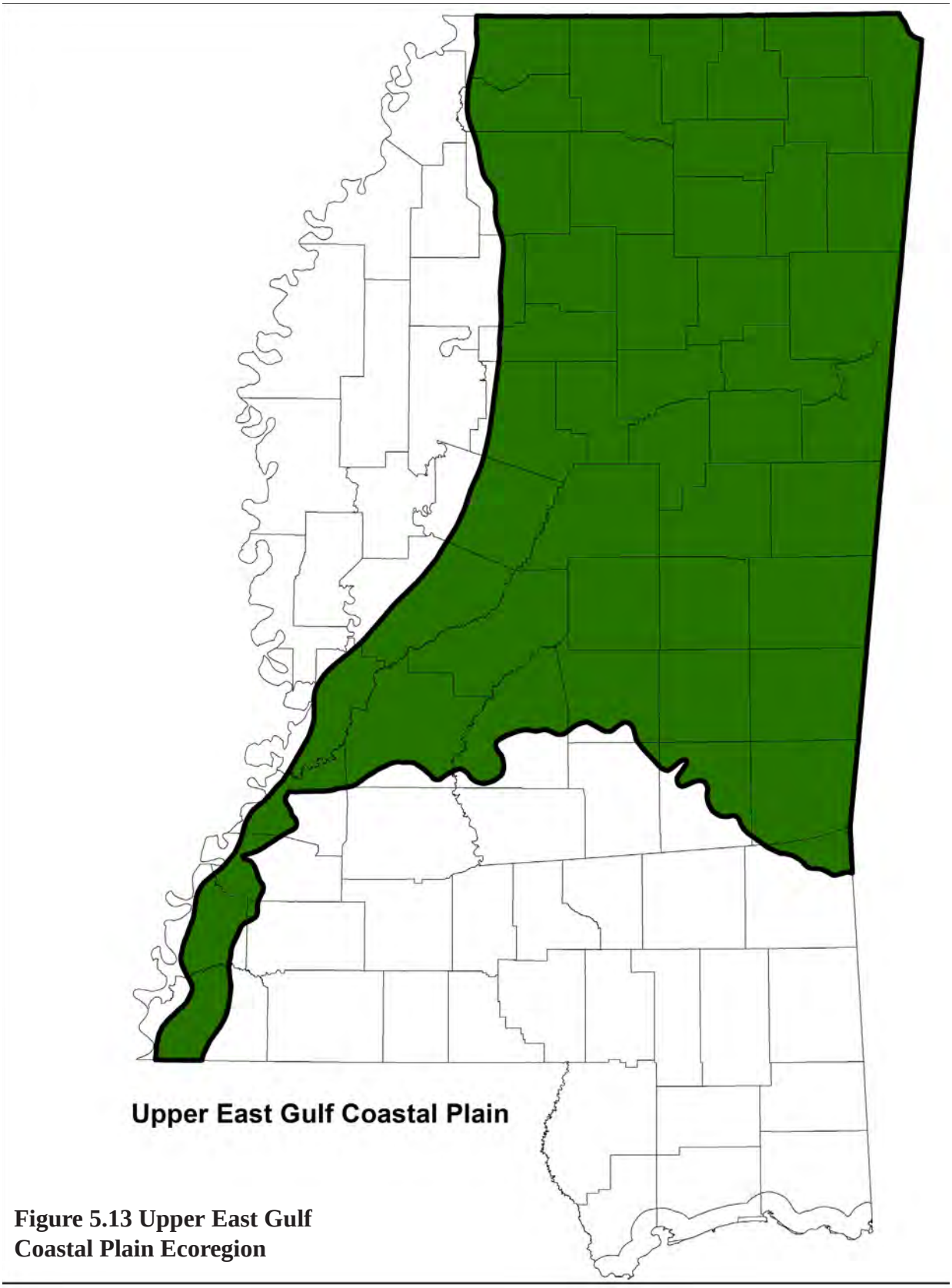

Figure 5.13 Upper East Gulf Coastal Plain Ecoregion

B. Upper East Gulf Coastal Plain

The Upper East Gulf Coastal Plain (UEGCP) ecoregion encompasses 33,861,051 acres over several states. 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 Mississippi River Alluvial Plain (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. Rugged terrain and hilly topography are characteristic of this region. In addition, the southern boundary approximates the range limits of major potential natural vegetation types with 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 Mississippi Embayment. 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 generate earthquake activity in the central United States. There have been many large magnitude earthquakes and abundant seismic activity in the region. The New Madrid earthquakes (1811-1812) were among the strongest earthquakes in the recorded history of the United States, 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. 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 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 and Jackson Prairies where they were derived from marl and chalk residues.

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

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 into the southern edge of 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. These areas are among the most distinctive 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 in a north-northwesterly arc approximately 300 miles across Mississippi and into adjacent parts of central Alabama. This region, generally 25 to 30 miles wide, derives its name from the nearly black, rich topsoil that developed over Selma Chalk. Both areas typically have calcareous soils and were formerly occupied by natural grasslands and associated vegetation.

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 in 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 have been or 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 five decades.

UEGCP Habitats:

1. Xeric-Mesic Upland Forests/Woodlands
   - 1.1 Xeric Hardwood Forests
   - 1.2 Xeric-Mesic Hardwood Forests
   - 1.3 Xeric-Mesic Shortleaf/Loblolly Pine Forests
2. Mesic Upland Forests
   - 2.1 Southern Mixed Hardwood Forests
   - 2.2 Loess Hardwood Forests
   - 2.3 Lower Slope/High Terrace Hardwood Forests
3. Rock Outcrops and Caves
   - 3.1 Rock Outcrops
   - 3.2 Caves
4. Bottomland Hardwood Forests
   - 4.1 Bottomland Hardwood Forests
5. Swamp Forests
   - 5.1 Bald Cypress/Gum Swamp Forests
   - 5.2 Small Stream Swamp Forests
6. Riverfront Forests/Herblands/Sandbars
   - 6.1 Cottonwood/Black Willow/River Birch Woodlands
   - 6.2 Sandbars
7. Prairies and Cedar Glades
   - 7.1 Northeast Prairie/Cedar Glades
   - 7.2 Jackson Prairie
8. Inland Freshwater Marshes
   - 8.1 Freshwater Marshes
9. Lacustrine (Lentic) Communities
   - 9.1 Oxbow Lakes
   - 9.2 Reservoirs
   - 9.3 Ephemeral (Temporary) Ponds
   - 9.4 Beaver Ponds
10. Artificial Habitats
    - 10.1 Urban and Suburban Lands
    - 10.2 Buildings, Bridges, Overpasses, Etc.
    - 10.3 Utility Right-of-ways
    - 10.4 Hay and Pasture Lands
    - 10.5 Pine Plantations
    - 10.6 Shrublands
    - 10.7 Row Crops
    - 10.8 Artificial Ponds

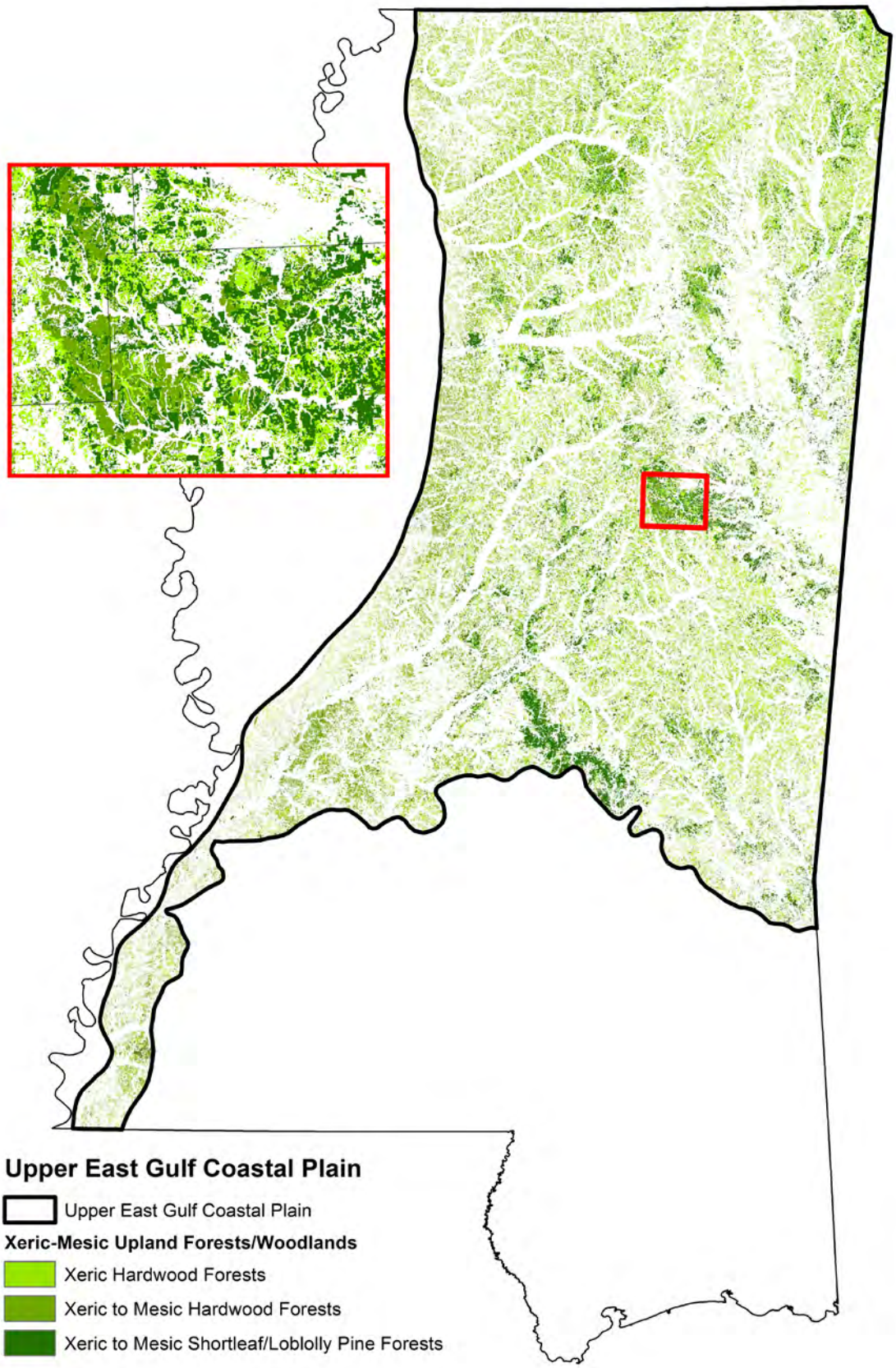

Figure 5.14 Xeric-Mesic Upland Forest In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

1. Xeric to Mesic (Dry to Moderately Moist) Upland Forests/Woodlands

Xeric to mesic forests are often found on excessive to somewhat excessively well-drained soils, and include hardwood and pine forest associations. Mixed pine-hardwoods forests are classified by the more abundant canopy tree type. Fire played an important role in maintaining these habitats by reducing densities of young saplings, recycling nutrients and oxidizing ground litter.

This type includes three subtypes in UEGCP: 1.1 Xeric Hardwood Forests, 1.2 Xeric to Mesic Hardwood Forests, and 1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests

GENERAL CONDITION

Although there are no estimates of the losses of Xeric to Mesic Upland Forests/Woodlands in Mississippi, it is possible to envision their overall condition by understanding the extent of development pressure generated on these habitats. Historically, large areas of upland hardwood and pine forests were converted to agricultural croplands and pasture. The tracts 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.

Due to a history of pine monoculture and fire suppression, typical upland forests lack a diverse understory and exhibit very high stem densities. Upland forests of Mississippi benefit from prescribed burning. However, timberlands and protected forestlands, such as federal refuges, and lands adjacent to Corps of

Engineers' reservoirs, are somewhat degraded due to limited exposure to fire, though continued efforts to increase application of prescribed burning on national forest lands may result in improved conditions. Timing of prescribed burning is an important issue. To most closely approximate condition of the historic forests, burns should occur in late spring and early summer, when natural ignitions were most likely and when litter moisture was low enough to facilitate fire propagation.

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, conditions of these forests may improve.

1.1 Xeric Hardwood Forests

DESCRIPTION

The xeric hardwood subtype of the UEGCP occupies 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. Six ecological communities are grouped into this subtype: Chestnut oak slope and ridge forests, oak-cedar forests, xeric upper slope oak forest, xeric oak-hickory forest, xeric oak-hickory forest/woodland with pine, and wet calcareous cliffs.

Chestnut oak slope and ridge forests are mainly found in the northeastern corner of the state. The forest is typically composed of chestnut oak with a combination of northern red oak, black oak, and/or chinkapin oak. These steep slopes are underlain by limestone, shale, and chert beds of the Carboniferous formation. This community is one of the dominant types of forest of J.P. Coleman State Park in Tishomingo County.

Oak-cedar forests (Black Belt hills and bluffs) are associated with the Black Belt Prairies and the Pontotoc Ridge forests. Medium sized oaks and eastern red cedar form a low forest along hill slopes and draws. The soils are shallow over Shelma Chalk. Common trees in this forest are chinkapin oak, eastern red cedar, Durand oak, blackjack oak, nutmeg hickory, and white ash. Scattered prairie wildflowers may also be found in areas of sunspots. Morgan Hill Research Natural Area on the Noxubee National Wildlife Refuge in Noxubee, Oktibbeha, and Winston counties has examples of this successional forest.

Xeric upper slope oak forests are one of the most abundant forest communities in the UEGCP. These are excessively well drained soils of the highest position of slopes. Typical trees in this forest include post oak, in combination with southern red oak, blackjack oak, white oak, sand hickory, mockernut hickory, and sweetgum. The presence of sweetgum in this habitat is an artifact of fire suppression. Herbaceous vegetation in sunspots will include native grasses, asters, sunflowers and lespedezas. Shelton Mountain, a Weyerhauser property in Webster County, is an excellent example of this habitat. The Strawberry Plains Audubon Center in Marshall County, as well as the Holly Spring National Forest and the Hell Creek WMA in Tippah County have examples of xeric hardwood forests.

Xeric oak-hickory forests/woodlands are another dominant community of the Upper East Gulf Coastal Plain. It differs from the previous type in the absence of white oak and sweetgum. Shortleaf pine may be present in

this habitat, but is a minor component, as these are volunteers from the ridgetop forest, which is dominated by pine. Several areas in Wall Doxey State Park, in Marshall County, have this community.

Xeric oak-hickory forests/woodlands with pine are rare in this ecoregion. It is a forest dominated by oaks (sand post, post, blackjack, and/or southern red), hickories (sand and/or mockernut), and pines (shortleaf and/or loblolly). One of the distinct characteristics of this community is the excessively well-drained, deep sands that underlie the habitat. Chitlin Corners, in Lowndes and Noxubee Counties, may be the only representation of this community in North Mississippi.

Wet calcareous cliffs are very rare, only occurring in the Tennessee River Hills Region (far northeastern part of the state), and are inclusions in the Chestnut oak slope and ridge forests. This community is dominated by American alumroot, hairy alumroot and jewelweed, rooted on bare rock slopes. Seepage from ridges above the cliffs keep these slopes wet through most of the year. Examples of this community are in J.P. Coleman State Park in Tishomingo County.

MNHP Ecological Community	Species Associations	MNHP Rank
Chestnut oak slope and ridge forest	*Quercus prinus - Q. rubra, Q. velutina, Q. muehlenbergii*	S1
Oak – cedar forest (black belt hills and bluffs)	*Quercus muehlenbergii - Juniperus virginiana - mixed deciduous hardwood species*	S3
Xeric upper slope oak forest	*Quercus stellata - Q. falcata, Q. marilandica, Q. alba - Carya pallida, C. tomentosa - Liquidambar styraciflua*	S2
Xeric oak – hickory forest/ woodland	*Quercus stellata, Q. marilandica, Q. falcata - Carya pallida, C. tomentosa*	S2
Xeric oak-hickory forests/ woodlands with pine	*Quercus (margarettiae, stellata, marilandica, falcata) - Carya (pallida, alba) - Pinus echinata*	S2
Wet calcareous cliffs	*Heuchera americana/H. villosa-Impatiens capensis*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Xeric 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 over 1,000,000 acres of this subtype exists in the UEGCP. Mesic hardwood and pine forests are situated below this community on mid-slopes. Stands of xeric hardwood forests are interspersed with agriculture and commercial timberlands, homesteads and urban centers.

Conversion of additional areas of xeric 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. Xeric hardwood forests are highly fragmented and considered to be in poor condition due to lack of fire management.

Xeric 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 unabated will likely lead to additional declines.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH XERIC HARDWOOD FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Antrostomus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Piranga olivacea*	Scarlet Tanager
Insects	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	2	Spilogale putorius	Eastern Spotted Skunk
	2	*Ursus americanus*	Black Bear
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip
	3	*Pituophis melanoleucus melanoleucus*	Northern Pine Snake

1.2 Xeric to Mesic Hardwood and Hardwood/Pine Forests

DESCRIPTION

Neither a very wet or very dry habitat, moderately mesic habitats are often found in a narrow zone between upland forests and low-lying areas such as bottomland hardwood forests, ponds, etc. This hardwood type refers to a collection of 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 overtime. Species have different environmental preferences within the mesic forest type: shumard oak type prefers fine textured soils; white ash, circumneutral soils; and tuliptree, areas with ample moisture. Smaller or subcanopy trees and shrubs may include American beech, eastern hophornbeam, flowering dogwood and sourwood. There are three communities in this subtype: xeric-mesic mixed oak forests, xeric-mesic mixed oak-pine forests, and interior flatwoods forests.

Xeric-mesic mixed oak forests are dominated by a canopy of white and post oaks, and usually pignut and mockernut hickories. The habitat type can generally be described as comprising areas of finer textured loams and clay loam soils with higher moisture holding capacity that are found on middle and upper slopes of the landscape. The Little Mountain Natural Area of Hugh White State Park in Grenada County is an example of this forest type.

Xeric-mesic mixed oak-pine forests have a canopy consisting of nearly equal proportions of pines and hardwoods. Historically, shortleaf pine would have been the primary pine of this community, but loblolly pine has now replaced it in many forests. The hardwood trees usually present include several oaks (white, southern red, water, and cherrybark oaks) and sweetgum. An example of this type is present at Richmond Mound Natural Area at Grenada Reservoir in Grenada County.

Interior flatwoods forests are associated with a region that extends as a belt or zone from three to fifteen miles wide north and south along the west edge of the Pontotoc Ridge and Black Belt Prairie Region. Oaks (post and black oaks), pines (shortleaf and loblolly pines), swamp tupelo and sweetgum are the usually trees composing this forest. This region, as the name implies, presents usually a low lying flat topography. The soils of the region are heavy, dark gray clay. This habitat is common on John W. Starr Memorial Forest and Noxubee National Wildlife Refuge in Noxubee, Oktibbeha and Winston Counties.

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric – mesic mixed oak forest	*Quercus alba – Q. rubra – Carya glabra, C. tomentosa – Liriodendron tulipifera*	S4
Xeric – mesic mixed oak – pine forest	*Pinus taeda, P. echinata – Quercus alba, Q. falcata, Q. nigra, Q. pagoda – Liquidambar styraciflua*	S4
Interior flatwoods forest	*Quercus stellata, Q. velutina – Pinus echinata, P. taeda – Liquidambar styraciflua*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Tracts of xeric-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. It is estimated that there are over one million acres of this forest subtype in 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; existing stands are in poor condition as a result of mismanagement. The lack of seasonally appropriate burning has also resulted in the deterioration of remaining tracts.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH XERIC TO MESIC HARDWOOD FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Dendroica discolor*	Prairie Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Scolopax minor*	American Woodcock
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Ursus americanus*	Black Bear
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Lampropeltis triangulum syspila*	Red Milk Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Lampropeltis getula nigra*	Black Kingsnake
	3	*Masticophis flagellum*	Eastern Coachwhip

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests

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 xeric and mesic uplands of Mississippi. Pine plantations are discussed in section 10.5. 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 the 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, tuliptree, 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 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 hardwoods 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.

Five ecological communities are grouped into this subtype: Xeric upper slope pine-oak forests, xeric upper slope shortleaf pine forests, xeric-mesic pine forest, lower slope mixed hardwood –pine forest, and lower slope pine forest.

Xeric upper slope pine-oak forests are very similar to the dry-mesic mixed oak - pine forests described earlier. However, in this forest the canopy is clearly dominated by shortleaf pine or loblolly pine. The hardwood trees usually present include several oaks (white, southern red, blackjack, and post oaks) and mockernut hickory. Examples of this community can be found at Jeff Busby State Park in Choctaw County, and Tishomingo State Park, in Tishomingo County.

Xeric upper slope shortleaf pine forests are relatively pure stands of shortleaf pine, with few hardwood trees present. Little remains of this habitat. Loblolly pines have been planted or naturalized into the historic range of this community. Intact shortleaf pine stands can be found at Enid Reservoir in Yalobusha County and Sardis Reservoir in Panola and Lafayette counties.

Xeric-mesic pine forests form one of the largest communities in this subtype. Shortleaf and/or loblolly pine form the canopy, with some occasional oak and hickory trees. Flowering dogwood often dominates the midcanopy; sourwood and blackgum are also usually present. Longleaf woodoats sometime form a dense groundcover, particularly in sunny spots. There are examples of this community in Holly Springs National Forests in Lafayette County.

Lower slope mixed hardwood pine forest is a transition community between a floodplain forest and the dryer upper slope forests. The canopy is nearly equally dominated by pines (loblolly and spruce pines) and hardwoods (primarily oaks). White, swamp chestnut, and water oaks are usually present. Additionally, tuliptree, sweetgum, post oak, and blackgum may be found in this habitat. George P. Cossar State Park in Yalobusha County and John Kyle State Park in Panola County both have examples of this habitat.

Lower slope pine forests are a very abundant community in the UEGCP. These forests consist of a nearly pure stand of loblolly pines over a patchy groundcover of Longleaf woodoats. This habitat is common on Noxubee National Wildlife Refuge.

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric upper slope pine-oak forest	*Pinus echinata, P. taeda – Quercus sp.* – mixed shrubs	S4
Xeric upper slope shortleaf pine forest	*Pinus echinata*	S2S3
Xeric mesic pine forest	*Pinus echinata – P. taeda – Cornus sp. – Toxicodendron radicans – Chasmanthium sessilifolium*	S4
Lower slope mixed hardwood –pine forest	*Quercus alba, Q. michauxii, Q. nigra* – mixed deciduous hardwoods – *Pinus taeda, P. glabra*	S4
Lower slope pine forest	*Pinus taeda- Chasmanthium sessilifolium*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Natural stands of xeric-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 over **800,000 acres** of this subtype in UEGCP ecoregion in Mississippi. 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.

Xeric-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 XERIC TO MESIC SHORTLEAF/LOBLOLLY PINE FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Aquila chrysaetos*	Golden Eagle
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	3	*Antrostomus 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	*Sitta pusilla*	Brown-headed Nuthatch
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Spilogale putorius*	Eastern Spotted Skunk
	3	*Mustela frenata*	Long-tailed Weasel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Lampropeltis getula nigra*	Black Kingsnake
	3	*Pituophis melanoleucus melanoleucus*	Northern Pine Snake

THREATS

1.0 Xeric to Mesic Upland Forests/Woodlands					
	CLASSIFICATION	**SUBCLASS**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric-Mesic Hardwood Forests**	**1.3 Xeric-Mesic Shortleaf/ Loblolly Pine Forests**
1	Residential and commercial development	1.1 Housing and urban areas	H	M	M
		1.2 Commercial and industrial areas	L	L	L
		1.3 Tourism and recreation areas		M	
2	Agriculture and aquaculture	2.1 Annual and Perennial nontimber crops	M		
		2.2 Wood and pulp plantations: bedding/shearing, herbicide practictes on site preparation	H	H	H
		2.3 Livestock farming and ranching		L	
3	Energy production and mining	3.2 Mining and quarrying: Sand mining, lignite mining	H	M	M
4	Transportation and service corridors	4.1 Roads and railways	H		M
		4.2 Utility and service lines: Non-selective herbicide use, establishment of non-native grasses	M		
5	Biological resource use	5.3 Logging and wood harvesting	H		H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	
7	Natural system modifications	7.1 Fire and fire suppression: Fire suppression, season and frequency of burning	H	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Kudzu, Japanese honeysuckle, cogongrass, wild hogs, fire ants, Japanese climbing fern, Chinese privet, Chinese tallow tree	H	M	M
		8.2 Problematic native species	H	M	M
9	Pollution	9.5 Air-borne polluntants: Acid rain associated with large urban areas	L	L	L

PRIORITY CONSERVATION ACTIONS FOR XERIC TO MESIC UPLAND FORESTS/WOODLANDS

1.0 Xeric to Mesic Upland Forests/Woodlands				
CLASSIFICATION	**SUBCLASS**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric-Mesic Hardwood Forests**	**1.3 Xeric-Mesic Shortleaf/ Loblolly Pine Forests**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Discourage incompatible recreational uses.	X	X	
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X		X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X		X
	Continue to restrict/monitor scientific collection of SGCN.	X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	

1.0 Xeric to Mesic Upland Forests/Woodlands				
CLASSIFICATION	**SUBCLASS**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric-Mesic Hardwood Forests**	**1.3 Xeric-Mesic Shortleaf/ Loblolly Pine Forests**
3.2 Species recovery	Initiate propagation program or establish next box program for selected SGCN: Nest boxes for Red-cockaded Woodpeckers and Southeastern American Kestrel.			X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
3.3 Species reintroduction	Initiate propagation program or establish next box program for selected SGCN: Translocation programs for Red-cockaded Woodpeckers			X
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X

1.0 Xeric to Mesic Upland Forests/Woodlands				
CLASSIFICATION	**SUBCLASS**	**1.1 Xeric Hardwood Forests**	**1.2 Xeric-Mesic Hardwood Forests**	**1.3 Xeric-Mesic Shortleaf/ Loblolly Pine Forests**
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Discourage incompatible recreational uses.	X	X	
	Improve enforcement of existing speices protection regulations.	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X		
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	
6.2 Substitution	Discourage incompatible recreational uses.	X	X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

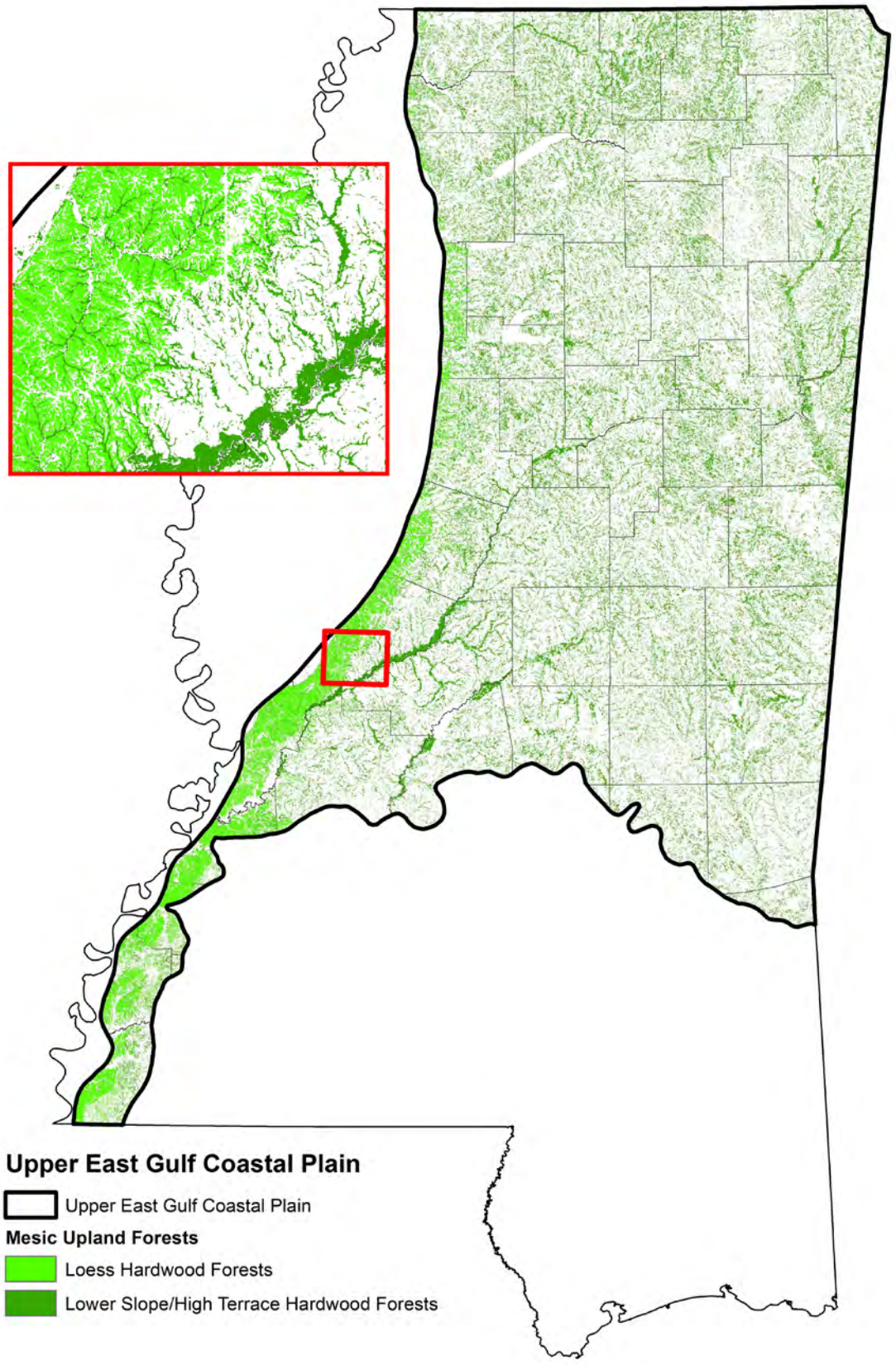

Figure 5.15 Mesic Upland Forests In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

2. Mesic Upland Forests

Mesic upland forests are supported by soils with higher moisture holding capacities than those of xeric to sub-xeric forest categories. Plant communities of mesic habitats in this ecoregion include beech/magnolia forests and lower slope/high terrace hardwoods. Hardwood forests in this type are often found on moist portions of upland habitats protected from fire (by slope) and high terraces or ridges of floodplains.

Included in these mesic forests are small seepage slopes or springs. 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 are used commercially for bottled 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 three subtypes in the UEGCP: 2.1 Southern Mixed Hardwood Forests, 2.2 Loess Hardwood Forests, and 2.3 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.

Forest management practices that prevent logging in streamside zones, designed to help improve water quality of streams, help conserve lower slope/high terrace hardwood forests. The expansion of terrace loblolly stands onto slopes of the hardwood or mixed hardwood upper slopes is a modern condition resulting from the suppression of fire. Conditions described for xeric to sub-xeric hardwood forests also apply to these forest communities.

2.1 Southern Mixed Hardwood Forests

DESCRIPTION

Southern mixed hardwood forests are found on deep soils of stream terraces, deep loess of slopes, and 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 American beech and magnolia are of limited commercial value, other species of trees are promoted after logging. There are two ecological communities in this subtype: Beech-Magnolia forests and Wooded/Spring seeps.

The Beech-magnolia forest community occurs in transitional areas from upland forests to stream bottoms. American 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, tuliptree, sweetgum, cherrybark oak and water oak. Sub-canopy trees may include bigleaf magnolia, American hornbeam, 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. Noxubee Crest Natural Research Area on the Tombigbee National Forest in Winston County has examples of this habitat type.

Narrow wooded seeps or spring seeps can be found on the steep slopes of this community. Soils of hardwood seeps are often saturated throughout the year. 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 springs and the size of accompanying wetlands can vary dramatically. Vegetation composition at spring heads depends on the duration of soil saturation and the slope of landforms supporting it. The effect of spring water temperature and water chemistry on the flora and fauna of springs warrants additional study. 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 viburnum. Common trees are sweetbay, swamp tupelo, red maple and tuliptree.

MNHP Ecological Community	Species Associations	MNHP Rank
Beech - magnolia forest	*Fagus grandifolia - Magnolia (grandiflora, macrophylla) - Liriodendron tulipifera - Hamamelis virginiana - Phegopteris hexogonoptera*	S1
Wooded seep/spring seep/wet terrace	*Alnus serrulata-Itea virginica-Magnolia virginiana/M. macrophylla-Osmunda regalis/O. cinnamomea- Woodwardia areolata – Athyrium filix-femina*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Southern mixed hardwood forests cover over **200,000 acres**, some in isolated small to medium-sized patches (100 to 1,000 acres) throughout the UEGCP Ecoregion in Mississippi. The community occurs on steep, hilly areas or blufflands, and along middle and lower slopes of ravines and river valleys. Southern mixed hardwood forests require over 70 to 100 years to reach maturity. Due to extensive logging, this natural community has been lost at many sites and may only support successional vegetation at others.

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.

Some hardwood seeps contained within these habitats have been damaged by development in the surrounding uplands which has altered subsurface water flow. 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. Although widespread, their sporadic occurrence makes survey difficult, and little is known about their overall condition.

The more widespread hardwood seeps are considered **vulnerable** due to a lack of high quality spring sites that have been documented. While no accurate figure exists, it is estimated that there are **500 to thousands of acres** of hardwood seeps in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SOUTHERN MIXED HARDWOOD FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Plethodon websteri*	Webster's Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	2	*Aquila chrysaetos*	Golden Eagle
	3	*Geothlypis formosus*	Kentucky Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Parkesia motacilla*	Louisiana Waterthrush
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Ursus americanus*	Black Bear
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Lampropeltis triangulum syspila*	Red Milk Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Lampropeltis getula nigra*	Black Kingsnake

2.2 Loess Hardwood Forests

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 they have 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. Two ecological communites are found in this subtype: Coastal plain loess forest and Wooded seep/spring seep/wet terrace.

Coastal plain loess forests dominate this region. Important trees of the area include many types of hardwoods, especially cherrybark oak, but also water oak, swamp chestnut oak, tuliptree, southern sugar maple, eastern hophornbean, American hornbeam, sassafras, pignut hickory and two-wing silverbell. American 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 original climax trees such as American basswood and black walnut which were once abundant in the diverse virgin forests. Important common small trees, shrubs and vines include pawpaw, red buckeye, flowering dogwood, northern spicebush, oakleaf hydrangea and grape vines. A representative example of loess forests may be seen at Clark Creek Natural Area in Wilkinson County.

Narrow wooded seeps or spring seeps can be found on the steep slopes of this community. Usually the soils of hardwood seeps are 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 that may be found in these seepage areas include giant cane, bristly stalked sedge, climbing hydrangea and roundleaf goldenrod. Wetland shrubs found clustered around seeps include Virginia sweetspire, poison sumac and possumhaw viburnum. Common trees are sweetbay, swamp tupelo, red maple and tuliptree.

MNHP Ecological Community	Species Associations	MNHP Rank
Coastal plain loess forest	*Quercus pagoda/alba - Fraxinus americana - Acer floridanum - Lindera benzoin*	S2
Wooded seep/spring seep/wet terrace	*Alnus serrulata - Itea virginica-Magnolia virginiana/M. macrophylla - Osmunda regalis/O. cinnamomea - Woodwardia areolata – Athyrium filix-femina*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 in the UEGCP ecoregion is approximately **600,000 acres.** Encroachment of homesteads into otherwise undeveloped areas, agriculture and clearcutting, conversion of hardwood forests to pinelands and invasion by the forest-topping kudzu have contributed to the destruction and fragmentation of this forest type. Adjoining ridgetops support Xeric to Mesic Hardwood Forests (1.3) and larger streams support Lower slope/high terrace hardwood forests (2.3).

Historically, the region experienced widespread agricultural 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, agriculture was abandoned in this region, allowing the 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 FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	2	*Plethodon websteri*	Webster's Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	2	*Aquila chrysaetos*	Golden Eagle
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Geothlypis formosus*	Kentucky Warbler
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Piranga olivacea*	Scarlet Tanager
Fish	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Ursus americanus*	Black Bear
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink

2.3 Lower Slope/High Terrace Hardwood Forests

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.

Eight ecological communities comprise this subtype: mesic calcareous bluff forests, mesic lowland hardwood forests, lower slope mixed hardwood forests, lower slope mixed hardwood—pine forests, mixed hardwoods forest – spruce pine, Jackson Prairie mesic-lowland hardwood forests, forested canebrakes and wooded seeps/spring seeps/wet terraces.

The rarest community in this subgroup is the mesic calcareous bluff forest. These forests are found over predominately calcareous soils derived from ancient marine deposits. The canopy is formed by mixed hardwoods, with white oak, Shumard oak, and white ash dominating. Usually southern sugar maple is present as an understory tree. Coonewah Creek Chalk Bluffs, a TNC holding in Lee County, is an example of this community.

Mesic lowland hardwood forests are lower slope oak-hickory dominated forests. Common canopy trees include cherrybark oak, swamp chestnut oak, willow oak, water oak, bitternut hickory, pignut hickory, and shagbark hickory. Usually American hornbeam, pawpaw and two-winged silverbell are present as dominant midcanopy trees. There are examples of this community in Holly Springs National Forest in Marshall and Lafayette Counties.

The most widespread communities in this subtype are the lower slope mixed hardwood forests and lower slope mixed hardwood—pine forest. In the former, white oak, water oak, cherrybark oak form the canopy. Other important canopy trees include swamp tupelo, mockernut hickory, American beech, tuliptree, and sweetgum. American hornbeam, red maple, and oak-leaf hydrangea are usually present in the midcanopy and shrub layer. Areas of Tombigbee State Park include examples of this community type. In the pine association type, swamp chestnut replaces cherrybark oak in the canopy. Usually loblolly pines and/or spruce pine occupy an equal proportion of the canopy cover relative to that of the hardwood components. Other hardwood trees present in the canopy include swamp tupelo, tuliptree, and sweetgum. Eastern hophornbeam, parsley hawthorn, and possumhaw holly are usually present in the midcanopy and shrub layers. Examples of this community occur at George P. Cossar State Park in Yalobusha County.

Another mixed forest in this subtype is the mixed hardwoods forest with spruce pine. This community is found near the toe of slopes and into floodplains. Swamp laurel oak, water oak, and spruce pine are important components of the canopy layer. Usually the understory is open in this forest. Sedges often form large patches in the herbaceous layer, but usually few species are present in this layer, and a thick leaf litter blocks most plant growth. This habitat may be seen in the upper Pearl River around the Ross Barrnett Reservoir in Rankin, Scott, and Leake Counties.

The Jackson Prairie mesic lowland hardwood forest is another rare community in this subtype. These forests are usually found on slopes below Jackson Prairies and into drainages. The most characteristic trees are Oglethorpe oak and Durand Oak. A mixed canopy of loblolly pines and hardwood trees usually towers over these two species. Common hardwood trees include willow oak, shagbark hickory, cherrybark oak, and white oak. The Durand Prairie of Bienville National Forest in Scott County is an example of this community.

Of historical significance are the canebrakes of the Mississippi riverine areas of the state. Extensive, impenetrable, giant cane thickets which 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 re-establishment. 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. Noxubee National Wildlife Refuge in Noxubee, Oktibbeha and Winston Counties has examples of this habitat type.

Soils of hardwood seeps within this habitat 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 viburnum. Common trees are sweetbay, swamp tupelo, red maple and tuliptree. Hardwood seeps can be found in the Holly Springs National Forest in Benton, Lafayette, Marshall, and Union Counties.

MNHP Ecological Community	Species Associations	MNHP Rank
Mesic calcareous bluff forest	*Quercus alba/shumardii - Fraxinus americana - Lithospermum tuberosum - Agrimonia pubescens*	S1
Mesic-lowland hardwood forest	*Quercus (pagoda, michauxii, phellos, nigra) - Carpinus caroliniana - Carya (cordiformis, glabra, ovata)*	S3
Lower slope mixed hardwood forest	*Quercus (alba, nigra, pagoda)* - mixed deciduous	S4
Lower slope mixed hardwood - pine forest	*Quercus (alba, michauxii, nigra)* - mixed deciduous - *Pinus (taeda, glabra)*	S4
Mixed hardwoods forest –spruce pine	*Quercus laurifolia/nigra - Pinus glabra*	S3
Jackson prairie mesic-lowland hardwood forest	*Quercus oglethorpensis - Quercus durandii*	S3
Forested canebrake	Mixed deciduous trees (open canopy) - *Arundinaria gigantea*	S1
Wooded seep/spring seep/wet terrace	*Alnus serrulata - Itea virginica - Magnolia virginiana/M. macrophylla - Osmunda regalis/O. cinnamomea - Woodwardia areolata - Athyrium filix-femina*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 (sequence of moist habitats) 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 **3,000,000 acres** of this subtype are estimated to occur in the UEGCP ecoregion in Mississippi.

Being somewhat drier, these forests have experienced a greater degree of conversion, fragmentation, and logging pressure than bottomland forests (subtype 4.1). 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 FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	2	*Plethodon websteri*	Webster's Salamander
	2	*Lithobates areolata*	Crawfish Frog
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Geothlypis formosus*	Kentucky Warbler
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Ursus americanus*	Black Bear
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
	4	*Lasionycteris noctivagans*	Silver-haired Bat
	4	*Myotis sodalis*	Indiana Bat
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink

THREATS

2.0 Mesic Upland Forests					
	CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Loess Hardwood Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	M	M	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Soil erosion		H	M
		2.2 Wood and pulp plantations: conversion to offsite species, improper use of forestry BMP's, bedding/shearing	H	H	H
		2.3 Livestock farming and ranching: soil compaction, lack of buffers along streams, changes in vegetative composition	L	L	L
3	Energy production and mining	3.2 Mining and quarrying: Gravel and sand mining (can be a high threat locally), lignite mining	M	L	
4	Transportation and service corridors	4.1 Roads and railways	L	M	
5	Biological resource use	5.3 Logging and wood harvesting: High grading timber stands, thinning rotations,		H	H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L	L	
7	Natural system modifications	7.2 Dams and water management/use:			
		Stream flow management			M
		Headcutting			L
		Ground and surface water withdrawal			M
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Nepalese browntop grass, Chinese privet, fire ants, kudzu, bamboo, Chinese tallow tree, Japanese climbing fern, Fortune's holly fern, bigleaf periwinkle, common periwinkle, chinaberry tree, English ivy, winter creeper, princess tree, silktree, Chinese parasol tree (localized), wild hogs	H	H	H

PRIORITY CONSERVATION ACTIONS

2.0 Mesic Upland Forests				
CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Loess Hardwood Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	

2.0 Mesic Upland Forests				
CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Loess Hardwood Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X

2.0 Mesic Upland Forests				
CLASSIFICATION	**SUBCLASS**	**2.1 Southern Mixed Hardwood Forests**	**2.2 Loess Hardwood Forests**	**2.3 Lower Slope/High Terrace Hardwood Forests**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X	X
	Discourage incompatible recreational uses.	X	X	X
	Improve enforcement of existing speices protection regulations.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

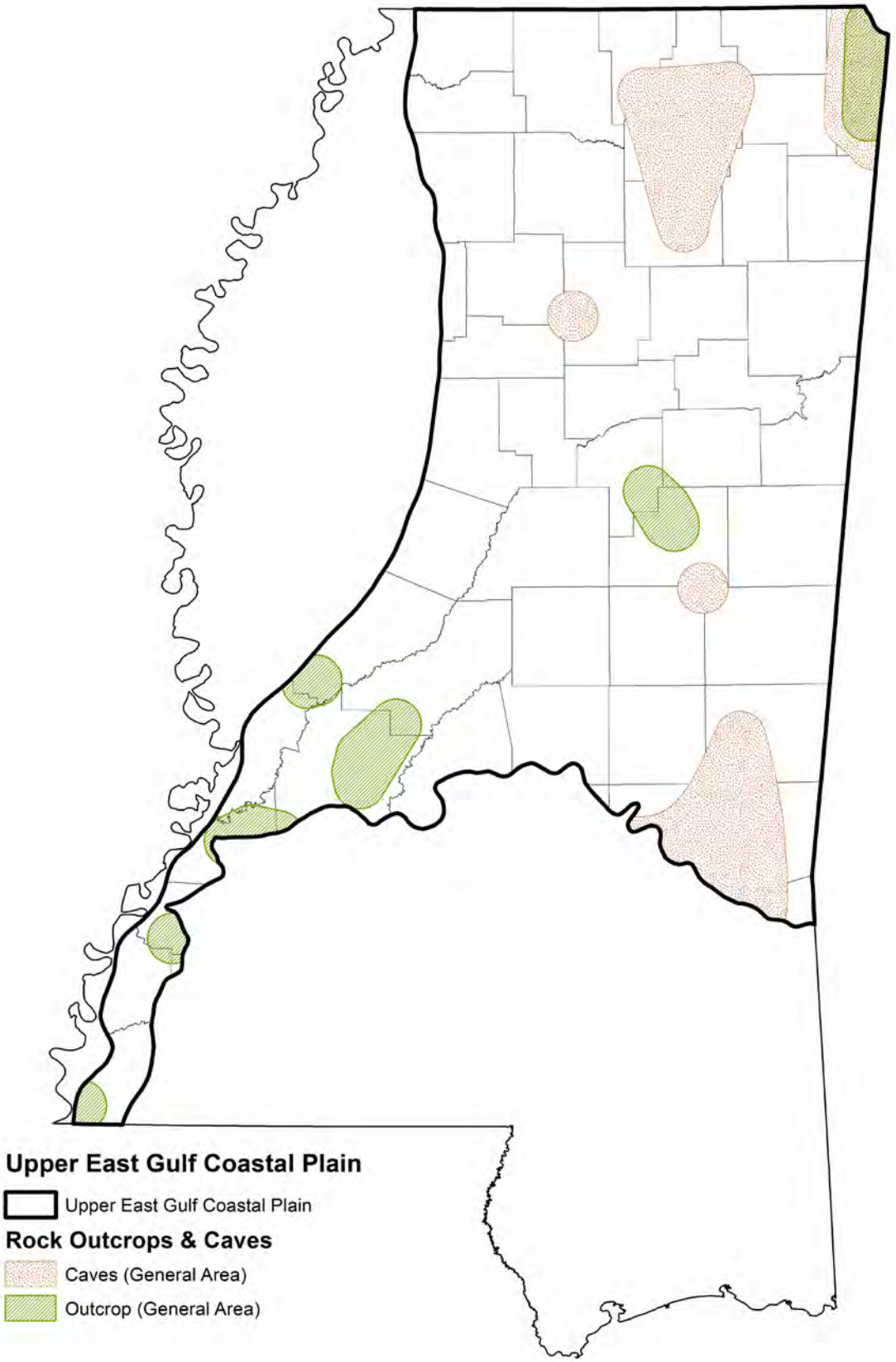

Figure 5.16 Rock Outcrops and Caves In Upper East Gulf Coastal Plain Ecoregion

3. 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: 3.1 Rock Outcrops and 3.2 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 (e.g. 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.

3.1 Rock Outcrops

DESCRIPTION

Most of the UEGCP is covered with deep soils originating from weathering of non-rocky, sedimentary deposits of marine, alluvial, or aeolian origin. With the exception of gravel deposits (many of which originate from areas far beyond the boundaries of Mississippi), outcrops of rock at the surface are generally uncommon in most portions of this ecoregion. Rock outcrops provide essential habitat for a few species of rare salamanders found nowhere else in the state, and may be facultatively important to others, probably by providing access to cool, moist, subterranean habitat, via cracks, fissures and solution channels, to species that cannot dig deeply unaided, and that could not otherwise survive hot, dry summers.

The eastern border of Tishomingo County is unique in Mississippi in having outcrops of Paleozoic rock, exposed by weathering of overlying Cretaceous deposits. Rock outcrops known to support rare salamander species include limestone (Fort Payne Formation, Pride Mountain Formation) and sandstone (Hartselle Formation), but rock associated with other formations may also support these species. In addition, interdigitated within these outcrop belts are vast gravel deposits, alluvial in origin, some of which include well-cemented chert pebble conglomerate zones (Tuscaloosa Formation-lower Cretaceous). Structurally similar conglomerate zones of Quaternary origin my also provide habitat for rare salamanders in this and other areas within this ecoregion.

In the central portion of the Loess Bluff region along the western edge of this ecoregion there are exposures of the Glendon and Marianna limestones of the Vicksburg Group (Oligocene), which outcrop intermittently where exposed by streams downcutting through the loess deposits.

Also within the loessal belt, but just east of it as well in some areas, and extending intermittently from central Hinds County to Wilkinson County, are sandstone/siltstone outcrops. These are associated with the Catahoula Group (Miocene) in the more northerly portion of this belt, and with the Hattiesburg and Pascagoula Formations (Miocene) farther south. They mainly occur along steep hill slopes, ravines or river channels where soils have eroded away, and in fact may be relatively soft when buried, becoming indurated (hardened) upon exposure subsequent to erosion. Outcrops of ironstone and ferruginous conglomerates are often associated with sandstone outcrops and with rock outcrops elsewhere in the state, and may also be of importance to certain species.

Other rock outcrops (Tallahala quartzite-Kosciusko Formation, Eocene; Ripley limestone-Ripley Formation, Upper Cretaceous; Ironstone-Wilcox Group) occur intermittently in belts elsewhere within this ecoregion, and could potentially support rare species, but their presence has not been documented.

Examples of sandstone outcrops can be found in Tishomingo State Park in Tishmingo County (Hartselle Sandstone), the Owens Creek area of the Natchez State Park in Claiborne County (Catahoula Sandstone), and the Clark Creek Natural Area in Wilkinson County (Hattiesburg/Pascagoula Formation). Limestone outcrops can be found on the Natchez Trace Parkway at Cave Springs in Tishomingo County (Pride Mountain Formation), and the eastern side of Lindsey Creek on the Natchez Trace Parkway in Hinds County (Glendon Limestone).

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Generalized outcrop belts of formations which may include limestone, sandstone, siltstone, ironstone, and well-cemented conglomeratic gravel are mapped by the Office of Geology, Mississippi Department of Environmental Quality. However, most of the actual outcrops remain unmapped, and as noted above there are comparatively few outcrops of surface rock in Mississippi, as the surface of the state is predominantly comprised of unconsolidated sediments.

Rock outcrops are **imperiled** in the state because of rarity and because of historic destruction by mining for building stone, for use in concrete manufacture (limestone and gravel), for production of agricultural lime, for road-building, and when inundated consequent to impoundment (damming of the Tennessee River and other streams). They are vulnerable to further decline from mining activity, and from conversion of outcrops and/or surrounding habitat to other uses (urban/suburban development; pasture, industrial forestry, highway construction).

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ROCK OUTCROPS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Aneides aeneus*	Green Salamander
	2	*Eurycea lucifuga*	Cave Salamander
	2	*Gyrinophilus porphyriticus*	Spring Salamander
	2	*Hemidactylum scutatum*	Four-toed Salamander
	2	*Plethodon ventralis*	Southern Zigzag Salamander
	2	*Plethodon websteri*	Webster's Salamander
	3	*Lithobates palustris*	Pickerel Frog
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	3	*Mustela frenata*	Long-tailed Weasel

3.2 Caves

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, primarily along the Vicksburg Group – a physiographic feature with a belt of lime-bearing, Oligocene strata that roughly bisects the state east to west and includes portions of Rankin County. 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. Mississippi has many man-made caves and abandoned mines that function similarly to natural caves and are used by SGCN.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Caves are found very rarely in some sandstone and limestone formations, including the Forest Hills Formation and the Tennessee River Hills. Of the **65 known caves** in the state, over half occur or did occur in the UEGCP. It is thought that many caves in Tishomingo County were inundated with the formation of Pickwick Lake. The caves are usually associated with upland hardwood forests.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Eurycea lucifuga*	Cave Salamander
	2	*Gyrinophilus porphyriticus*	Spring Salamander
	2	*Plethodon ventralis*	Southern Zigzag Salamander
	3	*Lithobates palustris*	Pickerel Frog
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat

THREATS

3.0 Rock Outcrops and Caves				
	CLASSIFICATION	SUBCLASS	3.1 Rock Outcrops	3.2 Caves
1	Residential and commercial development	1.1 Housing and urban areas	H	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: destruction of caves, alteration of habitat surrounding caves		L
		2.2 Wood and pulp plantations: destruction of caves, alteration of habitat surrounding caves		L
3	Energy production and mining	3.2 Mining and quarrying: Gravel, sandstone and limestone ming, historically high in caves,	H	L
4	Transportation and service corridors	4.1 Roads and railways	H	
5	Biological resource use	5.1 Hunting and collecting terrestrial animals: amphibians and crustaceans		M
6	Human intrusions and disturbance	6.1 Recreational activities: hiking, climbing, camping, exploring	L	H
7	Natural system modifications	7.2 Dams and water management/use: Inundation from dams/impoundments (historically high)		L
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese privet, White Nose Syndrome	M	H
9	Pollution	9.3 Agricultural and forestry effluents		L
		9.4 Garbage and solid wastes: litter, altered air flow from trash pushed into air holes		L

PRIORITY CONSERVATION ACTIONS

3.0 Rock Outcrops and Caves			
CLASSIFICATION	**SUBCLASS**	**3.1 Rock Outcrops**	**3.2 Caves**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.		X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Continue to restrict/monitor scientific collection of SGCN.		X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training		X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X

3.0 Rock Outcrops and Caves			
CLASSIFICATION	**SUBCLASS**	**3.1 Rock Outcrops**	**3.2 Caves**
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.		X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.		X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing speices protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.		X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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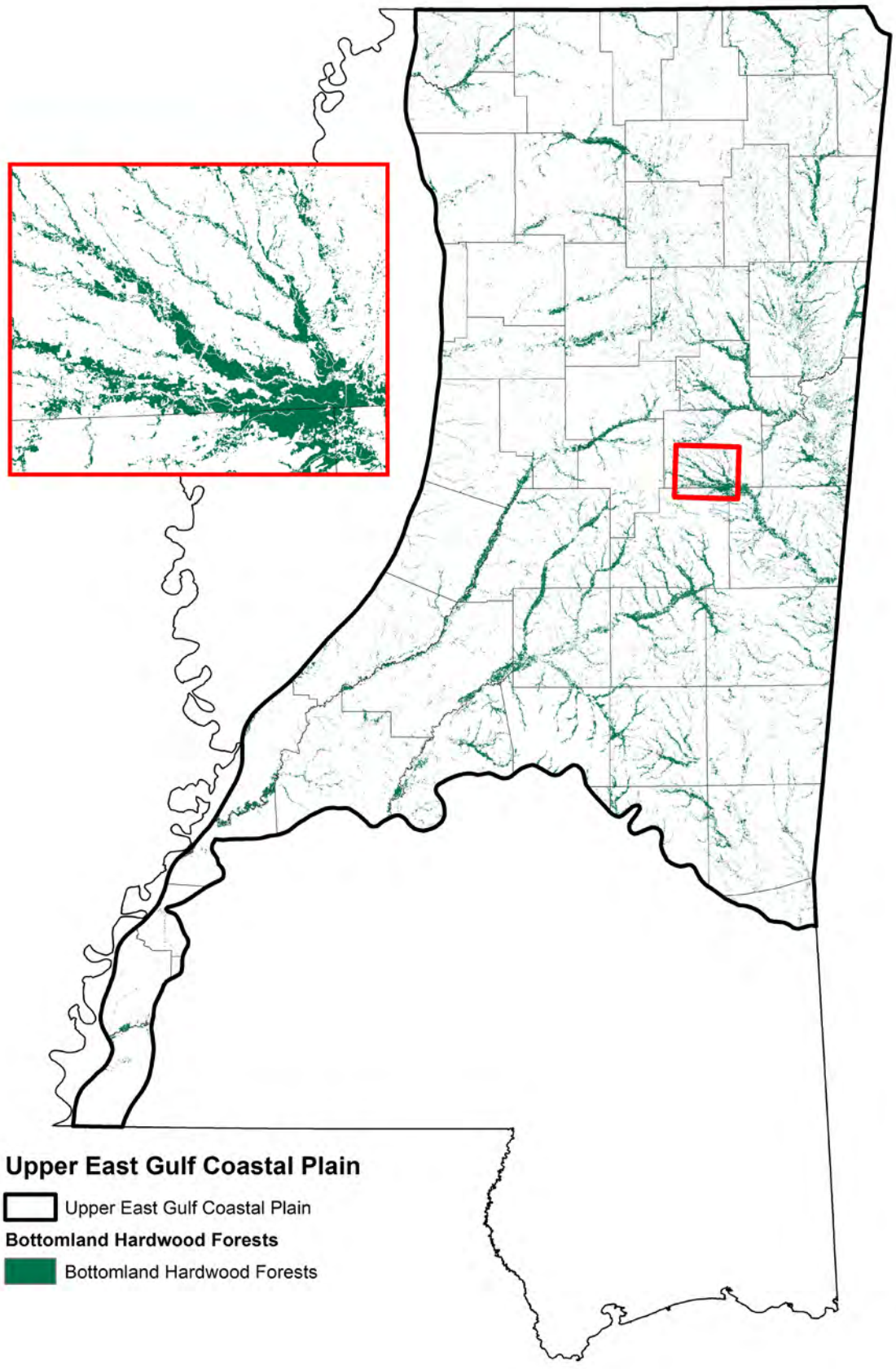

Figure 5.17 Bottomland Hardwood Forests In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

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 enriched by the influx of nutrients and sediments during floods.

This type includes one subtype in the UEGCP: 4.1 Bottom Hardwood Forests.

GENERAL CONDITION

Bottomland hardwood forests and swamps were once common in the Southeast U.S. Of an estimated 24 million acres of the original bottomland hardwood forests in the Lower Mississippi Alluvial Valley, 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.

The primary cause of bottomland hardwood losses has been historic 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

DESCRIPTION

Moderately wet bottomland hardwood forests are found on fertile, fine textured clay or loam soils of floodplains, stream terraces and wet lowland flats. Seven ecological communities have been merged into this habitat type: bottomland hardwood – pine forests, oak - mixed hardwood ridge bottom forests, sugarberry - American elm - green ash bottomland forests, wet hardwood bottom forests, silver maple - mixed floodplain forest, diamondleaf oak - willow oak - water oak forests and sweetgum – mixed oak bottomland forests.

Bottomland hardwood – pine forests have a canopy dominated by swamp laurel oak, willow oak, water oak and loblolly pines. This community seldom has long durations of inundation by high water events. The canopy trees are often elevated above the floodplain, usually about one foot higher than the surrounding landscape. There is often a thick groundcover of leaf material, which prohibits the growth of herbaceous species. In areas that are scoured by seasonal high water events, a sparse herbaceous layer of grasses, sedges, and wildflowers can be found. This habitat is common on Yockanookany Wildlife Management Area in Attala County. Mule Jail Multi-use trail on the Ross Barnett Reservoir spillway in Madison and Hinds Counties also includes examples of this habitat type.

Oak-mixed hardwood ridge bottom forests are found on mesic lowlands, second terraces and toe slopes. Infrequent flooding of short duration and loamy soils distinguish this habitat from other floodplain types. This community is usually found on terraces which were small levees created by ancient meander scrolls of the river. Water oak, cherrybark oak, white oak, and bitternut hickory all are common species in this habitat. Often thickets of pawpaw will also be present. Other common canopy trees include willow oak, swamp chestnut oak, sweetgum. Noxubee National Wildlife Refuge in Winston County has examples of this community type.

Sugarberry - American elm - green ash bottomland forests occur on large river flood plains. The tolerance of these species to long periods of inundation allows their dominance at these sites. Its position on the floodplain is on low terraces where annual flooding is regular and of moderate duration. Sugarberry and green ash, with additional common trees including box elder, silver maple, sweetgum, and overcup oak occur in this habitat. Trumpet creeper, Carolina coralbead, and possumhaw holly are common understory constituents. LeFleur's Bluff State Park in Hinds County has areas with this community type.

Wet hardwood bottom forests are dominated by a canopy composed of tall overcup oak and water hickory. Other canopy trees that occur infrequently are sweetgum, water oak, willow oak and sugarberry. This forest type is found on the wettest sites and at the edges of swamp depressions and oxbow lakes. The canopy is dense, forming from 60-100 percent cover. Planertree is usually present as a thick midstory. The shrub layer is also usually thick and typically dominated by eastern swampprivet, American snowbell, and common buttonbush. Below the dam of Grenada Lake, in Grenada County, is an example of this community in this ecoregion.

Silver maple - mixed floodplain forests are representative of early successional forests on alluvial wetlands and along oxbows. Silver maple and box elder are the most common trees present, although sycamore and water oak are often scattered through the forest. LeFleur's Bluff State Park in Hinds County has examples of this habitat type.

Laurel oak - willow oak - water oak forests are found on alluvial floodplains on poorly drained, flat sites. Red maple, green ash, Nuttall oak, sweetgum, water hickory, water locust and overcup oak are usually associates in the canopy of these forests. These areas are seasonally flooded, particularly in the early growing season. Yockanoockany WMA in Attala County has examples of this habitat type.

Sweetgum with mixed oak bottomland forests consist of a canopy of sweetgum, swamp chestnut oak, white oak, and cherrybark oak. Usually American elm is an important component of the midcanopy. Other canopy trees that may be present include: overcup oak, willow oak, water hickory, Nuttall oak, green ash, and bitternut hickory. Dwarf palmetto may form a dense shrub layer in this community type. Noxubee National Wildlife Refuge and John Starr Memorial Forest contain examples of this community.

MNHP Ecological Community	Species Associations	MNHP Rank
Bottomland hardwood – pine forest	*Quercus (laurifolia, phellos, nigra) - Pinus taeda*	S3
Oak - mixed hardwood ridge bottom forest	*Quercus (nigra, pagoda, alba) - Carya cordiformis - Asimina triloba*	S3
Sugarberry - American elm - green ash bottomland forest	*Celtis laevigata - Ulmus americana - Fraxinus pennsylvanica*	S4
Wet hardwood bottom forest	*Quercus lyrata - Carya aquatica*	S3
Silver maple - mixed floodplain forest	*Acer saccharinum*-mixed hardwoods	S4
Diamondleaf oak - willow oak - water oak forest	*Quercus laurifolia - Q. phellos - Q. nigra*	S3
Sweetgum – mixed oak bottomland forest	*Liquidambar styraciflua - Ulmus americana - Quercus michauxii/Q. alba/Q. pagoda*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The Bottomland Hardwood Forests subtype occurs in linear patches on floodplains along creeks and rivers. Collectively, bottomland hardwood forests make up almost seven percent of the state's land area (about two million acres). In the UEGCP ecoregion it is estimated that bottomland hardwoods cover almost **800,000 acres**. 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 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, wildlife viewing 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Geothylpis formosus*	Kentucky Warbler
	3	*Hylacichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	4	*Vermivora bachmanii*	Bachman's Warbler
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Ursus americanus*	Black Bear
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	3	*Lampropeltis getula nigra*	Black Kingsnake

THREATS

4.0 Bottomland Hardwood Forests			
	CLASSIFICATION	**SUBCLASS**	**4.1 Bottomland Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	L
		1.2 Commercial and industrial areas: Increased runoff from water impervious surfaces	L
		1.3 Tourism and recreation areas	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Historical agricultural conversion,	H
		2.2 Wood and pulp plantations	H
		2.3 Livestock farming and ranching	L
3	Energy production and mining	3.2 Mining and quarrying: sand and gravel mining	H
4	Transportation and service corridors	4.1 Roads and railways	M
5	Biological resource use	5.2 Gathering terrestrial plants	L
		5.3 Logging and wood harvesting: Improper use of forestry BMPs	M
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L
7	Natural system modifications	7.2 Dams and water management/use: Channel modification, ground and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese privet, kudzu, Chinese tallow tree, Nepalese browntop grass, Japanese climbing fern, bamboo, cogongrass, silktree, wild hogs	H
9	Pollution	9.1 Household sewage and urban waste water	M
		9.2 Industrial and military effluents	M
		9.3 Agricultural and forestry effluents: Pesticide runoff from agricultural fields	M

PRIORITY CONSERVATION ACTIONS FOR BOTTOMLAND HARDWOOD FOREST

4.0 Bottomland Hardwood Forests		
CLASSIFICATION	**SUBCLASS**	**4.1 Bottomland Hardwood Forests**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Discourage incompatible recreational uses.	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X

4.0 Bottomland Hardwood Forests		
CLASSIFICATION	**SUBCLASS**	**4.1 Bottomland Hardwood Forests**
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Discourage incompatible recreational uses.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
	Encourage proper disposal and cleanup of waste and litter.	X
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X

4.0 Bottomland Hardwood Forests		
CLASSIFICATION	**SUBCLASS**	**4.1 Bottomland Hardwood Forests**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Discourage incompatible recreational uses.	X
	Improve enforcement of existing speices protection regulations.	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Encourage proper disposal and cleanup of waste and litter.	X
6.0 Livelihood, economic and other incentives		
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
6.2 Substitution	Discourage incompatible recreational uses.	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

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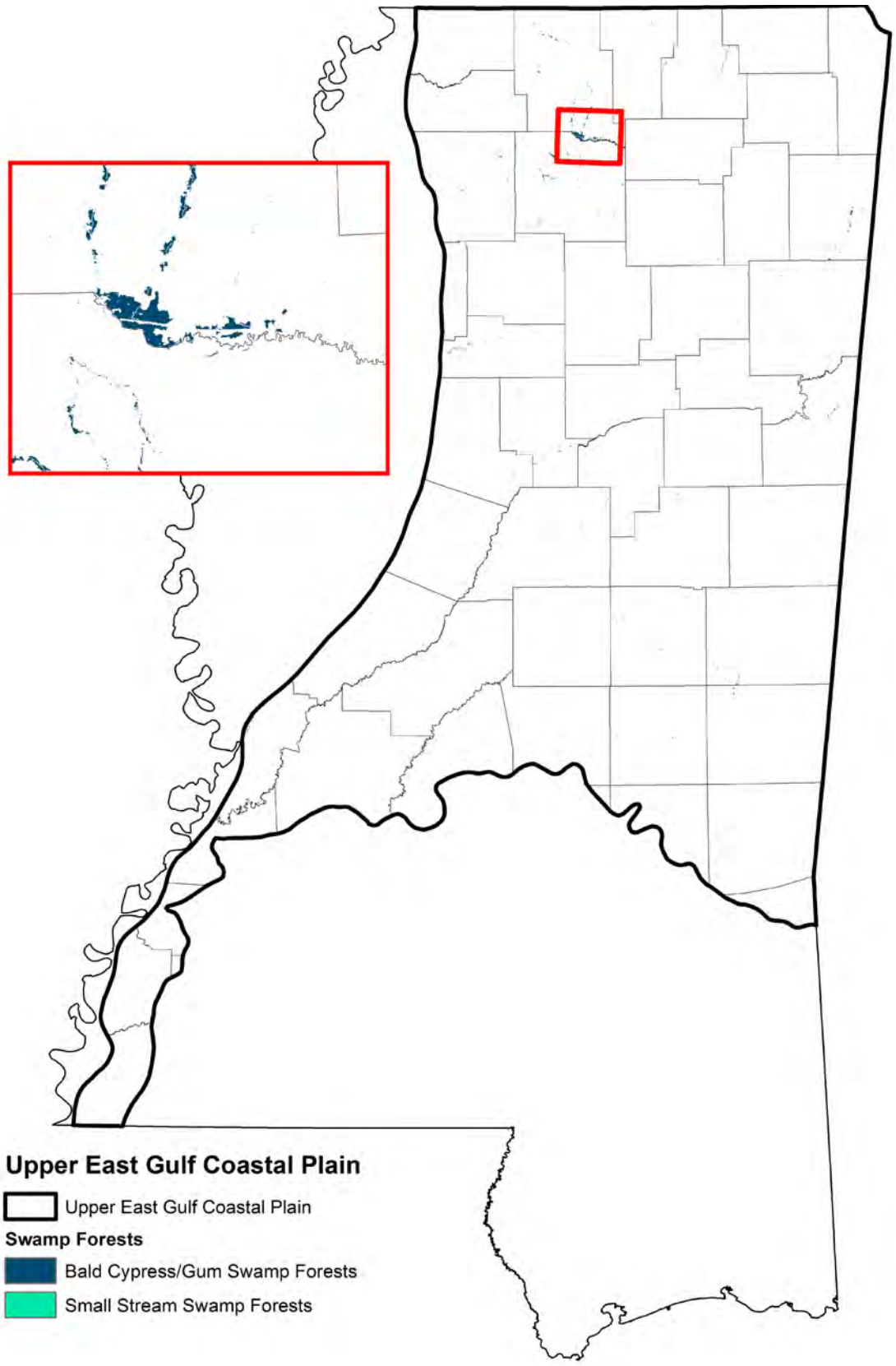

Figure 5.18 Swamp Forests In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

5. Swamp Forests

There are about 600,000 acres of swamp habitat in Mississippi, equivalent to about two percent of the state land area. 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, includes bay swamp forests in this ecoregion.

This type includes two subtypes in the UEGCP: 5.1 Bald Cypress/Gum Swamp Forests and 5.2 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 U.S. 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 coterminous 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 country is still documented from southern forested wetlands. 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 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.

5.1 Bald Cypress/Gum Swamp Forests

DESCRIPTION

Oxbow lakes, low floodplain terraces, bottomland flats, backwater areas or springheads are areas commonly supporting 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, swamp tupelo, water tupelo and other hardwood trees. Silver and red maple, persimmon, green ash, American hornbeam and water oak are occasional associates. Shrubs may include common 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 levels. Whitegrass, waterwillow, swamp sedge and opposite-leaf spotflower are persistent in shady swamps. Some swamp wetlands are shrubby, containing large patches of common buttonbush, eastern swampprivet and/or planertree.

Six ecological communities are grouped into this general type: Bald cypress swamp, Bald cypress-water tupelo swamp, Tupelo swamp, Bald cypress-hardwood swamp forest, Bald cypress-swamp tupelo swamp, and Buttonbush-swamp privet shrub wetlands.

Bald cypress swamps, bald cypress - water tupelo swamps, and tupelo swamps occupy semi-permanently flooded or seasonally flooded wetlands on landforms including back bays, depressions, oxbow lakes, and bottomland flats. Bald cypress and/or water tupelo dominate the canopy of these swamp habitats, and either can form pure stands. In the bald cypress – hardwood swamp forest type, bald cypress is present in the canopy, but other common woody species are water hickory, water elm, black willow, overcup oak, possumhaw holly, and American snowbell. The Noxubee National Wildlife Refuge in Noxubee, Oktibbeha, and Winston Counties includes areas with these habitats.

Bald cypress-swamp tupelo swamp forests occur in less frequently flooded and shallower areas than the previous community types. This community tends to dry out completely in the summer and fall, particularly in drought years. Choctaw Lake Recreational Area in Tombigbee National Forest in Choctaw County, Columbus Lake in Clay and Lowndes Counties, and Crawford Lake in Noxubee County features examples of this community type.

Buttonbush - swamp privet shrub wetlands occupy semi-permanently flooded lowland areas within and along the edges of creeks, rivers, sloughs, and oxbow lakes, often in zones surrounding deeper water. While beavers can be considered a nuisance, they are one of the primary natural engineers of this community type. The lands remain flooded or generally saturated throughout the year. Though the conditions of this wetland habitat resemble those of swamps, the scarcity of swamp trees distinguishes this type.

Fluctuating water levels cause herb density to vary widely in this ecological community. Common buttonbush is the indicator species for this habitat, while Virginia sweetspire and eastern swampprivet are less common. Choctaw Lake Recreational Area in Tombigbee National Forest (Choctaw County) includes examples of this community type.

MNHP Ecological Community	Species Associations	MNHP Rank
Bald cypress swamp	*Taxodium distichum*	S3
Bald cypress - water tupelo swamp	*Taxodium distichum –Nyssa aquatica*	S3
Tupelo swamp	*Nyssa aquatica*	S3
Bald cypress - hardwood swamp forest	*Taxodium distichum - Carya aquatica –Quercus lyrata-Planera aquatica-Salix nigra*	S3
Bald cypress - black gum swamp	*Taxodium distichum-Nyssa biflora*	S3
Buttonbush - swamp privet shrub wetland	*Cephalanthus occidentalis-Forestiera acuminata-Itea virginica*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 are situated in smaller backwater areas of creeks, where they occur adjacent to other bottomland hardwood forest types. About **25,000 acres** of this forest type occur in the UEGCP ecoregion of Misissippi.

The annual losses of forested wetlands in Mississippi during the 1960s and 1970s 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 result in destruction of some forests and create additional isolation and fragmentation in remnants.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BALD CYPRESS/GUM SWAMP FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Protonotaria citrea*	Prothonotary Warbler
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Ursus americanus*	Black Bear
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

5.2 Small Stream Swamp Forests

DESCRIPTION

This community is rarer in the northern portion of the state than in the southern region. As in the situation in the southern swamp forests, uplands serve as infiltration zones that produce seepage beds along lower slopes and intervening drainages.

One ecological community comprises this habitat sub-type in UEGCP: Coastal plain small stream swamp forest.

Coastal plain small stream swamp forests are alluvial swamps along small drainages. Their floodplains are often protected by a dense mat of interwoven tree roots, through which the braided streams flow. 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 contribute to the formation of organic muck soils. Sweetbay and swamp tupelo are the most common trees. Red maple, tuliptree and water oak are also common. The understory of these northern small stream swamp habitats tends to be more open than that of the southern equivalent, lacking the titi and buckwheat tree shrub layer. Hazel alder and possumhaw viburnum are the most common shrub species present. The ground cover is dominated by ferns and sedges. Choctaw Lake Recreational Area in the Tombigbee National Forest in Choctaw County has several areas exhibiting this habitat.

MNHP Ecological Community	Species Associations	MNHP Rank
Coastal plain small stream swamp forest	*Magnolia virginiana-Acer rubrum-Nyssa biflora*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Small stream swamp forests are situated on bottomlands of small streams. Estimates of size are hard to decipher but probably cover **several thousand acres** in the UEGCP ecoregion of Mississippi. The patches are long, narrow wetland habitats, which may reach up to 1,000 acres in size. They are situated between the stream channel and adjacent upland forests, and are often transected by transportation and power line corridors.

Wetlands are afforded greater protection from logging on lands where streamside management zones are established. Establishment of pine plantations on adjacent uplands can reduce the quality of these swamp forest habitats by exerting a drying effect on wetlands. Excessive intrusion and fragmentation that is occurring in urban and suburban lands has caused additional deterioration of small stream swamp forests. Headcutting, a process in which downcutting of the streambed accelerates the drainage of swampy lowlands, in part by reducing the frequency and/or duration of inundation, is destructive to small stream swamps.

The community that makes up a majority of this subtype is **vulnerable** to further decline due to a lack of seasonally appropriate prescribed fires and encroachment and fragmentation caused by urbanization.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH SMALL STREAM SWAMP FORESTS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Songbirds
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	3	*Geothlypis formosus*	Kentucky Warbler
	3	*Hylacichla mustelina*	Wood Thrush
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
Fish	1	*Etheostoma zonifer*	Backwater Darter
	3	*Heterandia formosa*	Least Killifish
Insects	1	*Neonympha mitchellii mitchellii*	Mitchell's Satyr
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus*	Black Bear
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat

THREATS

5.0 Swamp Forests				
	CLASSIFICATION	SUBCLASS	5.1 Bald Cypress/ Gum Swamp Forests	5.2 Small Stream Swamp Forests
1	Residential and commercial development	1.1 Housing and urban areas		L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops		M
		2.2 Wood and pulp plantations		M
4	Transportation and service corridors	4.1 Roads and railways		M
5	Biological resource use	5.3 Logging and wood harvesting: Improper use of forestry BMPs	H	M
		5.4 Fishing and harvesting aquatic resources	M	
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	H	
7	Natural system modifications	7.2 Dams and water management/use: Atleration of hydrology through dams and impoundments, groundwater and surface water withdrawals, channel modification, headcutting	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Nepalese browntop grass, Japanese climbing fern, Chinese privet, alligator weed, wild hogs, Chinese tallow tree	H	H
9	Pollution	9.3 Agricultural and forestry effluents: pesticide and nutrient runoff	L	M

PRIORITY CONSERVATION ACTIONS

5. Swamp Forests			
CLASSIFICATION	**SUBCLASS**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

5. Swamp Forests			
CLASSIFICATION	**SUBCLASS**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X

5. Swamp Forests			
CLASSIFICATION	**SUBCLASS**	**5.1 Bald Cypress/ Gum Swamp Forests**	**5.2 Small Stream Swamp Forests**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing speices protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

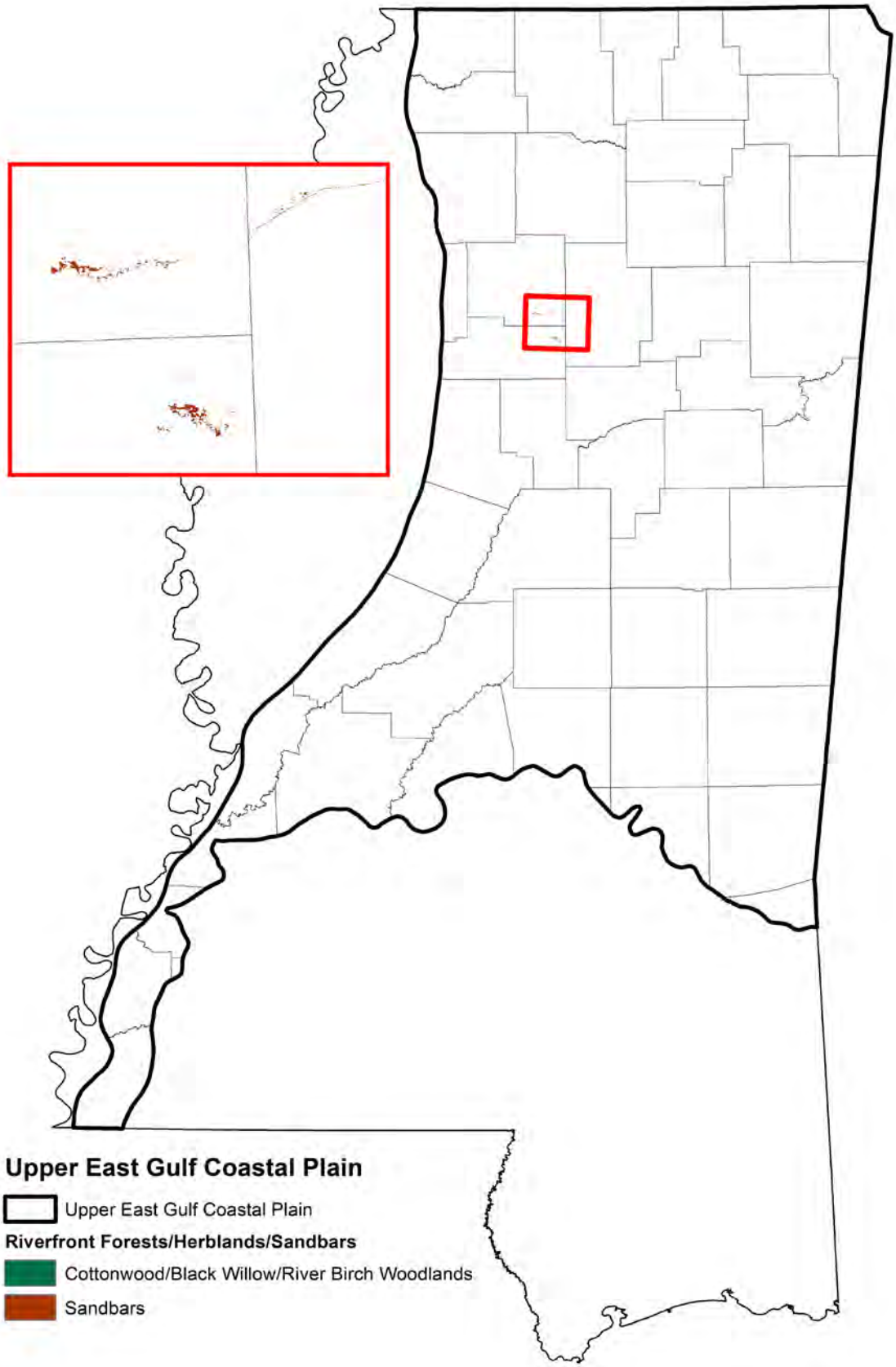

Figure 5.19 Riverfront Forsts/Herblands/Sandbars In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

6. 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 in the UEGCP: 6.1 Cottonwood/Black Willow/River Birch Woodlands, and 6.2 Sandbars

GENERAL CONDITION

Dams, channelization, man-made 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.

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.

6.1 Cottonwood/Black Willow/River Birch Woodlands

DESCRIPTION

Riverfront forests may last for over 50 years before the canopy trees begin to senesce (age and decline). In time these forests gradually become more diverse in shrubs, vines and herbs. Four ecological communities have been combined into this subtype: black willow riverfront pioneer forests, Eastern cottonwood-willow riverfront pioneer forests, river birch-sycamore riverfront forests, and native vinelands.

Black willow riverfront pioneer forests are often composed of only black willow trees. This habitat is found on recently deposited ground in the large river floodplains. Shrubs and herbaceous plants are usually absent, but peppervine, hempvine, poison ivy, smartweed, smallspike false nettle, Virginia dayflower, and American pokeweed may occasionally be present. LeFleur's Bluff State Park in Hinds County and Strawberry Plains Audubon Center in Marshall County have examples of this habitat type.

Eastern cottonwood-willow riverfront pioneer forests occur along the banks of large rivers and on islands. Red maple, green ash, river birch, planertree, American elm, sweetgum, red mulberry and silver maple may also be present in the canopy. American hornbeam, stiff dogwood and eastern swampprivet may be present in the subcanopy. The herb layer is usually sparse, but patches of Indian woodoats and switchgrass may be found. LeFleur's Bluff State Park in Hinds County has examples of this habitat type.

River birch - sycamore riverfront forests have a canopy dominated by river birch and sycamore. This habitat occurs primarily on levees along small rivers and streams. Other canopy associates include tuliptree, sweetgum, red maple, box elder, American elm, slippery elm, hackberry and various oaks. LeFleur's Bluff State Park in Hinds County and Noxubee National Wildlife Refuge in Noxubee County have examples of this habitat type.

Native vinelands develop following disturbances to riverfront forests. The habitat is dominated by greenbrier, peppervine, American buckwheat vine and trumpet creeper. Smartweed, spikerushes, muscadine, poison ivy, and bayberry may also be present. Holly Springs National Forest has examples of this natural community type.

MNHP Ecological Community	Species Associations	MNHP Rank
Black willow riverfront pioneer forest	*Salix nigra*	S3
Eastern cottonwood - willow riverfront pioneer forest	*Salix nigra –Populus deltoides*	S3
River birch - sycamore riverfront forest	*Betula nigra-Platanus occidentalis*	S3
Native vineland	*Smilax spp.-Campsis radicans-Ampelopsis arborea-Brunnichia ovata*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The subtype occurs in smaller patches along rivers of the state. The acreage is unknown. 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 hydrology which can reduce bare surfaces for colonization.

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

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Parkesia motacilla*	Louisiana Waterthrush
	3	*Protonotaria citrea*	Prothonotary Warbler
	1	*Ursus americanus luteolus*	Louisiana Black Bear
Mammals	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Ursus americanus*	Black Bear
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

6.2 Sandbars

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. 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. Examples of this habitat can be found along any of the larger streams or rivers in the state.

MNHP Ecological Community	Species Associations	MNHP Rank
Sand bar (exposed)	Various grasses – *Carex sp. – Salix interior*	S2

LOCATION, SIZE CONDITION AND CONSERVATION STATUS

Sandbars occur along most free flowing streams in Mississippi and in most watersheds where flow rates are sufficient to rework coarse sediments. **Several thousand acres** of sandbars 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.

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, Chinese tallow and other exotic weeds have invaded sandbar habitat.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
Reptiles	2	*Graptemys gibbonsi*	Pascagoula Map Turtle
	2	*Graptemys nigrinoda*	Black-knobbed Map Turtle
	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle
	2	*Graptemys pulchra*	Alabama Map Turtle

THREATS

6.0 Riverfront Forests/Herblands/Sandbars				
	CLASSIFICATION	**SUBCLASS**	**6.1 Cottonwood/Black Willow River Birch Woodlands**	**6.2 Sandbars**
1	Residential and commercial development	1.1 Housing and urban areas	L	
		1.2 Commercial and industrial areas	L	
		1.3 Tourism and recreation areas	L	H
2	Agriculture and aquaculture	2.3 Livestock farming and ranching	L	
3	Energy production and mining	3.2 Mining and quarrying: sand and gravel mining	M	H
5	Biological resource use	5.4 Fishing and harvesting aquatic resources: Overexploitation/Incidental capture of alligator snapping turtle, Black-knobbed map turtle, Pascagoula map turtle, Alabama map turtle, and ringed map turtle.	L	H
6	Human intrusions and disturbance	6.1 Recreational activities: off road vehicle use, boat wakes, camping and other recreation activities	H	H
7	Natural system modifications	7.2 Dams and water management/use: Operation of dams and impoundments, altered hydrology, channel modification, ground and surface water withdrawals,	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese tallow, Chinese privet, bamboo, wild hogs, Johnson grass, cogongrass, fire ants, non-native pasture grass	H	H
9	Pollution	9.4 Garbage and solid wastes: Oppurtunistic predators (i.e. racoons, crows attracted to trash left behind by recreational users)		M

PRIORTY CONSERVATION ACTIONS

6.0 Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**6.1 Cottonwood/Black Willow/ River Birch Woodlands**	**6.2 Sandbars**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X

6.0 Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**6.1 Cottonwood/Black Willow/ River Birch Woodlands**	**6.2 Sandbars**
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Initiate propagation program or establish next box program for selected SGCN.		
	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X

6.0 Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**6.1 Cottonwood/Black Willow/ River Birch Woodlands**	**6.2 Sandbars**
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing speices protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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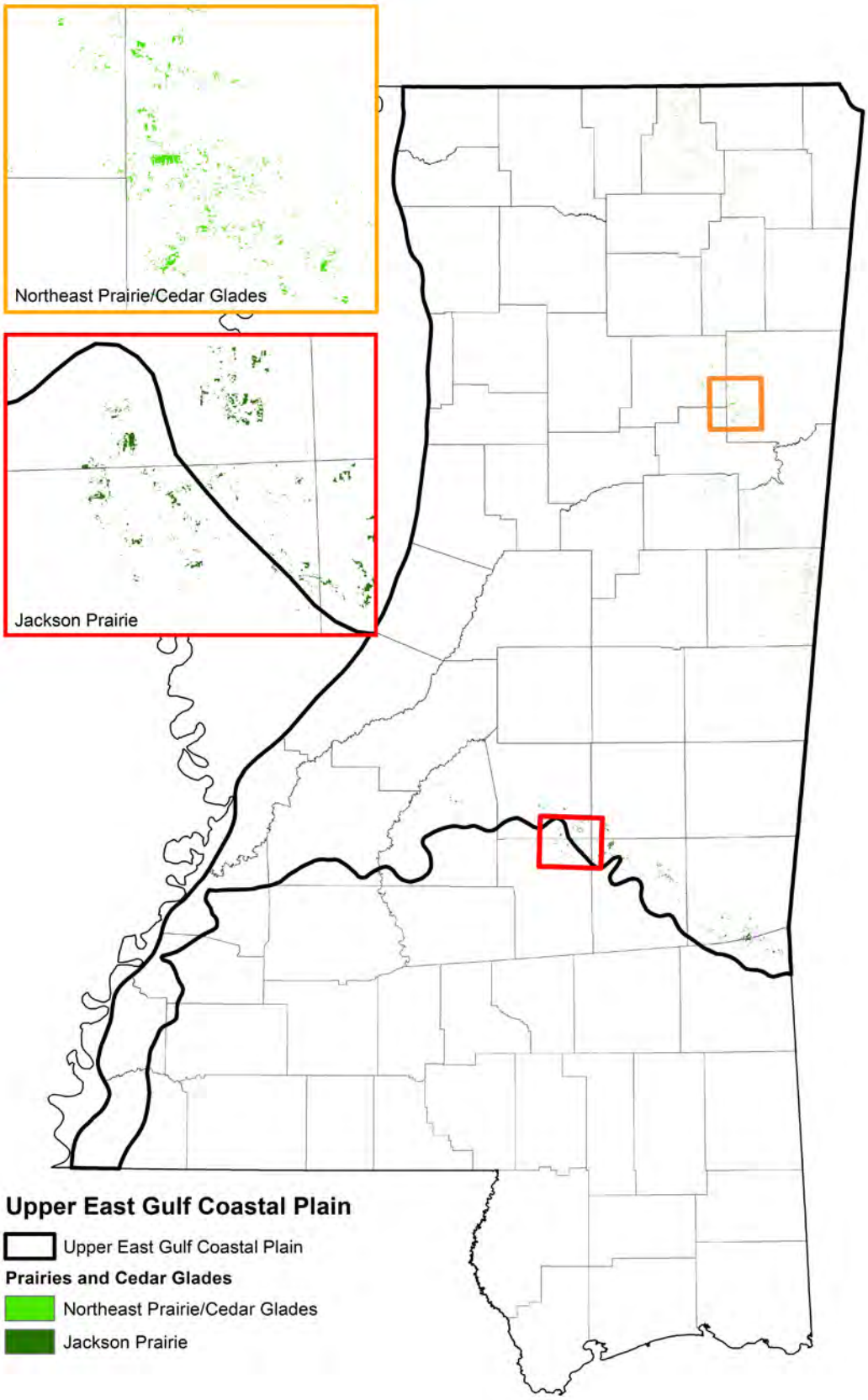

Figure 5.20 Prairies And Cedar Glades In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

7. Prairies

There are no accurate records of historical acreage for the Black Belt Prairie of Mississippi; however, estimates suggest that approximately 100,000 acres once existed in northeast Mississippi, some of which included Indian old fields, which were maintained by Native Americans. The largest known intact Black Belt Prairie is the privately owned Pulliam Prairie in Chickasaw County. The Jackson Prairie is disjunct, and small in size and extent, currently 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 Jackson Prairie known is within the US Forest Service Harrell Prairie Hill Botanical Area near the Forest, Mississippi.

This type includes two subtypes: 7.1 Black Belt Prairie, 7.2 Jackson Prairie.

GENERAL CONDITION

Historically, prairies were converted to agricultural uses by the early settlers. A majority of the Black Belt and Jackson prairies remain under cultivation for cropland and pasturage or have degraded into cedar glades or closed-canopy woodlands. Many areas exhibit erosion scars, chalk outcrops and weedy succession. Some gullied lands are being re-graded and converted to non-native pasture. 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 Right-of-ways and road ditches that are maintained in an early successional condition by mowing.

7.1 Black Belt Prairie

DESCRIPTION

A portion of the land historically supported native prairie vegetation in the Black Belt Prairie region, which in Mississippi extends from the Tennessee-Mississippi border in Alcorn County south through Lowndes County, then southeasterly through the northeastern corner of Noxubee County. The Black Belt Prairie is sometimes referred to as the Northeast Prairie.

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 extant examples of this prairie type are known. Another prairie type was found on mostly shallow soils on gentle to moderately steep slopes. The soils derived from the underlying Selma chalk, a calcareous stratum of the Cretaceous Period deposited over 65 million years ago. In these areas, underlying grayish-white chalk was later exposed in gullies, occasionally in wide patches. These marginal agricultural lands were subsequently abandoned or converted to pastures. In addition, 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. Eastern red cedar shrublands or cedar-oak woodlands often surround patches of prairies. The prairies of the 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 Indiangrass, 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, downy pagoda plant, diamondflower, white and purple prairie clovers, purple and yellow prairie coneflowers, rosin weeds, gayfeathers, false foxgloves, green antelopehorn, butterfly milkweed and a variety of asters.

Three ecological communities are found in this subtype: Chalk bluff Black Belt prairie, Vertisol Black Belt prairie, and Cedar glades/barrens.

Chalk bluff Black Belt prairies are dominated by little bluestem and yellow Indiangrass. Prairie goldenrod, rosinweed, and prairie coneflower are also usually present.

In Vertisol Black Belt prairies, big bluestem replaces little bluestem as the dominate grass. Yellow Indiangrass is also present; rosinweed increases in abundance in this community.

Cedar glades/barrens are areas dominated by Eastern redcedar. Switchgrass and yellow Indiangrass dominate the groundcover. This community replaces Black Belt prairies when fires are excluded from the environment. An example of both types of Black Belt prairie may be seen at Osborn Prairie near Starkville. Cedar glades/barrens can be seen along the Natchez Trace Parkway in Lee County.

MNHP Ecological Community	Species Associations	MNHP Rank
Black Belt prairie (chalk bluffs)	*Schizachyrium scoparium-Sorghastrum nutans-Solidago nemoralis-Silphium terebinthinaceum-Ratibida pinnata*	S1
Black Belt prairie (vertisol)	*Andropogon gerardii-Sorghastrum nutans-Silphium terebinthinaceum-Ratibida pinnata*	S1
Cedar glades/barrens (chalk bluffs)	*Juniperus virginiana-Panicum virgatum-Sorghastrum nutans*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. Parcels of this subtype are scattered through the northeastern Black Belt region and occasionally in the Pontotoc Hills region. The subtype is commonly situated on areas with shallow soils over chalk. Total remaining area of this subtype is estimated at **20,000 acres** in Mississippi.

Black Belt prairies are in poor condition because of habitat conversion, extensive subsequent erosion, and a lack of ecosystem management on the remaining parcels. Prescribed fire is necessary to maintain the presence of prairie species. An exotic grass, pitted beardgrass, is becoming established on some prairie sites and cogongrass is also becoming more prevalent in the region.

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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BLACK BELT PRAIRIES

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Lithobates areolata*	Crawfish Frog
	4	*Ambystoma tigrinum*	Tiger Salamander
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	2	*Peucaea aestivalis*	Bachman's Sparrow
	3	*Antrostomus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Setophaga discolor*	Prairie Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Tyto alba*	Barn Owl
Crustaceans	1	*Hobbseus cristatus*	Crested Rivulet Crayfish
	1	*Hobbseus orconectoides*	Oktibbeha Rivulet Crayfish
	1	*Hobbseus petilus*	Tombigbee Rivulet Crayfish
	1	*Orconectes mississippiensis*	Mississippi Crayfish
	1	*Procambarus cometes*	Mississippi Flatwoods Crayfish
	2	*Hobbseus prominens*	Prominence Rivulet Crayfish
	2	*Procambarus hagenianus vesticeps*	Egyptian Crayfish
Insects	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper
	4	*Gryllotalpa major*	Prairie Mole Cricket
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip

7.2 Jackson Prairie

DESCRIPTION

The Jackson Prairie, located in central Mississippi, is one of two regions of Black Belt 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. **Although portions of the Jackson Prairie fall within the East Gulf Coastal Plain ecoregion, it is discussed in its entirety in the UEGCP ecoregion herein.**

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 red cedar, 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.

Jackson Prairies are 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. Harrell Hill Botanical Area near Forest is an easily accessed, high quality Jackson Prairie example. Cedar glades/barrens are areas dominated by Eastern redcedar. Switchgrass and yellow Indiangrass domi nate the groundcover. This community replaces Jackson prairies when fires are excluded from the environment. Bienville National Forest in Scott County has examples of this community

MNHP Ecological Community	Species Associations	MNHP Rank
Jackson Prairie	*Schizachyrium scoparium-Sorghastrum nutans-Dalea candida-Dalea purpurea-Silphium integrifolium*	S1
Cedar glades/barrens (chalk bluffs)	*Juniperus virginiana-Panicum virgatum-Sorghastrum nutans*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 **less than 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 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Antrostomus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Setophaga discolor*	Prairie Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Tyto alba*	Barn Owl
Crustaceans	1	*Procambarus barbiger*	Jackson Prairie Crayfish
Insects	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper
	4	*Gryllotalpa major*	Prairie Mole Cricket
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip

THREATS

7.0 Prairies and Cedar Glades				
	CLASSIFICATION	**SUBCLASS**	**7.1 Northeast Prairie/ Cedar Glades**	**7.2 Jackson Prairie**
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: conversion of native prairie to agriculture or wildlife food plots	H	H
			H	H
		2.2 Wood and pulp plantations: conversion to forest	L	L
		2.3 Livestock farming and ranching: overgrazing	H	H
4	Transportation and service corridors	4.2 Utility and service lines: Indiscriminate use of herbicides on Right-of-ways	H	H
6	Human intrusions and disturbance	6.1 Recreational activities	L	L
7	Natural system modifications	7.1 Fire and fire suppression	H	H
		7.2 Dams and water management/use: Channelization, flood control measures	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Osage orange, cogongrass, tall fescue, bermuda grass, fire ants, wild hogs	H	H
		8.2 Problematic native species: Eastern red cedar and other woody species encroaching from lack of fire	H	H

PRIORITY CONSERVATION ACTIONS

7.0 Prairies and Cedar Glades			
CLASSIFICATION	**SUBCLASS**	**7.1 Northeast Prairie/ Cedar Glades**	**7.2 Jackson Prairie**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X

7.0 Prairies and Cedar Glades			
CLASSIFICATION	**SUBCLASS**	**7.1 Northeast Prairie/ Cedar Glades**	**7.2 Jackson Prairie**
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.		X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X

7.0 Prairies and Cedar Glades			
CLASSIFICATION	**SUBCLASS**	**7.1 Northeast Prairie/ Cedar Glades**	**7.2 Jackson Prairie**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.		X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing speices protection regulations.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

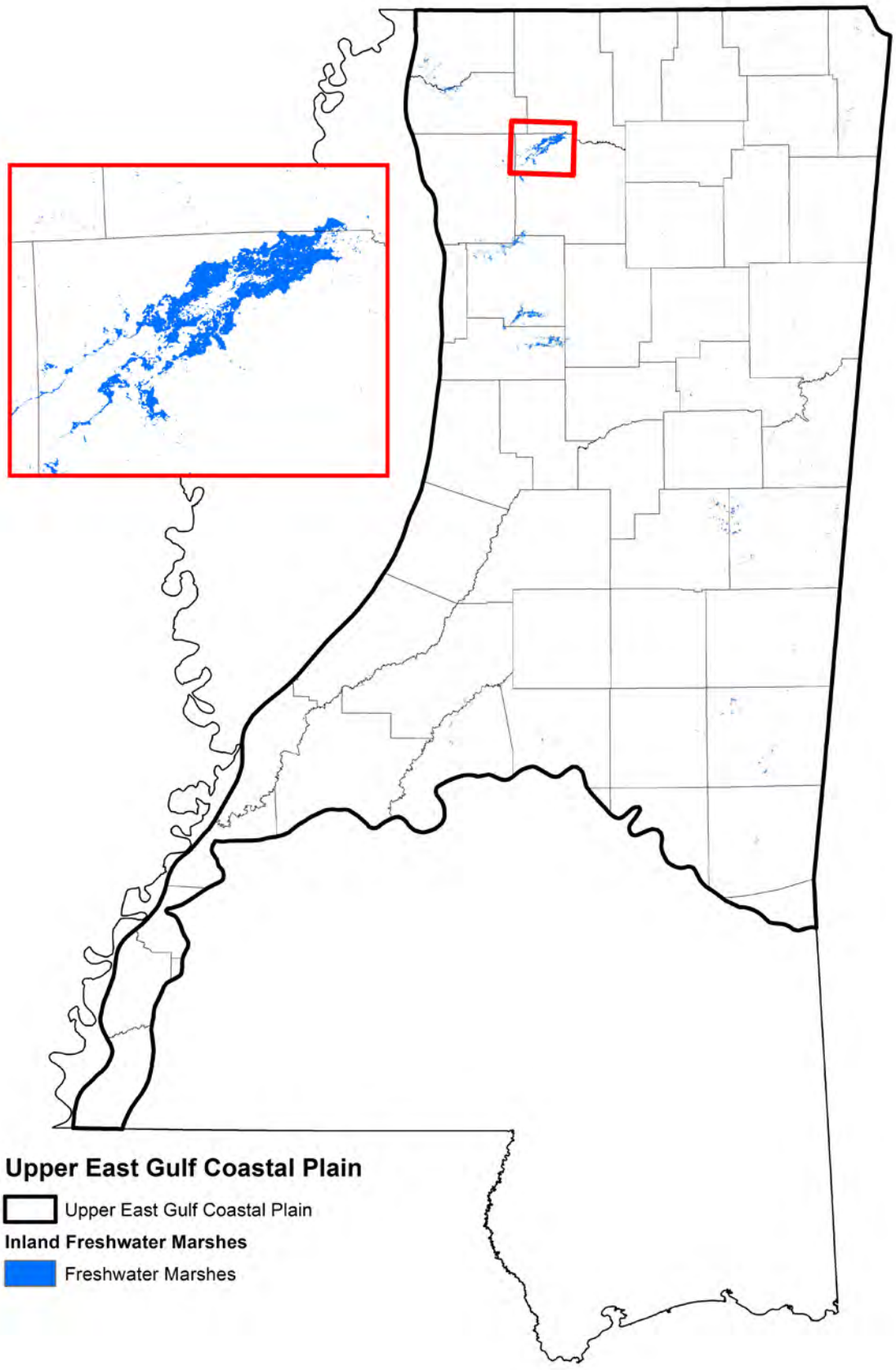

Figure 5.21 Inland Fresh Water Marshes In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

8. Inland Freshwater Marshes

It is estimated that there are approximately 200,000 acres of inland freshwater marshes in Mississippi. 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: 8.1 Freshwater Marshes.

GENERAL CONDITION

Mississippi experienced a 59 percent loss in wetlands from 1780s (9,872,000 acres) to the 1980s (4,067,000 acres) due to land use changes. In the 1780s, wetlands comprised 32 percent of the area of Mississippi. By the 1980s wetlands comprised only 13 percent of the area. 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 Reserve Program and Wetland Reserve Program (now Agricultural Conservation Easements Program) have reduced the rate of marsh loss. The MNHP 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, are increasingly encountered in marshes.

8.1 Freshwater Marshes

DESCRIPTION

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, American lotus and white 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. 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. There are two ecological communities in this subtype: Freshwater marsh, and Semi-permanently flooded marsh.

The ecological community called Freshwater marsh is an area of shallow water and mucky saturated soils along the shoreline. It contains a variety of herbaceous plants, but reeds, bulrushes, flatsedges, ditch stonecrop, and lizard's tail are characteristic species. Giant cutgrass, pickerel weed, cattail, rosemallow and primrose willow, along with numerous other graminoids and herbs, may also be present. Other typical species include valley redstem, cardinal flower, aquatic milkweed, jewelweed, common rush, hempvine, redtop panicgrass, camphor pluchea, swamp smartweed, and waterpod. Sardis Lake has areas of this community in the eastern end of the lake and below the spillway in the lower lake.

As its name implies, Semi-permanently flooded marshes are seasonally inundated by high water events. This community is usually in the zone above the freshwater marsh, on broad flat areas of alluvial plain. Oneflower false fiddleleaf, alligatorweed, and denseflower knotweed form dense patches of vegetation. Many of the plants found in freshwater marshes may also be found within this zone. Ross Barnett Reservoir in the Pearl River Wildlife Management Area of Madison County has areas of this community.

Throughout Mississippi, marsh has been created by water control structures (anthropogenic and natural, e.g. beavers), which manage stream discharges. Mudflats may also form along unimpounded streams during the late summer when water recedes from seasonally flooded riverine habitats. 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Freshwater marsh	*Juncus spp.-Scirpus spp.-Cyperus spp.-Penthorum sedoides-Saururus cernuus*	S3
Semi-permanently flooded marsh	*Hydrolea uniflora –Alternanthera philoxeroides-Persicaria densiflora*	S5

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Freshwater marshes are usually found in small patches, but some may be large, up to 1,000 acres, if associated with large water control structures such as dams and diversions. Freshwater marshes occur throughout the UEGCP but are more commonly found in lowlands and floodplains. They are adjacent to a variety of agricultural, forested and urban lands. There are approximately **50,000 acres** of freshwater marsh in the UEGCP ecoregion in the state.

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 (drainage etc), 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Elanoides forficatus*	Swallow-tailed Kite
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	2	*Asio flammeus*	Short-eared Owl
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucochephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Ixobrychus exilis*	Least Bittern
	3	*Nyticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Porphyrula martinica*	Purple Gallinule
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandria formosa*	Least Killifish
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Zapus hudsonius*	Meadow Jumping Mouse

THREATS

8.0 Inland Freshwater Marshes			
	CLASSIFICATION	**SUBCLASS**	**8.1 Freshwater Marshes**
1	Residential and commercial development	1.1 Housing and urban areas	M
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops	H
4	Transportation and service corridors	4.1 Roads and railways: Lack of wildlife corridors/underpasses/overpasses	L
5	Biological resource use	5.3 Logging and wood harvesting	L
7	Natural system modifications	7.2 Dams and water management/use: Operations of dams/impoundments, channel modification, groundwater and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow tree, wild hogs, Japanese climbing fern, Nepalese browntop grass, water hyacinth, alligator weed, water lettuce	H
9	Pollution	9.1 Household sewage and urban waste water	M
		9.2 Industrial and military effluents	M
		9.3 Agricultural and forestry effluents	M

PRIORITY CONSERVATION ACTIONS

8.0 Inland Freshwater Marshes		
CLASSIFICATION	**SUBCLASS**	**8.1 Freshwater Marshes**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X

8.0 Inland Freshwater Marshes		
CLASSIFICATION	**SUBCLASS**	**8.1 Freshwater Marshes**
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage proper disposal and cleanup of waste and litter.	X
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X

8.0 Inland Freshwater Marshes		
CLASSIFICATION	**SUBCLASS**	**8.1 Freshwater Marshes**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Improve enforcement of existing speices protection regulations.	X
	Encourage proper disposal and cleanup of waste and litter.	X
6.0 Livelihood, economic and other incentives		
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

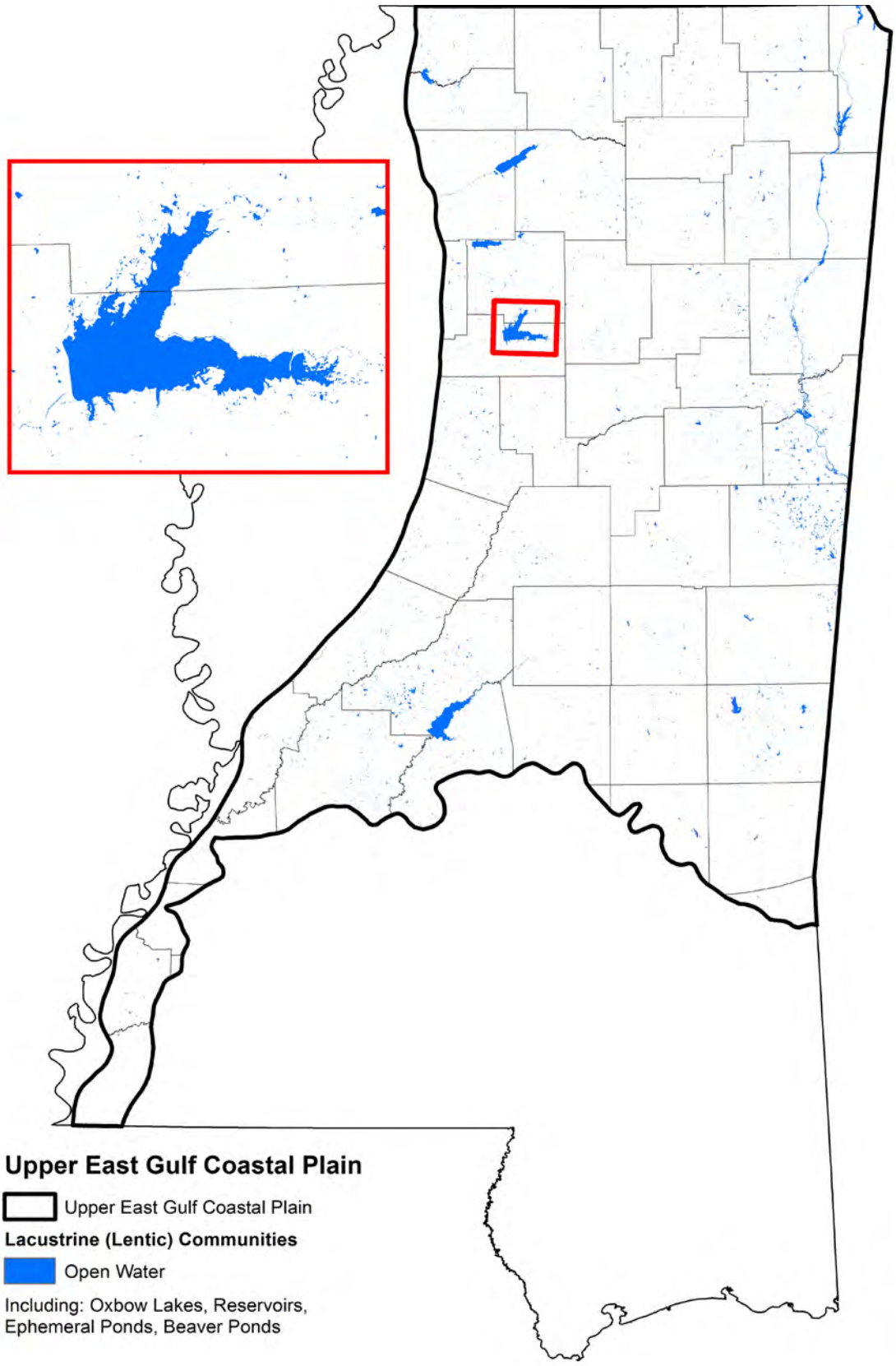

Figure 5.22 Lacustrine (Lentic) Communities In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

9. Lacustrine (Lentic) Communities

Lacustrine refers to standing water 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 (larger than 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 four subtypes in the UEGCP: 9.1 Oxbow Lakes, 9.2 Reservoirs, 9.3 Ephemeral (Temporary) Ponds and 9.4 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 Bay Springs Lake in Tishomingo County. 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 oxbows that occur along the Pearl River in the Pearl River Wildlife Management Area in Rankin County. 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. Common causes for these lakes not meeting their designated use are pesticides, nutrients and sediments.

From 2006 to 2010 58 percent of the fish kills investigated by MDEQ were associated with low dissolved oxygen resulting from natural processes; 12 percent were associated with excess nutrients, sewage, spills. Non-native, invasive species, some of which are quite aggressive, now present a threat to native lentic communities. Particular types of concern include aquatic plants (e.g hydrilla), fish (e.g Silver carp and Bighead 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 when they are young and throughout the lifespan of filter feeders such as paddlefish, gizzard shad and threadfin shad.

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.

9.1 Oxbow Lakes

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 meander and cut off their old channels. Man-made alterations such as channelization may also convert old stream channels into oxbow lakes. Natural formation involves a shift of the master stream into a new path with less resistance to flow, followed by a gradual loss of connectivity with the master stream as sediment fills portions of the old channel remaining connected to the new stream channel, at least during high flow events. 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. Man-made weirs placed near the outflows of oxbow lakes can retain higher lake levels after stream levels decrease.

Oxbow lakes support a variety of fish, amphibians, reptiles, mammals, and wading and shorebirds. Floodwater sometimes enters or inundates oxbow lakes which allow fish to move freely in and out. However, 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 water level fluctuations 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 the stream moves further away from an oxbow lake over time, the lake tends 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 and to support a fish assemblage composed of more fish-eating species. Oxbow lakes are found in the Pearl River Wildlife Management Area of Rankin County.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

There are 264 oxbow lakes in Mississippi which total **55,644 acres**. Oxbows can be found along most 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.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anas rubripes*	American Black Duck
	3	*Anhinga anhinga*	Anhinga
	3	*Calidris alpine*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
Fish	2	*Notropis amnis*	Pallid Shiner
	3	*Atractosteus spatula*	Alligator Gar
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Etheostoma asprigene*	Mud Darter
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
	3	*Sander canadense*	Sauger
	3	*Sander vitreum*	Walleye
Mammals	2	*Myotis grisescens*	Gray Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

9.2 Reservoirs

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. Enid Lake, Sardis Lake, and Grenada Lake are all reservoirs.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Dams have been constructed on several large rivers and creeks in the state. Some reservoirs are large; the largest, Grenada Lake, is 35,280 acres. The Corps of Engineers operates and manages 5 flood control reservoirs (Grenada, Arkabutla, Enid, Grenada, Okatibbee and Sardis) and nine navigation reservoirs (Aberdeen Lake, Amory Lock [Lock A], Aliceville Lake [Tom Bevill Lock and Dam], Bay Springs Lake [Jamie Whitten Lock and Dam], Columbus Lake [John C. Stennis Lock and Dam], Fulton Lock [Lock C], G.V. Montgomery Lock [Lock E], Glover Wilkins Lock [Lock B] and John Rankin Lock [Lock D]) along the Tennessee-Tombigbee Waterway. These reservoirs are usually rimmed with federally managed woodland and recreational sites. Residential areas are often situated adjacent to reservoirs. Woodlands adjoin most reservoir shores except where entered by streams. At the mouths of feeder streams, a large area of marshland habitat is often encountered. Sometimes urban centers are located nearby. There are **167,767 acres** of this subtype in Mississippi at conservation pool and **257,957 acres** at flood pool.

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 protected coves. Drawdown of flood control reservoirs leaves wide unvegetated shorelines exposed and barren. Sedimentation is an issue on reservoirs. Sediment from upstream slowly fills in reservoirs and can increase turbidity. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Haliaeetus leucocephalus*	Bald Eagle
	3	*Aythya affinis*	Lesser Scaup
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Pandion haliaetus*	Osprey
Fish	1	*Ambloplites rupestris*	Rock Bass
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Moxostoma macrolepidotum*	Shorthead Redhorse
	2	*Notropis amnis*	Pallid Shiner
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
	3	*Sander canadensis*	Sauger
	3	*Sander vitreum*	Walleye
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-Eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-Eared Bat
	2	*Myotis sodalis*	Indiana Bat
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Mussels	2	*Quadrula rumphiana*	Ridged Mapleleaf
	3	*Potamilus alatus*	Pink Heelsplitter
Reptiles	2	*Graptemys nigrinoda*	Black-knobbed Map Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle

9.3 Ephemeral (Temporary) Ponds

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. Parts of the Natchez Trace Parkway in Hinds County have examples of ephemeral ponds.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 development in 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 has reduced the quality of these ponds. In upland ponds fire helps to prevent the encroachment of hardwoods and shrubs into pond basins.

Ephemeral ponds associated with stream terraces are **vulnerable** because of disruption of streamflow caused by water control structures, and by headcutting, which by triggering incisement of channels can lower water tables locally, resulting in less flooding of adjoining scour channels, which can be important breeding habitat for amphibians.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH EPHEMERAL (TEMPORARY) PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
	3	*Lithobates palustris*	Pickerel Frog
	4	*Ambystoma tigrinum*	Tiger Salamander
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	3	*Caladris aplina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Porphyrula martinica*	Purple Gallinule
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	3	*Procambarus shermani*	Gulf Crayfish

9.4 Beaver Ponds

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 US, beavers can cause extensive damage to valuable timberland by flooding bottomland forests and eating tree seedlings. The beavers' favorite tree in southern 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. Sam D. Hamilton Noxubee National Wildlife Refuge has many areas with beaver ponds.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 nuisance species because of their potential to flood significant areas of forest, agriculture and developed land. Wildlife control measures are being taken by agriculture authorities such as USDA Wildlife Services 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolor Heron
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Parkesia motacilla*	Louisana Waterthrush
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandria formosa*	Least Killifish
Insects	1	*Neonympha mitchellii mitchellii*	Mitchell's Satyr
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis soldalis*	Indiana Bat
	2	*Zapus hudsonius*	Meadow Jumping Mouse
	4	*Lasionycteris noctivagans*	Silver-haired Bat

THREATS

9.0 Lacustrine (Lentic) Communities						
	CLASSIFICATION	SUBCLASS	9.1 Oxbow Lakes	9.2 Reservoirs	9.3 Ephemeral (Temporary) Ponds	9.4 Beaver Ponds
1	Residential and commercial development	1.1 Housing and urban areas	L	M	M	
		1.2 Commercial and industrial areas	L		L	
		1.3 Tourism and recreation areas	L	M	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: pesticide and nutrient runoff, loss of habitat to agricultural fields	H	L	H	M
		2.3 Livestock farming and ranching: improper grazing practices causing bank damage and erosion	L	L		M
3	Energy production and mining	3.2 Mining and quarrying: sand and gravel mining	L			
4	Transportation and service corridors	4.1 Roads and railways	L		M	
5	Biological resource use	5.1 Hunting and collecting terrestrial animals: Beaver eradication programs				H
		5.3 Logging and wood harvesting	L	L	H	
		5.4 Fishing and harvesting aquatic resources: overexploitation/Incidental capture of alligator snapping turtle, alligator gar, and paddlefish	M	L		
6	Human intrusions and disturbance	6.1 Recreational activities: off road vehicle use	L		M	
7	Natural system modifications	7.2 Dams and water management/use:				
		Operations of dams/impoundments, alteration of natural movement patterns for SGCN	M	H	H	
		Channel modification	H	L	H	
		Groundwater and surface water withdrawal	H			
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Nepalese browntop grass, Johnson grass, hydrilla, Chinese tallow tree, Chinese privet, alligator weed, silver carp, bighead carp, zebra mussels, water lettuce, torpedo grass, water hyacinth, parrotfeather watermilfoil, Eurasian milfoil, giant salvinia, bradford pear, nutria, Indian heliotrope, cockleburr, purple loosestrife	H	H	H	L
9	Pollution	9.1 Household sewage and urban waste water	H	M		
		9.2 Industrial and military effluents	H			
		9.3 Agricultural and forestry effluents	H	L	M	M

PRIORITY CONSERVATION ACTIONS

9.0 Lacustrine (Lentic) Communities					
CLASSIFICATION	**SUBCLASS**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
1.0 Land/Water Protection					
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X
2.0 Land/Water Management					
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	
	Discourage incompatible recreational uses.	X		X	
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X	X
3.0 Species Management					
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X

9.0 Lacustrine (Lentic) Communities					
CLASSIFICATION	**SUBCLASS**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
4.0 Education and Awareness					
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X		X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
5.0 Law and Policy					
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN; Discourage construction in sensitive areas that might entail the installation of levees, dams, etc. which would interfere with interactions with main stream channels.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X

9.0 Lacustrine (Lentic) Communities					
CLASSIFICATION	**SUBCLASS**	**9.1 Oxbow Lakes**	**9.2 Reservoirs**	**9.3 Ephemeral (Temporary) Ponds**	**9.4 Beaver Ponds**
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X	
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	
	Improve enforcement of existing speices protection regulations.	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
6.0 Livelihood, economic and other incentives					
6.1 Linked Enterprises And Livelihood Alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X		X	
6.2 Substitution	Discourage incompatible recreational uses.	X		X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
7.0 External Capacity Building					
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X

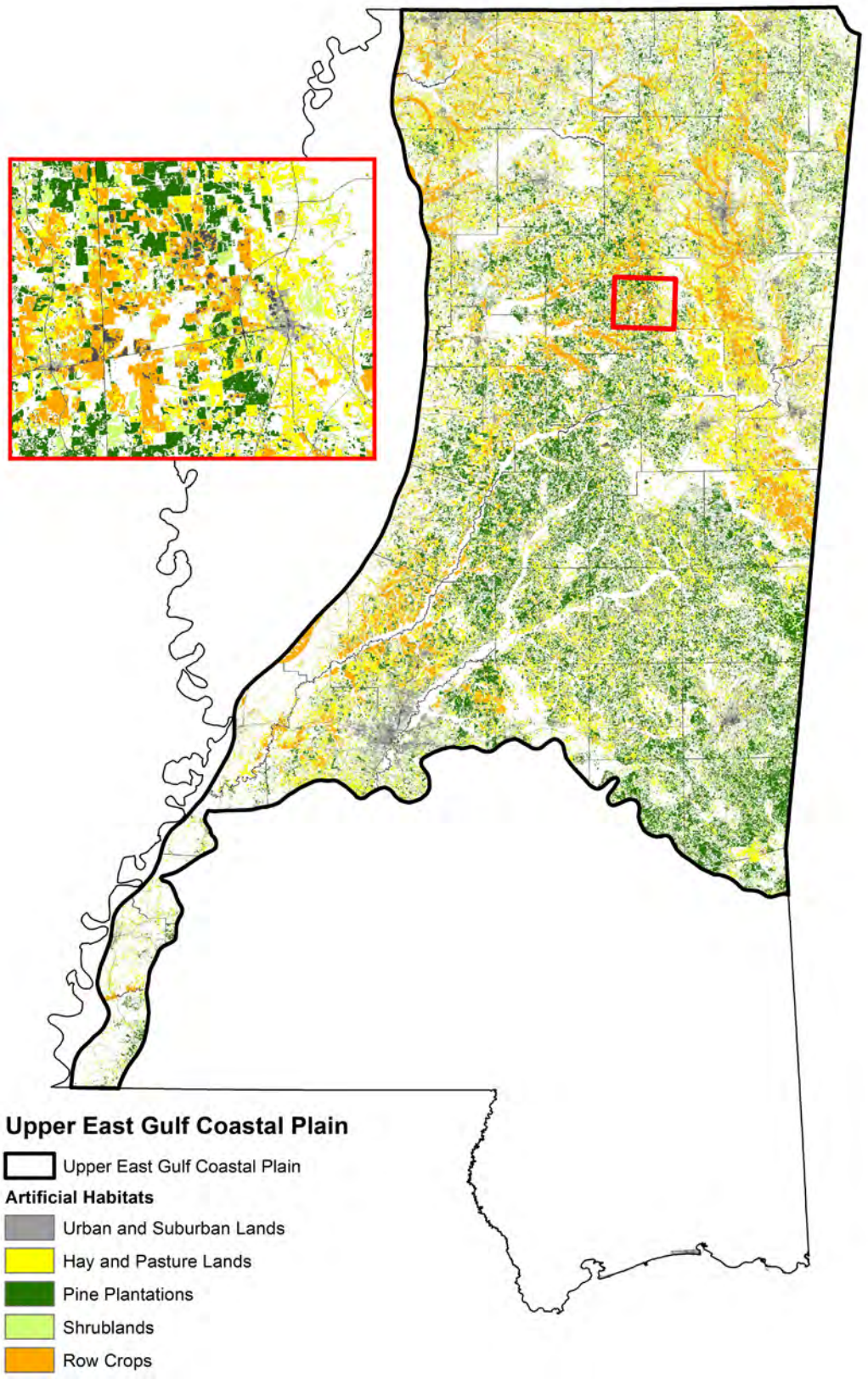

Figure 5.23 Artificial Habitats In Upper East Gulf Coastal Plain Ecoregion - with inset showing detail.

10. Artificial Habitats

Artificial habitats are those that have been altered by humans in some way. While often considered degraded or disturbed, these habitats are used by some species, most often birds and bats. These areas may contain some remnant of the original vegetation, but are usually greatly altered, with many invasive, noxious, or exotic species dominating. Small patches of less disturbed habitat may exist within larger disturbed areas that allows for many species to survive, and sometimes thrive.

This type includes eight subtypes in the UEGCP: 10.1 Urban and Suburban Lands, 10.2 Buildings, Bridges, Overpasses, Etc., 10.3 Utility Right-of-ways, 10.4 Hay and Pasture Lands, 10.5 Pine Plantations, 10.6 Shrublands, 10.7 Row Crops, and 10.8 Artificial Ponds.

10.1 Urban and Suburban Lands

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; 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 increased erosion and a degradation of the water quality of streams below these areas. Vacant lots, landscaped yards, vegetable gardens, fruit orchards, and wooded areas along drainages provide some habitats beneficial to wildlife.

A number of native animals spend part or all of their lives inside the city limits. Many programs, such as the National Wildlife Federation's Backyard Wildlife Habitat certification program, work to improve habitat quality in urban and suburban areas for wildlife. Habitat generalists, including birds like the mockingbird, house wren and mourning dove, and mammals such 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. Most rare species tend to avoid the urban areas, if possible, or are extirpated from developed areas due to deterioration of their habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Urban and suburban lands encompass one to two percent of the land area of Mississippi, over **1,000,000 acres** of land in the UEGCP ecoregion of Mississippi. 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 several hundred thousand acres in the Jackson Metro area. Urban lands are surrounded by less developed areas usually consisting of hardwood and pine forests and cutover areas, agricultural fields and wetlands along creeks and rivers.

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/SUBURBAN LANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Tyto alba*	Barn Owl
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

10.2 Buildings, Bridges, Overpasses, Etc.

DESCRIPTION

Structures such as buildings, bridges, overpasses, and culverts can provide habitat for several bird and bat species. The structures can serve as nesting sites or as winter roosts. Properly designed bridges and culverts can mitigate loss of habitat for some bat species. For little to no costs, existing bridges can be modified to provide better roosting habitat for bats. 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 human disturbances from traffic and rebuilding efforts. Abandoned buildings, while commonly used as bat roosts, decay quickly and become unsuitable over time. As a result, bridges and buildings often do not provide a permanent roosting site for many bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

This habitat subtype is mostly concentrated in urban centers. Some are found in isolated areas such as bridges and culverts along major road systems, or abandoned homes in rural areas. There are thousands of buildings in the state. Acreage of this subtype is combined in that of urban and suburban lands type. Buildings are made of impervious materials and cause increased amounts 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, bridges, overpasses and culverts are **common, widespread, and abundant** and considered secure in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BUILDINGS, BRIDGES, OVERPASSES, ETC.

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	3	*Tyto alba*	Barn Owl
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat

10.3 Utility Right-of-ways

DESCRIPTION

Utility Right-of-ways (ROWs) are corridors used for transmission lines or gas pipelines. In the Eastern U.S., many are found in wooded areas. Impacts on surrounding ecosystems can be detrimental but properly managed ROWs can have positive aspects. ROWs can contain grass, shrub or wetland habitats, or a mixture of many habitats. Gas pipline ROWs usually have much more impact on the environment, denuding most of the corridor, and the gas pipeline industry requires that herbaceous cover be maintained over shrub cover.

The plant communities in which utility ROWs have had a positive effect are those that are graminoid or herbaceous species dominated or communities in which fire played a factor in maintaining the community. Remnant Black Belt Prairie and Jackson Prairies have survived along utility ROWs. Inland freshwater marshes often form in low areas on the ROW corridors. The maintenance of the ROWs to minimize woody species also profits prairie remnants and sandhill communities.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

ROWs are found throughout the state. Estimates of acreages would be difficult to obtain. Development of this subtype usually results in the loss of other more valuable wildlife habitat.

Utility ROWs are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UTILITY Right-of-ways

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	2	*Ammondramus leconteii*	LeConte's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Columbina passerina*	Common Ground Dove
	3	*Colinus virginianus*	Northern Bobwhite
Insects	1	*Pogonomyrmex badius*	Harvester Ant
Mammals	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
Reptiles	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink

10.4 Hay and Pasture Lands

DESCRIPTION

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, and herbs. The land use/land cover estimates indicate that there are nearly 7 million acres of pasture/grassland. The amount of non-cultivated land has increased since 1982; conversely the acreage of cultivated land has decreased, due mainly to economic factors and in part to the USDA Conservation Reserve Program (CRP) initiated in the 1985 Farm Bill. Similarly the amount of pasturage has decreased to approximately 3.7 million acres.

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 non-native grass varieties, such as fescue and Bermuda grass. Unimproved pastures that are heavily grazed contain a variety of native and non-native grasses and weeds. Some weeds that are unpalatable will increase in grazed pastures. If left ungrazed or not managed by mowing, tillage, or prescribed burning, trees and shrubs quickly invade and form brushy thickets and eventually woodlands.

MNHP Ecological Community	Species Associations	MNHP Rank
Disturbed upland grassland (old field/ pasture/mowed)	*Solidago canadensis - Symphyotrichum pilosum - Verbena brasiliensis*	S5
Mesic grassland (savanna) - mowed	*Savanna graminoids such as Dichanthelium, Schizachrium scoparium, and Aristida purpurascens*	SM
Disturbed wetland grassland (pasture/mowed)	*Paspalum sp - Panicum rigidulum - Rubus sp.*	S4?

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 UEGCP, with over **1,000,000 acres** estimated for this ecoregion. Pine and hardwood forests, pine plantations and cutover areas often adjoin this subtype.

Hay and pasture lands are habitats used to raise forage for livestock. These open lands are available for use by wildlife, but are only marginally attractive to most 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 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	TIER	SCIENTIFIC NAME	COMMON NAME
Arachnid	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Scolopax minor*	American Woodcock
	3	*Tyto alba*	Barn Owl
Crayfish	1	*Procambarus barbiger*	Jackson Prairie Crayfish
Insects	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
	1	*Pogonomyrmex badius*	Florida Harvester Ant
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	3	*Mustela frenata*	Long-tailed Weasel
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip

10.5 Pine Plantations

DESCRIPTION

Pine plantations of the UEGCP occupy a wide range of topographic positions and soil types. Establishment of pine plantations is generally practiced in moderately well-drained, acidic to neutral soils. Pine plantation establishment is usually unsuccessful on sites where pine species are naturally absent or exhibit poor growth due to insufficient drainage or alkaline soils, although techniques such as bedding have been used to overcome drainage limitations on some sites. The majority of pine plantations in the UEGCP ecoregion are established in loblolly pine. Shortleaf pine is also adapted to many sites across the region and may increase in acreage established on suitable sites due to its greater resistance to ice damage, higher value timber products (e.g. poles), and potential for mitigation of complete stand loss from fire in young plantations.

Pine plantations are typically established by planting seedlings grown in nurseries on a uniform spacing within and between rows of trees. Seedling density at planting is controlled by spacing, and this may vary depending on objectives of establishment. Much research and development has gone into producing "improved" loblolly pine seedling stocks through various plant breeding or selection methods that favor timber production characteristics such as fast growth, desirable stem form, disease resistance, and site adaptability. Pine plantations are frequently planted for production of timber products, or where a quickly established forest cover is desired (e.g. visual screening, soil stabilization, windbreaks, and other conservation-oriented uses), or for development into a more diverse, future forest type, or some combination of these and other objectives. Much of the acreage established to pine plantations is found on industrial and non-industrial private lands, although many publicly owned lands also establish pine plantations to meet various land use objectives.

Pine plantations are generally viewed as monotypic forests that lack structural (e.g. varied canopy layers) and compositional (e.g. variety of plants) habitat diversity. However, the extent to which a given pine plantation provides wildlife habitat value depends on the age, structure, composition, and management. These characteristics are largely a function of age of trees; silvicultural or other manipulative treatments; weather effects (e.g. storm damage); natural mortality caused by competition, insects, or diseases; and site-specific growing conditions (e.g. soil fertility, moisture, and site preparation prior to planting).

MNHP Ecological Community	Species Associations	MNHP Rank
Xeric-mesic pine forest (plantation)	*Pinus (elliotii, taeda, echinata)*	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

In all upland regions of the state except the Mississippi Delta, parts of the loess hills and the Black Belt regions, there has been significant conversion of forest and agricultural lands to pine plantations. Over **2 million acres** of pine plantation can be found in the UEGCP ecoregion. 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, agricultural lands, urban/suburban areas, and many other habitat types. Most of these pine plantations are established to loblolly pine. A small proportion of may be established to shortleaf pine, and acreage of this type may increase as a result of conservation programs (e.g. Shortleaf Pine Initiative), site and climate adaptations, and landowner objectives that favor shortleaf pine establishment.

Pine species may or may not be considered an off-site species for a given site. Pine may be suitable to the site, but establishing or converting other forest types to predominately monoculture forest stands simplifies habitats. Practices such as bedding to favor pine growth on wet sites negatively affect site hydrology. Furthermore, off-site pine species may be more susceptible to losses from disease or insect pests and extreme weather events (e.g. flooding, ice storms, and drought).

Pine plantations will continue to be a part of modern landscapes, and although this habitat type may not be considered ideal wildlife habitat, there are stages in which different wildlife species utilize and sometimes thrive in these habitats. Furthermore, silvicultural management activities (e.g. thinning and prescribed burning) that are part of normal production timber objectives can enhance habitat conditions for some wildlife species during the life of the stand. Other management practices to enhance wildlife habitat in pine plantations may include decreasing planting densities, establishing or retaining desirable hardwood trees, and controlling invasive species.

Young pine plantations (0 to 5 years of age) usually provide short-term early successional habitat and are used by wildlife species associated with this early seral stage. During this time, other tree and shrub species may become established.

As young pine plantations progress from seedlings to saplings (5 to 12 years of age), canopy closure of pines usually occurs and the ground is almost completely shaded. As a result, herbaceous understory plant coverage is sparse, and the ground is covered with a substantial amount of leaf litter and other residue. Because it is difficult to manage young pine plantations with prescribed fire, other tree species that have become established often persist under the dominant pine canopy. Some songbirds that utilize closed-canopy forests find dense plantations suitable for various habitat requirements (e.g. feeding or nesting), and deer and turkey may use the heavy cover for concealment.

When pine plantations reach 12 to 25 years of age, trees are of a sufficient size to remove merchantable timber products such as pulp wood through thinning. This is often termed a mid-rotation age class because it is approximately half way through the life of the stand in the context of a timber production rotation that ends in complete harvest of the stand. Often a second thinning occurs after the initial thinning to utilize additional timber products and increase growing space for trees that will be left, although some stands may be completely harvested at this time if it meets certain timber production objectives. Thinning intensity and timing are primarily a function of land use objectives, tree growth rates, and timber market demand for specific products. Understory productivity increases as plantations are thinned to reduce stem and canopy density, although reduction in canopy density is only for a few years as residual tree crowns grow to occupy the open space. Hardwood species such as sweetgum formerly suppressed underneath the pine canopy may also be released and capture much of the sunlight that is allowed through the pine canopy. After thinning, prescribed fire can be introduced to increase herbaceous vegetation and reduce hardwood brush. If necessary, selective herbicide treatments may also be applied to control hardwood brush invasion and favor more herbaceous ground cover. These management practices can increase habitat diversity and in turn increase wildlife species diversity.

When pine plantations reach 25 years of age and older, stands are usually either harvested completely (clear cut) or a decision may be made to perpetuate the stand. Frequently, the rotation is started over by replanting pine. Perpetuating and maintaining the stand will mimic more of a natural pine or mixed pine-hardwood stand. Depending on land use objectives, perpetuated stands may be managed to maintain a relatively dominant pine component or allowed to revert to a climax forest type.

Pine 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	TIER	SCIENTIFIC NAME	COMMON NAME
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Birds	2	*Columbina passerina*	Common Ground Dove
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Peucaea aestivalis*	Bachman's Sparrow
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Dendroica discolor*	Prairie Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Sitta pusilla*	Brown-headed Nuthatch
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Plestiodon anthracinus pluvialis*	Southern Coal Skink
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Masticophis flagellum*	Eastern Coachwhip
	4	*Drymarchon couperi*	Eastern Indigo Snake

10.6 Shrublands

DESCRIPTION

Shrublands are old fields or fallow lands that contain a variety of annual and perennial weeds, shrubs and/or young trees. Grasses such as broomsedge, 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. If fields and grassy openings are left untended over several years, many vines, shrubs and trees such as gallberry, possumhaw, eastern redcedar, Chinese privet, rattan-vine, persimmon, eastern baccharis, and various pines 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 scrub-shrub type is dominated by southern bayberry and blackberry shrubs. Other common components include red maple, inkberry, yaupon, various oak species and blueberries.

The wetland scrub-shrub community consists of mixed shrubs and young trees. Southern bayberry, yaupon, and large gallberry tend to form dense thickets. Other shrubs and small trees that may be present include red maple, hickory, blackgum, giant cane, buttonbush, planer tree, ash, possumhaw, Chinese privet, sugarberry and hawthorns. Vines may also be found in abundance; common vines include ladies' eardrops, grapes, trumpet creeper, peppervine, Japanese honeysuckle. These usually form in cutover coastal palustrine woodlands that are succeeding to pine woodlands; its vegetation is a result of management or modification of natural vegetation, or the lack of fire.

Herbaceous wetlands with shrubs, which are maintained by mowing, have bog herbaceous vegetation with associated shrubs such as titi and sweetbay saplings. This is another cutover coastal palustrine woodlands type, which succeeds to pine woodlands. In this community, the vegetation is a result of mowing or other similar modifications and the lack of fire.

The vegetation is deemed a forest once trees reach an average height of 15 feet tall. Trees that have wind dispersed seeds such as pine, sweetgum, ash, winged elm and red maple encroach into old-field openings. Hickories and oaks, which are dispersed by animals, are often prevalent.

The wetland scrub-shrub community consists of mixed shrubs and young trees. Southern bayberry, yaupon, and large gallberry tend to form dense thickets.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Shrublands include cutover areas or old fields dominated by young hardwoods or pines and shrub species released following canopy removal or established by natural plant succession. 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 with over **800,000 acres** in the Upper East Gulf Coastal Plain ecoregion.

The vegetation of this subtype is in transition as trees gain coverage and dominance of the stand. Succession of open shrubland or old fields can be set back with prescribed fire. Wildlife species that thrive in open shrubland habitats are usually common; however, some, including the gopher tortoise and northern bobwhite, 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 SHRUBLANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aimophila aestivalis*	Bachman's Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Passerina ciris*	Painted Bunting
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Scolopax minor*	American Woodcock
	3	*Setophaga discolor*	Prairie Warbler
	3	*Tyto Alba*	Barn Owl
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Peromyscus polionotus*	Oldfield Mouse
	2	*Zapus hudsonius*	Meadow Jumping Mouse
	3	*Mustela frenata*	Long-tailed Weasel
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	3	*Lampropeltis getula nigra*	Black Kingsnake
	3	*Masticophis flagellum*	Eastern Coachwhip

10.7 Row Crops

DESCRIPTION

As estimated by the Natural Resources Conservation Service, 55 percent of Mississippi's farmland is in cropland and produces such commodities as cereal, soybeans, cotton, vegetables, and oil seed. The amount and type of herbaceous cover will depend on many factors including field usage, crop phenology, and types and frequency of agricultural treatments. According to the National Agriculture Statistical Service, in 2012 Mississippi had over 3 million acres of land in farms, about 33 percent of the total land area of Mississippi.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. The Black belt 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 creeks and areas with gentle topographic relief. Croplands encompass approximately **900,000 acres** in the UEGCP Ecoregion.

Although modern agricultural 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 successional habitat by disking or prescribed burning fallow fields to manage for Northern Bobwhite Quail and Mourning Dove. Northern Bobwhite, which are in considerable decline, are dependent on the availability of ample cover and food (seeds and insects) resources from native grasses and forbs in agricultural landscapes.

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 AGRICULTURAL FIELDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Lithobates areolatus*	Crawfish Frog
	3	*Ambystoma texanum*	Small-mouthed Salamander
Birds	2	*Ammodrammus savannarum*	Grasshopper Sparrow
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Tyto alba*	Barn Owl
Crustaceans	1	*Procambarus barbiger*	Jackson Prairie Crayfish
	2	*Procambarus hagenianus vesticeps*	Egyptian Crayfish
Mammals	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	3	*Sciurus niger bachmani*	Bachman Fox Squirrel
Reptiles	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	3	*Lampropeltis getula nigra*	Black Kingsnake
	3	*Masticophis flagellum*	Eastern Coachwhip

10.8 Artificial Ponds

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 often rely on wells for maintaining water levels. Farm and residential area ponds are usually created by building 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. 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. 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 can provide habitat for shore and wading birds during drought periods and winter drawdown.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Mississippi has more than 160,000 small water bodies totaling more than **190,000 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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Lithobates areolatus*	Crawfish Frog
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Calidris alpine*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
Fish	1	*Ethostoma zonifer*	Backwater Darter
Mammals	2	*Zapus hudsonius*	Meadow Jumping Mouse
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

10.0 Artificial Habitats										
	CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
1	Residential and commercial development	1.1 Housing and urban areas: Bat species killed or displaced from roosts in homes and buildings; Loss of tree cover and snags for use by wildlife	H			M	M	M	M	
		1.2 Commercial and industrial areas				L	L	L	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: conventional tilling practices, lack of field borders, use of non-native vegetation for soil stablilization				H		L	H	M
		2.2 Wood and pulp plantations				H		H		
		2.3 Livestock farming and ranching: improper grazing practices causing bank damage and erosion				M				M
4	Transportation and service corridors	4.1 Roads and railways: Road construction/ maintenance, Incompatible bridge designs, timing of bridge maintenance (for bats)	H	H		L		L		
		4.2 Utility and service lines: Indiscriminate use of herbicides			H		H			
5	Biological resource use	5.3 Logging and wood harvesting					H			
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use, distuburbance of bat roosts	L	L	H					
7	Natural system modifications	7.1 Fire and fire suppression: altered fire regimes				H	H	H		
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow tree, Chinese privet, fire ants, armadillos, wild hogs, Johnson grass, kudzu, bamboo, Southern pine beetle,	H		H	H	H	H	H	L
		8.2 Problematic native species: Yaupon, gallberry				H	H			
9	Pollution	9.3 Agricultural and forestry effluents					M			M

PRIORITY CONSERVATION ACTIONS

10.0 Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
1.0 Land/Water Protection									
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	X		X	X
1.2 Resource and habitat protection		X	X		X	X		X	X
2.0 Land/Water Management									
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X		X	X	X	X	
	Discourage incompatible recreational uses.	X	X	X					
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Limit/discourage the introduction or propogation of exotic and invasive species (plant and animal). Control/eradicate such species when present: Encourage fish producers to only raise and sell certified triploid grass carp for biological plant control.	X	X	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X						
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: promote use of native vegetation on gas pipelines, discourage planting of wildlife food plots on utility Right-of-ways.		X	X	X	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.		X						X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X		X	X	X	X	X

10.0 Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
2.3 Habitat and natural process restoration	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X			X	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X		X	X	X	X	X
3.0 Species Management									
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X	X	X	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X		X		X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X						
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X	X
4.0 Education and Awareness									
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X	X		
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X		X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.		X		X	X	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X					
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X						

10.0 Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
4.3 Awareness and communications	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X						
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	X	X	X	X
5.0 Law and Policy									
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X		X	X	X	X	
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.								X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.				X	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN; Discourage construction in sensitive areas that might entail the installation of levees, dams, etc. which would interfere with interactions with main stream channels.	X	X		X	X	X	X	
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X						X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.				X	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X	X		

10.0 Artificial Habitats									
CLASSIFICATION	**SUBCLASS**	**10.1 Urban and Suburban Lands**	**10.2 Buildings, Bridges, and Overpasses, Etc.**	**10.3 Utility Right-of-ways**	**10.4 Hay and Pasture Lands**	**10.5 Pine Plantations**	**10.6 Shrublands**	**10.7 Row Crops**	**10.8 Artificial Ponds**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X			X	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.								X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X		X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X						X	X
	Discourage incompatible recreational uses.	X	X	X					
	Improve enforcement of existing speices protection regulations.	X	X	X	X	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X	X	X	X	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	X	X	X	X
6.0 Livelihood, economic and other incentives									
6.1 Linked Enterprises And Livelihood Alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	X	X	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X					
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	X		X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X	X	X
7.0 External Capacity Building									
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X	X	X

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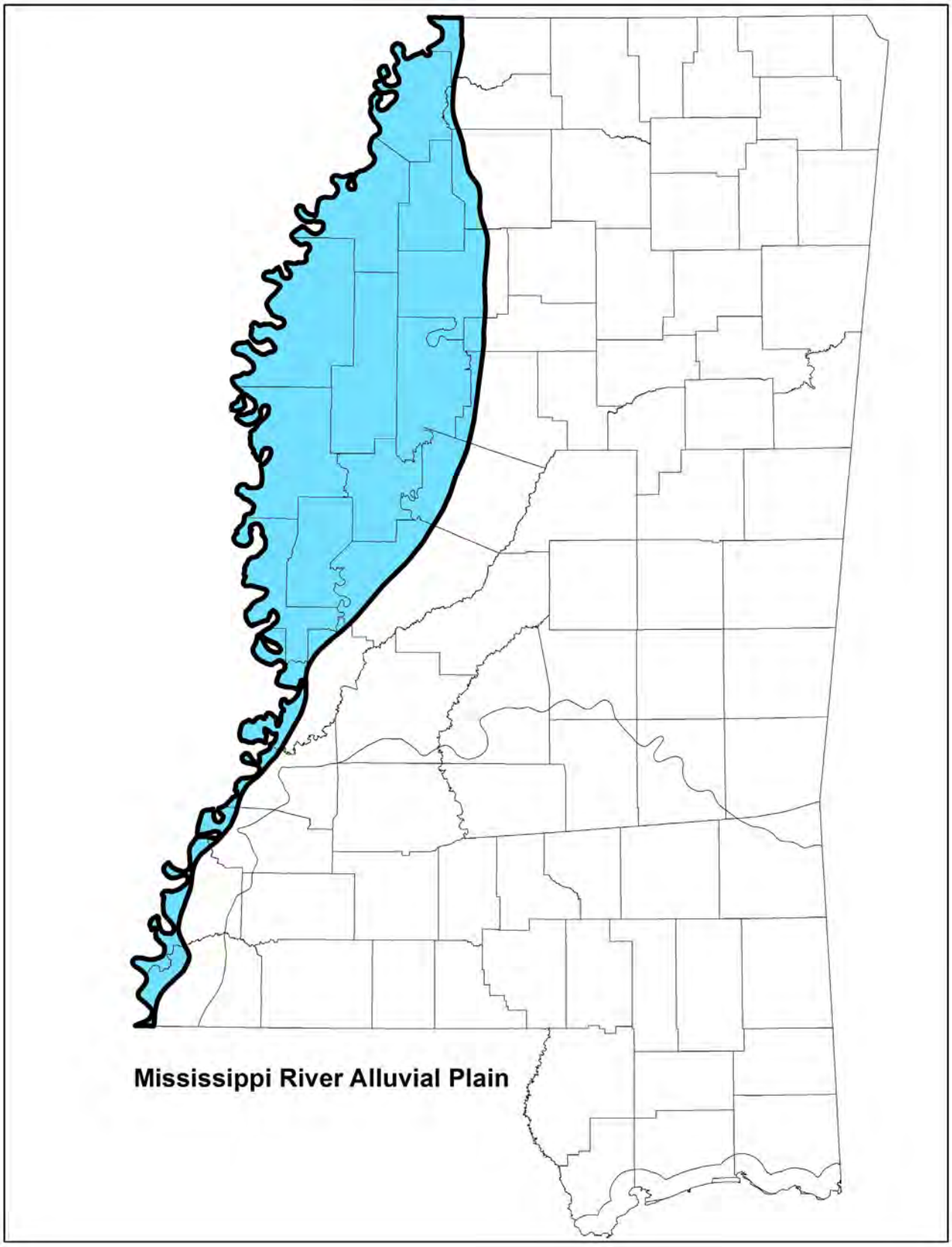

Figure 5.24 Mississippi River Alluvial Plain Ecoregion

C. Mississippi River Alluvial Plain

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 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. The 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.

The bottomland hardwood forest is by far the dominant natural plant community of the MSRAP. It is maintained by regular backwater and headwater flood events and by localized ponding on poorly drained soils. Headwater or mainstem flooding results from rainstorms over the watersheds of the Mississippi River tributaries, and produces the great spring floods characteristic of the 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 the 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 can 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 the MSRAP undergo ecological succession from pioneer communities dominated by black willow or cottonwood (depending on soil drainage characteristics) to red oak and finally a 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 the MSRAP were likely a shifting mosaic partially defined by minute differences in elevation and tolerances among a large number of woody plants.

Historically, the diversity of forests and other habitats characterizing this landscape provided extraordinary array of conditions suitable for a wide range of species. River floodplain systems are highly productive and provide exceptional habitat for a variety of vertebrates including foraging and spawning fish, amphibians and reptiles. In addition, the Mississippi River, its tributaries and their associated floodplains are high in diversity of mammal and bird species.

MSRAP Habitats:

1. Bottomland Hardwood Forests
    - 1.1 Bottomland Hardwood Forests
2. Swamp Forests
    - 2.1 Bald Cypress/Gum Swamp Forests
3. Riverfront Forests/Herblands/Sandbars
    - 3.1 Cottonwood/Black Willow/River Birch Woodlands
    - 3.2 Sandbars
4. Inland Freshwater Marshes
    - 4.1 Freshwater Marshes
5. Lacustrine (Lentic) Communities
    - 5.1 Oxbow Lakes
    - 5.2 Ephemeral (Temporary) Ponds
    - 5.3 Beaver Ponds
6. Artificial Habitats
    - 6.1 Urban and Suburban Lands
    - 6.2 Buildings, Bridges, Overpasses Etc.
    - 6.3 Utility Right-of-ways
    - 6.4 Hay and Pasture Lands
    - 6.5 Old Fields
    - 6.6 Row Crops
    - 6.7 Artificial Ponds

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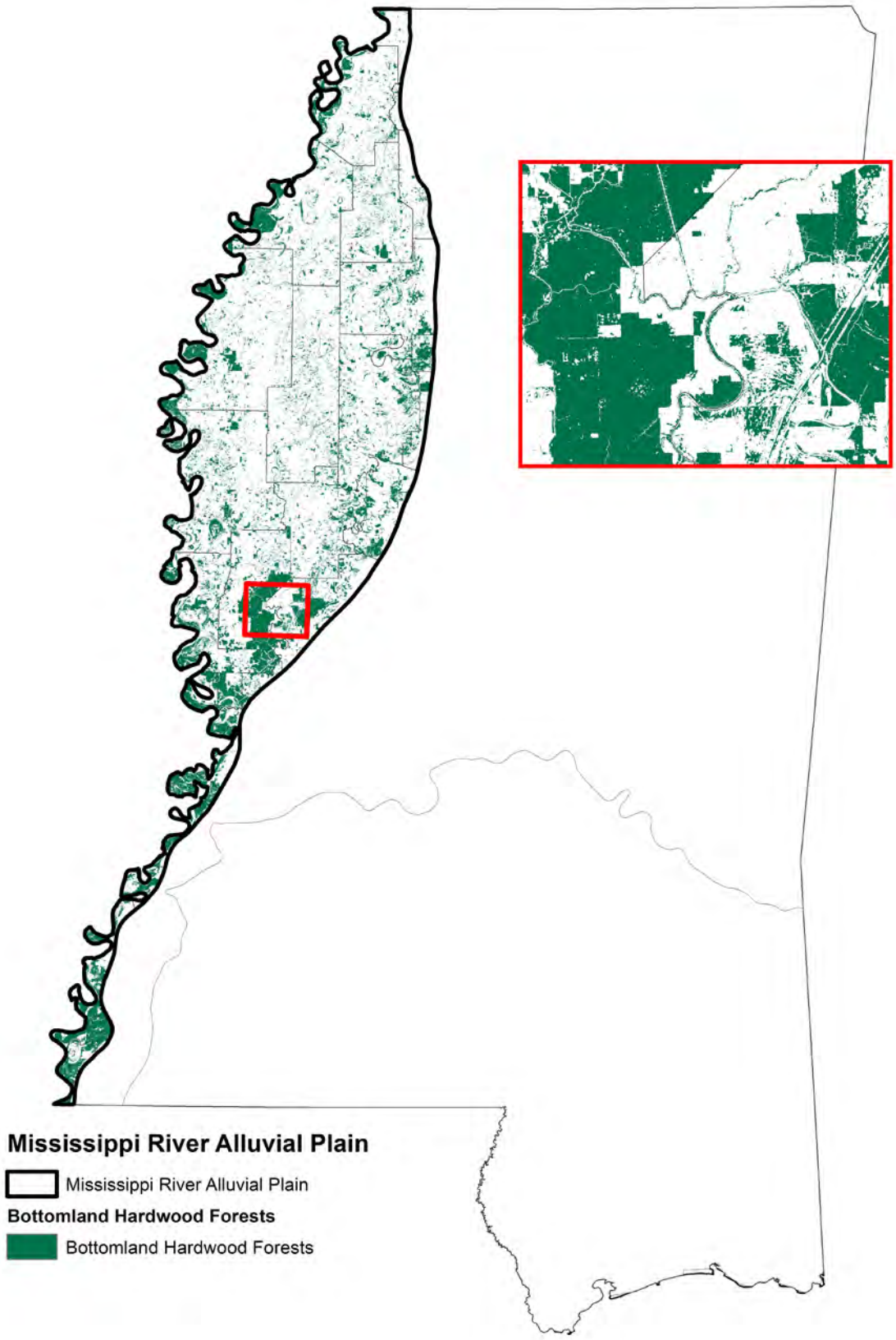

Figure 5.25 Bottomland Hardwood Forests In Mississippi River Alluvial Plain Ecoregion - with inset showing detail.

1. 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. The soils are enriched by the influx of nutrients and sediments during floods.

This type includes one subtype in the MSRAP: 1.1 Bottom Hardwood Forests.

GENERAL CONDITION

Bottomland hardwood forests and swamps were once common in the Southeast. Of an estimated 24 million acres of the original bottomland hardwood forests in the Lower Mississippi River Valley, 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.

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.

1.1 Bottomland Hardwood Forests

DESCRIPTION

Prominent in the Mississippi River alluvial plain, wet palustrine forests occur 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 and overcup oak are 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, planertree, eastern swamp privet, dwarf palmetto, American snowbell and possumhaw holly. Wet palustrine forests 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.

Seven ecological communities are represented in this ecoregion: Oak – mixed hardwood ridge bottom forest, Wet hardwood bottom forests, silver maple – mixed floodplain forest, sugarberry - American elm - green ash bottomland forest, diamondleaf oak - willow oak - water oak forest, Sweetgum with mixed oak bottomland forests, and forested canebrakes.

Oak – mixed hardwood ridge bottom forests are found on mesic lowlands, second terraces and toe slopes. Infrequent flooding of short duration and loamy soils distinguish this habitat from other floodplain types. This community is usually found on terraces which were small levees created by ancient meander scrolls of the river. Water oak, cherrybark oak, white oak, and bitternut hickory all are common species in this habitat. Often thickets of pawpaw will also be present. Other common canopy trees include willow oak, swamp chestnut oak, shagbark hickory, water hickory and sweetgum. Malmaison Wildlife Management Area, in Grenada, Carroll, and Leflore Counties, has examples of this community.

Wet hardwood bottom forests are dominated by canopy composed of tall overcup oak and water hickory. Other canopy trees that occur infrequently are sweetgum, water oak, willow oak and sugarberry. This forest type is found on the wettest sites and at the edges of swamp depressions and oxbow lakes. The canopy is dense, forming from 60-100percent cover. Planertree is usually present as a thick midstory. The shrub layer is also usually abundant, and typically dominated by swamp privet, American snowbell, and common buttonbush. Delta National Forest in Sharkey County has the best example of this community in this ecoregion.

Silver maple - mixed floodplain forests are representative of early successional forests on alluvial wetlands and along oxbows. Silver maple and boxelder are the most common trees present, although American sycamore, pecan and water oak are often scattered through the forest. An example of the community is found on Shipland Wildlife Management Area in Issaquena County.

Sugarberry - American elm - green ash bottomland forests occur on large river flood plains, especially along the batture lands of the Mississippi River. The tolerance of these species to long periods of inundation allows their dominance at these sites. Its position on the floodplain is on low terraces where annual flooding is regular and of moderate duration. Sugarberry and green ash, with additional common trees including boxelder, silver maple, sweetgum, and overcup oak, occur in this habitat. Trumpet creeper, Carolina coralbead, and possumhaw holly are common understory constituents. Delta National Forest, in Sharkey County, has areas with this community type.

Diamondleaf oak - willow oak - water oak forests are found on alluvial floodplains on poorly drained, flat sites. The canopy is dominated by swamp laurel oak, willow oak and water oak. Red maple, green ash, Nuttall oak, sweetgum, water hickory, water locust and overcup oak are usually associates in the canopy of these forests. These areas are seasonally flooded, particularly in the early growing season. Mahannah Wildlife Management Area in Issaquena County and O'Keefe Wildlife Management Area in Quitman County has examples of this community.

Sweetgum with mixed oak bottomland forests consist of a canopy of sweetgum, swamp chestnut oak, white oak, and cherrybark oak. Usually American elm is an important component of the midcanopy. Other canopy trees that may be present include: overcup oak, willow oak, water hickory, Nuttall oak, green ash, and bitternut hickory. Dwarf palmetto may form a dense shrub layer in this community type. Red Gum Research Natural Area in the Delta National Forest in Sharkey County, Malmasion Wildlife Management Area in Grenada County, and O'Keefe Wildlife Management Area in Quitman County have examples of this community.

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 apparent extirpation of Bachman's warbler, which was last heard in canebrakes, its required habitat. Most remaining canebrake habitats are located on private property and are not publicly accessible.

MNHP Ecological Community	Species Associations	MNHP Rank
Oak – mixed hardwood ridge bottom forest	*Quercus nigra/Q. pagoda/Q. alba – Carya cordiformis – Asimina triloba*	S3
Wet hardwood bottom forest	*Quercus lyrata - Carya aquatica*	S3
Silver maple - mixed floodplain forest	*Acer saccharinum*-mixed hardwoods	S4
Sugarberry - American elm - green ash bottomland forest	*Celtis laevigata- Ulmus americana –Fraxinus pennsylvanica*	S4
Sweetgum – mixed oak bottomland forest	*Liquidambar styraciflua – Ulmus americana – Quercus michauxii/Q. alba/Q. pagoda*	S2
Forested canebrake	Mixed deciduous trees (open canopy) - *Arundinaria gigantea*	S1
Diamondleaf oak - willow oak - water oak forest	*Quercus laurifolia-Q. phellos-Q. nigra*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The bottomland hardwood forests subtype occurs in linear patches on floodplains along creeks and rivers. Several large patches are found along lowland stretches of 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. In the Mississippi Delta, they occur within wide expanses of agricultural land, covering over **1 million acres**.

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, exotic weeds and insects are also negatively affecting these forests.

Additionally, many existing forests have been negatively affected by improper timber management, including diameter-limit harvests and large (>40 acre) clear cuts, resulting in altered species composition and poor forest structure with homogeneous canopy characteristics in reduced diversity of understory and herbaceous vegetation. 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 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Songbirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	2	*Mycteria americana*	Wood Stork
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Hylacichla mustelina*	Wood Thrush
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisiana Waterthrush
	4	*Vermivora bachmanii*	Bachman's Warbler
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Ursus americanus*	Black Bear
	4	*Lasionycteris noctivagans*	Silver-haired Bat

THREATS

	1. Bottomland Hardwood Forests		
	CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Bottomland Hardwood Forests**
1	Residential and commercial development	1.1 Housing and urban areas	L
		1.2 Commercial and industrial areas	L
		1.3 Tourism and recreation areas	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Incompatible agricultural practices, pesticide runoff, agricultural conversion (historical)	H
		2.2 Wood and pulp plantations	H
		2.3 Livestock farming and ranching: Soil compaction, alteration of vegetative composition	L
3	Energy production and mining	3.2 Mining and quarrying: Sand and gravel mining	H
4	Transportation and service corridors	4.1 Roads and railways	M
5	Biological resource use	5.2 Gathering terrestrial plants	L
		5.3 Logging and wood harvesting: Improper use of forestry BMPs	M
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L
7	Natural system modifications	7.2 Dams and water management/use: Groundwater and surface water withdrawal; Operation of dams/impoundments - Levees and channel modification altering flood duration, geographic extent, and amplitude	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese privet, kudzu, Chinese tallow, Japanese climbing fern, cogongrass, silktree, wild hogs	H
9	Pollution	9.1 Household sewage and urban waste water	M
		9.3 Agricultural and forestry effluents	H

PRIORITY CONSERVATION ACTIONS

1. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Bottomland Hardwood Forests**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible: Discourage disturbance at colonial waterbird roosting/nesting sites.	X
	Discourage incompatible recreational uses.	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/ roosting sites for bear, squirrel, bats, and cavity nesting birds; Encourage habitat restoration through reforestation with site appropriate species.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X

1. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Bottomland Hardwood Forests**
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Discourage incompatible recreational uses.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
	Encourage proper disposal and cleanup of waste and litter.	X
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Discourage incompatible recreational uses.	X
	Improve enforcement of existing species protection regulations.	X
	Encourage proper disposal and cleanup of waste and litter.	X

1. Bottomland Hardwood Forests		
CLASSIFICATION	**CONSERVATION ACTION**	**1.1 Bottomland Hardwood Forests**
6.0 Livelihood, economic and other incentives		
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
6.2 Substitution	Discourage incompatible recreational uses.	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

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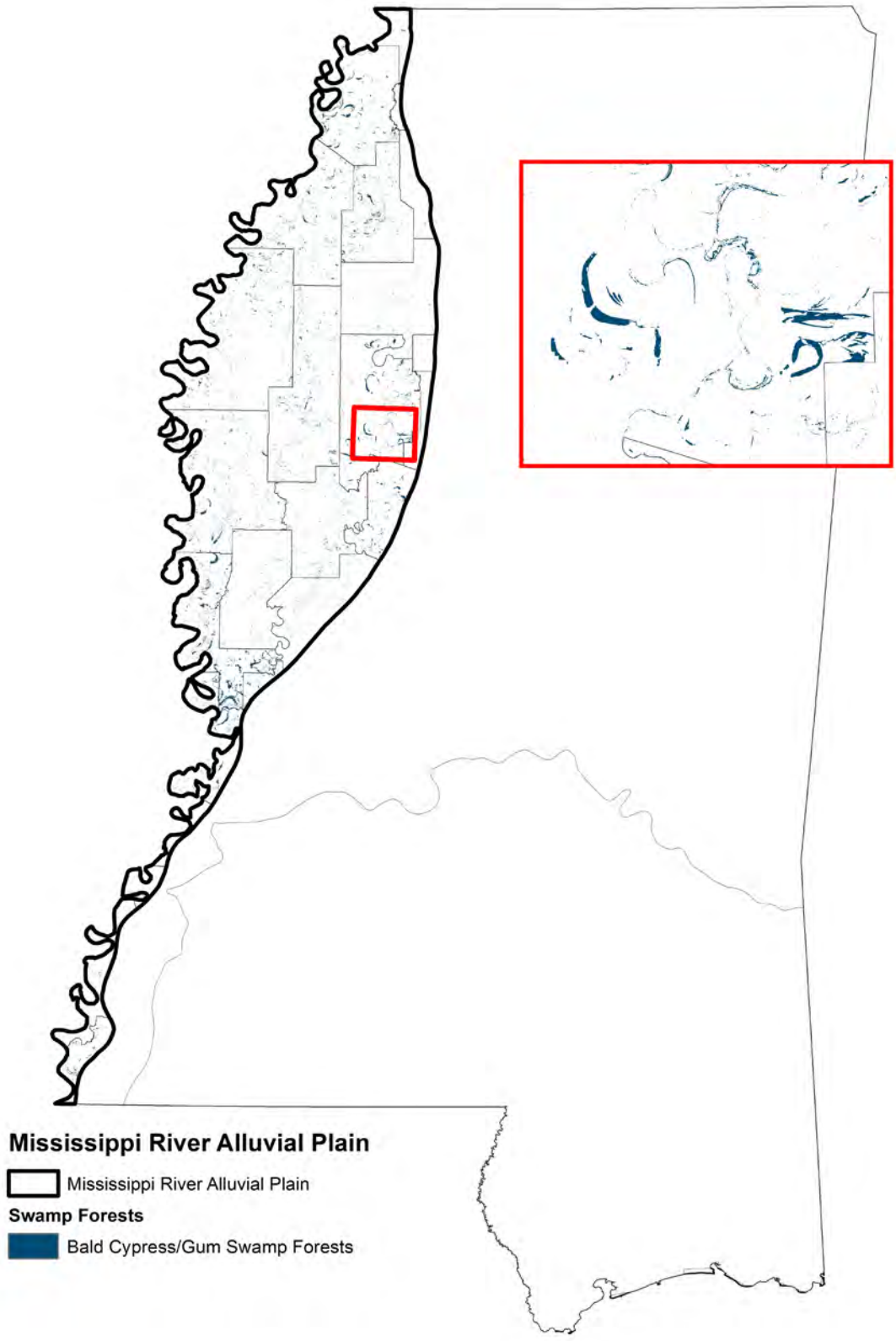

Figure 5.26 Swamp Forests Mississippi River Alluvial Plain Ecoregion- with inset showing detail.

2. Swamp Forests

There are about 600,000 acres of swamp habitat in Mississippi, equivalent to about two percent of the state land area. 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.

This type includes one subtype in the MSRAP: 2.1 Bald Cypress/Gum 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 coterminous 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 1990s 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 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. It is estimated that about 80 percent of the wetlands in the Delta have been lost to habitat and drainage alteration.

2.1 Bald Cypress/Gum Swamp Forests

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, swamp tupelo, water tupelo and other hardwood trees. Silver and red maple, persimmon, green ash, American hornbeam and water oak are occasional associates. Shrubs may include common 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 common buttonbush, eastern swampprivet and/or planertree.

Six ecological communities are grouped into this general type: bald cypress swamp, bald cypress-water tupelo swamp, Tupelo swamp, bald cypress-hardwood swamp forest, bald cypress-swamp tupelo swamp, and buttonbush-swamp privet shrub wetlands.

Bald cypress swamps, bald cypress - water tupelo swamps, and tupelo swamps occupy semi-permanently flooded or seasonally flooded wetlands on landforms including back bays, depressions, oxbow lakes, and bottomland flats. Bald cypress and/or water tupelo dominate the canopy of these swamp habitats, and either can form pure stands. In the bald cypress-hardwood swamp forest type, bald cypress is present in the canopy, but other common woody species are water hickory, planertree, black willow, overcup oak, possumhaw holly, and American snowbell. St. Catherine's Creek National Wildlife Refuge in Adams County has areas with these habitats.

Bald cypress-swamp tupelo swamp forests occur in less frequently flooded and shallower areas than the previous community types. This community tends to dry out completely in the summer and fall, particularly in drought years. Sky Lake Wildlife Management Area in Humphries County is an example of this habitat.

Buttonbush-swamp privet shrub wetlands occupy intermittently exposed to semi-permanently flooded lowland areas within and along the edges of creeks, rivers, sloughs, and oxbow lakes, often in zones surrounding deeper water. The lands remain flooded or generally saturated throughout the year. Though the conditions of this wetland habitat resemble those of swamps, the scarcity of swamp trees distinguishes this type. Fluctuating water levels cause herb density to vary widely in this ecological community. Common buttonbush is the indicator species for this habitat, while Virginia sweetspire and eastern swampprivet are less common. St. Catherine's Creek National Wildlife Refuge in Adams County has examples of this community type.

MNHP Ecological Community	Species Associations	MNHP Rank
Bald cypress swamp	*Taxodium distichum*	S3
Bald cypress - water tupelo swamp	*Taxodium distichum –Nyssa aquatica*	S3
Tupelo swamp	*Nyssa aquatica*	S3
Bald cypress - hardwood swamp forest	*Taxodium distichum - Carya aquatica –Quercus lyrata-Planera aquatica-Salix nigra*	S3
Bald cypress - swamp tupelo swamp	*Taxodium distichum-Nyssa biflora*	S3
Buttonbush - swamp privet shrub wetland	*Cephalanthus occidentalis-Forestiera acuminata-Itea virginica*	S4
Diamondleaf oak - willow oak - water oak forest	*Quercus laurifolia-Q. phellos-Q. nigra*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. Over **100,000 acres** of this forest type is found in the MSRAP ecoregion of Mississippi.

The annual losses of forested wetlands in Mississippi during the 1960s and 1970s 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
Birds	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucpcephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Ursus americanus*	Black Bear
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

	2. Swamp Forests		
	CLASSIFICATION	**SUBCLASS**	**2.1 Bald Cypress/ Gum Swamp Forests**
3	Energy production and mining	3.2 Mining and quarrying	L
4	Transportation and service corridors	4.1 Roads and railways	L
5	Biological resource use	5.3 Logging and wood harvesting: Mulch	H
		5.4 Fishing and harvesting aquatic resources: Alligator snapping turtle	M
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	L
7	Natural system modifications	7.2 Dams and water management/use: Operation of dams/impoundments, channel modification, groundwater and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese tallow, Japanese climbing fern, Chinese privet, alligator weed, wild hogs	H
9	Pollution	9.3 Agricultural and forestry effluents: Pesticide/nutrient runoff	L

PRIORITY CONSERVATION ACTIONS

2. Swamp Forests		
CLASSIFICATION	**SUBCLASS**	**2.1 Bald Cypress/ Gum Swamp Forests**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible: Discourage disturbance at colonial waterbird roosting/nesting sites.	X
	Discourage incompatible recreational uses.	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/ roosting sites for bear, squirrel, bats, and cavity nesting birds; Encourage habitat restoration through reforestation with site appropriate species.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X
	Continue to restrict/monitor scientific collection of SGCN.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X

2. Swamp Forests		
CLASSIFICATION	**SUBCLASS**	**2.1 Bald Cypress/ Gum Swamp Forests**
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Discourage incompatible recreational uses.	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
	Encourage proper disposal and cleanup of waste and litter.	X
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Develop/implement/continue recovery plans for individual SGCN.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Discourage incompatible recreational uses.	X
	Improve enforcement of existing species protection regulations.	X
	Encourage proper disposal and cleanup of waste and litter.	X

2. Swamp Forests		
CLASSIFICATION	**SUBCLASS**	**2.1 Bald Cypress/ Gum Swamp Forests**
6.0 Livelihood, economic and other incentives		
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X
6.2 Substitution	Discourage incompatible recreational uses.	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

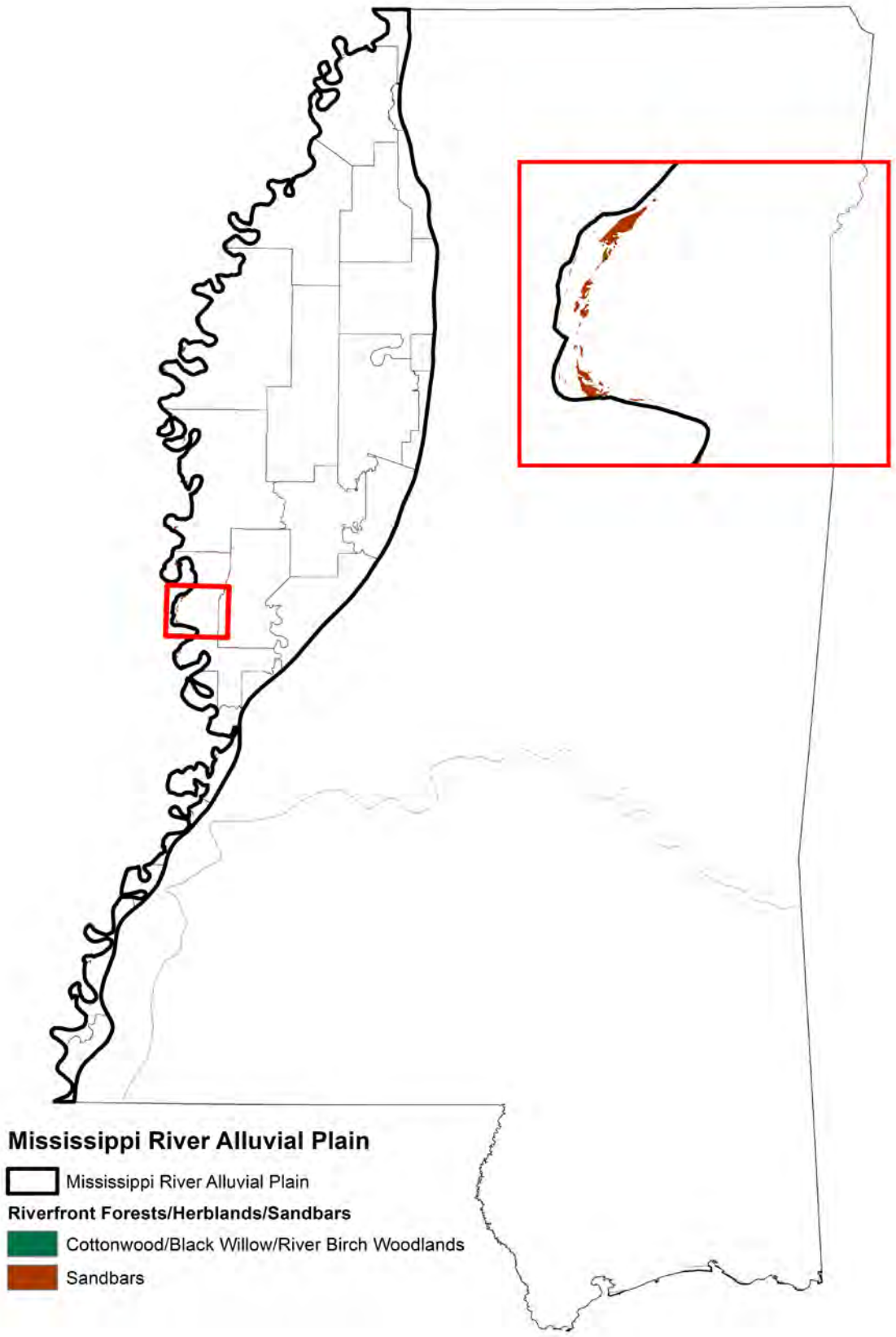

Figure 5.27 Riverfront Forests/Herblands/Sandbars Mississippi River Alluvial Plain Ecoregion - with inset showing detail.

3. 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 in the MSRAP: 3.1 Cottonwood/Black Willow/River Birch Woodlands, and 3.2 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.

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.

3.1 Cottonwood/Black Willow/River Birch Woodlands

DESCRIPTION

Riverfront forests may last for over 50 years before the canopy trees begin to age and decline. In time these forests gradually become more diverse in shrubs, vines and herbs. Four ecological communities have been combined into this subtype: Black willow riverfront pioneer forests, Eastern cottonwood-willow riverfront pioneer forests, Native vinelands, and Mississippi River sandfield mixed herbland.

Black willow riverfront pioneer forests are often composed of only black willow trees. This habitat is found on recently deposited ground in the Mississippi River Alluvial Plain and other large river floodplains. Shrubs and herbaceous plants are usually absent, but peppervine, climbing hempvine, eastern poison ivy, smartweed, smallspike false nettle, Virginia dayflower, and American pokeweed may be present. Other canopy trees that may be present include bald cypress, hackberry, American elm and eastern cottonwood. Shipland Wildlife Management Area in Issaquena County has examples of this community.

Eastern cottonwood - willow riverfront pioneer forests occur along the banks of large rivers and on islands. Red maple, green ash, river birch, planertree, American elm, sweetgum, red mulberry and silver maple may also be present in the canopy. American hornbeam, swamp dogwood and eastern swampprivet dominate the subcanopy. The herb layer is usually sparse, but patches of Indian woodoats may be found. St. Catherine's Creek National Wildlife Refuge in Adams County has examples of this community type.

Native vinelands develop following disturbances to riverfront forests. The habitat is dominated by greenbrier, peppervine, American buckwheat vine and trumpet creeper. Smartweed, spikerushes, muscadine, eastern poison ivy and bayberry may also be present. Examples of this habitat can be found in Shipland Wildlife Management Area in Issaquena County or St. Catherine's Creek National Wildlife Refuge in Adams County.

Mississippi river sandfield mixed herblands are characterized by a diverse herbaceous groundcover dominated by brome grass, sixweeks fescue and prickly pear cactus. These are dry sand plains on terraces created in special flooding circumstances of the Mississippi River, such as sand bars left high and dry after flood waters recede. The community generally remains treeless due to the great depth of the sands, which prevents trees from invading the sand zones. Trees are uncommon but include Chickasaw plum, eastern cottonwood, black willow, Hercules' club, honeylocust, red maple, eastern swampprivet, buckthorn bully, green ash, American elm, false indigo bush, chinaberry tree, silktree, swamp dogwood, and possumhaw holly. Great River Road State Park in Bolivar County has examples of this community.

MNHP Ecological Community	Species Associations	MNHP Rank
Black willow riverfront pioneer forest	*Salix nigra*	S3
Eastern cottonwood - willow riverfront pioneer forest	*Salix nigra –Populus deltoides*	S3
Native vineland	*Smilax spp.-Campsis radicans-Ampelopsis arborea-Brunnichia ovata*	S4
Mississippi river sandfield mixed herbland	*Bromus sp.-Vulpia octoflora-Opuntia sp.*	S1
Bald cypress - swamp tupelo swamp	*Taxodium distichum-Nyssa biflora*	S3
Buttonbush - swamp privet shrub wetland	*Cephalanthus occidentalis-Forestiera acuminata-Itea virginica*	S4
Diamondleaf oak - willow oak - water oak forest	*Quercus laurifolia-Q. phellos-Q. nigra*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The cottonwood/black willow/river birch woodlands subtype covers less than **20,000 acres** in the MSRAP ecoregion and are especially prominent in the batture lands of the Mississippi River, where cottonwood and willow are found in extensive linear patches. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
Mammals	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Ursus americanus*	Black Bear
	4	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

3.2 Sandbars

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. Sandbars can be found along the Mississippi River and most MSRAP rivers and streams.

MNHP Ecological Community	Species Associations	MNHP Rank
Sand bar (exposed)	Various grasses – *Carex sp.* – *Salix exigua*	S2

LOCATION, SIZE CONDITION AND CONSERVATION STATUS

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 sandbars 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.

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, Chinese tallow and other exotic weeds have invaded sandbar habitat; this is a particularly severe problem in the southern part of the state. It is important to note that many sandbars in the MSRAP have been sown to coastal bermudagrass for hay production.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	2	*Sterna antillarum athalassos*	Interior Least Tern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper

THREATS

	4. Riverfront Forests/Herblands/Sandbars			
	CLASSIFICATION	**SUBCLASS**	**3.1 Cottonwood/Black Willow/River Birch Woodlands**	**3.2 Sandbars**
1	Residential and commercial development	1.1 Housing and urban areas	L	
		1.2 Commercial and industrial areas	L	
		1.3 Tourism and recreation areas	L	H
2	Agriculture and aquaculture	2.3 Livestock farming and ranching	L	
3	Energy production and mining	3.2 Mining and quarrying: sand/gravel mining	M	H
5	Biological resource use	5.4 Fishing and harvesting aquatic resources: Overharvest/overexploitation of alligator snapping turtle	L	
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use, boat traffic, trash from camping or other human activities	H	H
7	Natural system modifications	7.2 Dams and water management/use:		
		Operation of dams/impoundments	H	H
		Channel modification	L	H
		Groundwater and surface water withdrawal	L	
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Chinese tallow, Chinese privet, wild hogs, fire ants, Johnson grass, cogongrass, non-native pasture grasses, opportunistic predators (i.e. raccoons, crows attracted to trash left behind by recreational users)	H	H
9	Pollution	9.4 Garbage and solid wastes		M

PRIORITY CONSERVATION ACTIONS

3. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**3.1 Cottonwood/Black Willow/River Birch Woodlands**	**3.2 Sandbars**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible: Discourage disturbance at colonial waterbird roosting/nesting sites.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds; Encourage habitat restoration through reforestation with site appropriate species.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

3. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**3.1 Cottonwood/Black Willow/River Birch Woodlands**	**3.2 Sandbars**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X

3. Riverfront Forests/Herblands/Sandbars			
CLASSIFICATION	**SUBCLASS**	**3.1 Cottonwood/Black Willow/River Birch Woodlands**	**3.2 Sandbars**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

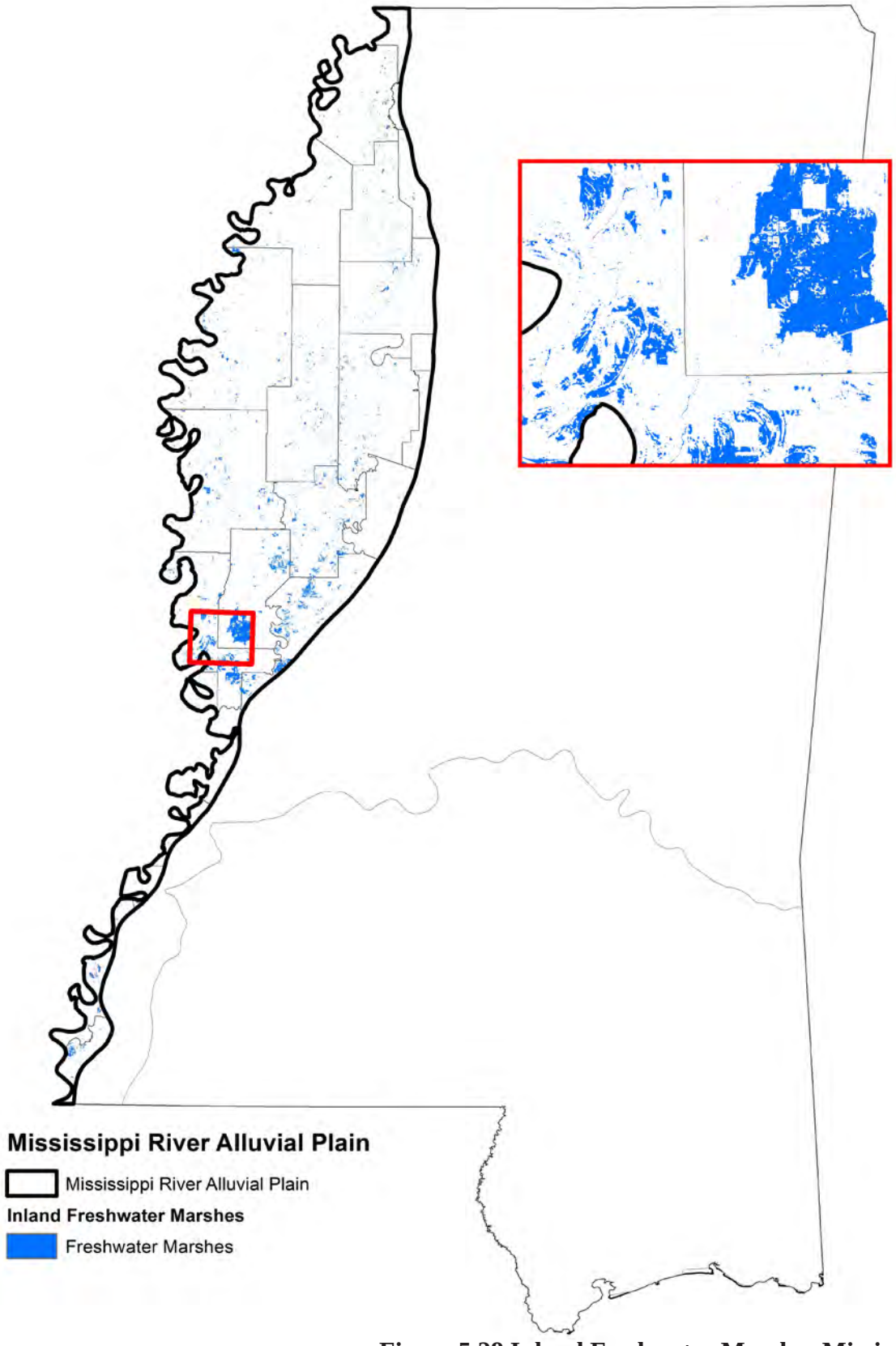

Figure 5.28 Inland Freshwater Marshes Mississippi River Alluvial Plain Ecoregion - with inset showing detail.

4. Inland Freshwater Marshes

It is estimated that there are approximately 200,000 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 in the MSRAP: 4.1 Freshwater Marshes.

GENERAL CONDITION

Mississippi experienced a 59 percent loss in wetlands from 1780s (9,872,000 acres) to the 1980s (4,067,000 acres) due to land use changes. In the 1780s wetlands comprised 32 percent of the area of Mississippi but by the 1980s wetlands comprised only 13 percent of the area of Mississippi. 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 Natural Heritage Program 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.

4.1 Freshwater Marshes

DESCRIPTION

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 waterthyme, are present. The deeper zones contain a variety of emergent aquatic plants such as pondweed, watershield, American lotus and American white 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, climbing hempvine, redtop panicgrass, camphor pluchea, swamp smartweed, waterpod and lizard's tail. Introduced exotic weeds such as alligatorweed, giant salvinia, waterthyme, water lettuce, Eurasian milfoil and water hyacinth tend to overwhelm marshlands by their rapid and abundant growth.

There are two ecological communities in this subtype: Freshwater marsh and Semi-permanently flooded marsh. The ecological community called "freshwater marsh" is an area of shallow water and mucky saturated soils along the shoreline. It contains a variety of herbaceous plants, but reeds, bulrushes, flatsedges, ditch stonecrop, and lizard's tail are characteristic species. Giant cutgrass, pickerel weed, cattail, rosemallow and primrose willow along with numerous other graminoids and herbs may also be present. Other typical species include valley redstem, cardinal flower, aquatic milkweed, jewelweed, common rush, climbing hempvine, redtop panicgrass, camphor pluchea, swamp smartweed, and waterpod.

As its name implies, semipermanently flooded marshes are seasonally inundated by high water events. This community is usually in the zone above the freshwater marsh, on broad flat areas of the alluvial plain. Oneflower false fiddleleaf, alligatorweed, and denseflower knotweed form dense patches of vegetation. Many of the plants found in freshwater marshes may also be found in this zone. This habitat would be typical at the head of most MSRAP lakes, for example Swan Lake near Clarksdale, MS and the Indianola Wildlife Management Area.

Throughout Mississippi, marshy habitat has been created by water control structures, which manage stream discharges. 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Freshwater marsh	*Juncus spp.-Scirpus spp.-Cyperus spp.-Penthorum sedoides-Saururus cernuus*	S3
Semi-permanently flooded marsh	*Hydrolea uniflora –Alternanthera philoxeroides-Persicaria densiflora*	S5

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. Freshwater marshes occur throughout the state but are more commonly found in lowlands and floodplains in the Mississippi Delta. They are adjacent to a variety of agricultural, forested and urban lands. There are approximately **120,000 acres** of freshwater marsh in the MSRAP ecoregion of the state.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Elanoides forficatus*	Swallow-tailed Kite
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	2	*Asio flammeus*	Short-eared Owl
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria Americana*	Wood Stork
	2	*Sterna antillarum athalassos*	Interior Least Tern
	3	*Anhinga anhinga*	Anhinga
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpine*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Ixobrychus exilis*	Least Bittern
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Porphyrula martinica*	Purple Gallinule
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat

THREATS

	4. Inland Freshwater Marshes		
	CLASSIFICATION	**SUBCLASS**	**4.1 Freshwater Marshes**
1	Residential and commercial development	1.1 Housing and urban areas	M
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use, nutrient runoff, sedimentation, spray drift, agricultural conversion (historical), conversion to catfish ponds	H
4	Transportation and service corridors	4.1 Roads and railways: lack of wildlife corridors/underpasses	L
5	Biological Resource Use	5.3 Logging and wood harvesting	L
7	Natural system modification	7.2 Dams and water management/use: Operation of dams/impoundments, channel modification, groundwater and surface water withdrawal	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Cogongrass, Chinese tallow, wild hogs, Japanese climbing fern, water hyacinth, alligator weed	H
9	Pollution	9.3 Agricultural and forestry effluents	H

PRIORITY CONSERVATION ACTIONS

4. Inland Freshwater Marshes		
CLASSIFICATION	**CONSERVATION ACTION**	**4.1 Freshwater Marshes**
1.0 Land/Water Protection		
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
1.2 Resource and habitat protection		X
2.0 Land/Water Management		
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X
3.0 Species Management		
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X
4.0 Education and Awareness		
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X
	Provide public education about the conservation of SGCN and/or their habitats.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
	Encourage proper disposal and cleanup of waste and litter.	X

4. Inland Freshwater Marshes		
CLASSIFICATION	**CONSERVATION ACTION**	**4.1 Freshwater Marshes**
5.0 Law and Policy		
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X
	Improve enforcement of existing species protection regulations.	X
	Encourage proper disposal and cleanup of waste and litter.	X
6.0 Livelihood, economic and other incentives		
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X
7.0 External Capacity Building		
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X

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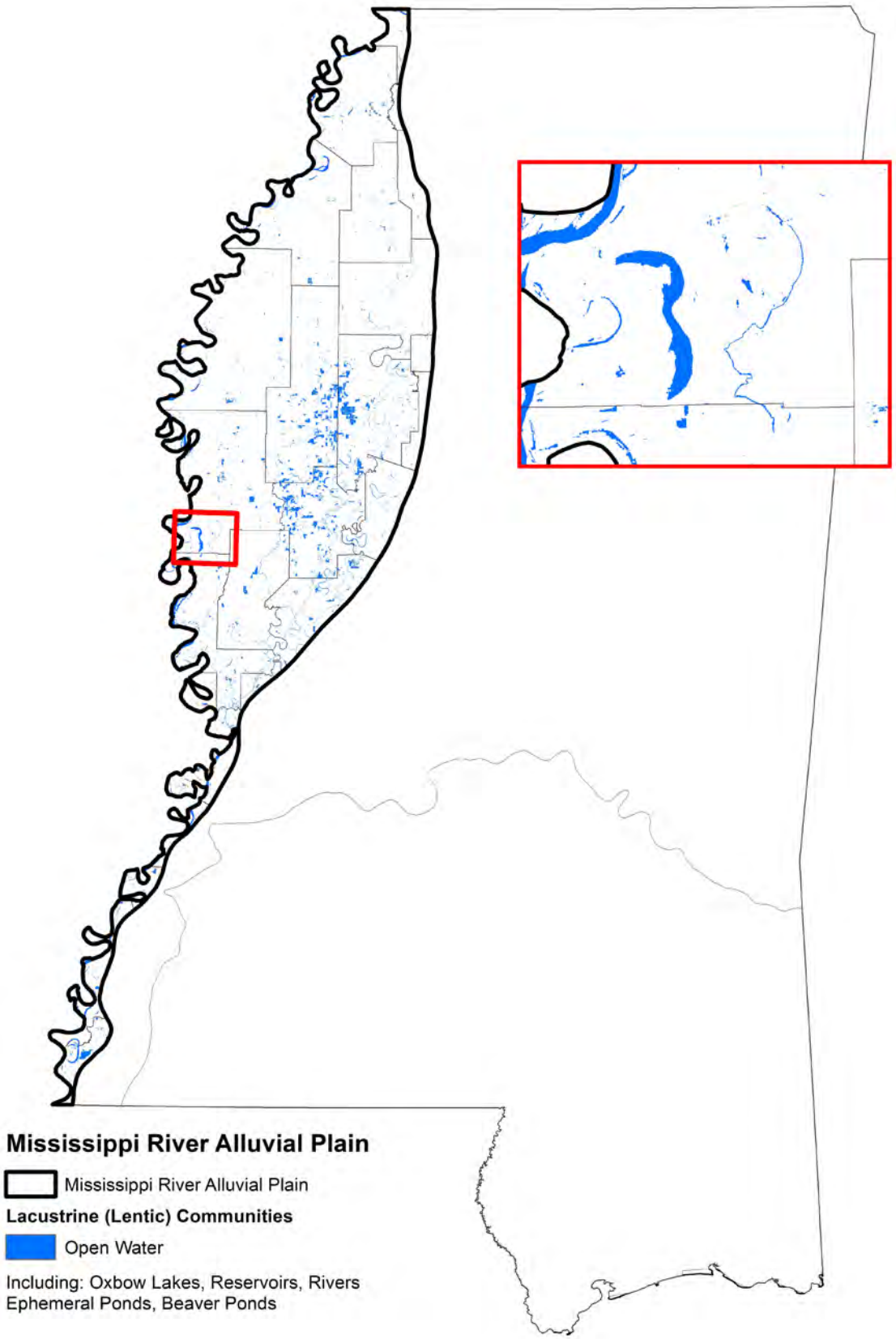


Figure 5.29 Lacustrine (Lentic) In Mississippi River Alluvial Plain Ecoregion - with inset showing detail.

5. Lacustrine (Lentic) Communities

Lacustrine refers to standing water 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, ephemeral ponds and beaver ponds. In 2015, the MDWFP Fisheries Bureau reported that there were 83 publicly owned lakes and reservoirs in Mississippi totaling 173,123 acres. MDEQ data has reservoirs and ponds (>25 acres) covering approximately 273,000 acres. The largest reservoirs include flood-control impoundments in the Yazoo Basin and the Ross Barnett Reservoir, a water supply lake near Jackson, MS.

This type includes three subtypes in the MSRAP: 5.1 Oxbow Lakes, 5.2 Ephemeral (Temporary) Ponds, and 5.3 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, however, stream channel alterations, levees, deforestation and water diversions impact the natural progression of oxbow lakes by modifying runoff and accelerating sediment accumulation.

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 2008-2012, 30 percent of the fish kills investigated by MDEQ were associated with low dissolved oxygen and 24 percent with nutrient overloads, sewage spills or unpermitted discharge. 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. Species 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.

5.1 Oxbow Lakes

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 meander and cut off 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 higher lake levels after stream levels decrease, improving fisheries but negatively impacting other species, such as birds that feed on mudflats.

Oxbow lakes support a variety of fish, amphibians, reptiles, mammals, and wading and shorebirds. Although floodwater sometimes enters or inundates r oxbow lake which allows 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 water level fluctuations 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 the stream moves further away from an oxbow lake over time, the lake tends 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 and to support a fish assemblage composed of more fish-eating species. Oxbow lakes are widespread along the Mississippi River. Examples of oxbow lakes can be found on many public lands including Shipland Wildlife Management Area in Issaquena County.

MNHP Ecological Community	Species Associations	MNHP Rank
Floodplain pool	Open water/barren substrate supporting aquatic organisms; sparse vegetation attached to substrate	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

There are 264 oxbow lakes in Mississippi which total 55,644 acres. There are 35 major oxbow lakes in the Delta region totaling **50,200 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	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Mycteria americana*	Wood Stork
	2	*Sterna antillarum athalassos*	Interior Least Tern
	3	*Anhinga anhinga*	Anhinga
	3	*Aythya affinis*	Lesser Scaup
	3	*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	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Protonotaria citrea*	Prothonotary Warbler
Fish	3	*Atractosteus spatula*	Alligator Gar
	3	*Etheostoma asprigene*	Mud Darter
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
	3	*Sander canadense*	Sauger
	3	*Sander vitreum*	Walleye
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle
	3	*Deirochelys reticularia miaria*	Western Chicken Turtle

5.2 Ephemeral (Temporary) Ponds

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.

MNHP Ecological Community	Species Associations	MNHP Rank
Pond (natural)	Open water/barren substrate supporting aquatic organisms; sparse vegetation attached to substrate	S1

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH EPHEMERAL PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
	3	*Lithobates palustris*	Pickerel Frogs
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	2	*Sterna antillarum athalassos*	Interior Least Tern
	3	*Caladris aplina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Porphyrula martinica*	Purple Gallinule
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	3	*Lasionycteris noctivagans*	Silver-haired Bat
Reptiles	3	*Deirochelys reticularia miaria*	Western Chicken Turtle

5.3 Beaver Ponds

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. Beaver ponds can be found throughout the MSRAP.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. Because of the ephemeral nature of the beaver pond acreage estimates are not available.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Egretta caerula*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisana Waterthrush
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis Lucifigus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
Reptiles	3	*Deirochelys reticularia miaria*	Western Chicken Turtle

THREATS

5. Lacustrine (Lentic) Communities					
	CLASSIFICATION	**SUBCLASS**	**5.1 Oxbow Lakes**	**5.2 Ephemeral (Temporary) Ponds**	**5.3 Beaver Ponds**
1	Residential and commercial development	1.1 Housing and urban areas	L	M	
		1.2 Commercial and industrial areas	L	L	
		1.3 Tourism and recreation areas	L	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Incompatible agricultural practices, agricultural conversion (historical)	H	H	M
		2.3 Livestock farming and ranching: exclusion of livestock	L		M
3	Energy production and mining	3.2 Mining and quarrying	L		
4	Transportation and service corridors	4.1 Roads and railways	L	M	
5	Biological resource use	5.3 Logging and wood harvesting	L	H	
		5.4 Fishing and harvesting aquatic resources: Over exploitation/ Incidental capture of alligator snapping turtle, alligator gar, paddlefish	M		
6	Human intrusions and disturbance	6.1 Recreational activities: off road vehicle use	L	M	
7	Natural system modification	7.2 Dams and water management/use: Operation of dams/ impoundments, channel modification (removing connections to river), groundwater and surface water withdrawal	H	H	
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Johnson grass, Chinese tallow, Chinese privet, alligator weed, silver carp, bighead carp, zebra mussel, water hyacinth, parrot feather watermilfoil, cockleburr, nutria.	H	H	L
9	Pollution	9.3 Agricultural and forestry effluents: Spray drift; pesticide, herbicide and animal waste runoff	H		M

PRIORITY CONSERVATION ACTIONS

5. Lacustrine (Lentic) Communities				
CLASSIFICATION	**SUBCLASS**	**5.1 Oxbow Lakes**	**5.2 Ephemeral (Temporary) Ponds**	**5.3 Beaver Ponds**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	
	Discourage incompatible recreational uses.	X	X	
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take)	X	X	
	Continue to restrict/monitor scientific collection of SGCN.	X		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X

5. Lacustrine (Lentic) Communities				
CLASSIFICATION	**SUBCLASS**	**5.1 Oxbow Lakes**	**5.2 Ephemeral (Temporary) Ponds**	**5.3 Beaver Ponds**
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	

5. Lacustrine (Lentic) Communities				
CLASSIFICATION	**SUBCLASS**	**5.1 Oxbow Lakes**	**5.2 Ephemeral (Temporary) Ponds**	**5.3 Beaver Ponds**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Discourage incompatible recreational uses.	X	X	
	Improve enforcement of existing species protection regulations.	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X		
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	
6.2 Substitution	Discourage incompatible recreational uses.	X	X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

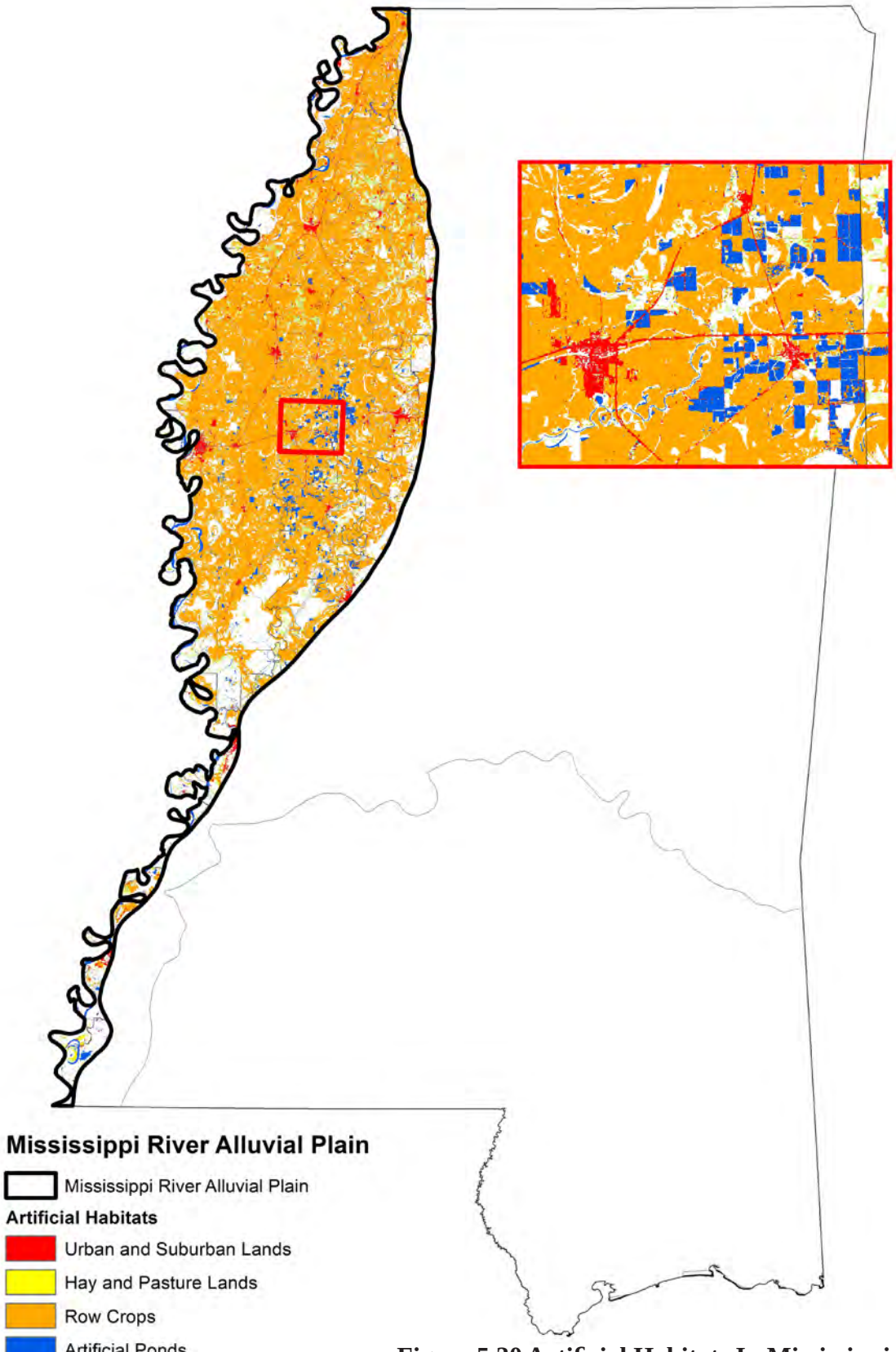


Figure 5.30 Artificial Habitats In Mississippi River Alluvial Plain Ecoregion - with inset showing detail.

6. Artificial Habitats

Artificial habitats are those that have been altered by humans in some way. While often considered degraded or disturbed, these habitats will be used by some species, most often birds and bats. These areas may contain some remnant of the original vegetation but are usually greatly altered, with many invasive, noxious, or exotic species dominating. Small patches of less disturbed habitat may exist within larger disturbed areas that allows for many species to survive, and sometimes thrive.

This type includes eight subtypes in the MSRAP: 6.1 Urban and Suburban Lands, 6.2 Buildings, Bridges, Overpasses, Etc., 6.3 Utility Right-of-ways, 6.4 Hay and Pasture Lands, 6.5 Pine Plantations, 6.6 Shrublands, 6.7 Row Crops, and 6.8 Artificial Ponds.

6.1 Urban and Suburban Lands

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; 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 increased erosion and a degradation of the water quality of streams below these areas.

Vacant lots, landscaped yards, vegetable gardens, fruit orchards, and wooded areas along drainages provide some habitats beneficial to wildlife. There are numerous native animals that spend part or all of their lives inside the city limits. Many programs, such as the National Wildlife Federation's Backyard Wildlife Habitat certification program, work to improve habitat quality in urban and suburban areas for wildlife. Habitat generalists, including birds like the mockingbird, house wren and mourning dove, and mammals such 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. Most rare species tend to avoid the urban areas, if possible, or are extirpated from developed areas due to deterioration of their habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Urban and suburban lands encompass one to two percent of the land area of Mississippi, nearly **200,000 acres** in the MSRAP ecoregion of Mississippi. 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 of hardwood and pine forests and cutover areas, agriculture fields and wetlands along the creeks and rivers.

SGCN are rarely found in urban and suburban areas, partially due to the loss of habitat for these species. However, some species of wildlife (especially birds) have thrived in urban settings and may be more common than in pre-settlement 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	3	*Tyto alba*	Barn Owl
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat

6.2 Buildings, Bridges, Overpasses, Etc.

DESCRIPTION

Structures such as buildings, bridges, overpasses, and culverts can provide habitat for several bird and bat species. The structures can serve as nesting sites or as winter roosts. Properly designed bridges and culverts can mitigate loss of habitat for some bat species. For little to no costs, existing bridges can be modified to provide better roosting habitat for bats. 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 human disturbances from traffic and rebuilding efforts. Abandoned buildings, while commonly used as bat roosts, decay quickly and become unsuitable over time. As a result, bridges and buildings often do not provide a permanent roosting site for many bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

This habitat subtype is mostly concentrated in urban centers. Some are found in isolated areas such as bridges and culverts along major road systems, or abandoned homes in rural areas. There are thousands of buildings in the state. Acreage of this subtype is combined in that of urban and suburban lands type. Buildings are made of impervious materials and cause increased amounts 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, bridges, overpasses and culverts are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH URBAN AND SUBURBAN LANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	3	*Tyto alba*	Barn Owl
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	3	*Myotis septentrionalis*	Northern Long-eared Bat

6.3 Utility Right-of-ways

DESCRIPTION

Utility Right-of-ways (ROWs) are corridors used for transmission lines or gas pipelines. In eastern US many are found in wooded areas. Impacts on surrounding ecosystems can be detrimental but properly managed ROWs can have positive aspects. ROWs can contain grass, shrub or wetland habitats, or a mixture of many habitats. Gas pipeline ROWs usually involve much more impact on the environment, denuding most of the corridor, and the gas pipeline industry requires that herbaceous cover be maintained over shrub cover. For this ecoregion, canebrakes are the community type that probably has been positively impacted by the presence of utility right-of-ways.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

ROWs are found throughout the state. Development of this subtype usually results in the loss of other more valuable wildlife habitat.

Utility ROWs are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UTILITY RIGHT-OF-WAYS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Columbia passerina*	Common Ground-dove
	3	*Antrostomus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Scolopax minor*	American Woodcock
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake

6.4 Hay and Pasture Lands

DESCRIPTION

A large percentage of the land surface area of Mississippi is in various states 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 – 49 percent of Mississippi is non-forested and is dominated by shrubs, small trees, and herbs. The land use/land cover estimates indicate that there are nearly 7 million acres of pasture/grassland. The amount of non-cultivated land has increased since 1982; conversely the acreage of cultivated land has decreased, due mainly to economic factors and 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.

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 non-native grass varieties, such as fescue and Bermuda grass. Unimproved pastures that are heavily grazed contain a variety of native and non-native grasses and weeds. Some weeds that are unpalatable will increase in grazed pastures. If left ungrazed or not managed by mowing, tillage, or prescribed burning, trees and shrubs quickly invade and form brushy thickets and eventually woodlands.

MNHP Ecological Community	Species Associations	MNHP Rank
Disturbed upland grassland (old field/pasture/mowed)	*Solidago canadensis - Symphyotrichum pilosum - Verbena brasiliensis*	S5
Mesic grassland (savanna) – mowed	Savanna graminoids such as *Dichanthelium, Schizachyrium scoparium, and Aristida purpurascens*	SM
Disturbed wetland grassland (pasture/mowed)	*Paspalum sp. - Panicum rigidulum - Rubus sp.*	S4?

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. It is estimated there are more than **30,000 acres** of hay and pasture in the MSRAP ecoregion. They often occur on less productive soils and steeper hill slopes. Pine and hardwood forests, pine plantations and cutover areas often adjoin this subtype.

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 UTILITY RIGHT-OF-WAYS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Scolopax minor*	American Woodcock
	3	*Tyto alba*	Barn Owl
Mammals	2	*Lasiurus cinereus*	Hoary Bat
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake

6.5 Shrublands

DESCRIPTION

The northern upland shrub and wetland scrub-shrub communities make up this subtype in this ecoregion. A large percentage of the land surface area of Mississippi is in various stages of regeneration after clearing due to logging, cropping, or natural disasters such as catastrophic fires or windstorms. The small stature of shrubs and young hardwood trees is the main distinguishing feature differentiating this type from others. In the first years of growth after disturbance, shrubs have been released, and trees proportionately cover a small area of the ground surface. With the loss of canopy trees, herbs, vines, and shrubs that were already established will flourish. They quickly respond to the increased nutrient and light availability.

Although widely varying in duration of their abundance, 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 will become widespread. Shrubs, coppicing hardwoods, and seedling hardwoods overshadow the openings and reduce the abundance of herbs. If the opening is an old field, variety of trees that have wind dispersed seeds including such species as pines, sweetgum, ash, winged elm, and red maple readily encroach into openings. Often hickories and oaks are also prevalent. Within the next five to ten years, shrubs and trees regain dominance. Scrub – shrub vegetation often contains a wide variety of opportunistic and invasive species like poison ivy, Japanese honeysuckle, and Chinese privet. The northern scrub – shrub type contains a variety trees, shrubs, woody vines, including devil's walking stick, eastern baccharis, American beautyberry, common persimmon, sassafras, sweetgum, hickory, oak, sumac, winged elm, grape, Virginia creeper, and poison ivy. Wetland scrub – shrub vegetation contains an abundance of vines including American buckwheat vine, grape, trumpet creeper, peppervine, Japanese honeysuckle, and an assortment of shrubs and trees, i.e., red maple, hickory, swamp tupelo, giant cane, common buttonbush, planertree, ash, possumhaw holly, Chinese privet, sugarberry, and hawthorn. The vegetation is deemed a forest once trees reach an average height of 15 feet tall.

Old fields or fallow lands contain a variety of annual and perennial weeds and may support such grasses as purpletop tridens, velvet panicum, bristlegrass, bahia grass, and Johnson grass. Many fields, roadsides, and yards are maintained in an open grassy condition by mowing periodically during the growing season. Areas not mowed support a large number of ruderal herbs including annual ragweed, Canada golderrod, annual marshelder, and Queen Anne's lace. Ideal growing conditions in the spring bring a flush of ephemeral herbs to mowed areas, waste places, vacant lots, and along roadsides. The seasonal wetness prevents the areas from being mowed. Some of the common forbs are: bittercress, bluestar, Carolina bristlemallow, butterweed, bedstraw, buttercup, chervil, chickweed, cinquefoil, clover, cornsalad, corn speedwell, crowpoison, dandelion, forget me not, garlic, geranium, Japanese mazus, lyreleaf sage, field madder, Philadelphia fleabane, plantain, Carolina ponysfoot, spotted medick, toadflax, and Venus' lookingglass. If fields and grassy openings are left unattended over several years, shrubs, vines, and small pine and hardwood trees, such as possumhaw holly, eastern redcedar, Chinese privet, rattan vine, persimmon, and eastern baccharis will steadily increase in cover.

MNHP Ecological Community	Species Associations	MNHP Rank
Northern upland scrub - shrub	*Rhus copallina - Rubus sp.*	S5
Wetland scrub - shrub	Mixed shrubs and young trees	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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, over **180,000 acres** in the MSRAP ecoregion of Mississippi.

The vegetation of this subtype is in transition as trees gain coverage and dominance of the stand. Succession of open shrubland or old fields can be set back with prescribed fire. 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 SHRUBLANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Colulmbina passerina*	Common Ground Dove
	2	*Passerina ciris*	Painted Bunting
	3	*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*	Barn Owl
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake

6.6 Row Crops

DESCRIPTION

The amount and type of herbaceous cover will depend on many factors including field usage, crop phenology, and types and frequency of agricultural treatments. As estimated by the Natural Resources Conservation Service, 55 percent of Mississippi's farmland is in cropland and produces such commodities as cereal, soybeans, cotton, vegetables, and oil seed. The amount and type of herbaceous cover will depend on many factors including field usage, crop phenology, and types and frequency of agricultural treatments. According to the National Agriculture Statistical Service, in 2012 Mississippi had over 3 million acres of land in farms, about 33 percent of the total land area of Mississippi.

MNHP Ecological Community	Species Associations	MNHP Rank
Row crops	Monoculture plantings of species, particularly *Glycine max, Gossypium sp., Zea mays*	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 5 million acres, where 65 percent is used for crops, roughly **3 million acres**. 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, they 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. Northern Bobwhite, which are in considerable decline, are dependent on the availability of ample cover and food (seeds and insects) resources from native grasses and forbs in agricultural landscapes.

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 AGRICULTURAL FIELDS (ROW CROPS)

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Ambystoma texanum*	Small-mouthed Salamander
Birds	1		Migrant Shorebirds
	1	*Coturnicops noveboracensis*	Yellow Rail
	2	*Ammodramus leconteii*	LeConte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	2	*Eudocimus albus*	White Ibis
	2	*Rallus elegans*	King Rail
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpina*	Dunlin
	3	*Colinus virginianus*	Northern Bobwhite
	3	*Ixobrychus exilis*	Least Bittern
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Porphyrula martinica*	Purple Gallinule
	3	*Tyto alba*	Barn Owl
Mammals	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis lucifugus*	Little Brown Bat
Reptiles	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake

6.7 Artificial Ponds

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. 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. 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

Mississippi has more than 160,000 small water bodies less than 100 acres totaling more than **190,000 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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL PONDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Lithobates palustris*	Pickerel Frog
Birds	1		Migrant Shorebirds
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Mycteria americana*	Wood Stork
	3	*Anhinga anhinga*	Anhinga
	3	*Aythya affinis*	Lesser Scaup
	3	*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	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle
Mammals	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Myotis Lucifigus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat

THREATS TO ARTIFICIAL HABITATS

6. Artificial Habitats									
	CLASSIFICATION	**SUBCLASS**	**6.1 Urban and Suburban Lands**	**6.2 Buildings, Bridges, and Overpasses, Etc.**	**6.3 Utility Right-of-ways**	**6.4 Hay and Pasture Lands**	**6.5 Shrublands**	**6.6 Row Crops**	**6.7 Artificial Ponds**
1	Residential and commercial development	1.1 Housing and urban areas: bat species killed or displaced from roosts				M	M	M	
		1.2 Commercial and industrial areas				L	L	L	
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use, conventional tilling practices, sedimentation, erosion, excessive fertilization, lack of field borders/buffers.				H	L	H	M
		2.2 Wood and pulp plantations: Conversion to offsite forest species				H	H		
		2.3 Livestock farming and ranching				M			M
4	Transportation and service corridors	4.1 Roads and railways: Road construction/ maintenance, incompatible bridge designs, timing of bridge maintenance, destruction of bat roosts, lack or wildlife crossings or corridors	H	H		L	L		
		4.2 Utility and service lines: Indiscriminate use of herbicides, blanket coverage of herbicides destroying native vegetation			H				
6	Human intrusions and disturbance	6.1 Recreational activities	L	L	H				
7	Natural system modifications	7.1 Fire and fire suppression: altered fire regimes				H	H		
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Fire ants, cogongrass, wild hogs, Johnson grass, Chinese privet, goosegrass, nutsedge, non-native morning glories, Water hyacinth, alligator weed, torpedo grass, Japanese honeysuckle, kudzu			H	H	H	H	L
		8.2 Problematic native species: encroachment of native species due to lack of fire				H			
9	Pollution	9.3 Agricultural and forestry effluents							M

PRIORITY CONSERVATION ACTIONS

6. Artificial Habitats								
CLASSIFICATION	**SUBCLASS**	**6.1 Urban and Suburban Lands**	**6.2 Buildings, Bridges, and Overpasses, Etc.**	**6.3 Utility Right-of-ways**	**6.4 Hay and Pasture Lands**	**6.5 Shrublands**	**6.6 Row Crops**	**6.7 Artificial Ponds**
1.0 Land/Water Protection								
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X			X		X	X
1.2 Resource and habitat protection		X			X		X	X
2.0 Land/Water Management								
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X		X	X	X	
	Discourage incompatible recreational uses.	X	X					
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X				
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X		X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.		X					X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X		X	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X	X	X	X	X
3.0 Species Management								
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X		X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).		X		X	X		

6. Artificial Habitats								
CLASSIFICATION	**SUBCLASS**	**6.1 Urban and Suburban Lands**	**6.2 Buildings, Bridges, and Overpasses, Etc.**	**6.3 Utility Right-of-ways**	**6.4 Hay and Pasture Lands**	**6.5 Shrublands**	**6.6 Row Crops**	**6.7 Artificial Ponds**
3.1 Species management	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X				
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X
4.0 Education and Awareness								
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X		
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.				X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X		X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X	X	X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X				
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X		X	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X				
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X	X
5.0 Law and Policy								
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X	X	X	
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.							X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X	X	X	

6. Artificial Habitats								
CLASSIFICATION	**SUBCLASS**	**6.1 Urban and Suburban Lands**	**6.2 Buildings, Bridges, and Overpasses, Etc.**	**6.3 Utility Right-of-ways**	**6.4 Hay and Pasture Lands**	**6.5 Shrublands**	**6.6 Row Crops**	**6.7 Artificial Ponds**
5.2 Policies and regulations	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X					X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X		X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.					X		
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.							X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X					X	X
	Discourage incompatible recreational uses.		X					
	Improve enforcement of existing species protection regulations.	X	X	X	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.							
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X	X
6.0 Livelihood, economic and other incentives								
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	X	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X	X	X	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X		X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X
7.0 External Capacity Building								
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X	X	X	X

Figure 5.31 Northern Gulf Of Mexico Ecoregion

D. Northern Gulf of Mexico (NGM)

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. These habitats grade through salt marshes to productive estuaries. For the purposes of this plan, habitats including upland maritime and estuarine fringe beaches, maritime grasslands, scrub and maritime forests have been classified as part of the NGM ecoregion.

In Mississippi, the NGM 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 mud. 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 of the most fertile lands in the world. However, because much of this land is in agricultural use, fertilizers, herbicides and pesticides threaten the productivity of the Gulf.

The Gulf is ranked as the top region in the country for seafood harvest in both poundage and monetary value. In 1997, the estimated commercial value of the finfish and shell-fish harvest was $823 million. 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 are abundant in the NGM and are estimated to be ten times more valuable to humans than any terrestrial habitat for ecosystem services like food production, recreation and nutrient cycling.

NGM Habitats:

1. Upland Maritime and Estuarine Fringe
    - 1.1 Barrier Island Uplands
    - 1.2 Barrier Island Wetlands
    - 1.3 Barrier Island Beaches
    - 1.4 Mainland Beaches
    - 1.5 Shell Middens and Estuarine Shrublands
    - 1.6 Maritime Woodlands
2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)
    - 2.1 Estuarine Bays, Lakes and Tidal Streams
    - 2.2 Estuarine Marshes
    - 2.3 Salt Pannes
    - 2.4 Seagrass Beds
    - 2.5 Mollusk Reefs
    - 2.6 Mississippi Sound
    - 2.7 Barrier Island Passes
3. Marine Habitats (Outside Barrier Islands)
    - 3.1 Marine Habitats (Smooth Bottoms)
    - 3.2 Hard Bottoms and Oceanic Reefs
4. Artificial Habitats
    - 4.1 Man-Made Beaches
    - 4.2 Artificial Reefs
    - 4.3 Urban and Suburban Lands
    - 4.4 Buildings, Bridges, Overpasses Etc.
    - 4.5 Utility Right-of-ways

Figure 5.32 Upper Maritime And Estuarine Fringe In Northern Gulf Of Mexico Ecoregion

1. 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 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 1700s and is now located about four miles west of Dauphin Island. Round and Deer Islands are mainland remnants isolated by rising sea level. Sand Island (aka Spoil Island) was created by dredge spoil from channel maintenance. Some of their habitats are similar to the barrier islands and are included in island habitat descriptions below.

This type includes six subtypes: 1.1 Barrier Island Uplands, 1.2 Barrier Island Wetlands, 1.3 Barrier Island Beaches 1.4 Mainland Beaches, 1.5 Shell Middens and Estuarine Shrublands and 1.6 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 2, Estuary and Mississippi Sound, for additional discussion on conditions of coastal habitats.

1.1 Barrier Island Uplands

DESCRIPTION

Barrier island uplands include dry to mesic meadows and inland dune systems. Both of these habitats consist of excessively well-drained windblown sand, and some upland areas may be 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, and salt spray. As flats and berms along the back beach 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.

Back beaches and semi-stable dunes commonly support a sparse cover of a variety of graminoids, including gulf bluestem, Leconte's flatsedge, sea oats, and southern umbrella sedge. Common herbs are squareflower, poorjoe, pineland scalypink, Dixie sandmat, camphorweed, coastal sands frostweed and beach morning glory. 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. Relict dunes are dominated by shrubby species: wild rosemary, woody goldenrod, prickly pear, saw palmetto and occasionally sand live oak.

The dry meadows are dominated by southern umbrella sedge, torpedo grass, broomsedge, needlepod rush and contain lesser amounts of saltmeadow cordgrass. These non-forested areas are somewhat higher than marshes, but with more available moisture than beach or relic dunes. This habitat occupies swales behind the primary dunes and along low treeless interior beach ridges in exposed areas. They may be inundated in some seasons but usually dry out in the summer and fall.

Two types of woodlands are found on the barrier islands: slash pine dominated and live oak and /or sand live oak dominated woods. Soils vary from sandy to peaty and fire is an important component of the habitats. A sparse to moderately dense shrub layer composed of saw palmetto, winged sumac, beach rosemary, wax myrtle, eastern baccharis and yaupon may be present in both woodland types. Live oaks represent a climax woodland community on the islands. Yaupon and sand live oak are present in the understory of this woodland.

MNHP Ecological Community	Species Associations	MNHP Rank
Barrier island mesic/xeric meadows	*Fuirena scirpoidea - Dichanthelium sabulorum var. patulum - Euthamia leptocephala*	S2
Barrier island relic dune shrubland/ scrub oak	*Ceratiola ericoides - Chrysoma pauciflosculosa - Helianthemum arenicola*	S2
Barrier island slash pine woodland	*Pinus elliottii –Serenoa repens*	NR
Barrier island live oak woodland	*Quercus virginiana – Q. geminata*	NR

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 supports a total of **2,000 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 aggradation, which is necessary to compensate for normal losses caused by wind and wave action during storms. The size of the relict dunes has been diminished and apparently the area occupied by mobile sand dunes is increasing. Some areas have exotic weeds (cogongrass). However, most of the islands are protected as a national park by federal statues and some areas are designated as “wilderness”.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Charadrius alexandrinus tenuirostris*	Southeastern Snowy Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Haematopus palliatus*	American Oystercatcher
	1		Migrant Songbirds
	2	*Asio flammeus*	Short-eared Owl
	2	*Caprimulgus carolinensis*	Chuck-will's-widow
	2	*Columbina passerina*	Common Ground-Dove
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Dendroica discolor*	Prairie Warbler
	3	*Falco peregrinus*	Peregrine Falcon
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Pandion haliaetus*	Osprey
	3	*Passerina ciris*	Painted Bunting
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
	3	*Tyto alba*	Barn Owl
Insects	1	*Pogonomyrmex badius*	Florida Harvester Ant
Reptiles	3	*Masticophis flagellum*	Eastern Coachwhip

1.2 Barrier Island Wetlands

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.

Fresh water marshes on the barrier islands are located in troughs between sand ridges; areas closest to the island's shoreline will have a brackish component, while the areas near the island's interior will be nearly completely composed of fresh water. The deepest areas of inundation will be vegetated by white waterlily and bladderworts, closer to shore Jamaica swamp sawgrass will dominate and the borders of the marsh will be composed of black needlerush. Cattails and bulltongue arrowhead will be present with the Jamaica swamp sawgrass.

Saltmeadow cordgrass, marsh fimby and American cupscale are also usually found in association with the black needlerush community. Common reed is present in this community type on Horn and Petit Bois Islands.

Brackish marshes are characterized by a salinity range of 0.1 to 1.5 percent through most of the year, and this impacts the vegetation present in this habitat. They are often composed of relatively pure stands of black needlerush, but smooth cordgrass is a common associate in zones. Carolina sealavender, American bulrush and sturdy bulrush may be occasionally found in brackish marshes.

Slightly elevated above brackish marshes are the salt meadows, which are dominated by salt meadow cordgrass and torpedo grass. Saltmarsh morning glory, dotted smartweed, bushy goldentop, and poorjoe are common forbs.

The estuarine shrublands contain an abundance of eastern baccharis, wax myrtle 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 slash pine woodlands 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, wax myrtle and occasionally, sand live oak. Herbs include bushy goldentop, erect centella, manyflower marsh pennywort, seaside primrose willow, saltmarsh morning glory and Maryland meadowbeauty.

MNHP Ecological Community	Species Associations	MNHP Rank
Barrier island freshwater marsh	*Cladium mariscus ssp jamaicense – Juncus roemerianus – Nymphaea odorata*	NR
Brackish marsh	*Juncus roemerianus – Spartina cynosuroides*	S3
Frequently flooded saline marsh	*Spartina alterniflora*	S2
Saltmeadow cordgrass herbaceous coastlands (high marsh)	*Spartina patens – Panicum virgatum – Baccharis halimifolia*	S2
Estuarine shrublands	*Baccharis halimifolia – Morella cerifera – Iva frutescens*	S3
Maritime slash pine flatwoods/ savanna	*Pinus elliottii – Spartina patens – Andropogon glomeratus var. glaucopsis*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

The wetlands, estimated to cover about **1,500 acres**, are found throughout the islands and comprise approximately half of the islands. The wetland complexes probably range from about 50 to 1,000 **acres** each in size.

Barrier island wetlands remain in good condition because most are under public ownership and are not threatened by development initiatives. Unfortunately, the exotic weed torpedo grass has become well established.

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, most of the wetlands are protected from further development and are maintained as a protected area by the National Park Service.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND WETLANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Charadrius alexandrinus tenuirostris*	Southeastern Snowy Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Haematopus palliatus*	American Oystercatcher
	1	*Laterallus jamaicensis*	Black Rail
	1		Migrant Shorebirds
	2	*Ammodramus maritimus*	Seaside Sparrow
	2	*Ammodramus nelsoni*	Nelson's Sparrow
	2	*Anas fulvigula*	Mottled Duck
	2	*Asio flammeus*	Short-eared Owl
	2	*Calidris melodus*	Red Knot
	2	*Charadrius melodus*	Piping Plover
	2	*Egretta caerulea*	Little Blue Heron
	2	*Egretta rufescens*	Reddish Egret
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limosa fedoa*	Marbled Godwit
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Ixobrychus exilis*	Least Bittern
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Pelecanus occidentalis*	Brown Pelican
Reptiles	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake

1.3 Barrier Island Beaches

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 can 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 area of the beach between the high tide line and the dunes and serves as a transition zone to the vegetated landscape. The wrack line forms at the edge of the high tide mark and seaborne debris and dead animals accumulate, creating foraging grounds for many species. 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 beach habitats in Mississippi are ephemeral habitats such as wrack line deposits including bryozoans, algae, seagrasses, and detritus. These are seasonally important and provide structural habitat and nutrient and carbon sources that are used by invertebrates, fishes and wading birds.

MNHP Ecological Community	Species Associations	MNHP Rank
Barrier island beach dune herbland	*Uniola paniculata – Ipomoea stolonifera – Heterotheca subaxillaris*	S2

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 **5,000 acres** of this habitat in the state.

The barrier island beaches are largely considered intact because very limited development has occurred on the islands. Environmental forces continually reshape 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	1	*Charadrius alexandrinus tenuirostris*	Southeastern Snowy Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Haematopus palliatus*	American Oystercatcher
	2	*Calidris canutus*	Red Knot
	2	*Charadrius melodus*	Piping Plover
	2	*Egretta rufescens*	Reddish Egret
	2	*Limosa fedoa*	Marbled Godwit
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Falco peregrinus*	Peregrine Falcon
	3	*Pelecanus occidentalis*	Brown Pelican
Reptiles	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin

1.4 Mainland Natural Beaches

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 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 such as wrack line deposits including bryozoans, algae, seagrasses, and detritus. These are seasonally important and provide structural habitat and nutrient and carbon sources that are used by invertebrates, fishes and wading birds.

MNHP Ecological Community	Species Associations	MNHP Rank
Unvegetated sand shore	*Lepidactylus sp.* - *Paraonis fulgens* - *Emerita talpoida* - *Malaclemys terrapin*	S1
Unvegetated mud shore	*Uca minax* - *Sesarma reticulatum* - *Littoridinops palustris* - *Tagelus plebeius*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 less than **500 acres** along approximately 300 miles of tidal stream. During high tide they become submerged, and at low tide they reemerge and expand in size. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Charadrius alexandrines tenuirostris*	Southeastern Snowy Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Haematopus palliatus*	American Oystercatcher
	1		Migrant Shorebirds
	2	*Calidris canutus*	Red Knot
	2	*Charadrius melodus*	Piping Plover
	2	*Egretta caerulea*	Little Blue Heron
	2	*Egretta rufescens*	Reddish Egret
	2	*Eudocimus albus*	White Ibis
	2	*Limosa fedoa*	Marbled Godwit
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Falco peregrinus*	Peregrine Falcon
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pelecanus occidentalis*	Brown Pelican
Reptiles	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin

1.5 Shell Middens and Estuarine Shrublands

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. Plants found on shell middens include southern red cedar, coral bean, gum bully, red buckeye, yucca and prickly pear.

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, wax myrtle and bigleaf sumpweed.

MNHP Ecological Community	Species Associations	MNHP Rank
Shell midden shrub/woodland	*Juniperus virginiana var. silicicola – Sideroxylon lanuginosum*	S1
Estuarine shrublands	*Baccharis halimifolia – Morella cerifera – Iva frutescens*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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 effect on the subtype. Increased nutrient loads from runoff (fertilizer, sewage etc.) 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Songbirds
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Passerina ciris*	Painted Bunting
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Dendroica discolor*	Prairie Warbler
	3	*Falco peregrinus*	Peregrine Falcon
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Seiurus motacilla*	Louisiana Waterthrush
Reptiles	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin

1.6 Maritime Woodlands

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, coastal live oak woodlands are situated on prominent coastal cheniers and ancient beach ridges that straddle the coast line. The live oak 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 live oak 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 live oak woodlands are found on deep sand ridges that are excessively well drained. They may include upland laurel Darlington's oak, live oak, dwarf live oak and rarely turkey oak. Gopher apple, elegant blazing star, prickly pear cactus, and woody goldenrod are common herbaceous plants found in this habitat.

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. Wax myrtle, 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 live oak forests provide essential points for neotropical migrants staging their trans-Gulf journey in the fall and recuperating upon their return in the spring.

MNHP Ecological Community	Species Associations	MNHP Rank
Maritime slash pine flatwoods/ savanna	*Pinus elliottii – Spartina patens – Andropogon glomeratus var. glaucopsis*	S1
Maritime live oak forest	*Quercus virginiana – Q. hemisphaerica*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Situated in highly urbanized coastal areas, maritime woodlands have been significantly impacted 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. It is estimated that there is approximately **2,000 acres** of this habitat in Mississippi. Some of the wettest areas near the Hancock County marsh and within the Grand Bay National Estuarine Research Reserve in Jackson County remain intact and provide prime examples of this subtype. The live oak woodlands have been extensively developed, but a few pockets remain on some large private holdings.

Extensive areas of maritime woodlands have been developed for other uses. Woodlands found on private lands are vulnerable to commercial development or intensive forest management. Much of the remaining areas are under public ownership. Cogongrass is rampant across the range of this community and has invaded much of the roadsides 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1		Migrant Songbirds
	2	*Aimophila aestivalis*	Bachman's Sparrow
	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Columbina passerina*	Common Ground-Dove
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Passerina ciris*	Painted Bunting
	2	*Setophaga cerulea*	Cerulean Warbler
	3	*Caprimulgus carolinensis*	Chuck-will's-widow
	3	*Dendroica discolor*	Prairie Warbler
	3	*Falco peregrinus*	Peregrine Falcon
	3	*Helmitheros vermivorus*	Worm-eating Warbler
	3	*Hylocichla mustelina*	Wood Thrush
	3	*Lanius ludovicianus*	Loggerhead Shrike
	3	*Melanerpes erythrocephalus*	Red-headed Woodpecker
	3	*Oporornis formosus*	Kentucky Warbler
	3	*Piranga olivacea*	Scarlet Tanager
	3	*Protonotaria citrea*	Prothonotary Warbler
	3	*Scolopax minor*	American Woodcock
	3	*Seiurus motacilla*	Louisiana Waterthrush
Reptiles	1	*Rhadinaea flavilata*	Pine Woods Snake
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle
	4	*Heterodon simus*	Southern Hognose Snake

THREATS

1. Upland Maritime and Esturine Fringe									
	CLASSIFICATION	SUBCLASS	1.1 Barrier Island Uplands	1.2 Barrier Island Wetlands	1.3 Barrier Island Beaches	1.4 Mainland Beaches	1.5 Shell Middens and Estuarine Shrublands	1.6 Maritime Woodlands
1	Residential and commercial development	1.1 Housing and urban areas: wastewater discharge, increased point source pollution				M		H
		1.2 Commercial and industrial areas: wastewater discharge, increased point source pollution			H	H		
		1.3 Tourism and recreation areas: wastewater discharge, increased point source pollution				M		H
3	Energy production and mining	3.1 Oil and gas drilling: oil spill impacts	L	H	H	H	L	L
6	Human intrusions and disturbance	6.1 Recreational activities: camping, litter, disturbance to shorebird or colonial waterbird nesting areas, beach grooming, public collection of artifacts	L	L	H	H	H	L
7	Natural system modifications	7.1 Fire and fire suppression	L	L				M
		7.2 Dams and water management/use: Maintenance dredging disrupting longshore sand transport			H	H		
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Fire ants, torpedo grass, cogongrass, nutria, Chinese tallow, wild hogs	H	H		H	H	H
9	Pollution	9.1 Household sewage and urban waste water				M		H
		9.4 Garbage and solid wastes: litter, marine debris, Excessive nest predation from opportunistic predators attracted to litter	L	L	H	H	L	L
11	Climate change and severe weather	11.1 Habitat shifting and alteration: Sea level rise	H	H	H	H	H	H

PRIORITY CONSERVATION ACTIONS

1. Upland Maritime and Esturine Fringe							
CLASSIFICATION	**SUBCLASS**	**1.1 Barrier Island Uplands**	**1.2 Barrier Island Wetlands**	**1.3 Barrier Island Beaches**	**1.4 Mainland Beaches**	**1.5 Shell Middens and Estuarine Shrublands**	**1.6 Maritime Woodlands**
1.0 Land/Water Protection							
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X	X	X
2.0 Land/Water Management							
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	X	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.			X	X		
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.			X	X		
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.			X	X		X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.			X	X		X
3.0 Species Management							
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X

1. Upland Maritime and Esturine Fringe							
CLASSIFICATION	**SUBCLASS**	**1.1 Barrier Island Uplands**	**1.2 Barrier Island Wetlands**	**1.3 Barrier Island Beaches**	**1.4 Mainland Beaches**	**1.5 Shell Middens and Estuarine Shrublands**	**1.6 Maritime Woodlands**
4.0 Education and Awareness							
4.1 Formal education 4.2 Training	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X
	Discourage incompatible recreational uses.		X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X			X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X
5.0 Law and Policy							
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.				X		X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.			X	X		
5.2 Policies and regulations	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.				X		X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.			X	X		
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X

1. Upland Maritime and Esturine Fringe							
CLASSIFICATION	**SUBCLASS**	**1.1 Barrier Island Uplands**	**1.2 Barrier Island Wetlands**	**1.3 Barrier Island Beaches**	**1.4 Mainland Beaches**	**1.5 Shell Middens and Estuarine Shrublands**	**1.6 Maritime Woodlands**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.			X	X		X
	Prohibit sand/gravel mining in stream channels, discourage sand/gravel mining in floodplains and improve oversight and planning for such mines (such as lignite, stone, dirt/fill, sand/gravel, clay) on upland sites.			X	X		
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.			X	X		
	Discourage incompatible recreational uses.	X	X	X	X	X	X
	Improve enforcement of existing species protection regulations.	X	X	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.						
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X
6.0 Livelihood, economic and other incentives							
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X			X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X
7.0 External Capacity Building							
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X			X	X	X

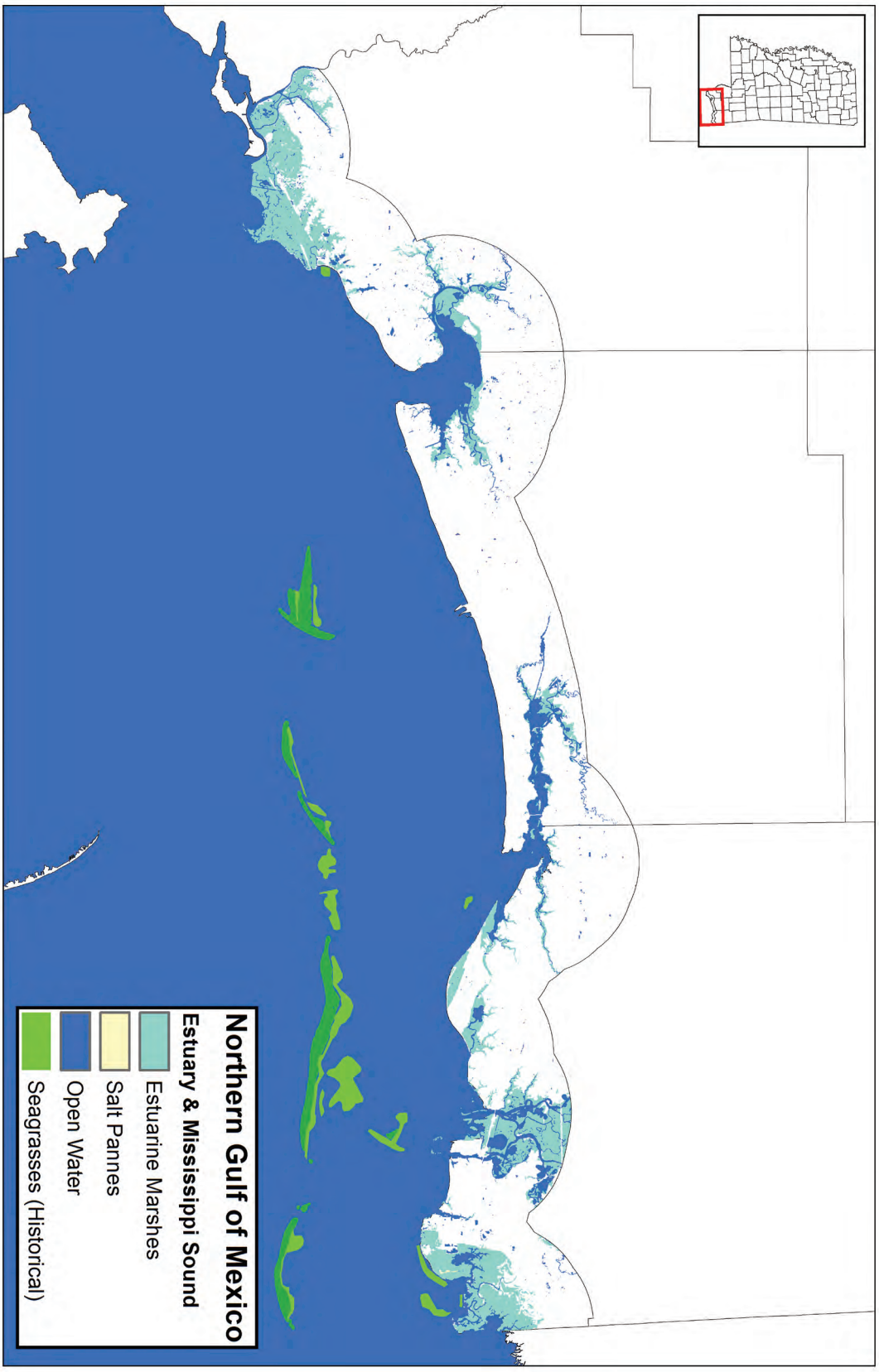


Figure 5.33 Estuary & Mississippi Sound In Northern Gulf Of Mexico Ecoregion

2. 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 the 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.

This type includes seven subtypes: 2.1 Estuarine Bays, Lakes, and Tidal Streams, 2.2 Estuarine Marshes, 2.3 Salt Pannes, 2.4 Seagrass Beds, 2.5 Mollusk Reefs 2.6 Mississippi Sound, and 2.7 Barrier Island Passes.

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; stormwater runoff containing chemicals and excess nutrients; 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. 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.

2.1 Estuarine Bays, Lakes and Tidal Streams

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 menhaden, sea trout, redfish, flounder, shrimp, and blue crabs. Bays and bayous are important foraging areas for many birds such shorebird and waterbirds.

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, bluecrabs, 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Freshwater tidal bald cypress-tupelo swamp	*Taxodium distichum* – mixed arborescent species	S3
Tidal creek	*Geukensia demissa – Melampus bidentatus – Butorides virescens – Fundulus jenkinsii*	S3
Tidal river channel – mixed-fine bottom	*Acipenser oxyrhynchus desotoi – and polychaetes,* clams, crustaceans, waterfowl, shorebirds	S3
Tidal river channel – sand bottom	*Acipenser oxyrhynchus desotoi – and polychaetes, c*lams, crustaceans, waterfowl, shorebirds	S3
Mainland coast pond/lake	*Callinectes sapidus – Hobsonia florida – Littoridinops palustris – Texadina spinctostoma*	S3
Embayment – mud bottom	*Cyathura polita – Cradidierella bonnieroides – Rhithropanopeus harrisii – Rangia cuneata* – other estuarine organisms including polychaetes, clams, crustaceans, and snails	S3
Tidal river edge shrub wetland	*Iva frutescens - Acer rubrum var. drummondii - Nyssa biflora - Myrica cerifera*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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, riverine estuaries adjoin bottomland hardwood forests.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Anas fulvigula*	Mottled Duck
	2	*Egretta caerulea*	Little Blue Heron
	2	*Egretta rufescens*	Reddish Egret
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Anas acuta*	Northern Pintail
	3	*Aythya affinis*	Lesser Scaup
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Pelecanus occidentalis*	Brown Pelican
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	2	*Morone saxatilis*	Striped Bass
	3	*Atractosteus spatula*	Alligator Gar
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandria formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	2	*Trichechus manatus*	Manatee
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle

2.2 Estuarine Marshes

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 2.3

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.

Jamaica swamp 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. Bulltongue arrowhead, switchgrass, shortbristle beaksedge and spikerush are commonly encountered.

Estuarine shrublands, including rare shell midden habitats (discussed in 1.5) 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Saltmeadow cordgrass herb coastlands (high marsh)	*Spartina patens – Panicum virgatum – Baccharis halimifolia*	S2
Tidal freshwater marsh/wet coastal prairie	*Sagittaria lancifolia - Panicum virgatum – Rhynchospora corniculata – Eleocharis obtusa/ E. tuberculosa/ E. quadrangulata – Schoenoplectus tabernaemontani*	S3
Intermediate marsh - Jamaica swamp sawgrass	*Cladium jamaicense*	S3
Brackish marsh	*Juncus roemerianus – Spartina cynosuroides*	S3
Irregularly flooded saline marsh	*Juncus roemerianus – Distichlis spicata*	S3
Frequently flooded saline marsh	*Spartina alterniflora*	S2
Wet coastal prairie	*Panicum virgatum - Rhynchospora corniculata – Xyris sp. - Cladium jamaicense*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Approximately **45,000 acres** of 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.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Haematopus palliatus*	American Oystercatcher
	1	*Laterallus jamaicensis*	Black Rail
	1	*Rallus elegans*	King Rail
	1		Migrant Shorebirds
	2	*Ammodramus maritimus*	Seaside Sparrow
	2	*Ammodramus nelsoni*	Nelson's Sparrow
	2	*Anas fulvigula*	Mottled Duck
	2	*Asio flammeus*	Short-eared Owl
	2	*Egretta caerulea*	Little Blue Heron
	2	*Eudocimus albus*	White Ibis
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Aythya affinis*	Lesser Scaup
	3	*Botaurus lentiginosus*	American Bittern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Egretta tricolor*	Tricolored Heron
	3	*Ixobrychus exilis*	Least Bittern
	3	*Nycticorax nycticorax*	Black-crowned Night-Heron
	3	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
	3	*Pandion haliaetus*	Osprey
	3	*Porphyrula martinica*	Purple Gallinule
Fish	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	3	*Heterandria formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Reptiles	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle

2.3 Salt Pannes

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.

MNHP Ecological Community	Species Associations	MNHP Rank
Salt flat (including salt panne)	*Salicornia virginiana - Distichlis spicata - Salicornia bigelovii - Suaeda linearis*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Approximately **400 acres** of salt pannes exist within the coastal zone in Mississippi. Small patches of a few acres to several dozen acres are mainly found in the Grand Bay National Estuarine Research Reserve in Jackson County and along the eastern end of Deer Island in Harrison County. The patches are surrounded by estuarine marsh habitat. In Jackson County, the 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.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migrant Shorebirds
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Coturnicops noveboracensis*	Yellow Rail
	1	*Haematopus palliatus*	American Oystercatcher
Birds	1	*Laterallus jamaicensis*	Black Rail
	2	*Ammodramus maritimus*	Seaside Sparrow
	2	*Ammodramus nelsoni*	Nelson's Sparrow
	2	*Anas fulvigula*	Mottled Duck
	2	*Egretta caerulea*	Little Blue Heron
	2	*Egretta refescens*	Reddish Egret
	2	*Eudocimus albus*	White Ibis
	2	*Limosa fedoa*	Marbled Godwit
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*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	*Nyctanassa violaceus*	Yellow-crowned Night-Heron
Reptiles	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin

2.4 Seagrass Beds

DESCRIPTION

Mississippi coastal waters contain three submergent bed types: barrier island seagrass, widgeon grass and American wildcelery (tapegrass) 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: shoalweed, turtle, and manatee grasses. Several of these have become very rare or have disappeared altogether. The beds, now composed almost entirely of shoalweed , occur in less turbid, moderately saline habitats of the nearshore zone north of the barrier islands with a couple of nearshore mainland exceptions, including Grand Bay National Estuarine Research Reserve. The barrier island pond/lagoon areas are often dominated by wigeon grass and contain trapped fresh or brackish water. Widgeon grass beds occur in shallow and moderately turbid waters that are lower in salinity. The beds are found in bays, along bayous, on submerged mudflats and occasionally in barrier island ponds. Both widgeon grass and shoalweed abundance in Mississippi waters have fluctuated dramatically over time due to damage caused by hurricanes and anthropogenic impacts. While hurricanes tend to temporarily displace these grasses from some locations, they may also allow them to establish in others by shifting sediments, making previously unusable areas more conducive to seagrass colonization. Widgeon grass and shoalweed are often interchangeable within a specific area depending on rainfall, turbidity, and depth. Shoalweed requires slightly higher salinities than widgeon grass and during long periods of drought will colonize areas generally occupied by widgeon grass due to lower fresh water inflows. The opposite can also occur during times of excessive rainfall. Recently, widgeon grass has returned to many of the areas in which it once existed while shoalweed (and the other historical species) seems less able to recover on its own. American wildcelery 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 nursery habitat, forage areas, and refuge for numerous aquatic species. Productivity and aerial coverage of seagrass beds can be promoted by improving local water quality, increasing public awareness, and by reducing 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 in the past 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.

MNHP Ecological Community	Species Associations	MNHP Rank
American wildcelery bed	*Vallisneria americana*	S1
Widgeon grass bed	*Ruppia maritima*	S2
Barrier island pond/lagoon	*Cyprinodon spp. – Hobsonia florida – Littoridinops palustris – Texadina sphinctostoma*	S3
Barrier island seagrass bed	*Thalassia testudina - Halophila engelmannii - Cymodocea filiformis*	S1
Barrier island macroscopic algae bed	*Gracilaria folliifera - Agardhiella tenera - Spyridia filimentosa*	S1

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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.

Seagrass beds formerly covered an estimated 19,000 acres, but recent estimates indicate that only a fraction of the original beds exist today. Seagrass beds were extensive prior to going into serious decline due to damages caused by Hurricane Camille. They may 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. The extensive loss 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. 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Aythya affinis*	Lesser Scaup
	3	*Pandion haliaetus*	Osprey
	3	*Pelecanus occidentalis*	Brown Pelican
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	3	*Atractosteus spatula*	Alligator Gar
	3	*Heterandria formosa*	Least Killifish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	2	*Trichechus manatus*	Manatee
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle
	3	*Chelonia mydas*	Green Sea Turtle

2.5 Mollusk Reefs

DESCRIPTION

Mollusk or oyster reefs are beds of oysters that range from just a few oysters to thousands of oysters covering large areas. They may be permanently submerged to intermittently exposed. 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.

MNHP Ecological Community	Species Associations	MNHP Rank
Mollusk reef	*Crassostrea virginica*	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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. The Mississippi Department of Marine Resources (MDMR) manages 17 natural oyster reefs. Approximately 97% of the commercially harvested oysters in Mississippi come from the reefs in the western Mississippi Sound, primarily from Pass Marianne, Telegraph and Pass Christian reefs. According to the MDMR, about 7,400 acres are located in the western Mississippi Sound, and the remainder are uncharted or hidden reefs. The MDMR has planted over 5,000 acres of oyster cultch from 1997 – 2005 to restore and enhance oyster reefs in the Mississippi sound.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Haematopus palliatus*	American Oystercatcher
	2	*Calidris canutus*	Red Knot
	2	*Limosa fedoa*	Marbled Godwit
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin

2.6 Mississippi Sound (Smooth Bottom)

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. Maintenance dredging can interrupt this sand movement and remove sands from the nearshore transport system. 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 brown pelicans, porpoises, marine turtles such as the Atlantic Ridley and loggerhead and occasionally manatees.

MNHP Ecological Community	Species Associations	MNHP Rank
Mississippi sound - nearshore mud bottom	*Corophium louisianum – Uca spp. – Penaeus aztecus* – and other estuarine organisms: *polychaetes*, clams, crustaceans, snails, echinoderms and fishes	S4
Mississippi sound - nearshore mixed-fine bottom	*Scolopios fragilis – Heleobops - Bowmaniella spp. - Macoma mitchelli*	S4
Mississippi sound - nearshore sand bottom	*Lepidactylus sp. - Emerita talpoida - Malaclemys terrapin*	S4
Mississippi sound - offshore mud bottom	*Paradalia americana – Ogyrides alphaerostris – Anadara ovalis – Cantharus cancellarus – Nassarius acutus – Urophycis floridana* – and *cumaceans*, snails, *sipunculids, echinoderms , nemerteans*	S4
Mississippi sound - offshore mixed-fine bottom	*Hemipholis elongata - Micropholis atra - Phascolion strombi - Nuculana concentrica*	S4
Mississippi sound - offshore sand bottom	*Brachiostoma caribaeum - Armandia maculata – Acanthohaustroeius sp. – Spiophanes bombyx - Crassinella lunulata* – and *polychaetes, archiannelids, cephalochordates*	S4
Tidal pass	*Brachiostoma caribaeum - Armandia maculata - Crassinella lunulata*	S4
Dredged bottom (unclassified)		SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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.

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.

The Mississippi Sound is **vulnerable** as a wildlife habitat as there is cause for longterm concern due to an increased nutrient and pollution load entering the Sound.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH THE MISSISSIPPI SOUND

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Aythya affinis*	Lesser Scaup
	3	*Pandion haliaetus*	Osprey
	3	*Pelicanus occidentalis*	Brown Pelican
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	2	*Morone saxatilis*	Striped Bass
	3	*Atractosteus spatula*	Alligator Gar
Mammals	2	*Trichechus manatus*	Manatee
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	3	*Chelonia mydas*	Green Sea Turtle
	3	*Dermochelys coriacea*	Leatherback Sea Turtle
	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle

2.7 Barrier Island Passes

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.

MNHP Ecological Community	Species Associations	MNHP Rank
Tidal pass	*Brachiostoma caribaeum - Armandia maculata - Crassinella lunulata*	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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.

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. Few impacts are known at this time.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BARRIER ISLAND PASSES

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Aythya affinis*	Lesser Scaup
	3	*Pandion haliaetus*	Osprey
	3	*Pelecanus occidentalis*	Brown Pelican
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	3	*Chelonia mydas*	Green Sea Turtle
	3	*Dermochelys coriacea*	Leatherback Sea Turtle
	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle

THREATS

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)									
	CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
1	Residential and commercial development	1.1 Housing and urban areas: Seawall/bulkhead construction, increased runoff, point source pollution, Excessive nest predation from opportunistic predators	H	M		M		L	
		1.2 Commercial and industrial areas: Bulkheading, increased runoff, non-point and point source pollution, Dredging of shipping channels	M	L		M	H	M	L
		1.3 Tourism and recreation areas	H	M		M			
3	Energy production and mining	3.1 Oil and gas drilling	H	H	H	H	H	H	H
		3.2 Mining and quarrying: Mining sand for beach renourishment							L
4	Transportation and service corridors	4.1 Roads and railways	L	L					
		4.3 Shipping lanes						M	H
5	Biological resource use	5.4 Fishing and harvesting aquatic resources:							
		Overexploitation/Incidental Capture of Mississippi diamondback terrapin, Alabama red-bellied turtle (boat strikes), Kemp's Ridley sea turtle, loggerhead sea turtle, green sea turtle, leatherback sea turtle, hawksbill sea turtle, alligator gar, Gulf sturgeon, manatee	H	H		H	H	H	H
6	Human intrusions and disturbance	6.1 Recreational activities: Boating, damage from boat wakes, prop scarring in submerged aquatic vegetation	M	L	H	H		L	
7	Natural system modifications	7.2 Dams and water management/use:							
		Operations of Dams/Impoundment: Upstream discharge altering salinity levels	L	L		L	M	L	
		Channel Modification: Salinity regime changes from channel dredging, Maintenance dredging disrupting longshore sand transport, creation of canals/boat slips, sedimentation from dredge spoil pile runoff	H	H		H	H	M	H
		Groundwater and surface water withdrawal		L					
		Altered hydrology		H	H			M	
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Tilapia, nutria, torpedo grass, alligator weed, Parrot feather milfoil	M	H		L	M		

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)										
	CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
9	Pollution	9.1 Household sewage and urban waste water	H	H	H	H	H	H	
		9.2 Industrial and military effluents	M		H	H		H	
		9.3 Agricultural and forestry effluents			H	H			
		9.4 Garbage and solid wastes: Marine litter and overboard discharge	M	H				M	
11	Climate change and severe weather	11.1 Habitat shifting and alteration: Sea level rise	H	H	H	H	H		H

PRIORITY CONSERVATION ACTIONS

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)								
CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
1.0 Land/Water Protection								
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X	X	X	X
2.0 Land/Water Management								
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	X		X	
2.2 Invasive/problematic species control	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X					
	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X		X	
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/ degraded habitat when possible. Emphasize careful planning, execution, and maintenance of coastal marsh created with beneficial use of dredge spoil and long term monitoring of created marsh. Address fish passage obstructions and connectivity issues	X	X	X	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.	X	X	X	X	X	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X					
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/ wetland habitats.	X	X	X	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X		X	X	X	X

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)								
CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
3.0 Species Management								
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take): Bycatch reduction devices on Crab pots, removal of derelict crab pots.	X	X		X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X		X	
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X
4.0 Education and Awareness								
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X
4.2 Training	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X					
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X	X	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	X		X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X		X	
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X		X		X	
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	X		X	
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X	X
5.0 Law and Policy								
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X	X	X	X

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)								
CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X	X	X	
	Limit bulkheading along coastal drainages.	X	X		X		X	
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X	X	X	
	Limit bulkheading along coastal drainages.	X	X		X		X	
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/ populations: restrict trawler access to sensitive areas, enforce current regulations.	X	X	X	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X	X	X	X
	Discourage incompatible recreational uses.	X	X	X	X		X	
	Improve enforcement of existing species protection regulations.	X	X	X	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		X	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X	X	X	X
6.0 Livelihood, economic and other incentives								
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X	X		X	
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X		X		X	

2. Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)								
CLASSIFICATION	**SUBCLASS**	**2.1 Estuarine Bays, Lakes, and Tidal Streams**	**2.2 Estuarine Marshes**	**2.3 Salt Pannes**	**2.4 Seagrass Beds**	**2.5 Mollusk Reefs**	**2.6 Mississippi Sound**	**2.7 Barrier Island Passes**
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X		X		X	
7.0 External Capacity Building								
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X		X		X	

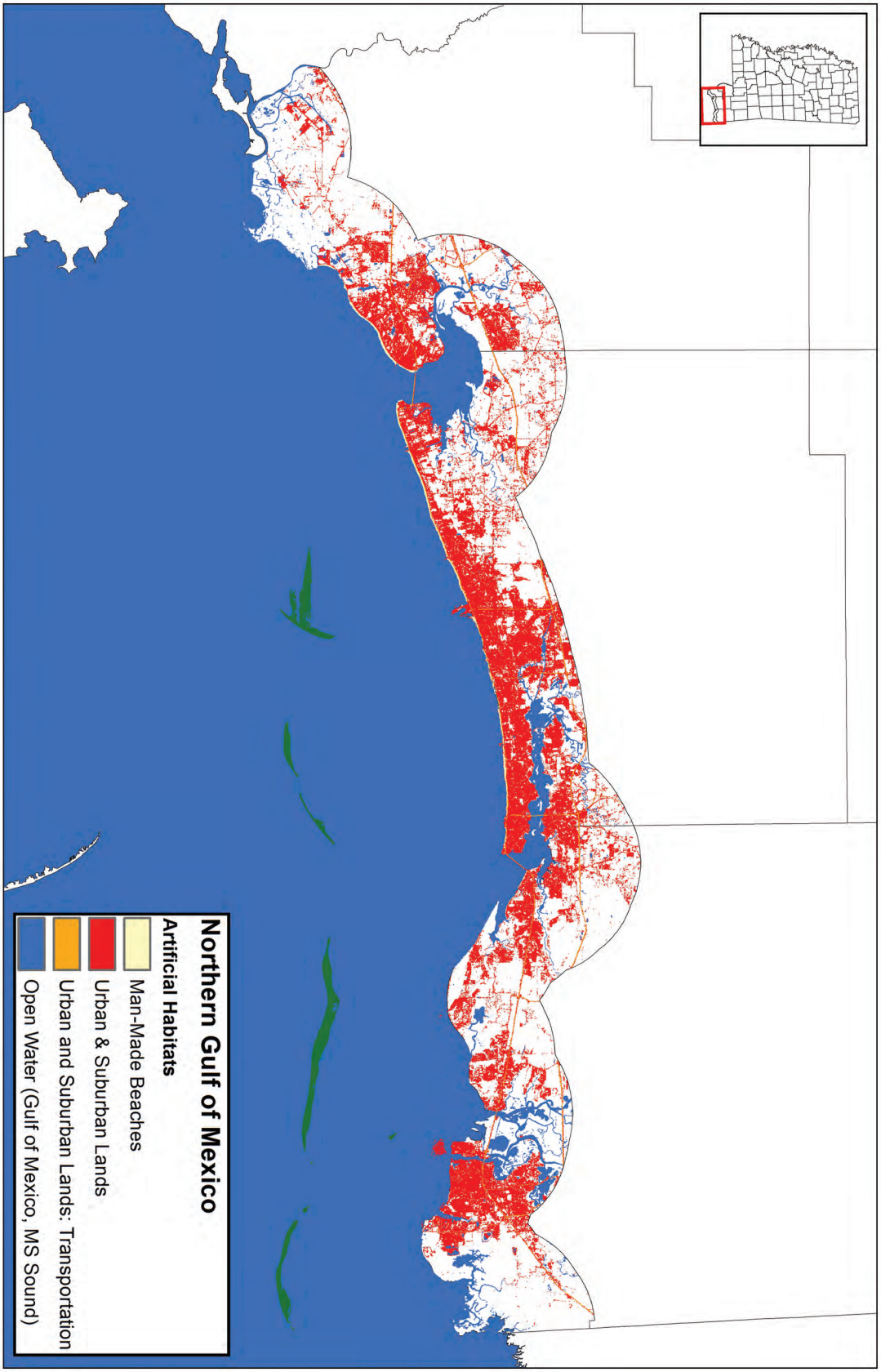


Figure 5.34 Artificial Habitats In Northern Gulf Of Mexico Ecoregion

3. 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 SWAP, discussion of marine habitats is generally limited to those located within the three mile territorial boundaries of Mississippi.

This type includes two subtypes: 3.1 Marine Habitats (Smooth Bottoms) and 3.2 Hard Bottoms and Oceanic 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 could potentially make overfishing a problem. Mississippi Department of Marine Resources, Artificial Reef Program has increased the amount of reef available. Mississippi's inshore artificial reefs are comprised of several different types of material for development including crushed concrete, limestone, and oyster shell. The development of these reefs has diversified habitat and increased high quality fishing sites which has proven in the past to support a great ecosystem for Mississippi's inshore reefs. These artificial reefs provide the preponderance of both vertical relief and hard substrate for a variety of fish and invertebrate species. The Mississippi Department of Marine Resources in conjunction with Mississippi Gulf Fishing Banks has 15 permitted offshore reef sites. The sites combined cover approximately 16,000 acres, with sites ranging from 3 to 10,000 acres. The sites located north of the barrier islands consist of concrete rubble while the sites located south of the barrier islands consist of concrete culverts, steel hull vessels, and "Florida Limestone" artificial reef pyramids. The soft bottom areas may also be vulnerable to overfishing. In addition, oil spills and other pollutants that persist in the open seas and sea floor 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 occasionally included pebble to cobble sized sandstone and iron pebbles. These hard bottoms within territorial waters of Mississippi as well as those in Alabama were continually in burial-exhumation 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.

3.1 Marine Habitats (Smooth Bottoms)

DESCRIPTION

A large diversity of species inhabits the marine waters and resides 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.

Marine habitats can be classified as nearshore or offshore, usually based on depth of the water column. The substrate and sand component will affect the species associations in each area. There are 6 ecological communities in this habitat.

The Nearshore Mud Bottom –Marine community is described as a high-energy environment no more than 10 m in depth and in areas with silt and clay substrate containing less than 50 percent sand. Less than 1 percent of the nearshore zone has a mud bottom.

Nearshore Mixed-fine Bottom-Marine communities are in a high-energy environment no more than 10 m in depth and in areas with silt and clay substrate containing 50-85 percent sand. This substrate underlies roughly 20 percent of the nearshore zone in Mississippi coastal waters.
Nearshore Sand Bottom-Marine communities are a high-energy environment no more than 10 m in depth and with a substrate comprised of more than 85 percent sand, and underlies approximately 80 percent of the nearshore zone.

Offshore Mud Bottom Community-Marine communities are those occupying areas with depths greater than 10 m, and with substrates containing less than 50 percent sand. This is a low-energy environment.
Offshore Mixed-fine Bottom-Marine communities are low-energy environments in areas of 10-100 m depth with substrates containing 50-85 percent sand.

Offshore Sand Bottom-Marine communities are low-energy environments at depths greater than 10 m and with a substrate comprised of more than 85 percent sand.

MNHP Ecological Community	Species Associations	MNHP Rank
Gulf of Mexico – nearshore mud bottom	*Olivella mutica – Abra lioica – Luidia clathrata – Bowmaniella floridana – Ancinus depressus – Strongylura timucu* and polychaetes, cumaceans, amphipods, isopods, clams, surf fish.	S4
Gulf of Mexico –nearshore mixed-fine bottom	*Heleobops – Scoloplos fragilis – Bowmaniella – Macoma mitchelli* and various mollusks, crustaceans, polychaetes, and echinoderms	S4
Gulf of Mexico – nearshore sand bottom	*Gemma gemma – Lepidactylus – Acanthohaustorius – Paraonis* other mollusks, crustaceans, and echinoderms	S4
Gulf of Mexico – offshore mud bottom	*Nuculana concentrica – Hemipholis elongata – Oxyurostylis smithi – Myriochele oculata – Renilla mulleri* – and mollusks, polychaetes, decapods, echinoderms	S4
Gulf of Mexico – offshore mixed-fine bottom	*Photis macromanus – Nereis micromma – Aglaophamus verrilli* – and other marine organisms: mollusks, polychaetes, decapods, echinoderms	S4
Gulf of Mexico – offshore sand bottom	*Branchiostoma caribaeum – Aspidosiphon albus – Brania wellfleetensis* – and other marine organisms: mollusks, polychaetes, decapods, echinoderms	S4

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

For the purposes of the SWAP, 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 mixed and contain more silt and clay. There are about **100,000 acres** of this subtype in state jurisdictional waters.

Issues 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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Aythya affinis*	Lesser Scaup
	3	*Pandion haliaetus*	Osprey
	3	*Pelicanus occidentalis*	Brown Pelican
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	3	*Chelonia mydas*	Green Sea Turtle
	3	*Dermochelys coriacea*	Leatherback Sea Turtle
	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle

3.2 Hard Bottoms and Oceanic Reefs

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.

MNHP Ecological Community	Species Associations	MNHP Rank
Gulf of Mexico – offshore reef & inter-reef	*Antipathes sp.* – *Gorgonian* – *Holanthias sp.* – and ellisellid sea whips, comatulid crinoids, upright sponges, ahermatypic corals, basket stars, primary reef fish	S3

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

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.

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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	3	*Chelonia mydas*	Green Sea Turtle
	3	*Dermochelys coriacea*	Leatherback Sea Turtle
	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle

THREATS

	3. Marine Habitats (Outside Barrier Islands)			
	CLASSIFICATION	**SUBCLASS**	**3.1 Marine Habitats (Smooth Bottom)**	**3.2 Hard Bottoms and Oceanic Reefs**
1	Residential and commercial development	1.2 Commercial and industrial areas: Pipelines, LNG	L	L
3	Energy production and mining	3.1 Oil and gas drilling	H	M
5	Biological resource use	5.4 Fishing and harvesting aquatic resources: Overexploitation/ Incidental capture of sea turtles	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Australian spotted jellyfish	H	
9	Pollution	9.4 Garbage and solid wastes: Marine litter and overboard discharge	M	M
11	Climate change and severe weather	11.1 Habitat shifting and alteration: sea level rise	H	H

PRIORITY CONSERVATION ACTIONS

3. Marine Habitats (Outside Barrier Islands)			
CLASSIFICATION	**SUBCLASS**	**3.1 Marine Habitats (Smooth Bottom)**	**3.2 Hard Bottoms and Oceanic Reefs**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X

3. Marine Habitats (Outside Barrier Islands)			
CLASSIFICATION	**SUBCLASS**	**3.1 Marine Habitats (Smooth Bottom)**	**3.2 Hard Bottoms and Oceanic Reefs**
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training		X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X

4. Artificial Habitats

Artificial habitats are those that have been made or altered by humans in some way. While often considered degraded or disturbed, these habitats are used by some SGCN. In the Northern Gulf of Mexico ecoregion many birds, including shorebirds, wading birds, and raptors, have thrived in these artificial habitats. These areas may contain some remnant of the original vegetation but are usually greatly altered, with many invasive or exotic species dominating. Small patches of less disturbed habitat may exist within larger disturbed areas that allows for many species to survive, and sometimes thrive. Human presence typically will limit SGCN to those more tolerant of disturbance.

This habitat type contains 5 subtypes: 4.1 Man-made beaches, 4.2 Artificial reefs, 4.3 Urban and suburban lands, 4.4 Buildings, bridges, overpasses, etc. 4.5 Utility right-of-ways.

4.1 Man-Made Beaches

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 is 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 beach habitats in Mississippi is ephemeral habitat such as wrack line deposits including bryozoans, algae, seagrasses, and detritus. 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

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**. 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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH HARD BOTTOMS AND OCEANIC REEFS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1	*Charadrius alexandrinus tenuirostris*	Southeastern Snowy Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	1	*Haematopus palliatus*	American Oystercatcher
	1		Migrant Shorebirds
	2	*Calidris canutus*	Red Knot
	2	*Charadrius melodus*	Piping Plover
	2	*Egretta rufescens*	Reddish Egret
	2	*Limosa fedoa*	Marbled Godwit
	2	*Pelecanus occidentalis*	Brown Pelican
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	3	*Calidris alpina*	Dunlin
	3	*Calidris mauri*	Western Sandpiper
	3	*Egretta thula*	Snowy Egret
	3	*Pelecanus occidentalis*	Brown Pelican
Reptiles	2	*Caretta caretta*	Loggerhead Sea Turtle

4.2 Artificial Reefs

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 have been created to enhance sportfishing. These reefs are constructed out of several types of materials: sunken liberty ships and military equipment and concrete rubble.

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 (obligate) reef fishes 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.

The MDMR Rigs to Reef Program offers conservation minded alternatives for oil platforms, as opposed to onshore disposal with no subsequent habitat value. The average platform jacket can provide up to 2-3 acres of hard bottom habitat for marine invertebrates and fishes, and these submerged platform jackets currently provide habitat for thousands of marine species. This habitat is beneficial to both the marine organisms that inhabit these reef systems and the commercial and recreational fishermen who seek the highly prized fish that can be found within this newly created ecosystem.

MNHP Ecological Community	Species Associations	MNHP Rank
Gulf of Mexico – artificial reef	Information lacking	SM

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Artificial reefs have been established throughout the Mississippi Sound and cover less than **100 acres**. Their positioning and establishment requires approval by federal and state agencies, including the Mississippi Department of Marine Resources.

Artificial reefs consist of essentially inert discarded materials. There are **no concerns** for the condition of these habitats.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH ARTIFICIAL REEFS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Pelagic Birds
	1	*Haematopus palliatus*	American Oystercatcher
	3	*Pelecanus occidentalis*	Brown Pelican
Reptiles	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Caretta caretta*	Loggerhead Sea Turtle
	4	*Eretmochelys imbricata*	Hawksbill Sea Turtle

4.3 Urban and Suburban Lands

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; 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 increased erosion and a degradation of the water quality. Vacant lots, landscaped yards, vegetable gardens, fruit orchards, and wooded areas along drainages provide some habitats beneficial to wildlife. There are numerous native animals that spend part or all of their lives inside the city limits. Many programs, such as the National Wildlife Federation's Backyard Wildlife Habitat certification program, work to improve habitat quality in urban and suburban areas for wildlife. Habitat generalists, including birds like the Northern Mockingbird, House Wren and Mourning Dove, and mammals such 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. Terns and other shorebirds are known to create nesting areas on the rooftops of businesses close to the man-made beaches along the coast. Most rare species tend to avoid the urban areas, if possible, or are extirpated from developed areas due to deterioration of their habitats.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

Urban and suburban lands encompass one to two percent of the land area of Mississippi, nearly **400,000 acres statewide**. Urban lands are defined by the high percentage of water 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 of maritime hardwood forests, pine flatwoods, and cutover areas, pasture lands and wetlands along the creeks and rivers.

SGCN are rarely found in urban and suburban areas, partially due to the loss of habitat for these species. However, some species of wildlife (especially birds) have thrived in urban settings and may be more common than in pre-settlement times. Least Terns are known to create nesting areas on the large, flat roofs of commercial buildings along the coast. Osprey nesting on power poles near water is a common sight along the Mississippi Coast. Urban lands may contain parks and possibly functional riverine bottomlands that provide corridors and stopping points for migratory birds. Mainland beaches in urban areas support shorebirds throughout the year.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH URBAN AND SUBURBAN LANDS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	1		Migratory Songbirds
	2	*Sterna antillarum*	Least Tern
	2	*Pandion haliaetus*	Osprey
Mammals	2	*Lasiurus intermedius*	Northern Yellow Bat
Reptiles	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Psuedemys alabamensis*	Alabama Red-bellied Turtle

4.4 Buildings, Bridges, Overpasses, Etc.

DESCRIPTION

Structures such as buildings, bridges, overpasses, and culverts can provide habitat for several bird and bat species. The structures can serve as nesting sites or as winter roosts. Properly designed bridges and culverts can mitigate loss of habitat for some bat species. For little to no costs, existing bridges can be modified to provide better roosting habitat for bats. 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 human disturbances from traffic and rebuilding efforts. Abandoned buildings, while commonly used as bat roosts, decay quickly and become unsuitable over time. As a result, bridges and buildings often do not provide a permanent roosting site for many bat species.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

This habitat subtype is mostly concentrated in urban centers. Some are found in isolated areas such as bridges and culverts along major road systems, or abandoned homes in rural areas. There are thousands of buildings in the state. Acreage of this subtype is combined in that of urban and suburban lands type. Buildings are made of impervious materials and cause increased amounts 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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BUILDINGS, BRIDGES, OVERPASSES, ETC.

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Mammals	1	*Myotis austroriparius*	Southeastern Myotis

4.5 Utility Right-of-ways

DESCRIPTION

Utility Right-of-ways (ROWs) are corridors used for transmission lines or gas pipelines. Impacts on surrounding ecosystems can be detrimental but properly managed ROWs can have positive aspects. ROWs can contain grass, shrub or wetland habitats, or a mixture of many habitats. Gas pipeline ROWs usually involve much more impact on the environment, denuding most of the corridor, and the gas pipeline industry requires that herbaceous cover be maintained over shrub cover.

LOCATION, SIZE, CONDITION AND CONSERVATION STATUS

ROWs are found throughout the state. Estimates of acreages would be difficult to obtain. Development of this subtype usually results in the loss of other more valuable wildlife habitat.

Utility ROWs are common, widespread, and abundant and considered **secure** in the state.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UTILITY RIGHT-OF-WAYS

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Pandion haliaetus*	Osprey
Reptiles	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Psuedemys alabamensis*	Alabama Red-bellied Turtle

THREATS

4. Artificial Habitats							
	CLASSIFICATION	**SUBCLASS**	**4.1 Man-made Beaches**	**4.2 Artificial Reefs**	**4.3 Urban and Suburban Lands**	**4.4 Buildings, Bridges, Overpasses, Etc.**	**4.5 Utility Right-of-ways**
1	Residential and commercial development	1.2 Commercial and industrial areas		L			
3	Energy production and mining	3.1 Oil and gas drilling	H	M			
4	Transportation and service corridors	4.1 Roads and railways: Road construction/ maintenance, incompatible bridge designs, timing of bridge maintenance, destruction of roosts (bats)			H	H	
		4.2 Utility and service lines: Indiscriminate use of herbicides, blanket coverage of herbicides destroying vegetation					H
5	Biological resource use	5.4 Fishing and harvesting aquatic resources: Overexploitation/Incidental capture of Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle, Hawksbill Sea Turtle		H			
6	Human intrusions and disturbance	6.1 Recreational activities: Pier construction, unrestrained pets, beach grooming	H		L	L	H
7	Natural system modifications	7.3 Other ecosystem modifications: wind and water erosion leading to increased beach restoration activities	H				
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Lionfish, cogongrass, torpedo grass, fire ants, armadillos		L			H
9	Pollution	9.4 Garbage and solid wastes: Opportunistic predators (i.e. raccoons, crows) attracted to trash left behind by recreational users.	H	M			
11	Climate change and severe weather	11.1 Habitat shifting and alteration: Sea level rise	H	H			

PRIORITY CONSERVATION ACTIONS

4. Artificial Habitats						
CLASSIFICATION	**SUBCLASS**	**4.1 Man-made Beaches**	**4.2 Artificial Reefs**	**4.3 Urban and Suburban Lands**	**4.4 Buildings, Bridges, Overpasses, Etc.**	**4.5 Utility Right-of-ways**
1.0 Land/Water Protection						
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	
1.2 Resource and habitat protection		X	X		X	
2.0 Land/Water Management						
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X		X	X
	Discourage incompatible recreational uses.	X		X	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present.	X	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible.	X	X		X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.				X	
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.		X	X	X	
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/ atmosphere.		X			
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.		X		X	X

4. Artificial Habitats						
CLASSIFICATION	**SUBCLASS**	**4.1 Man-made Beaches**	**4.2 Artificial Reefs**	**4.3 Urban and Suburban Lands**	**4.4 Buildings, Bridges, Overpasses, Etc.**	**4.5 Utility Right-of-ways**
3.0 Species Management						
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).		X	X	X	
	Continue to restrict/monitor scientific collection of SGCN.		X			
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X		X	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	X
4.0 Education and Awareness						
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X
4.2 Training		X	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X		X	
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X	X
	Discourage incompatible recreational uses.	X			X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X			X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X			X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	X
5.0 Law and Policy						
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.		X		X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.		X			

4. Artificial Habitats						
CLASSIFICATION	**SUBCLASS**	**4.1 Man-made Beaches**	**4.2 Artificial Reefs**	**4.3 Urban and Suburban Lands**	**4.4 Buildings, Bridges, Overpasses, Etc.**	**4.5 Utility Right-of-ways**
5.2 Policies and regulations	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.		X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X			
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X	
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/ atmosphere.		X			
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.		X			
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X		X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.		X			
	Discourage incompatible recreational uses.	X			X	X
	Improve enforcement of existing species protection regulations.	X	X		X	X
	Continue to restrict/monitor scientific collection of SGCN.		X			
	Encourage proper disposal and cleanup of waste and litter.	X	X		X	
6.0 Livelihood, economic and other incentives						
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X			X	X
6.2 Substitution	Discourage incompatible recreational uses.	X			X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X		X	X

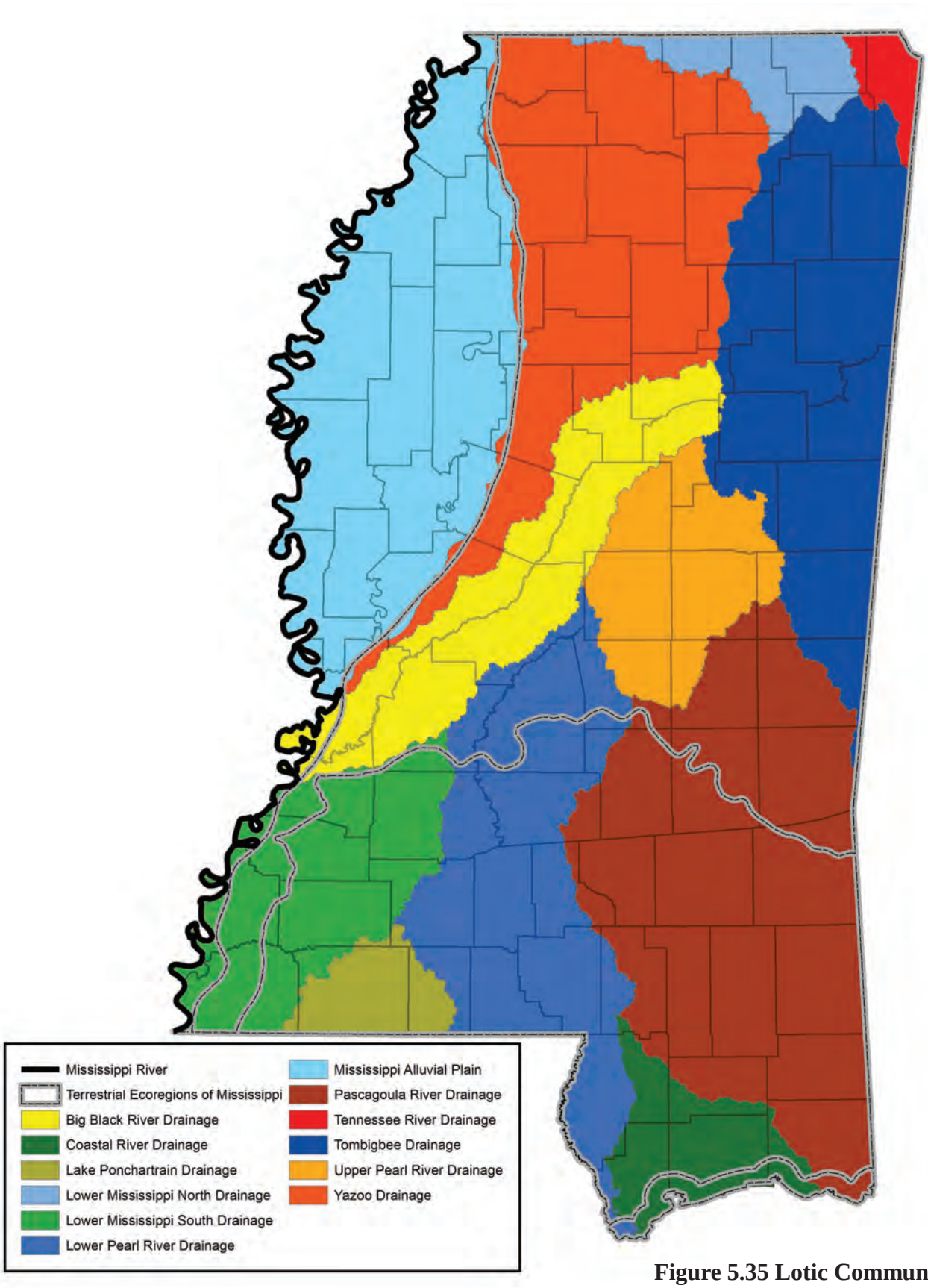


Figure 5.35 Lotic Communities

E. 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. Mississippi has about over 120,000 miles of perennial streams. Mississippi law 51-1-4 defines a public waterway as "those portions of all natural flowing streams in this state having a mean annual flow of not less than one hundred (100) cubic feet per second". MDWFP GIS data indicates there are 5,719 miles of public waterways in the state. The USGS 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 document, streams (lotic or flowing water systems) are classified into 13 major drainages and then into smaller subtypes by stream size.

GENERAL CONDITION

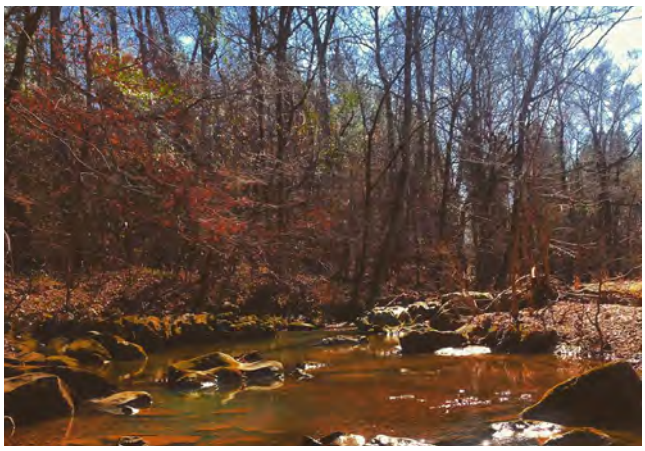
Streams throughout Mississippi have been subjected to a wide array of alterations. Stream channels have been widened, deepened, desnagged and straightened through channelization projects for flood control. This has resulted in shortening of streams, increases in stream gradient and loss of habitat for 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. Fish passage in the Pearl River is also restricted by the Pools Bluff sill in Pearl River County and the low water weir at the City of Jackson's water treatment plant in Hinds County. 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 nine locks and dams in Mississippi, 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 increased erosion. Headcutting, which can be caused by stream channel alteration, sand and gravel mining, and stream channelization , 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 significant decrease in the water table in some areas, especially in the Delta region. In some cases the groundwater level is below the level of the river bed so that groundwater does not contribute to the baseflow in the streams. This has caused extremely low flows in these streams during dry periods. Streams are impacted by 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.

Another significant potential threat to Mississippi streams is inadequate water flow due to consumptive water withdrawals. The flow regime in a stream is the dominant variable in determining the form and function of a stream. Minimum flow is determined by 7Q10 or the lowest 7-day average flow that occurs (on average) once every 10 year. Alternative instream flow levels which mimic the natural hydrograph are needed in Mississippi to provide for healthy stream ecosystems and aquatic biota. Richter et al. (2011) found that high and moderate levels of ecological protection can be achieved when daily flow withdrawals exceed 10 percent and 20 percent respectively.

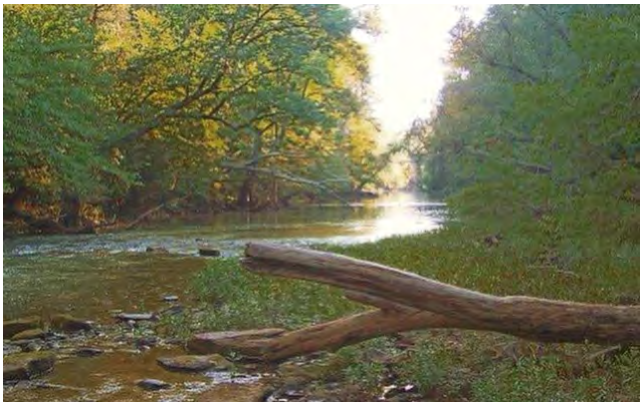
Stream riparian zones support some of the most dynamic wildlife assemblages compared to any other habitat. Healthy riparian zones also help stabilize stream banks and provide organic input and woody structure into stream channels.



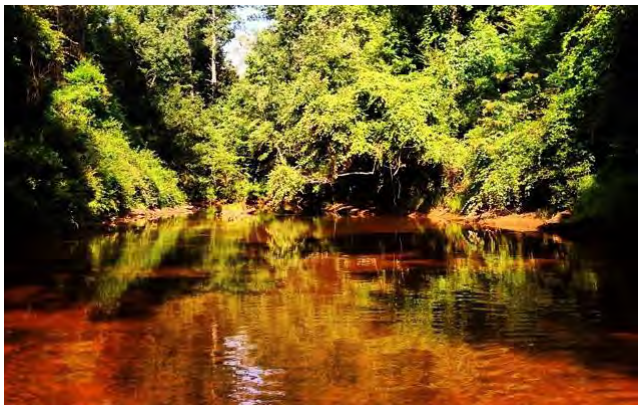
Small Streams. Streams of this type drain basins less than 75 square miles and often occur in the headwaters of larger streams. These streams typically have extensive canopy and low flow rates. Substrate, water depth and other microhabitat characteristics vary among streams and among reaches within these streams.

Loess Hills Small Streams. These are streams that are confined to the loess hills region of Mississippi, and are tributaries of the Big Black, Yazoo or Mississippi rivers.

Blackwater Small 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.



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.



Blackwater Medium Streams. These streams are similar in size to the other medium streams but they have dark, tannin-stained waters.

Large Streams. Large streams drain 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.

Stream drainages in Mississippi:

1. Mississippi River and Associated Drainages
    - 1.1. Mississippi River
    - 1.2. Mississippi Alluvial Plain (MAP)
    - 1.3. Upper Coastal Plain, Yazoo Drainage
    - 1.4. Big Black River Drainage
2. Northeast Mississippi Drainages
    - 2.1. Northeast Hills, Tennessee River Drainage
    - 2.2. Tombigbee Drainage
    - 2.3. Lower Mississippi River North Drainage
3. Pearl River Drainage
    - 3.1. Upper Coastal Plain, Pearl River Drainage
    - 3.2. Lower Coastal Plain, Pearl River Drainage
4. Southeast Mississippi Drainages
    - 4.1. Pascagoula River Drainage
    - 4.2. Coastal Streams Drainage
5. Southwest Mississippi Drainages
    - 5.1. Lake Ponchartrian Drainages
    - 5.2. Lower Mississippi River South Drainage

1. Mississippi River and Associated Drainages

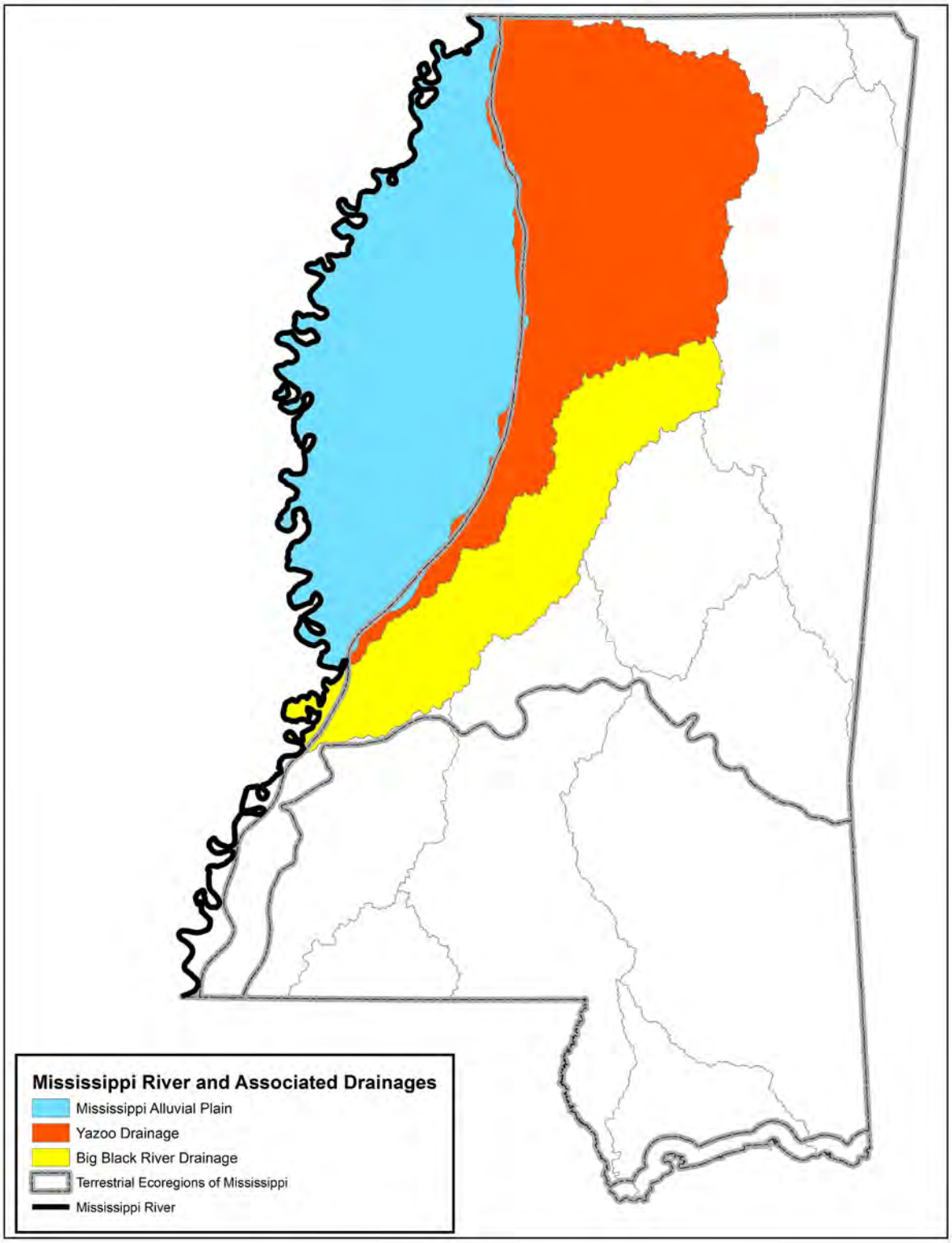


Figure 5.36 Mississippi River And Associated Drainages

1.1 Mississippi River

DESCRIPTION AND LOCATION

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 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.

Figure 5.37
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	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Sterna antillarum athalassos*	Interior Least Tern
	3	*Pandion haliaetus*	Osprey
Fish	1	*Scaphirhynchus albus*	Pallid Sturgeon
	2	*Cycleptus elongatus*	Blue Sucker
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Noturus flavus*	Stonecat
	2	*Scaphirhynchus platorynchus*	Shovelnose Sturgeon
	3	*Atractosteus spatula*	Alligator Gar
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
	3	*Stizostedion canadense*	Sauger
	3	*Stizostedion vitreum*	Walleye
	4	*Macrhybopsis gelida*	Sturgeon Chub
	4	*Macrhybopsis meeki*	Sicklefin Chub
	4	*Platygobio gracilis*	Flathead Chub
Mussels	1	*Potamilus capax*	Fat Pocketbook
	3	*Potamilus alatus*	Pink Heelsplitter
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

1.2 Mississippi Alluvial Plain (MAP)

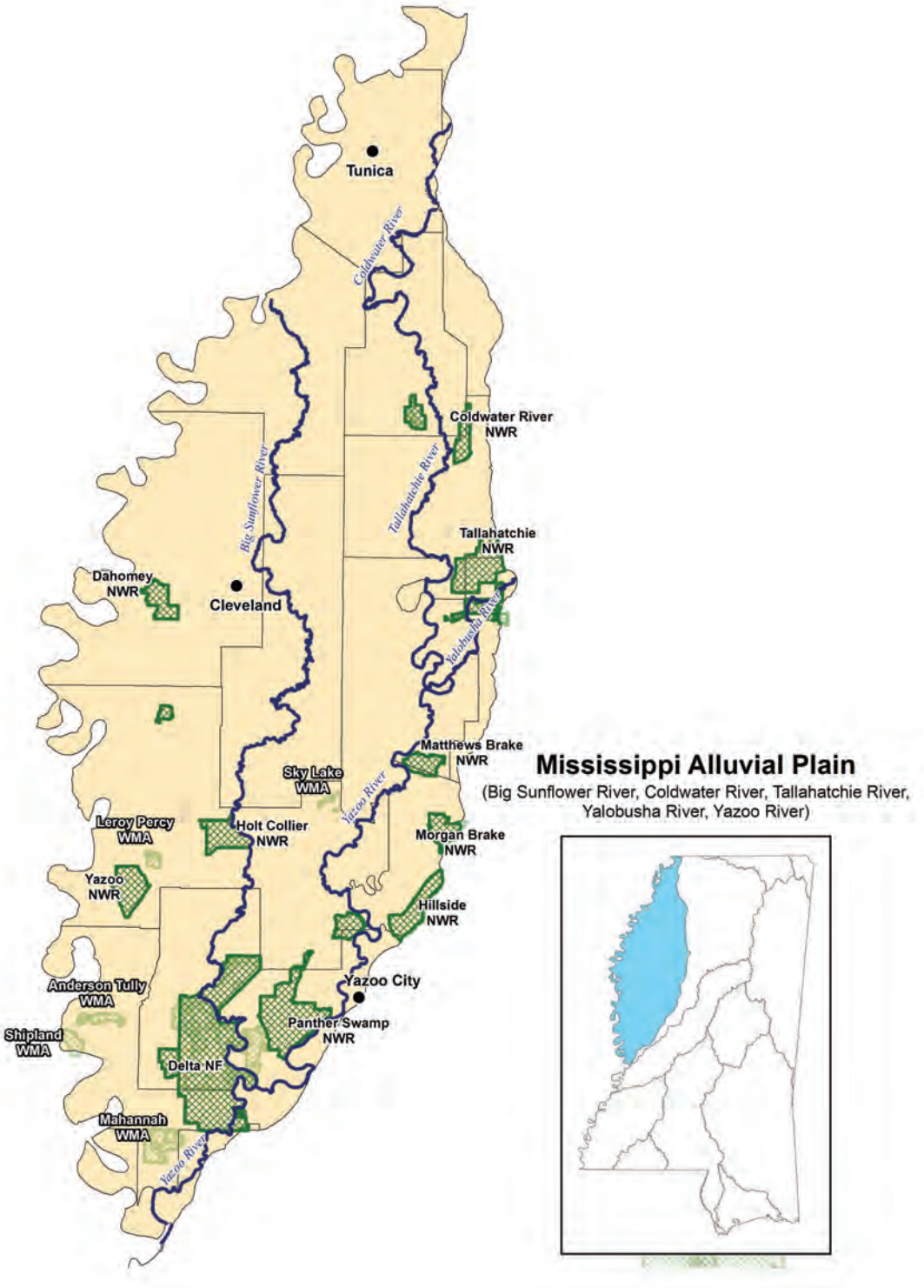


Figure 5.38 Mississippi Alluvial Plain Drainage

DESCRIPTION AND LOCATION

Although the Mississippi Alluvial Plain (MAP), also known as the Delta, is widest (approximately 70 miles) between Vicksburg and the Tennessee state line, it continues along the Mississippi River down to the Louisiana state line. In general, these are low gradient streams with fine substrate and sparse patches of gravel. The area is characterized by slow moving streams and abundant oxbows. This drainage includes the Big Sunflower, Tallahatchie and Yazoo rivers, and portions of the Yalobusha and Coldwater Rivers. 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. This system contains small, medium and large streams.

CONDITION AND CONSERVATION STATUS

Streams in the MAP have been extensively modified for flood control and agricultural development. Many streams have been converted to straight canals to improve drainage for agriculture. Weirs and lowhead dams block many streams. Diversion canals have been constructed to divert water from streams during high flow. Efforts to manage water systems for agriculture and flood control within the MAP have resulted in reduction in water flows, lowering of water tables, and a "dewatering" of the alluvial plain, which has resulted in extremely low flows in some streams. 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.

The MAP is considered **critically imperiled** because of its high conservation priority rank and the widespread degradation of stream habitats in this region. Mississippi Department of Environmental Quality and other experts are currently devising way to best monitor stream quality in the Mississippi Alluvial Plain Drainage. A Delta-wide fish advisory is in effect in the MAP.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH MISSISSIPPI ALLUVIAL PLAN (MAP)

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Sterna antillarum athalassos*	Interior Least Tern
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
	3	*Atractosteus spatula*	Alligator Gar
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
Mussels	1	*Actinonaias ligamentina*	Mucket
	1	*Elliptio dilatata*	Spike
	1	*Lampsilis hydiana*	Louisiana Fatmucket
	1	*Plethobasus cyphyus*	Sheepnose
	1	*Pleurobema rubrum*	Pyramid Pigtoe
	1	*Potamilus capax*	Fat Pocketbook
	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Ellipsaria lineolata*	Butterfly
	2	*Lampsilis cardium*	Plain Pocketbook
	2	*Quadrula nodulata*	Wartyback
	2	*Strophitus undulatus*	Squawfoot
	2	*Uniomerus declivis*	Tapered Pondhorn
	3	*Arcidens confragosus*	Rock Pocketbook
	3	*Lampsilis siliquoidea*	Fatmucket
	3	*Truncilla truncata*	Deertoe
	4	*Cyprogenia aberti*	Western Fanshell
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

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1.3 Yazoo Drainage

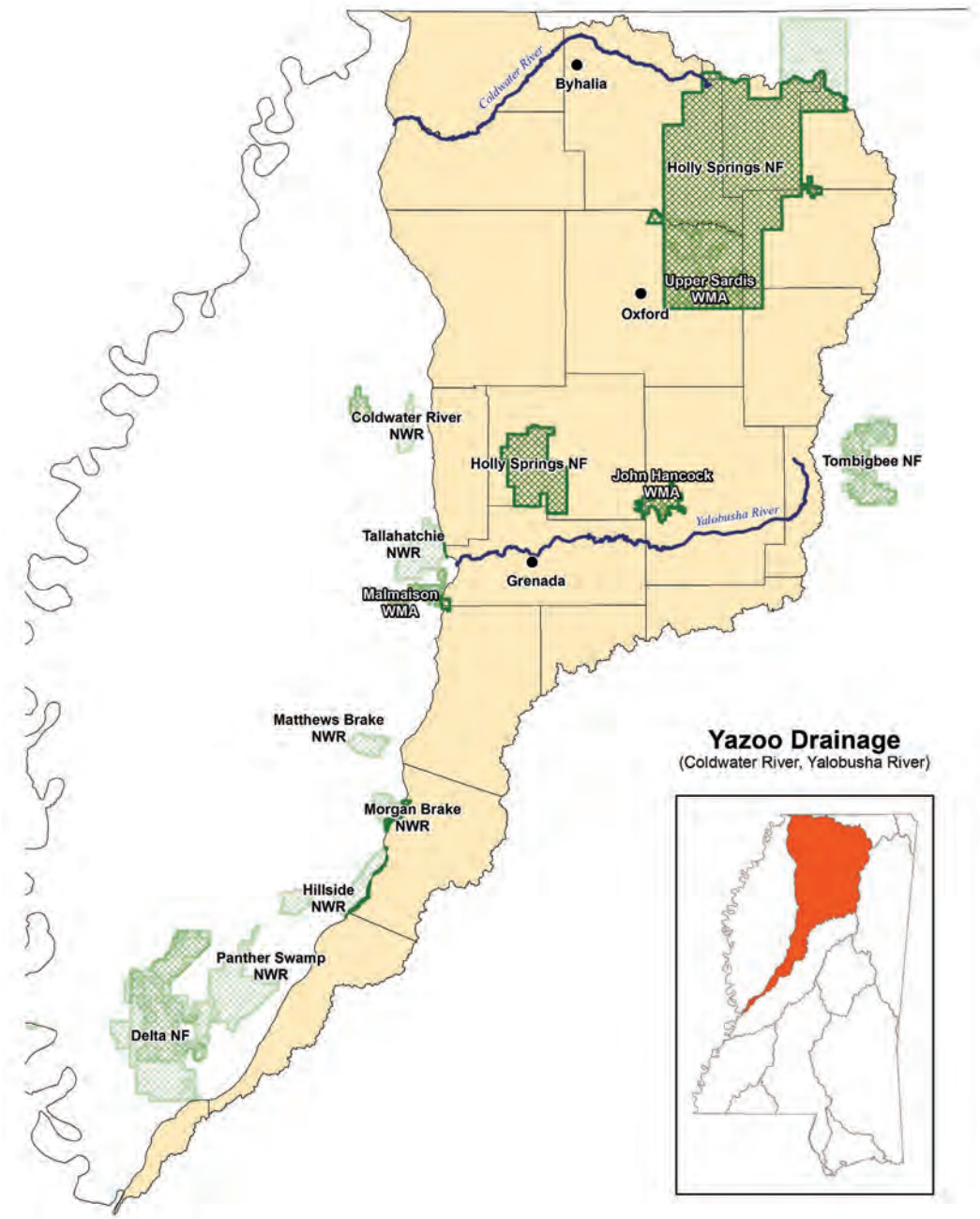

Figure 5.39 Yazoo River Drainage

DESCRIPTION AND LOCATION

These streams are tributaries of the Yazoo River which lie east of the Mississippi River Alluvial Plain. Portions of the Tallahatchie, Yocona, Yalobusha and Coldwater rivers 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. This system contains small streams, Loess Hills streams, medium, and large streams.

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 of the Yazoo River (Coldwater, Tallahatchie, Yocona and Yalobusha rivers) have been impounded by flood control reservoirs. Barriers to fish passage present a significant obstacle to movement of numerous species including many SGCN (i.e. Yazoo Darter).

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. Of the streams in the Yazoo Drainage monitored by the Mississippi Department of Environmental Quality 23 percent are rated good or very good, 36 percent are rated as fair, and 41 percent are rated as poor.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH YAZOO DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	1	*Hobbseus yalobushensis*	Yalobusha Rivulet Crayfish
	1	*Orconectes hartfieldi*	Yazoo Crayfish
	1	*Procambarus connus*	Carrolton crayfish
	1	*Procambarus lylei*	Shutispear Crayfish
	2	*Orconectes etnieri*	Ets Crayfish
	2	*Procambarus hagenianus vesticeps*	Egyptian Crayfish
Fish	1	*Etheostoma raneyi*	Yazoo Darter
	1	*Notorus gladiator*	Piebald Madtom
	2	*Cycleptus elongatus*	Blue Sucker
	2	*Cyprinella whipplei*	Steelcolor Shiner
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Percina phoxocephala*	Slenderhead Darter
	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
	3	*Atractosteus spatula*	Alligator Gar
	3	*Etheostoma asprigene*	Mud Darter
	3	*Ictiobus niger*	Black Buffalo
	3	*Notropis sabinae*	Sabine Shiner
	3	*Polyodon spathula*	Paddlefish
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

1.4 Big Black River Drainage

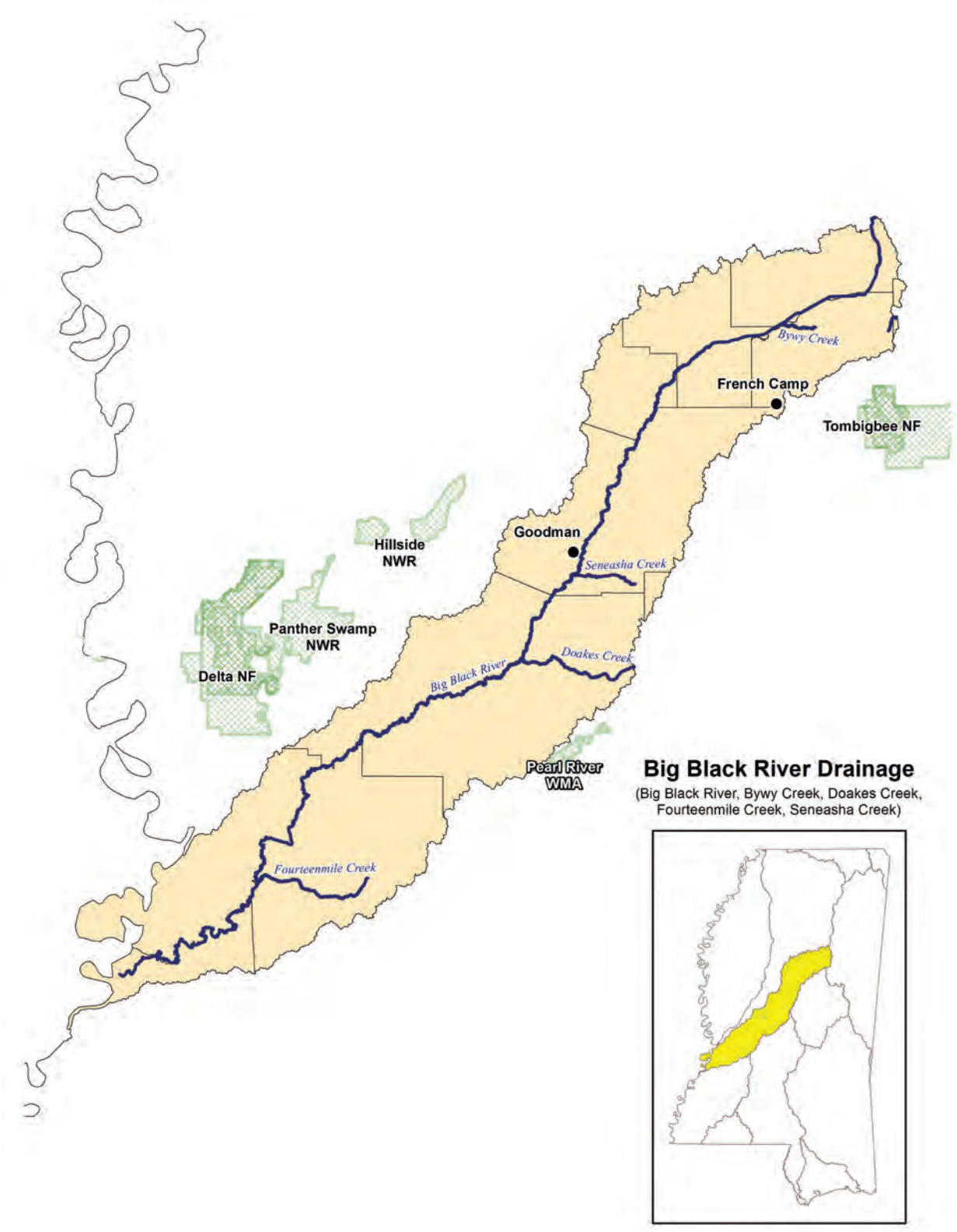

Figure 5.40 Big Black River Drainage

DESCRIPTION AND LOCATION

The Big Black River lies south and east of the Yazoo River. The drainage extends 155 miles and averages 22 miles wide and covers all or part of 13 counties. 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. This system contains small, Loess Hills, medium, and large streams.

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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH BIG BLACK RIVER DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Fish	1	*Noturus gladiator*	Piebald Madtom
	2	*Cycleptus elongatus*	Blue Sucker
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	3	*Etheostoma asprigene*	Mud Darter
	3	*Ictiobus niger*	Black Buffalo
	3	*Moxostoma erythrurum*	Golden Redhorse
	3	*Notropis sabinae*	Sabine Shiner
	3	*Polyodon spathula*	Paddlefish
	4	*Ammocrypta clara*	Western Sand Darter
Mussels	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria subrotunda*	Round Hickorynut
	1	*Pleurobema rubrum*	Pyramid Pigtoe
	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Ellipsaria lineolata*	Butterfly
	2	*Lampsilis cardium*	Plain Pocketbook
	2	*Quadrula nodulata*	Wartyback
	2	*Uniomerus declivis*	Tapered Pondhorn
	3	*Arcidens confragosus*	Rock Pocketbook
	3	*Lampsilis siliquoidea*	Fatmucket
	3	*Truncilla truncata*	Deertoe
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

1. Mississippi River and Associated Drainages						
	CLASSIFICATION	**SUBCLASS**	**1.1 Mississippi River**	**1.2 Mississippi Alluvial Plain (MAP)**	**1.3 Yazoo Drainage**	**1.4 Big Black River Drainage**
1	Residential and commercial development	1.1 Housing and urban areas: Threat from MS can be low in some systems but impacts from states upstream is high	L		M	M
		1.2 Commercial and industrial areas: Locally important in regards to MS but of higher concern is runoff from large cities upstream	M			L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: nutrient runoff, sedimentation, lack of field borders/buffers, farming in floodplains	H	H	H	H
		2.2 Wood and pulp plantations: Incompatible Forestry Practices (mostly historical)			M	M
		2.3 Livestock farming and ranching				M
3	Energy production and mining	3.2 Mining and quarrying: gravel/sand mining	H		L	L
4	Transportation and service corridors	4.1 Roads and railways			M	L
5	Biological resource use	5.3 Logging and wood harvesting	M		M	H
		5.4 Fishing and harvesting aquatic resources: Overexploitation/ incidental capture of sturgeon, paddlefish, alligator gar	M	M		L
6	Human intrusions and disturbance	6.1 Recreational activities			L	L
7	Natural system modifications	7.2 Dams and water management/use:				
		Operations of Dams/Impoundment: Direct threat in MS is an issue but impact from states upstream can be high.	L		H	
		Channel modification	H	H	H	H
		Groundwater and surface water withdrawal		H	L	L
		Headcutting	M		H	H
		No or insufficient instream flow standards for viable aquatic populations.	H	H		
		7.3 Other ecosystem modifications: Headcutting mainly on tributaries, increasing sedimentation into the river	M			
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Asian carp (black, silver, bighead, grass, and common carp), zebra mussel	H	H	L	L
9	Pollution	9.1 Household sewage and urban waste water	H	H		M
		9.2 Industrial and military effluents	H	H		L
		9.3 Agricultural and forestry effluents	H	H	H	H

PRIORITY CONSERVATION ACTIONS

1. Mississippi River and Associated Drainages					
CLASSIFICATION	**SUBCLASS**	**1.1 Mississippi River**	**1.2 Mississippi Alluvial Plain (MAP)**	**1.3 Yazoo Drainage**	**1.4 Big Black River Drainage**
1.0 Land/Water Protection					
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
1.2 Resource and habitat protection		X	X	X	X
2.0 Land/Water Management					
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X		X	X
	Discourage incompatible recreational uses.	X		X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present: Encourage fish producers to raise and sell only certified triploid grass carp for biological plant control	X	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.			X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Encourage implementation of Lower Mississippi River Conservation Committee habitat improvement/reclamation projects; address fish passage obstructions and connectivity issues	X	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity: Encourage development of holistic instream flow standards; Implement actions such as dike notching to allow navigation while supporting diverse habitats.	X	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X	X
3.0 Species Management					
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X	X

1. Mississippi River and Associated Drainages					
CLASSIFICATION	**SUBCLASS**	**1.1 Mississippi River**	**1.2 Mississippi Alluvial Plain (MAP)**	**1.3 Yazoo Drainage**	**1.4 Big Black River Drainage**
3.1 Species management	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.			X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
4.0 Education and Awareness					
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X		X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X		X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.			X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.			X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
5.0 Law and Policy					
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X	X	X

1. Mississippi River and Associated Drainages					
CLASSIFICATION	**SUBCLASS**	**1.1 Mississippi River**	**1.2 Mississippi Alluvial Plain (MAP)**	**1.3 Yazoo Drainage**	**1.4 Big Black River Drainage**
5.2 Policies and regulations	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X		X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X	X
	Discourage incompatible recreational uses.	X		X	X
	Improve enforcement of existing species protection regulations.	X	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X		X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X	X
6.0 Livelihood, economic and other incentives					
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.			X	X
6.2 Substitution	Discourage incompatible recreational uses.	X		X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X
7.0 External Capacity Building					
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X	X

2. Northeast Mississippi Drainages

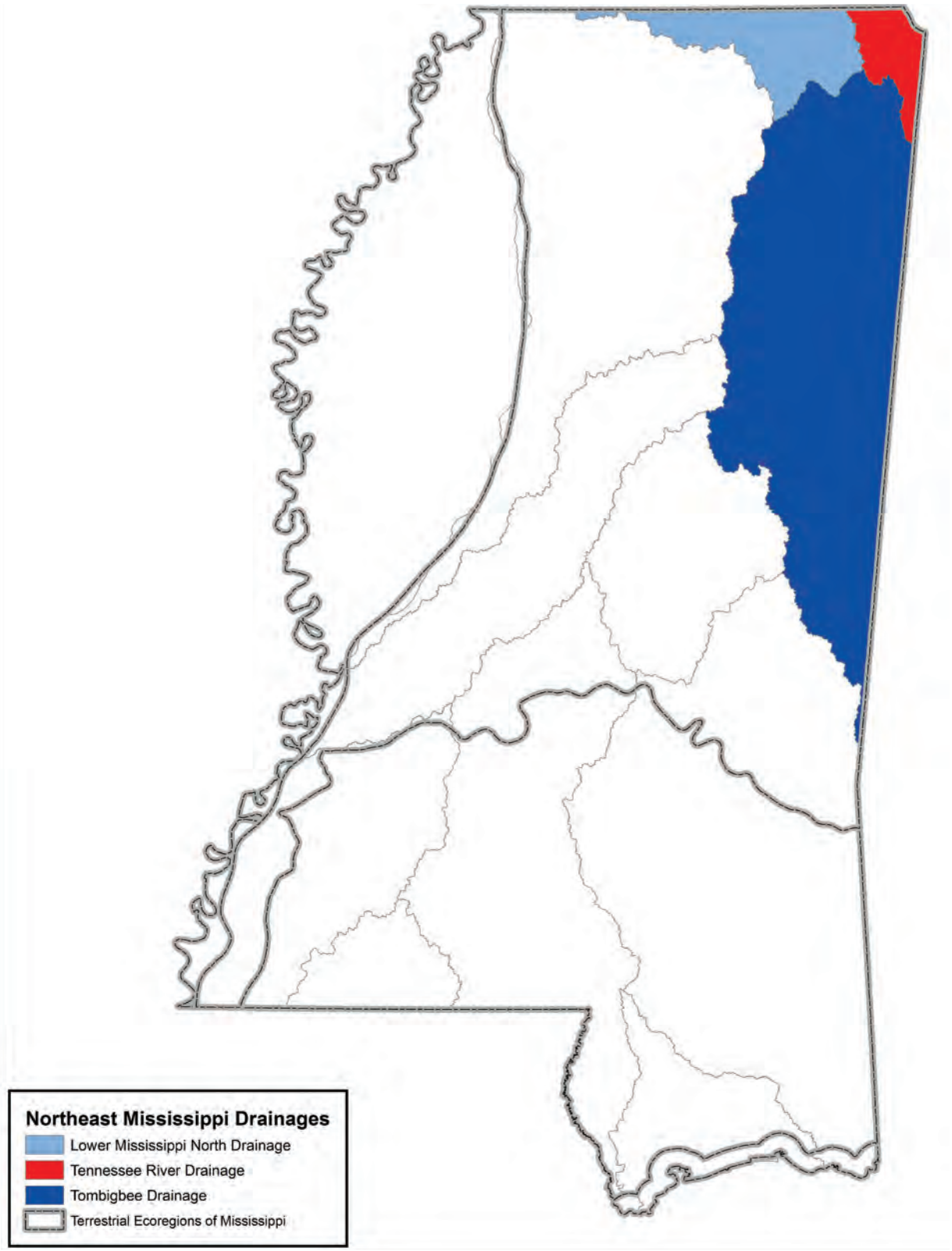

Figure 5.41 Northeast Mississippi Drainages

2.1 Northeast Hills, Tennessee River Drainage

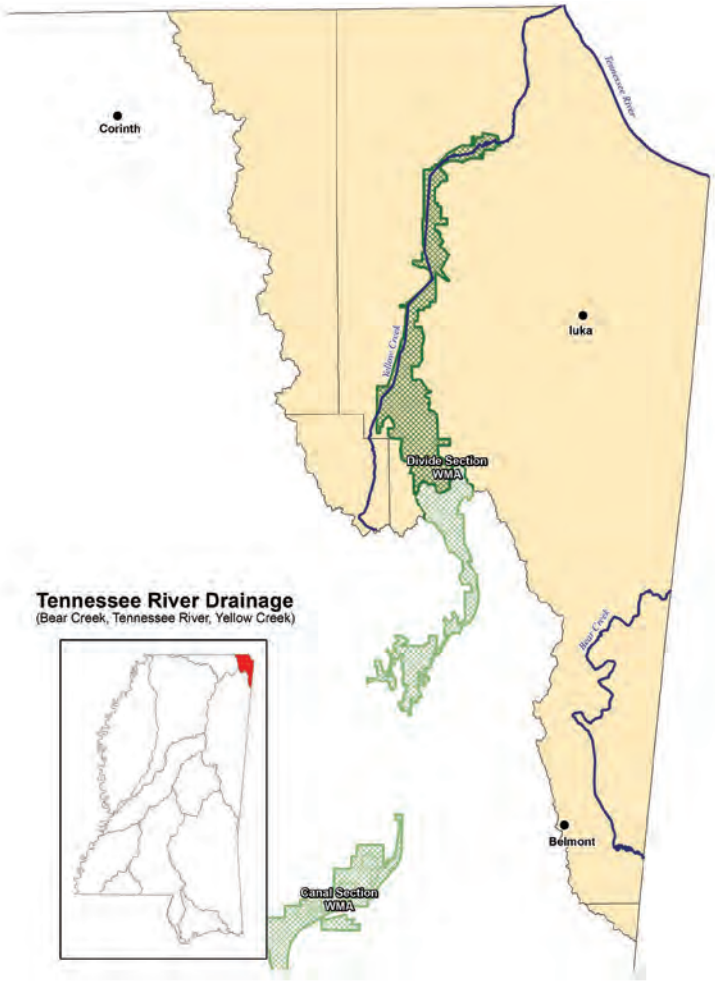

Figure 5.42 Tennessee River Drainage

DESCRIPTION AND LOCATION

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. This area includes the Tennessee River, Bear and Yellow Creeks. The basin drains an area in southern Tennessee and approximately **1,000 square miles** in Northern Mississippi. These streams are faunally distinct with numerous species occurring only in this relatively small region within the state.

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 have been at least partially 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.

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. Of the streams in the Tennessee River drainage monitored by the Mississippi Department of Environmental Quality 46 percent are rated good or very good, 46 percent are rated as fair, and 8 percent are rated as poor.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH NORTHEAST HILLS, TENNESSEE RIVER DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Cryptobranchus alleganiensis*	Hellbender
	2	*Gyrinophilus porphyriticus*	Spring Salamander
	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	2	*Orconectes etnieri*	Ets Crayfish
	2	*Procambarus ablusus*	Hatchie River Crayfish
	3	*Cambarus girardianus*	Tanback Crayfish
	3	*Cambarus rusticiformis*	Depression Crayfish
	3	*Orconectes spinosus*	Coosa River Spiny Crayfish
	3	*Orconectes validus*	Powerful Crayfish
	3	*Orconectes wrighti*	Hardin Crayfish
Fish	1	*Ambloplites repestric*	Rock Bass
	1	*Percina tanasi*	Snail Darter
	2	*Cottus carolinae*	Banded Sculpin
	2	*Cyprinella galactura*	Whitetail Shiner
	2	*Cyprinella whipplei*	Steelcolor Shiner
	2	*Etheostoma blennioides*	Greenside Darter
	2	*Etheostoma duryi*	Black Darter
	2	*Etheostoma kennicotti*	Stripetail Darter
	2	*Etheostoma nigripinne*	Blackfin Darter
	2	*Etheostoma zonistium*	Bandfin Darter
	2	*Moxostoma anisurum*	Silver Redhorse
	2	*Moxostoma carinatum*	River Redhorse
	2	*Moxostoma duquesnei*	Black Redhorse
	2	*Moxostoma macrolepidotum*	Shorthead Redhorse
	2	*Notropis boops*	Bigeye Shiner
	2	*Percina evides*	Gilt Darter
	2	*Percina phoxocephala*	Slenderhead Darter
	2	*Phenacobius mirabilis*	Suckermouth Minnow
	2	*Rhinichthys atratulus*	Blacknose Dace
	3	*Clinostomus funduloides*	Rosyside Dace
	3	*Cyprinella spiloptera*	Spotfin Shiner
	3	*Etheostoma flabellare*	Fantail Darter
	3	*Etheostoma rufilineatum*	Redline Darter
	3	*Ictiobus niger*	Black Buffalo
	3	*Lythrurus fasciolaris*	Rosefin Shiner
	3	*Moxostoma erythrurum*	Golden Redhorse
	3	*Stizostedion vitreum*	Walleye
	4	*Noturus exilis*	Slender Madtom
Mussels	1	*Cyclonaias tuberculata*	Purple Wartyback
	1	*Epioblasma brevidens*	Cumberlandian Combshell
	1	*Epioblasma triquetra*	Snuffbox
	1	*Ligumia recta*	Black Sandshell

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	1	*Pleuronaia barnesiana*	Tennessee Pigtoe
	1	*Pleuronaia dolabelloides*	Slabside Pearlymussel
	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot
	2	*Ellipsaria lineolata*	Butterfly
	2	*Lampsilis cardium*	Plain Pocketbook
	2	*Strophitus undulatus*	Creeper
	3	*Arcidens confragosus*	Rock Pocketbook
	3	*Lasmigona complanata*	White Heelsplitter
	3	*Potamilus alatus*	Pink Heelsplitter
	3	*Ptychobranchus fasciolaris*	Kidneyshell
	3	*Truncilla truncata*	Deertoe
Reptiles	2	*Regina septemvittata*	Queen Snake

2.2 Tombigbee Drainage

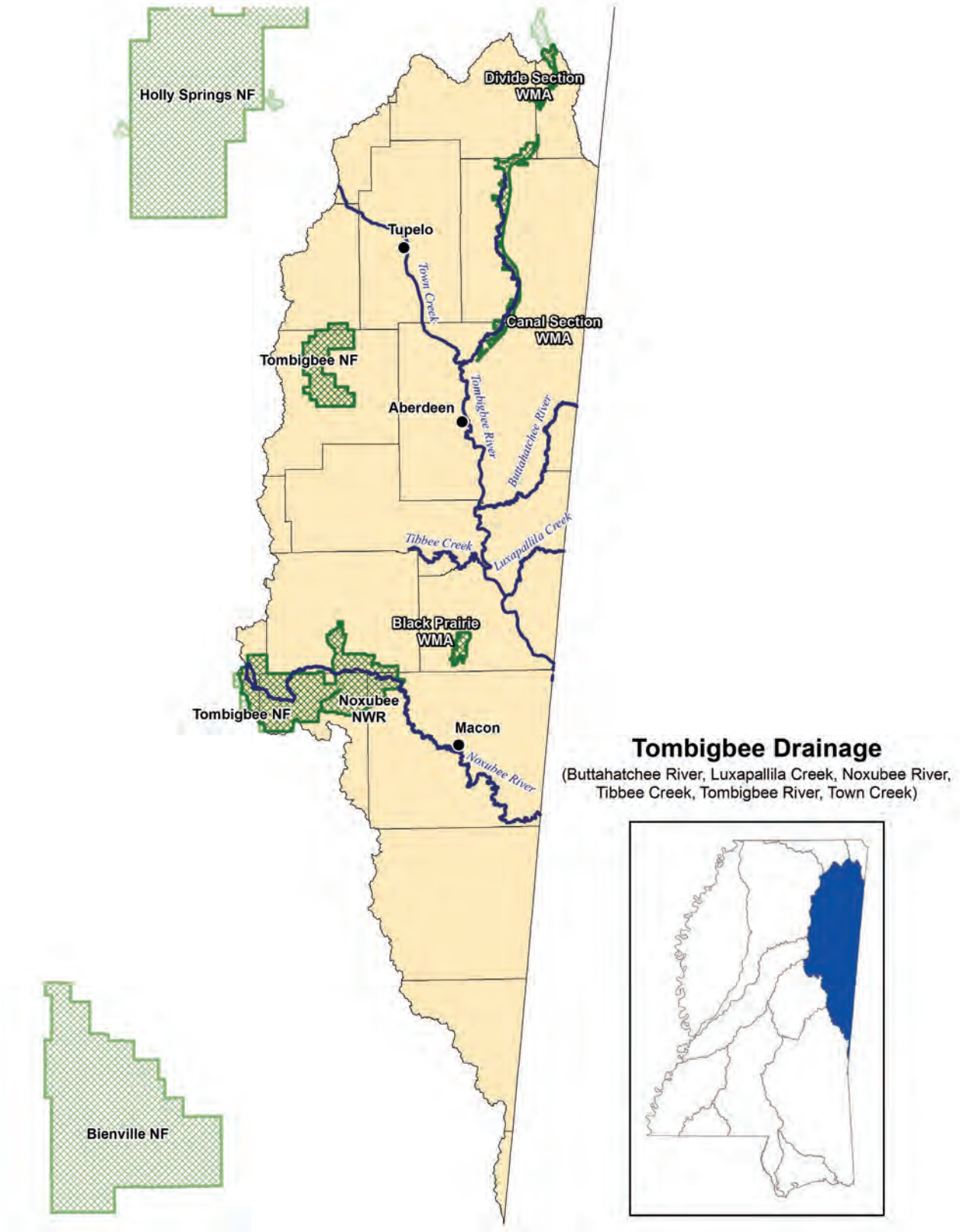

Figure 5.43 Tombigbee Drainage

DESCRIPTION AND LOCATION

Streams in this category are tributaries of the Tombigbee River, which has been highly modified by construction of the Tennessee-Tombigbee Waterway. The drainage covers 6,100 square miles and covers all or a portion of 19 counties in the Northeast part of Mississippi. There are **11,700 miles** of streams in the area, most of which only carry water after heavy rains. The streams flow into Alabama before entering the Gulf of Mexico through Mobile Bay. 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 and dams for navigation. This has effectively isolated many tributaries by creating a lentic barrier between lotic systems. Many of the tributaries have been altered by channelization. Headcutting, erosion, and sedimentation are often problems, 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. Of the streams in the Tombigbee Drainage monitored by the Mississippi Department of Environmental Quality 25 percent are rated good or very good, 33 percent are rated as fair, and 42 percent are rated as poor.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH TOMBIGBEE DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Birds	2	*Haliaeetus leucocephalus*	Bald Eagle
	3	*Pandion haliaetus*	Osprey
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	1	*Hobbseus cristatus*	Crested Rivulet Crayfish
	1	*Hobbseus orconectoides*	Oktibbeha Rivulet Crayfish
	1	*Hobbseus petilus*	Tombigbee Rivulet Crayfish
	1	*Orconectes mississippiensis*	Mississippi Crayfish
	1	*Procambarus lagniappe*	Lagniappe Crayfish
	2	*Hobbseus prominens*	Prominence Rivulet Crayfish
	2	*Orconectes jonesi*	Sucarnoochee River Crayfish
	2	*Procambarus lecontei*	Mobile Crayfish
Fish	1	*Alosa alabamae*	Alabama Shad
	1	*Etheostoma zonifer*	Backwater Darter
	1	*Noturus munitus*	Frecklebelly Madtom
	1	*Percina lenticula*	Freckled Darter
	1	*Scaphirhynchus suttkusi*	Alabama Sturgeon
	2	*Ammocrypta meridiana*	Southern Sand Darter
	2	*Crystallaria asprella*	Crystal Darter
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	2	*Cyprinella callistia*	Alabama Shiner
	2	*Etheostoma lachneri*	Tombigbee Darter
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Moxostoma carinatum*	River Redhorse
	2	*Notropis candidus*	Silverside Shiner
	2	*Notropis edwardraneyi*	Fluvial Shiner
	2	*Stizostedion sp 1**	Southern Walleye
	3	*Etheostoma rupestre*	Rock Darter
	3	*Hypentelium etowanum*	Alabama Hog Sucker
	3	*Moxostoma erythrurum*	Golden Redhorse
	3	*Percina kathae*	Mobile Logperch
	3	*Polyodon spathula*	Paddlefish
Mussels	1	*Elliptio arca*	Alabama Spike
	1	*Elliptio arctata*	Delicate Spike
	1	*Epioblasma penita*	Southern Combshell
	1	*Hamiota perovalis*	Orange-Nacre Mucket
	1	*Lasmigona 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

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	1	*Potamilus inflatus*	Inflated Heelsplitter
	1	*Strophitus connasaugaensis*	Alabama Creekmussel
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Ellipsaria lineolata*	Butterfly
	2	*Lampsilis straminea straminea*	Rough Fatmucket
	2	*Quadrula rumphiana*	Ridged Mapleleaf
	2	*Strophitus subvexus*	Southern Creekmussel
	2	*Uniomerus declivis*	Tapered Pondhorn
	3	*Arcidens confragosus*	Rock Pocketbook
	4	*Pleurobema curtum*	Black Clubshell
	4	*Pleurobema marshalli*	Flat Pigtoe
	4	*Pleurobema taitianum*	Heavy Pigtoe
	4	*Quadrula metanevra*	Monkeyface
	4	*Quadrula stapes*	Stirrupshell
Reptiles	2	*Graptemys nigrinoda*	Black-Knobbed Map Turtle
	2	*Graptemys pulchra*	Alabama Map Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle

**Undescribed species*

2.3 Lower Mississippi River North Drainage (Hatchie and Wolf River Systems)

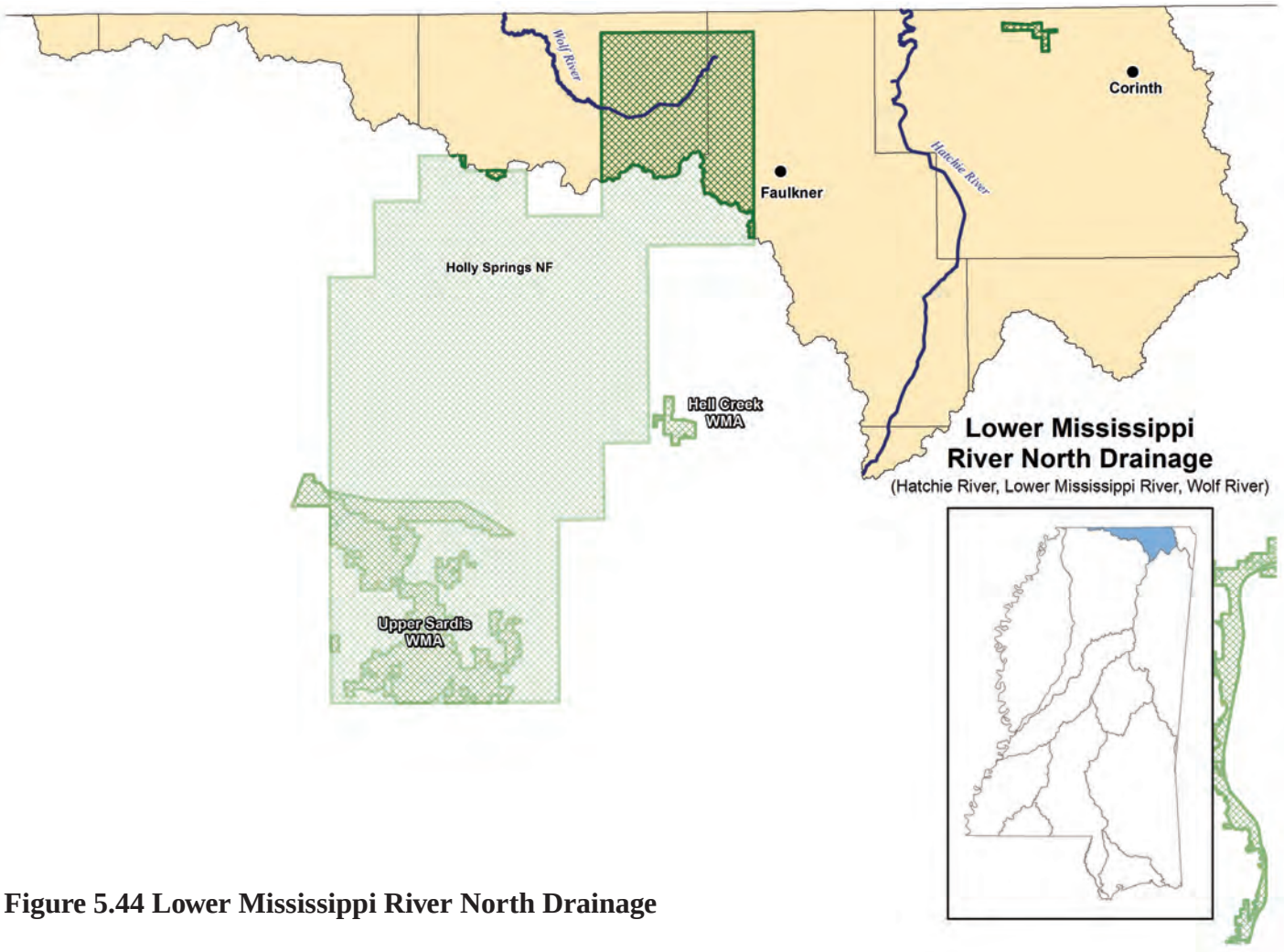

Figure 5.44 Lower Mississippi River North Drainage

DESCRIPTION AND LOCATION

Although most systems in this drainage occur outside of Mississippi, portions of the Hatchie, Tuscumbia, and Wolf River systems in North Mississippi are part of this drainage. The basin drains a portion of Tennessee and approximately **1,000 square miles** in Mississippi. This system contains Small and Medium streams.

CONDITION AND CONSERVATION STATUS

Much of the Lower Mississippi North Drainage 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**.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER MISSISSIPPI RIVER NORTH DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	2	*Orconectes etnieri*	Ets Crayfish
	2	*Procambarus ablusus*	Hatchie River Crayfish
Fish	1	*Notorus gladiator*	Piebald Madtom
	2	*Cyprinella whipplei*	Steelcolor Shiner
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

2. Northeast Mississippi Drainages					
	CLASSIFICATION	**SUBCLASS**	**2.1 Northeast Hills, Tennessee River Drainage**	**2.2 Tombigbee Drainage**	**2.3 Lower Mississippi River North Drainage**
1	Residential and commercial development	1.1 Housing and urban areas	M	M	
		1.2 Commercial and industrial areas: Yellow Creek	L	H	
		1.3 Tourism and recreation areas: Second home/vacation home development	M		
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Nutrient runoff, lack of field borders, erosion	H	H	H
		2.2 Wood and pulp plantations: Sedimentation, planting offsite species	L	M	
		2.3 Livestock farming and ranching: Lack of buffers along streams, damage to bank vegetation along stream banks due to livestock accessibility, erosion, hog farms	M	M	M
3	Energy production and mining	3.2 Mining and quarrying: Agricultural lime mining, sandstone and gravel mining	L	H	L
4	Transportation and service corridors	4.1 Roads and railways	L	M	
5	Biological resource use	5.3 Logging and wood harvesting	H	H	M
6	Human intrusions and disturbance	6.1 Recreational activities: ATVs causing damage to stream beds and banks, increased erosion, trash from recreational users	L	L	L
7	Natural system modification	7.2 Dams and water management/use:			
		Operations of Dams/Impoundments: Headwater dams on Bear Creek and Cedar Creek (Alabama) and Pickwick Lake	H	H	
		Channel Modification: Channelization of Bear Creek	M	H	H
		Groundwater and Surface Water Withdrawal		L	
		Headcutting		H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Asian carp (black, silver, bighead, grass, and common carp), weed shiner, Asian clam, zebra mussels, alligatorweed, water lettuce, Ouachita map turtle, wild hogs, Mississippi silverside, water flea	M	H	
9	Pollution	9.1 Household sewage and urban waste water	H		
		9.2 Industrial and military effluents		M	
		9.3 Agricultural and forestry effluents: Pesticide and nutrient runoff, sedimentation		M	M

PRIORITY CONSERVATION ACTIONS

2. Northeast Mississippi Drainages				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Northeast Hills, Tennessee River Drainage**	**2.2 Tombigbee Drainage**	**2.3 Lower Mississippi River North Drainage**
1.0 Land/Water Protection				
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
1.2 Resource and habitat protection		X	X	X
2.0 Land/Water Management				
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
2.2 Invasive species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present: Encourage fish producers to raise and sell only certified triploid grass carp for biological plant control	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Address fish passage obstructions and connectivity issues.	X	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity: Encourage development of holistic instream flow standards	X	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X	X
3.0 Species Management				
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X

2. Northeast Mississippi Drainages				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Northeast Hills, Tennessee River Drainage**	**2.2 Tombigbee Drainage**	**2.3 Lower Mississippi River North Drainage**
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X	X
4.0 Education and Awareness				
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
5.0 Law and Policy				
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X	X

2. Northeast Mississippi Drainages				
CLASSIFICATION	**CONSERVATION ACTION**	**2.1 Northeast Hills, Tennessee River Drainage**	**2.2 Tombigbee Drainage**	**2.3 Lower Mississippi River North Drainage**
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X	X
	Discourage incompatible recreational uses.	X	X	X
	Improve enforcement of existing species protection regulations.	X	X	X
	Continue to restrict/monitor scientific collection of SGCN.			
	Encourage proper disposal and cleanup of waste and litter.	X	X	X
6.0 Livelihood, economic and other incentives				
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X
7.0 External Capacity Building				
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X	X

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3. Pearl River Drainages

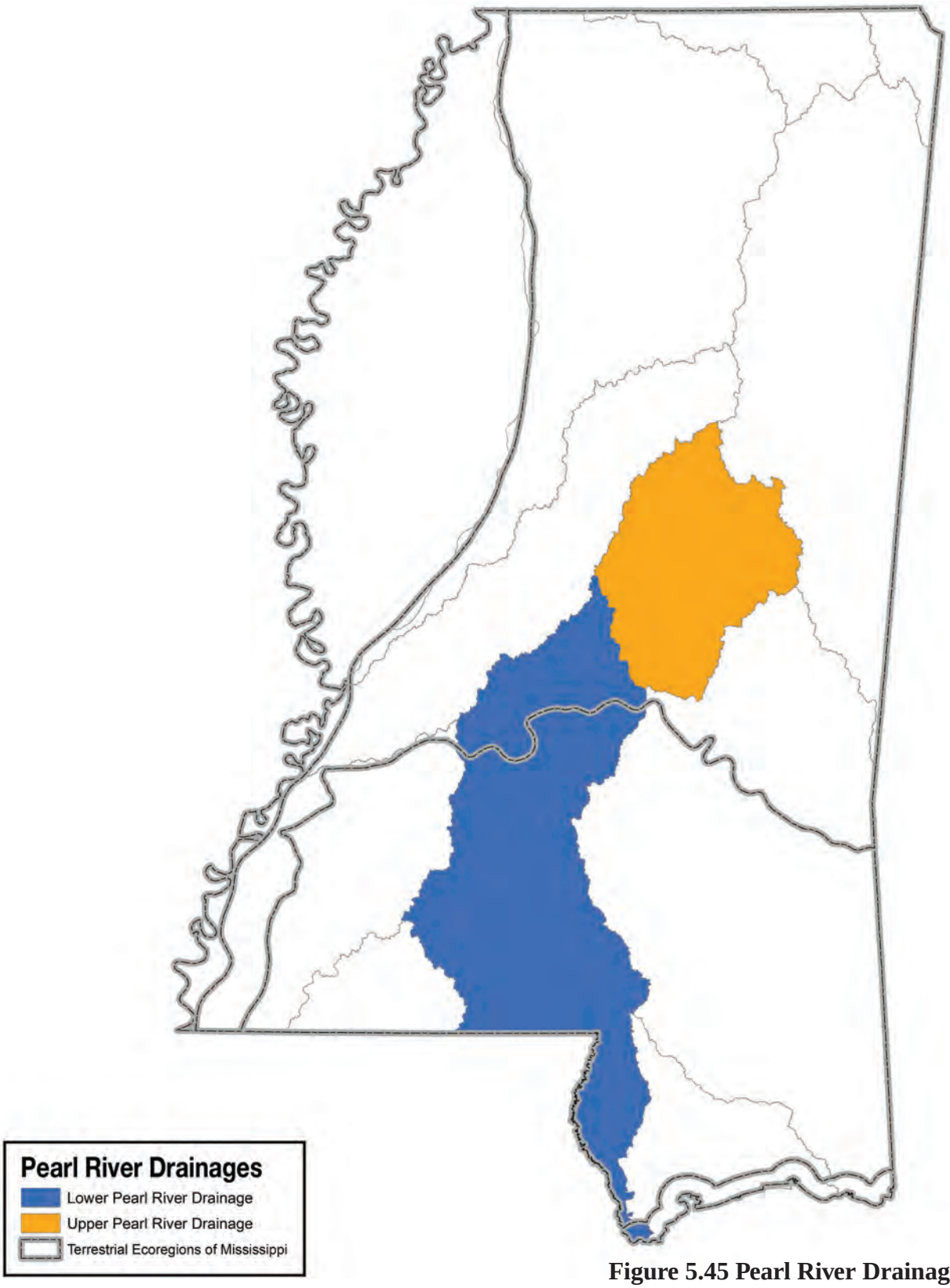
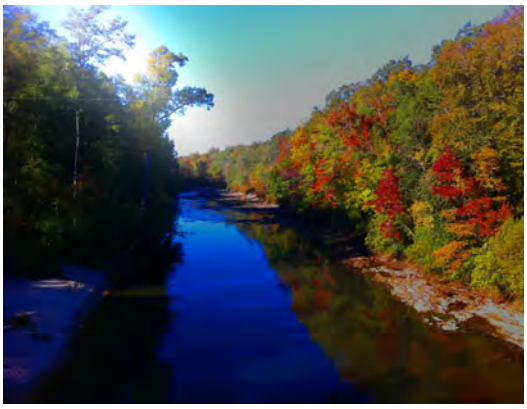


Figure 5.45 Pearl River Drainages

3.1 Upper Pearl River Drainage



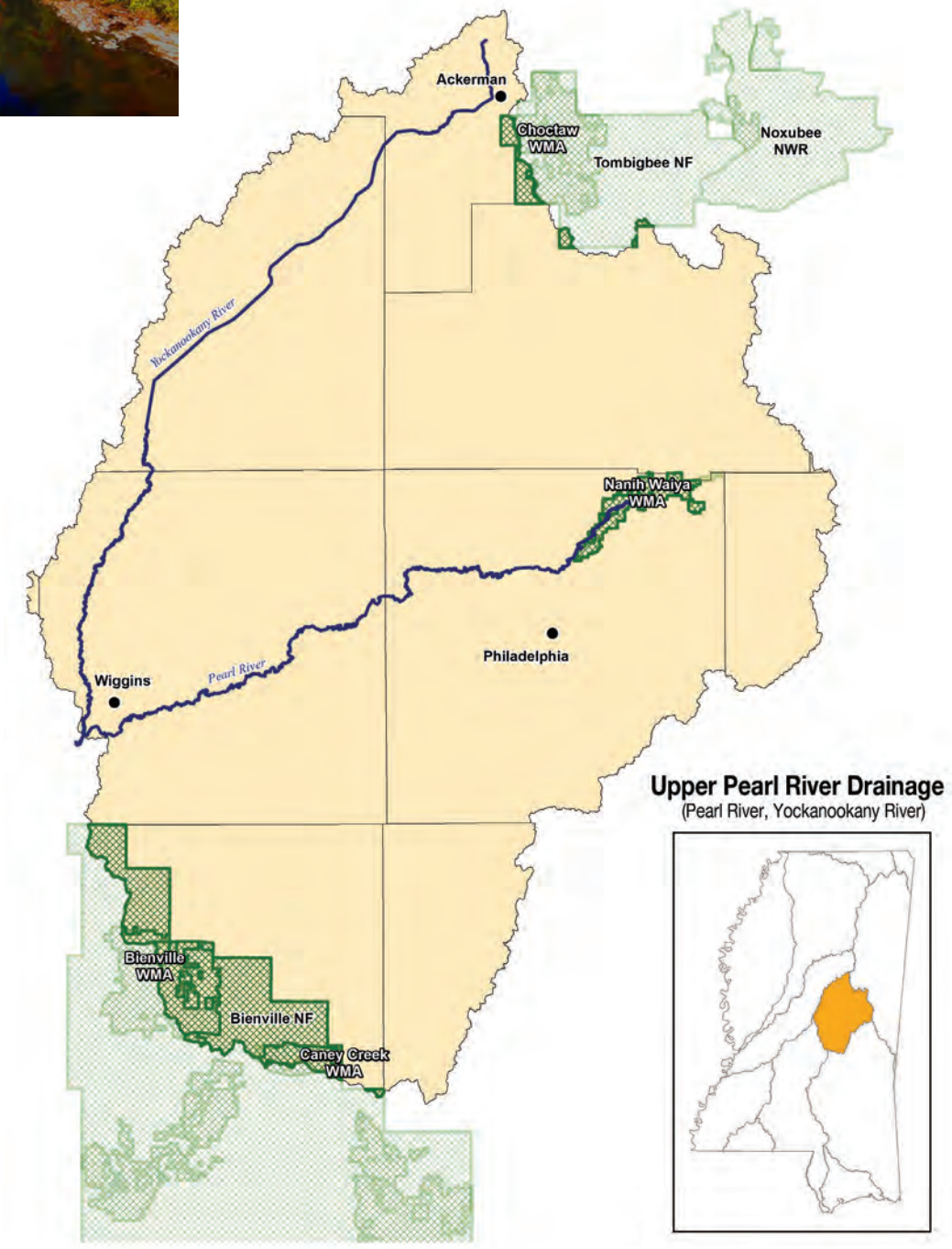


Figure 5.46 Upper Pearl River Drainage

DESCRIPTION AND LOCATION

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. This system contains small, medium and large streams.

CONDITION AND CONSERVATION STATUS

The main stem of the Pearl River is impounded by Ross Barnett Reservoir dam. 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 due to mercury and polychlorinated biphenyls (PCBs) on these waters.

The Upper Pearl River Drainage is considered **vulnerable** to further degradation. Of the streams in this drainage monitored by the Mississippi Department of Environmental Quality 58 percent are rated as good, 23 percent as fair, and 19 percent as poor or very poor. Pollutants found in the streams are pathogens and nutrients from animal wastes and failing septic systems, pesticides from agriculture and urban runoff, and eroded sediment from agricultural, timber harvesting, and construction sites.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH UPPER PEARL RIVER DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	1	*Hobbseus attenuatus*	Pearl Rivulet Crayfish
	1	*Hobbseus valleculus*	Choctaw Rivulet Crayfish
Fish	2	*Fundulus dispar*	Northern Starhead Topminnow
Mussels	1	*Elliptio arctata*	Delicate Spike
	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria unicolor*	Alabama Hickorynut
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
	3	*Lasmigona complanata*	White Heelsplitter
Reptiles	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle

3.2 Lower Pearl River Drainage

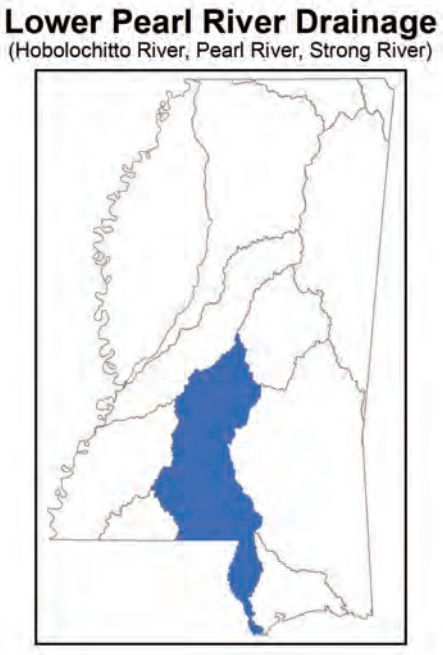


Figure 5.47 Lower Pearl River Drainage

DESCRIPTION AND LOCATION

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. This system contains small streams, small blackwater streams, medium streams, medium blackwater streams, and large streams.

CONDITION AND CONSERVATION STATUS

The lower Pearl River drainage is impacted from upstream by Ross Barnett Reservoir. 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, pollution, 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. A concrete sill on the Pearl River south of Bogalusa is a barrier to migrating fishes, particularly the Gulf Sturgeon, except during very high flow periods.

Because of the high conservation rank of this drainage, it is considered **vulnerable** in the state. Of the streams monitored in the Lower Pearl Drainage by the Mississippi Department of Environmental Quality, 58 percent are rated good or very good, 23 percent are rated as fair, and 19 percent are rated as poor. Major sources of pollution include pathogens and nutrients from animal wastes and failing septic systems, pesticides from agriculture and urban areas, and eroded sediment from agricultural, timber harvesting and construction sites.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER PEARL RIVER DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Pseudotriton montanus*	Mud Salamander
Birds	2	*Haliaeetus Leucocephalus*	Bald Eagle
	3	*Pandion haliaetus*	Osprey
Crustaceans	2	*Procambarus bivittatus*	Ribbon Crayfish
	2	*Procambarus penni*	Pearl Blackwater Crayfish
Fish	1	*Acipenser oxyrhinus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	1	*Notropis chalybaeus*	Ironcolor Shiner
	1	*Noturus munitus*	Frecklebelly Madtom
	1	*Percina aurora*	Pearl Darter
	1	*Percina lenticula*	Freckled Darter
	2	*Crystallaria asprella*	Crystal Darter
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Morone saxatilis*	Striped Bass
	2	*Moxostoma carinatum*	River Redhorse
	2	*Pteronotropis welaka*	Bluenose Shiner
	3	*Atractosteus spatula*	Alligator Gar
	3	*Heterandria formosa*	Least Killifish
	3	*Ictiobus niger*	Black Buffalo
	3	*Polyodon spathula*	Paddlefish
Mammals	2	*Trichechus manatus*	Manatee
Mussels	1	*Elliptio arctata*	Delicate Spike
	1	*Ligumia recta*	Black Sandshell
	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria unicolor*	Alabama Hickorynut
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
	3	*Arcidens confragosus*	Rock Pocketbook
	3	*Lasmigona complanata*	White Heelsplitter
Reptiles	2	*Farancia erytrogramma*	Rainbow Snake
	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

3. Pearl River Drainage				
	CLASSIFICATION	**SUBCLASS**	**3.1 Upper Pearl River Drainage**	**3.2 Lower Pearl River Drainage**
1	Residential and commercial development	1.1 Housing and urban areas: Point and non-point source pollution, erosion, increased runoff		H
		1.2 Commercial and industrial areas: Point source pollution, erosion, increased runoff from water impervious surfaces		M
		1.3 Tourism and recreation areas		M
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use, nutrient runoff, sedimentation, erosion, bank destabilization	M	L
		2.2 Wood and pulp plantations: Conversion of floodplain to pine plantations, siltation and increased erosion from bedding, improper implementation of BMPs	H	M
		2.3 Livestock farming and ranching: Runoff from chicken farms; Lack of buffers along stream banks leading to soil compaction, bank destabilization, and alteration of vegetation		H
3	Energy production and mining	3.1 Oil and gas drilling: oil/gas extraction getting into water systems,		H
		3.2 Mining and quarrying: Fill dirt, localized sand/gravel mining, transfer of exotic species from mining operations	L	H
4	Transportation and service corridors	4.1 Roads and railways		L
5	Biological resource use	5.3 Logging and wood harvesting		H
		5.4 Fishing and harvesting aquatic resources: Overexploitation/Incidental Capture of alligator snapping turtle, ringed map turtle, Pascagoula map turtle, alligator gar, Gulf sturgeon		M
6	Human intrusions and disturbance	6.1 Recreational activities: Camping on turtle nesting sandbars, increased boating traffic causing erosion of sandbars, off road vehicle use	H	M
7	Natural system modification	7.2 Dams and water management/use:		
		Operations of Dams/Impoundment: Alteration of natural hydrology	H	H
		Channel modification	H	
		Headcutting	L	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Hydrilla, Asian carp (black, silver, bighead, grass, and common carp), Chinese tallow, water hyacinth, water lettuce, torpedo grass, alligator weed, parrot feather milfoil, Eurasian milfoil, Asian clam, elephant ear, kariba weed, apple snail, woodrush flatsedge	L	L
9	Pollution	9.1 Household sewage and urban waste water		H
		9.2 Industrial and military effluents		H
		9.3 Agricultural and forestry effluents	M	H

PRIORITY CONSERVATION ACTIONS

3. Pearl River Drainages			
CLASSIFICATION	**SUBCLASS**	**3.1 Upper Pearl River Drainage**	**3.2 Lower Pearl River Drainage**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Address fish passage obstructions and connectivity issues.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity. Encourage development of holistic instream flow standards.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).		X
	Continue to restrict/monitor scientific collection of SGCN.		X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X

3. Pearl River Drainages			
CLASSIFICATION	**SUBCLASS**	**3.1 Upper Pearl River Drainage**	**3.2 Lower Pearl River Drainage**
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X

3. Pearl River Drainages			
CLASSIFICATION	**SUBCLASS**	**3.1 Upper Pearl River Drainage**	**3.2 Lower Pearl River Drainage**
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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4. Southeast Mississippi Drainages

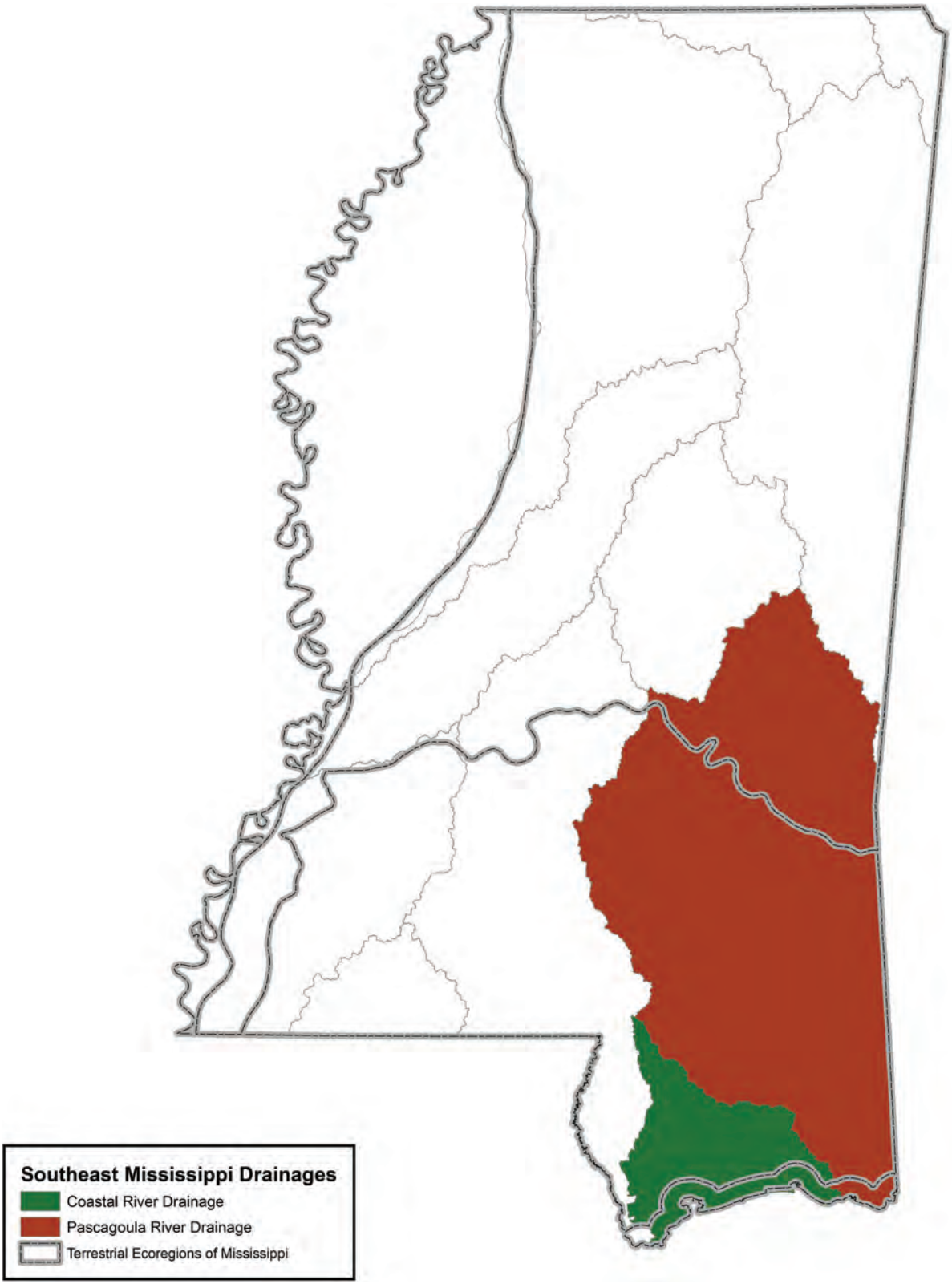

Figure 5.48 Southeast Mississippi Drainages

4.1 Pascagoula River Drainage

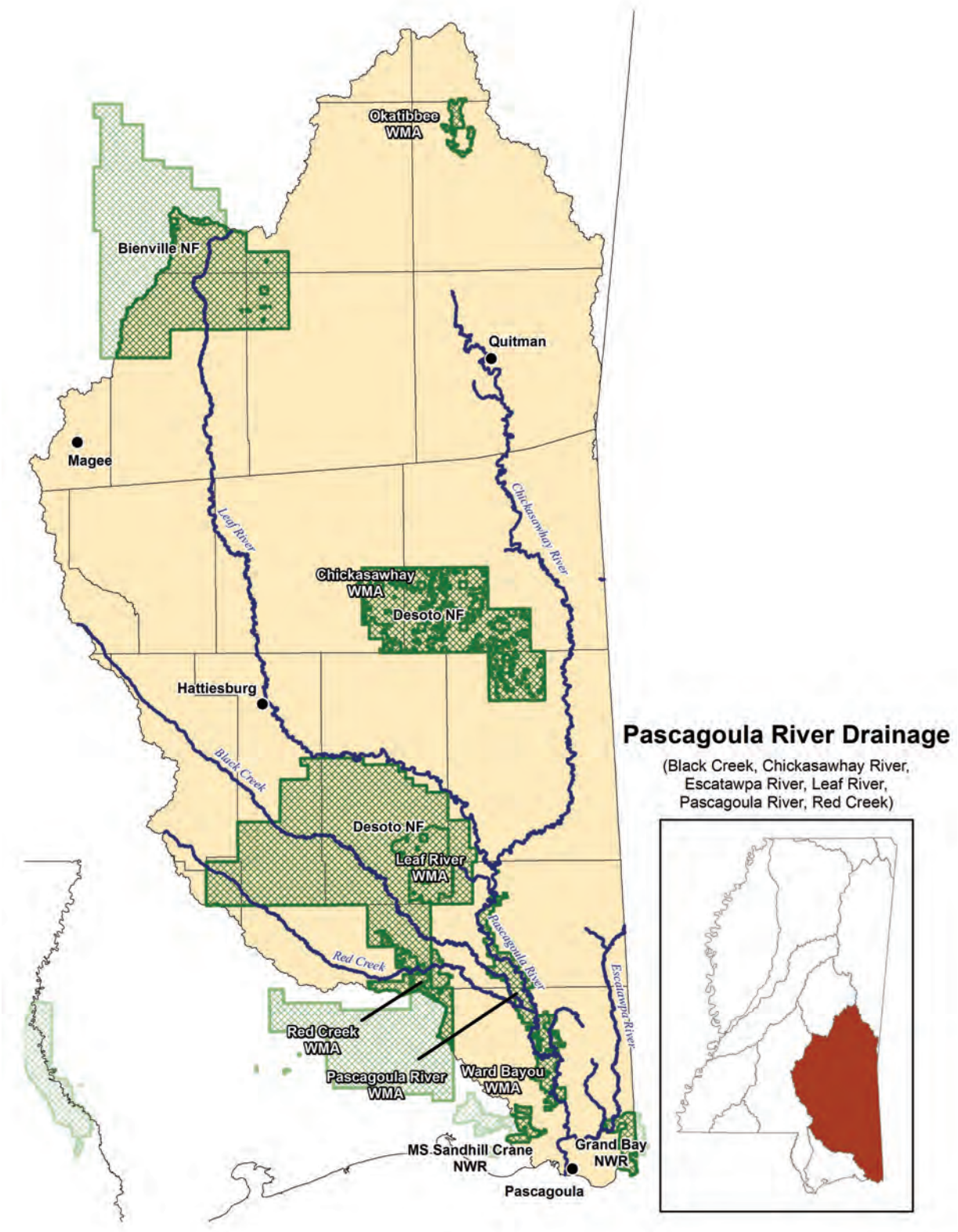

Figure 5.49 Pascagoula River Drainage

DESCRIPTION AND LOCATION

The Pascagoula River drains much of the southeastern quarter of Mississippi, covering all or parts of 22 counties. Over 15,000 miles of streams and rivers wind through the 9,600 square miles of the basin. 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. This system contains small, small blackwater, medium, medium blackwater, and large streams.

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. Of the streams monitored in the Pascagoula drainage by the Mississippi Department of Environmental Quality 61 percent are rated good or very good, 30 percent are rated fair, and 9 percent are rated poor or very poor. Both the Pascagoula and Escatawpa River have fish consumption advisories due to high levels of Mercury.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH PASCAGOULA DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
	2	*Pseudotriton montanus*	Mud Salamander
	3	*Pseudotriton ruber*	Red Salamander
Birds	2	*Haliaeetus leucocephalus*	Bald Eagle
	3	*Pandion haliaetus*	Osprey
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	1	*Hobbseus attenuatus*	Pearl Rivulet Crayfish
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	1	*Notropis chalybaeus*	Ironcolor Shiner
	1	*Notropis melanostomus*	Blackmouth Shiner
	1	*Percina aurora*	Pearl Darter
	1	*Percina lenticula*	Freckled Darter
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Morone saxatilis*	Striped Bass
	2	*Moxostoma carinatum*	River Redhorse
	2	*Pteronotropis welaka*	Bluenose Shiner
	3	*Atractosteus spatula*	Alligator Gar
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Polyodon spathula*	Paddlefish
	4	*Leptolucania ommata*	Pygmy Killifish
Mammals	2	*Trichechus manatus*	Manatee
Mussels	1	*Elliptio arctata*	Delicate Spike
	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria unicolor*	Alabama Hickorynut
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
	2	*Uniomerus declivis*	Tapered Pondhorn
	3	*Lasmigona complanata*	White Heelsplitter
Reptiles	2	*Farancia erytrogramma*	Rainbow Snake
	2	*Graptemys flavimaculata*	Yellow-blotched Map Turtle
	2	*Graptemys gibbonsi*	Pascagoula Map Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle
	2	*Regina septemvittata*	Queen Snake

4.2 Coastal Rivers Drainage

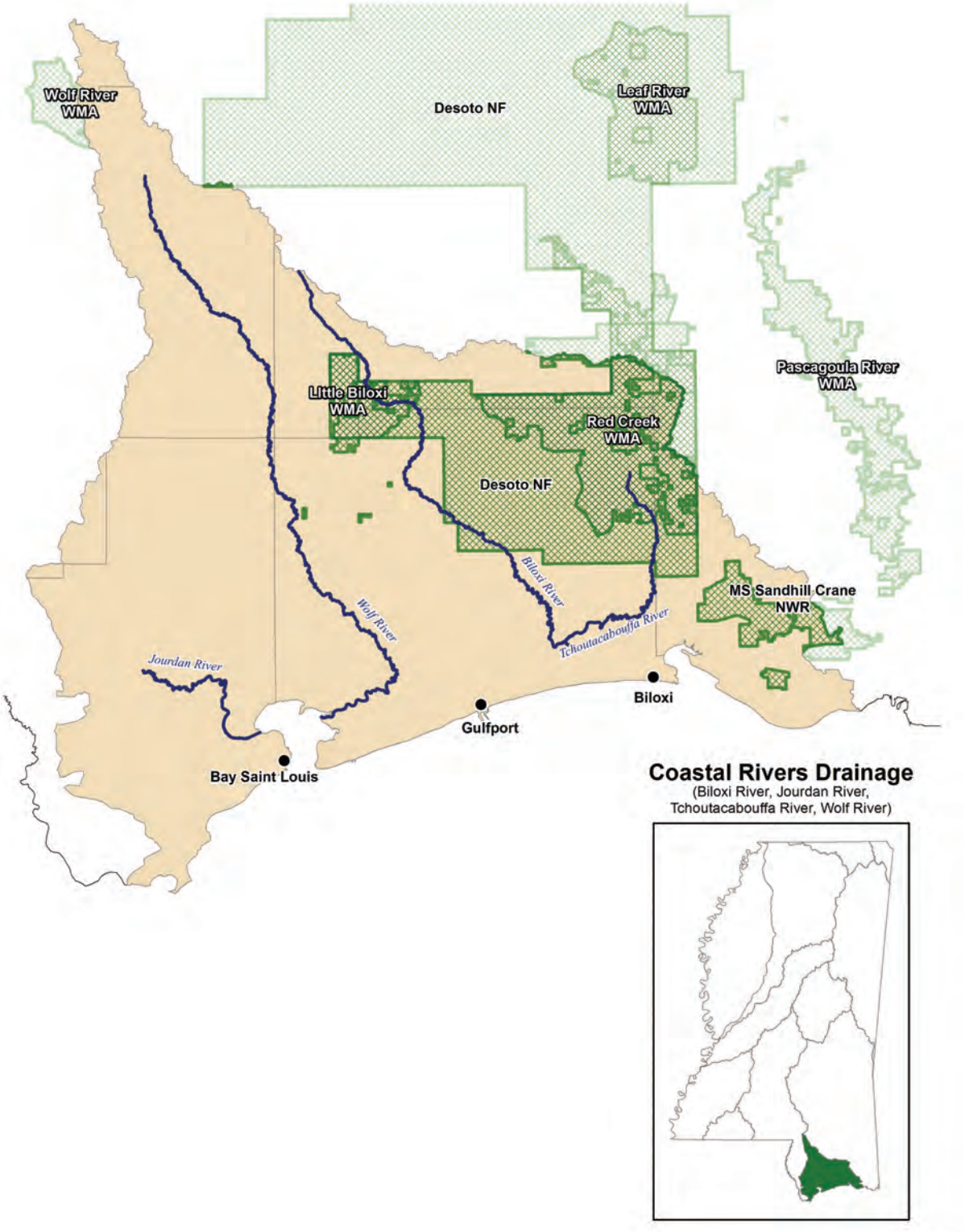

Figure 5.50 Coastal Rivers Drainage

DESCRIPTION AND LOCATION

Unlike other drainages in the Coastal Rivers Drainage is made up of small, independent watersheds rather than one large river system. These small rivers, the Wolf, Jourdan, Tchoutacabouffa, and 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 small or medium blackwater streams. The Coastal Rivers Drainage begins in Lamar County and includes Pearl River, Hancock, Stone, Harrison, and Hancock counties. These streams have not been as heavily impacted by human activity as streams in some other areas of the state, with most of the land being rural, although increased land development in the southern part of the state is a threat to these systems.

CONDITION AND CONSERVATION STATUS

These streams have received fewer disturbances than streams in some other areas of the state, although there are impacts from industrial and residential development, forestry and localized channelization of streams.

The coastal drainages are apparently **secure**. They are less disturbed than some other streams in the state. Of the streams monitored by the Mississippi Department of Environmental Quality, 89 percent are rated good or very good, 4 percent are rated as fair, and 7 percent are rated as poor.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH THE COASTAL RIVERS DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	1	*Lithobates heckscheri*	River Frog
	2	*Pseudotriton montanus*	Mud Salamander
Birds	2	*Haliaeetus leucocephalus*	Bald Eagle
	3	*Pandion haliaetus*	Osprey
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	1	*Notropis chalybaeus*	Ironcolor Shiner
	2	*Morone saxatilis*	Striped Bass
	2	*Pteronotropis welaka*	Bluenose Shiner
	3	*Atractosteus spatula*	Alligator Gar
	3	*Enneacanthus gloriosus*	Bluespotted Sunfish
	3	*Heterandria formosa*	Least Killifish
Mammals	2	*Trichechus manatus*	Manatee
Mussels	2	*Pleurobema beadleianum*	Mississippi Pigtoe
Reptiles	2	*Farancia erytrogramma*	Rainbow Snake
	2	*Macrochelys temminckii*	Alligator Snapping Turtle
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle

THREATS

4.0 Southeast Mississippi Drainages				
	CLASSIFICATION	**SUBCLASS**	**4.1 Pascagoula River Drainage**	**4.2 Coastal Rivers Drainage**
1	Residential and commercial development	1.1 Housing and urban areas: Houseboats, runoff, sewage, erosion	M	H
		1.2 Commercial and industrial areas: Point source pollution, erosion, increased runoff from water impervious surfaces	M	H
		1.3 Tourism and recreation areas	M	H
2	Agriculture and aquaculture	2.1 Annual and perennial non-timber crops	L	L
		2.2 Wood and pulp plantations: Siltation and increased erosion from bedding, improper implementation of BMPs	M	
		2.3 Livestock farming and ranching: Runoff from chicken farms, sedimentation, erosion, bank destabilization	H	
3	Energy production and mining	3.1 Oil and gas drilling	M	
		3.2 Mining and quarrying: Chalk/lime mining, sand/gravel mining	M	
4	Transportation and service corridors	4.1 Roads and railways	M	H
5	Biological resource use	5.3 Logging and wood harvesting	H	H
		5.4 Fishing and harvesting aquatic resources: Overexploitation/incidental capture of Alabama red-bellied turtle, alligator snapping turtle, yellow-blotched map turtle, Pascagoula map turtle, gulf sturgeon	M	
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use, increased erosion from boat wakes, trash from recreational users	M	M
7	Natural system modifications	7.2 Dams and water management/use:		
		Operations of Dams/Impoundment	L	M
		Channel Modification	L	
		Groundwater and Surface Water Withdrawal	L	
		No or insufficient instream flow standards for viable aquatic populations.	H	H
		Large scale river desnagging operations	L	L
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Hydrilla, water hyacinth, alligator weed, giant salvinia, tilapia, common reed, nutria, Chinese tallow tree, wild hogs, torpedo grass, Asian clam, cogongrass, water sprite, Cherokee rose	L	M
9	Pollution	9.1 Household sewage and urban waste water	M	
		9.2 Industrial and military effluents	M	
		9.3 Agricultural and forestry effluents: Pesticide use, nutrient runoff	M	L

PRIORITY CONSERVATION ACTIONS

4. Southeast Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**4.1 Pascagoula River Drainage**	**4.2 Coastal Rivers Drainage**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present. Encourage fish producers to raise and sell only certified triploid grass carp for biological plant control.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Address fish passage obstructions and connectivity issues.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity. Encourage development of holistic instream flow standards.	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

4. Southeast Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**4.1 Pascagoula River Drainage**	**4.2 Coastal Rivers Drainage**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X

4. Southeast Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**4.1 Pascagoula River Drainage**	**4.2 Coastal Rivers Drainage**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Continue to restrict/monitor scientific collection of SGCN.	X	
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

5. Southwest Mississippi Drainages

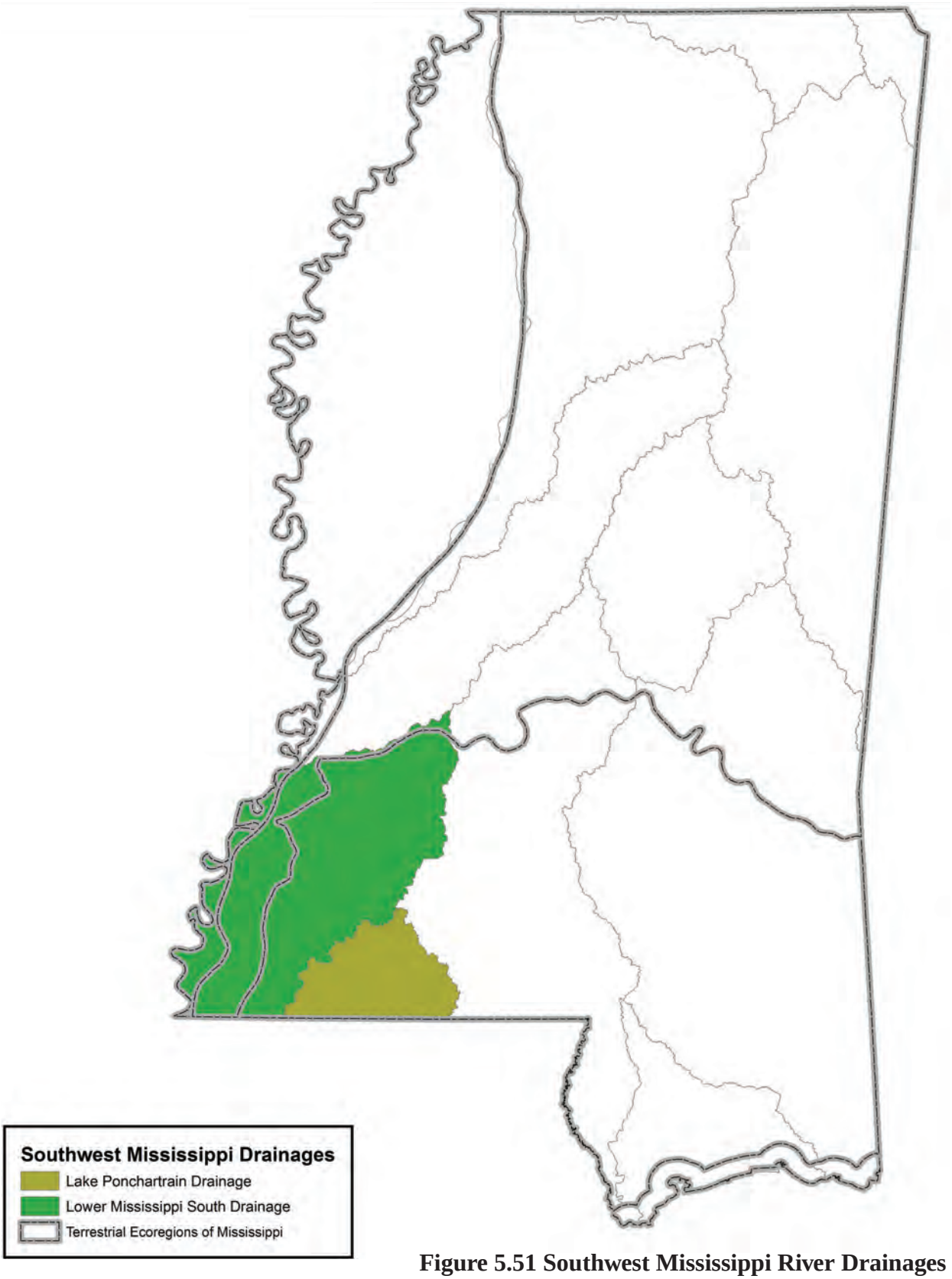

Figure 5.51 Southwest Mississippi River Drainages

5.1 Lake Ponchartrain Drainage

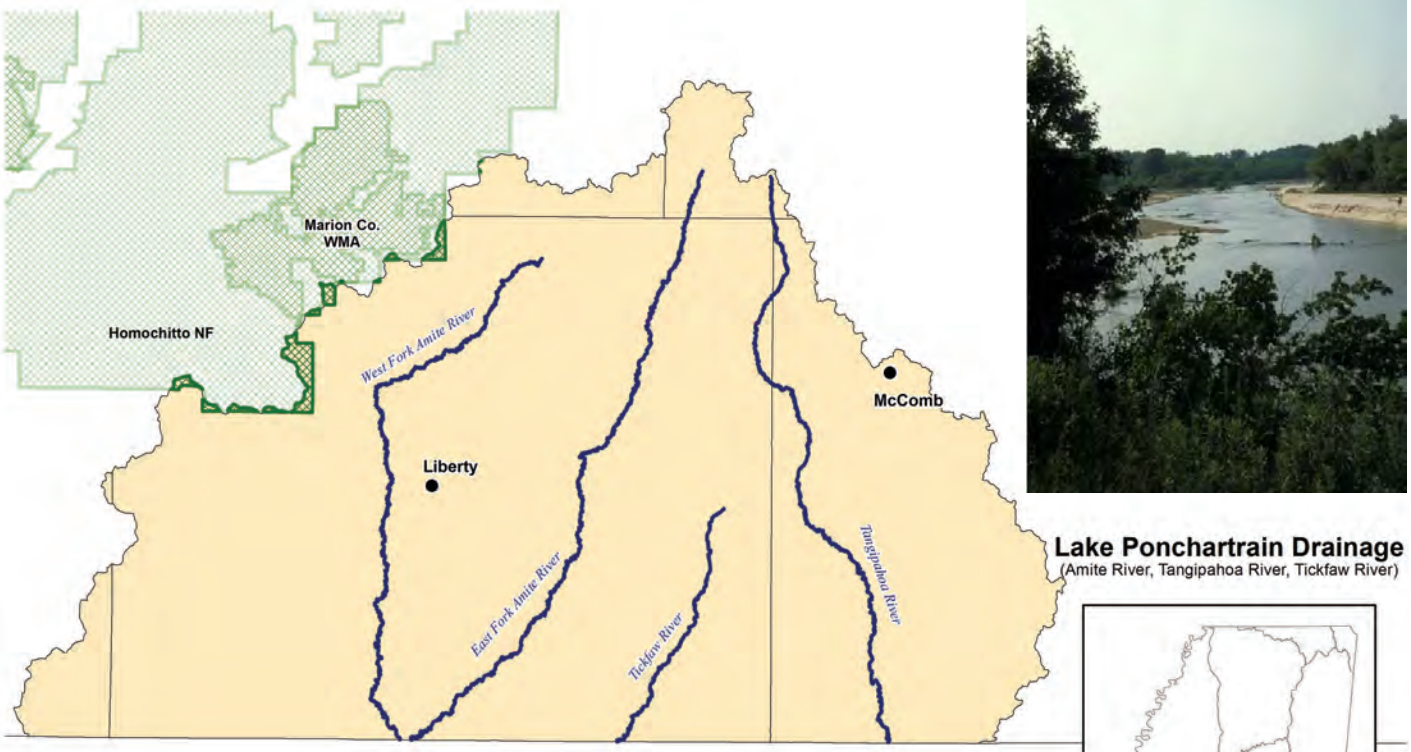

Figure 5.52 Lake Ponchartrain Drainage

DESCRIPTION AND LOCATION

These are generally small to medium sized streams in southwestern Mississippi which drain into Lake Pontchartrain. Streams in this drainage include the Amite, Tangipahoa, and Tickfaw Rivers. The lower portions of the larger streams lie in Louisiana. This system contains small, small blackwater, medium, medium blackwater, and large streams

CONDITION AND CONSERVATION STATUS

Streams in this drainage have been impacted by localized channelization and construction of small impoundments. Although there is a lack of information regarding this drainage it is assumed to be **vulnerable**.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LAKE PONCHARTRAIN DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Fish	1	*Alosa alabamae*	Alabama Shad
	2	*Fundulus euryzonus*	Broadstripe Topminnow
Mussels	1	*Obovaria jacksoniana*	Southern Hickorynut
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

5.2 Lower Mississippi River South Drainage

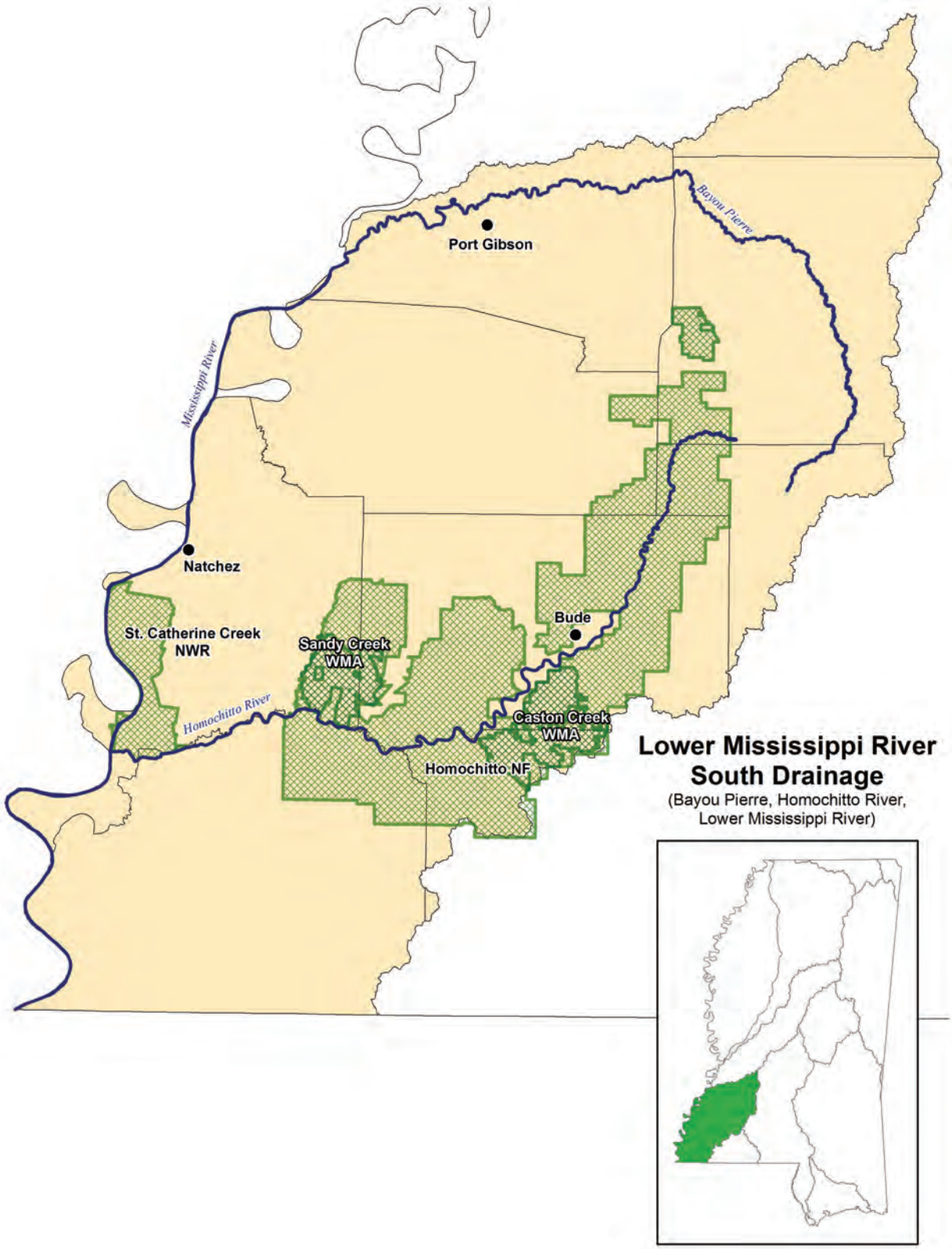

Figure 5.53 Lower Mississippi River South Drainage

DESCRIPTION AND LOCATION

This drainage contains tributaries of the Mississippi River, including Bayou Pierre, Homochitto and Buffalo River systems. It covers all or part of 11 counties in Southwest Mississippi and lies primarily outside of the Mississippi Alluvial Plain. The primary landuse in the area is forestry. Streams in this drainage are divided into three categories: small, medium and large.

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.

SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH LOWER MISSISSIPPI RIVER SOUTH DRAINAGE

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	3	*Pseudotriton ruber*	Red Salamander
Crustaceans	2	*Procambarus penni*	Pearl Blackwater Crayfish
Fish	1	*Etheostoma rubrum*	Bayou Darter
	2	*Crystallaria asprella*	Crystal Darter
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
	3	*Atractosteus spatula*	Alligator Gar
	3	*Etheostoma asprigene*	Mud Darter
	3	*Moxostoma erythrurum*	Golden Redhorse
	3	*Stizostedion canadense*	Sauger
Mussels	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Potamilus capax*	Fat Pocketbook
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Lampsilis cardium*	Plain Pocketbook
	2	*Quadrula nodulata*	Wartyback
	2	*Strophitus undulatus*	Squawfoot
	2	*Uniomerus declivis*	Tapered Pondhorn
	3	*Lampsilis siliquoidea*	Fatmucket
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle

THREATS

5. Southwest Mississippi Drainages				
	CLASSIFICATION	**SUBCLASS**	**5.1 Lake Ponchartrain Drainage**	**5.2 Lower Mississippi River South Drainage**
1	Residential and commercial development	1.1 Housing and urban areas: Point and non-point source pollution, erosion, increased runoff	L	L
2	Agriculture and aquaculture	2.1 Annual and perennial nontimber crops: Pesticide use, nutrient runoff, sedimentation, erosion, bank destabilization	L	L
		2.3 Livestock farming and ranching: Lack of buffers along stream banks leads to soil compaction, bank destabilization, and alteration of vegetation	M	H
3	Energy production and mining	3.1 Oil and gas drilling		
		3.2 Mining and quarrying: Topsoil mining, sand/gravel mining	H	H
4	Transportation and service corridors	4.1 Roads and railways		L
5	Biological resource use	5.3 Logging and wood harvesting	H	H
6	Human intrusions and disturbance	6.1 Recreational activities: Off road vehicle use	M	H
7	Natural resource modifications	7.2 Dams and water management/use:		
		Operations of Dams/Impoundment: Alteration of natural hydrology	L	H
		Channel Modification: Historical modification of Homochitto River		H
		Groundwater and surface water withdrawal	L	
		Headcutting due to channel modification from the Mississippi River, bank destabilization, sedimentation	H	H
8	Invasive and other problematic species and genes	8.1 Invasive non-native/alien species: Water spangles, Asian carp (black, silver, bighead, grass, and common carp, Asian clam, wild hogs	L	L
9	Pollution	9.1 Household sewage and urban waste water	M	M
		9.2 Industrial and military effluents	M	M
		9.3 Agricultural and forestry effluents: Pesticide and nutrient runoff, sedimentation	M	M

PRIORITY CONSERVATION ACTIONS

5. Southwest Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**5.1 Lake Ponchartrain Drainage**	**5.2 Lower Mississippi River South Drainage**
1.0 Land/Water Protection			
1.1 Site/area protection	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
1.2 Resource and habitat protection		X	X
2.0 Land/Water Management			
2.1 Site/area management	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Discourage incompatible recreational uses.	X	X
2.2 Invasive/problematic species control	Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal). Control/eradicate such species when present. Encourage fish producers to raise and sell only certified triploid grass carp for biological plant control.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
2.3 Habitat and natural process restoration	Encourage restoration and improved management of altered/degraded habitat when possible: Address fish passage obstructions and connectivity issues.	X	X
	Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity. Encourage development of holistic instream flow standards	X	X
	Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.	X	X
	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Enhance viability of SGCN by minimizing fragmentation and providing habitat corridors between disjunct populations or subpopulations.	X	X
3.0 Species Management			
3.1 Species management	Plan and conduct additional research (i.e. habitat needs, status surveys, breeding status, disease, etc.) on SGCN.	X	X
	Monitor/address SGCN harvest/over harvest issues (including bycatch or incidental take).		X
	Continue to restrict/monitor scientific collection of SGCN.		
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
3.2 Species recovery	Develop/implement/continue recovery plans for individual SGCN.	X	X

5. Southwest Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**5.1 Lake Ponchartrain Drainage**	**5.2 Lower Mississippi River South Drainage**
4.0 Education and Awareness			
4.1 Formal education	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.2 Training	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X
	Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
4.3 Awareness and communications	Discourage/limit human access in highly critical areas and special habitats, when possible.	X	X
	Provide public education about the conservation of SGCN and/or their habitats.	X	X
	Discourage incompatible recreational uses.	X	X
	Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
5.0 Law and Policy			
5.1 Legislation	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
5.2 Policies and regulations	Encourage and improve agricultural/forestry/watershed land-use planning and BMP/s to address nonpoint pollution, erosion, and water quality issues.	X	X
	Develop/improve urban/suburban infrastructure land use development planning/ zoning to address SGCN.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Develop/implement/continue recovery plans for individual SGCN.	X	X
5.3 Private sector standards and codes	Encourage and improve agricultural/forestry/watershed land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.	X	X
	Discourage incompatible forestry practices such as bedding as a method of site preparation and planting extremely high stocking densities.	X	X

5. Southwest Mississippi Drainages			
CLASSIFICATION	**SUBCLASS**	**5.1 Lake Ponchartrain Drainage**	**5.2 Lower Mississippi River South Drainage**
5.4 Compliance and enforcement	Monitor/limit commercial/residential/industrial point source erosion and sedimentation or pollution into streams/atmosphere.	X	X
	Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve oversight and planning for such mines on upland sites.	X	X
	Improve environmental review and permit process and oversight and enforcement of existing regulations in important habitats/populations.	X	X
	Limit/discourage surface and groundwater withdrawals that are not sustainable and significantly alter flow, depth and salt intrusion.	X	X
	Discourage incompatible recreational uses.	X	X
	Improve enforcement of existing species protection regulations.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
	Encourage proper disposal and cleanup of waste and litter.	X	X
6.0 Livelihood, economic and other incentives			
6.1 Linked enterprises and livelihood alternatives	Encourage appreciation of SGCN and their habitats by providing public access and compatible recreational activities.	X	X
6.2 Substitution	Discourage incompatible recreational uses.	X	X
6.3 Market forces	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
6.4 Conservation payments	Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.	X	X
	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X
7.0 External Capacity Building			
7.3 Conservation finance	Promote and develop landowner incentive and assistance programs for conservation of SGCN and their habitats.	X	X

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CHAPTER 6

CONSERVATION OPPORTUNITY AREAS

Introduction and Need

Conservation Opportunity Areas (COAs) are large, loosely defined, geographic areas within Mississippi that have been identified by MDWFP as priority areas for implementing conservation actions recommended in Mississippi's State Wildlife Action Plan (SWAP). They may contain priority habitats or Species of Greatest Conservation Need (SGCN), represent areas that have unique habitats (e.g. prairies) within them but they are composed of many different habitats, or may have been chosen because they have a wide range of SGCN, or include areas that are particularly important to one SGCN.

These priority areas should not be used to exclude conservation actions in other areas of the state. All SGCN and their habitats in Mississippi are important. The COAs were developed to provide direction when resources are limited. Conservation investments in COAs can potentially benefit a wider range of species or priority habitats. COAs can also be a guide to organizations seeking to focus on key areas in Mississippi and are an opportunity to develop partnerships.

In the future iterations of the SWAP, as more information on SGCN and their habitats is known or as resources or priorities change, the COA's may be refined to support conservation needs of the state's SGCN. The Best Practices for State Wildlife Action Plans (AFWA 2012) lists the creation of COA's as a "Best practice" for SWAP Required Element Two, describing the extent and condition of key habitats and community types.

Identification of Conservation Opportunity Areas

Since the purpose of COAs are to direct the conservation of SGCN and their important habitats, the first step in identifying priority areas was to map the records of SGCN across the state. We chose to focus on Tier 1 and Tier 2 species (Figure 6.1a). We first concentrated on areas with heavier clusters of Tier 1 and Tier 2 species. Boundaries were defined using Hydrologic Unit Code (HUC) boundaries. Next, we reviewed other statewide plans that listed priority areas for conservation developed by state and federal resource agencies or non-government conservation organizations working in Mississippi's landscapes. Examples of plans considered include: Mississippi Forestry Commission's Forest Legacy Areas, The Nature Conservancy's Conservation Area Plan for the Pascagoula and the Pearl Rivers, Gulf Coast Joint Venture Landbird Plan, Land Trust for The Mississippi Coastal Plain Conservation Legacy Strategy for the Mississippi Gulf Coast, the Partnership for Gulf Coast Land Conservation's Land Conservation Vision for the Gulf of Mexico Region, among many others.

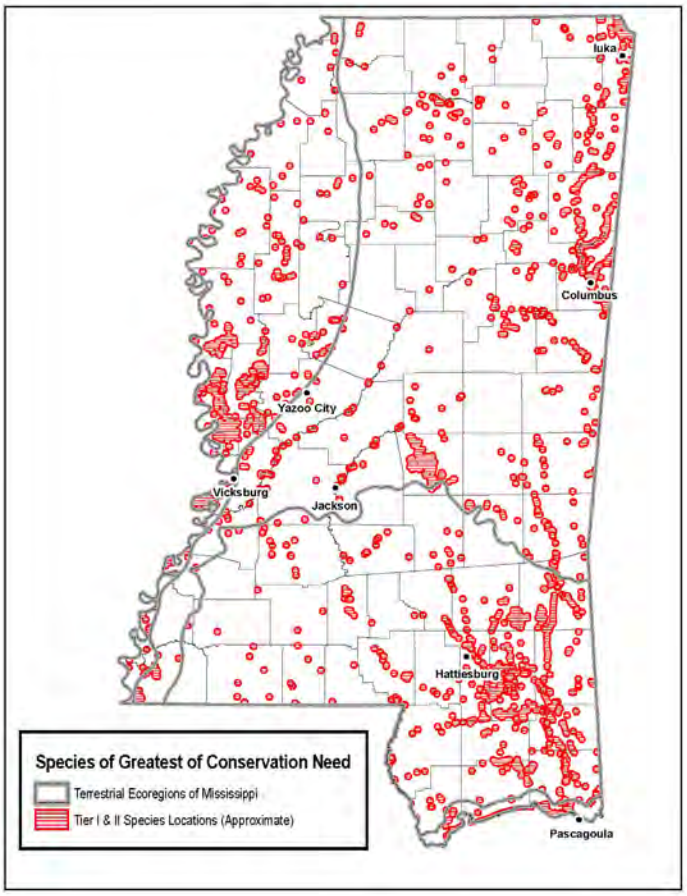


Figure 6.1a Tier 1 and Tier 2 SGCN locations in Mississippi. Source MNHP database.

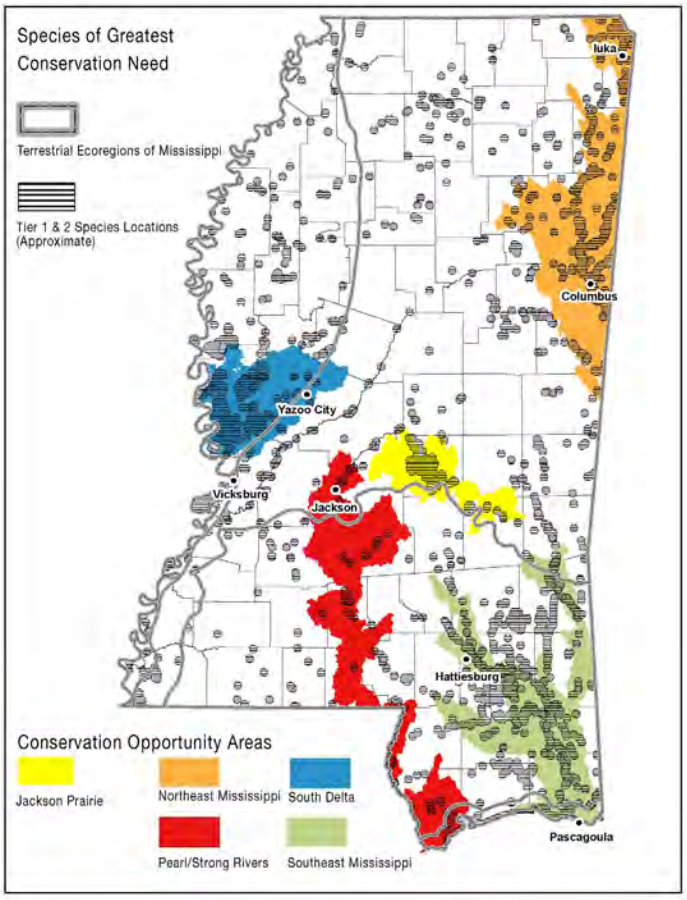


Figure 6.1b Tier 1 and Tier 2 SGCN with COAs. Source MNHP database.

One of the objectives in identifying COAs is to direct conservation of SGCN and their habitats through voluntary land protection and management actions (such as fee acquisition for enlargement of protected areas, or through tools such as permanent conservation easements on private lands, landowner assistance or management incentives). While many public lands are included within COAs, the focus of the COAs is mainly non-public lands that have no current protections or management plans for SGCN.

An example of a parallel plan that is being implemented for forest conservation in the state is *Mississippi's Forest Legacy Program* (FLP) *Assessment of Need 2007-2012* (2007) in which Forest Legacy Areas (FLA) have been defined "to protect environmentally important forests in Mississippi threatened by conversion to non-forest use". Three FLAs were designated, one each in the Northeast, Central, and Southeast MS. The FLP lists areas adjacent to public conservation lands as a priority. Other priorities are those located adjacent to mitigation banks, scenic roads, Important Bird Areas (IBA's) and existing private conservation lands.

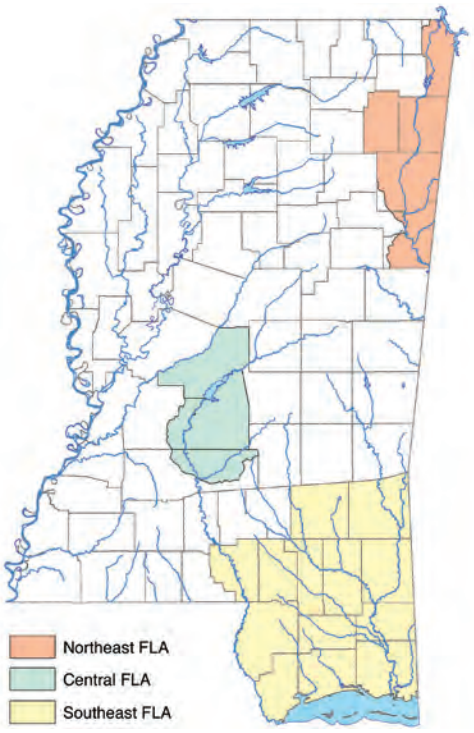


Figure 6.1c Mississippi Forest Legacy Area. Source MNHP database.

Five Conservation Opportunity Areas in Mississippi

The following five regions were chosen as initial COAs for Mississippi. COA descriptions include a map, short geographic description, lists of SGCN and priority habitat subtypes, summary of major regional threats and recommended conservation actions, and are described in more detail below and a list of potential conservation partners.

- The **Northeast COA** incorporates the Tombigbee River and Black Prairie area.
- The **Southeast COA** covers the Pascagoula River and its tributaries, as well as coastal areas in Jackson County.
- The **Pearl River/Strong River COA** runs from Jackson to the coast and incorporates the Jourdan River and coastal areas of Hancock County.
- The **Jackson Prairie COA** includes most of the Bienville National Forest and surrounding areas.
- The **South Delta COA** lies in the MSRAP ecoregion, north of Vicksburg.

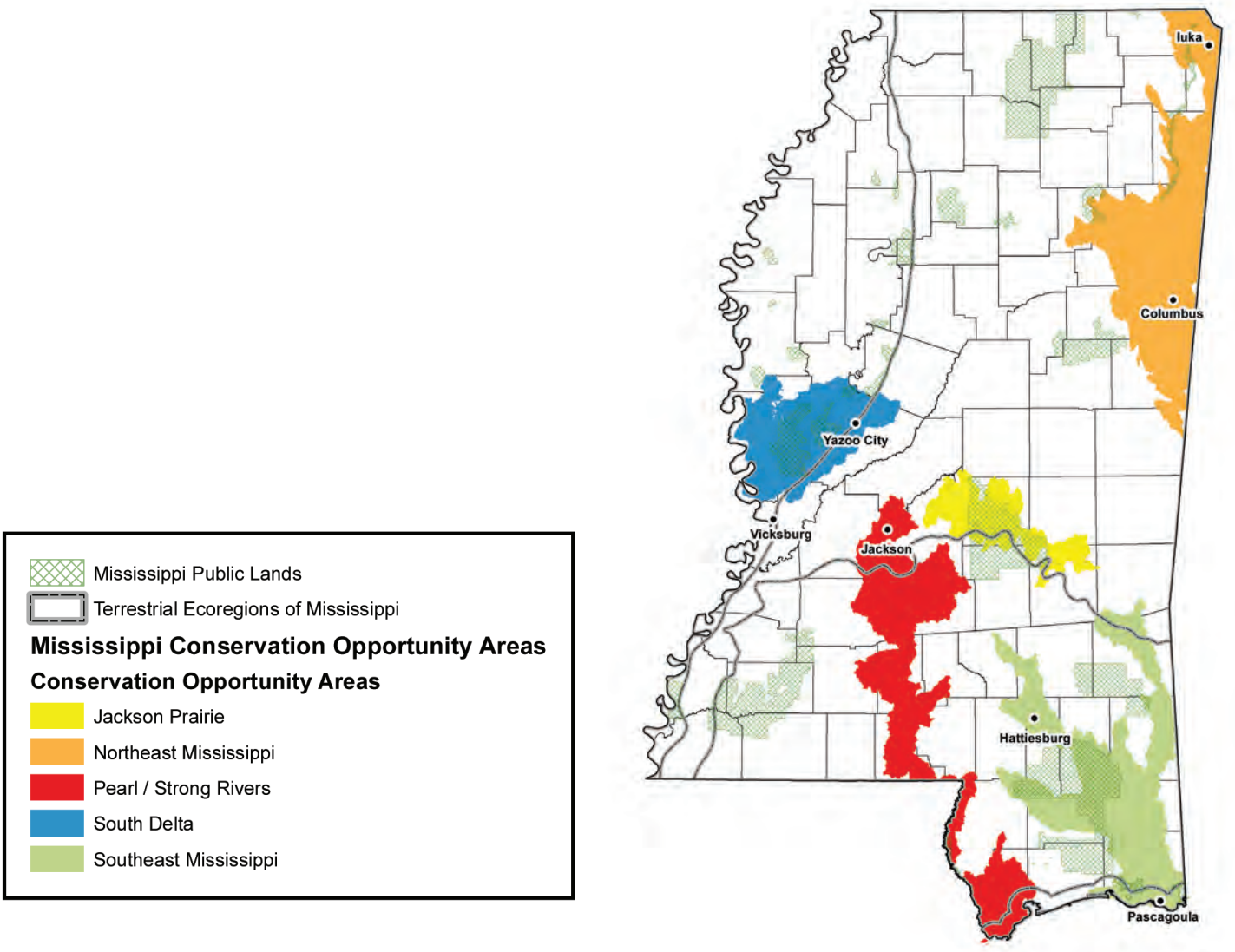
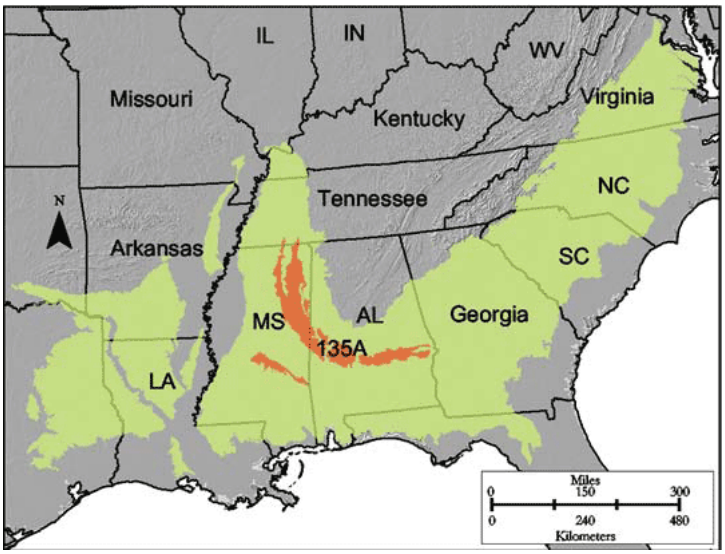


Figure 6.2 Conservation Opportunity Areas in Mississippi

Northeast Conservation Opportunity Area

The Northeast COA incorporates areas around the Tombigbee River and its tributaries, as well as most of the Black Prairie soil region in the Northeastern part of the state (Figure 6.2a and 6.2b). This COA incorporates all or parts of 11 counties stretching from Kemper County north along the Alabama state line to Tishomingo County. The Mississippi Forestry Commission's Forest Legacy Program (2007) also lists the Northeast portion of the state as a designated Forest Legacy Area.



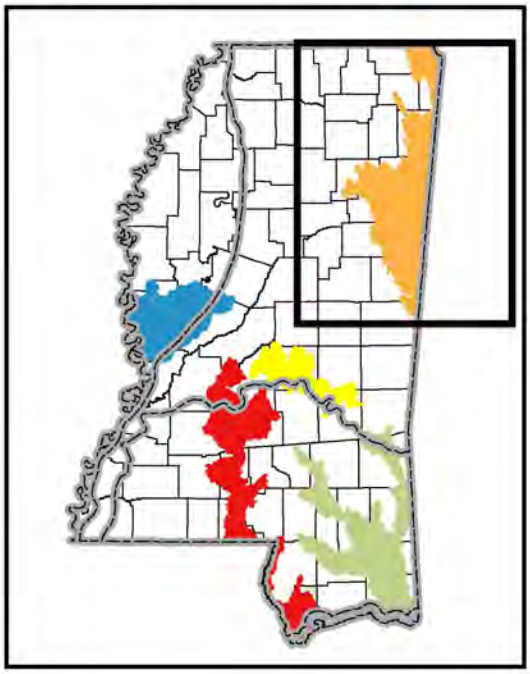


Figure 6.2a Northeast Mississippi Conservation Opportunity Area

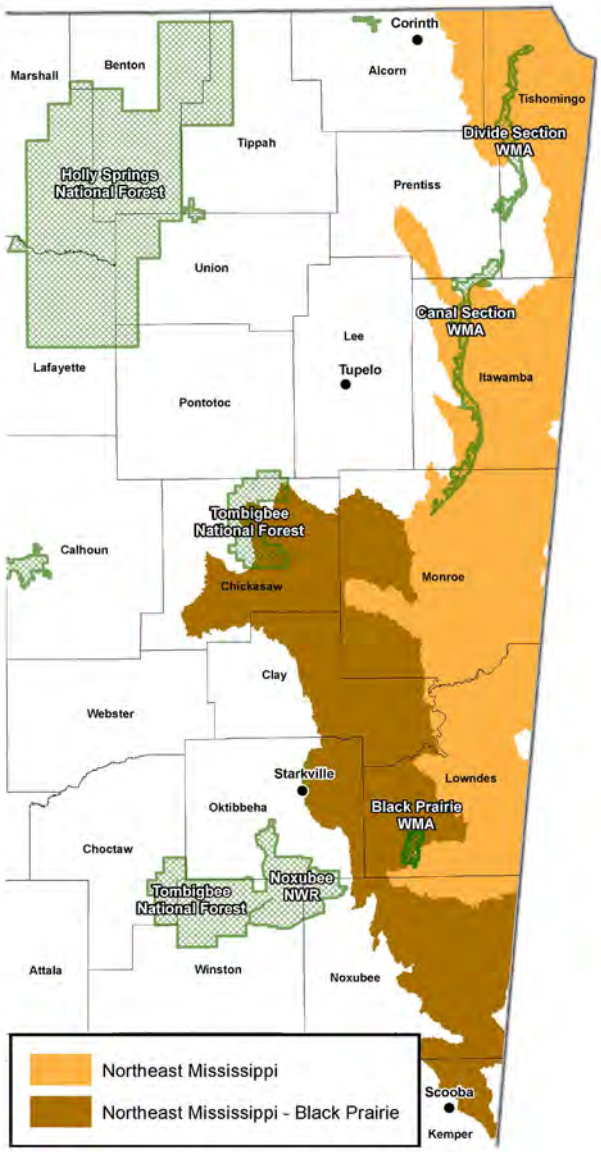


Figure 6.2b NRCS Major Land Resource Area 135A, showing the Alabama and Mississippi Blackland Prairie areas in orange. (NRCS 2006)

Table 6.1: Important Habitats in Northeast COA

Habitat	Ecoregion and SWAP Sections (Chapter 5)
Xeric-mesic upland forests woodlands	UEGCP 1
Mesic upland forests	UEGCP 2
Bottomland hardwood forests	UEGCP 4
Swamp forests	UEGCP 5
Riverfront forests/herblands/sandbars	UEGCP 6
Northeast prairie/cedar glades	UEGCP 7.1
Lacustrine (lentic) communities	UEGCP 9
Northeast mississippi drainages	Streams 2.1 and 2.2

Threats

Threats to the Northeast COA are similar to other parts of the state. Urban and suburban development, fragmentation, and forest conversion pose a threat to all of the habitats within this COA. Channel modifications and sand/gravel mining are impacting the streams and rivers, and the SGCN within them. Prairie threats include the exclusion of fire, overgrazing and row-crop agriculture. Multiple invasive species are an issue in this COA, with two of the worst plant invaders being kudzu and Chinese privet. Others include wild hogs, fire ants, Asian carp, exotic mussels, and numerous aquatic invasives. For a more complete list of threats refer to specific habitats listed above in Chapter 5.

Priority Conservation Actions

Conservation Action 1 Land/water protection

- Encourage and improve agriculture/forestry/land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.
- Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.
- Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal).

Conservation Action 2 Land/water management

- Coordinate with other agencies, NGOs, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.

Conservation Action 4 Education and awareness

- Educate landowners on the benefits of maintaining a diverse, healthy forest using sound practices.
- Develop informational materials promoting the optimal conditions and management needs of habitats.
- Encourage the increased use and acceptance of prescribed fire through increased communications and partnerships.
- Provide prescribed fire training opportunities for private landowners. Focus on training landowners to achieve fire capacity and application at a large scale.

Northeast COA Species of Greatest Conservation Need

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Mussels	1	*Cyclonaias tuberculata*	Purple Wartyback
	2	*Ellipsaria lineolata*	Butterfly
	1	*Epioblasma brevidens*	Cumberlandian Combshell
	1	*Epioblasma triquetra*	Snuffbox
	2	*Lampsilis cardium*	Plain Pocketbook
	1	*Ligumia recta*	Black Sandshell
	1	*Pleuronaia barnesiana*	Tennessee Pigtoe
	1	*Pleuronaia dolabelloides*	Slabside Pearlymussel
	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot
	2	*Quadrula rumphiana*	Ridged Mapleleaf
	2	*Strophitus undulatus*	Creeper
	2	*Anodontoides radiatus*	Rayed Creekshell
	1	*Elliptio arca*	Alabama Spike
	1	*Elliptio arctata*	Delicate Spike
	1	*Epioblasma penita*	Southern Combshell
	1	*Hamiota perovalis*	Orange-Nacre Mucket
	2	*Lampsilis straminea straminea*	Rough Fatmucket
	1	*Lasmigona 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	*Potamilus inflatus*	Inflated Heelsplitter
	1	*Strophitus connasaugaensis*	Alabama Creekmussel
	2	*Strophitus subvexus*	Southern Creekmussel
	2	*Uniomerus declivis*	Tapered Pondhorn
Crustaceans	1	*Hobbseus cristatus*	Crested Rivulet Crayfish
	1	*Hobbseus orconectoides*	Oktibbeha Rivulet Crayfish
	1	*Hobbseus petilus*	Tombigbee Rivulet Crayfish
	2	*Hobbseus prominens*	Prominence Rivulet Crayfish
	1	*Orconectes mississippiensis*	Mississippi Crayfish
	2	*Procambarus hagenianus vesticeps*	Egyptian Crayfish
	1	*Hobbseus cristatus*	Crested Rivulet Crayfish
	1	*Hobbseus orconectoides*	Oktibbeha Rivulet Crayfish
	1	*Hobbseus petilus*	Tombigbee Rivulet Crayfish
	2	*Hobbseus prominens*	Prominence Rivulet Crayfish
	2	*Orconectes etnieri*	Ets Crayfish
	2	*Orconectes jonesi*	Sucarnoochee River Crayfish
	1	*Orconectes mississippiensis*	Mississippi Crayfish
	2	*Procambarus ablusus*	Hatchie River Crayfish
	1	*Procambarus lagniappe*	Lagniappe Crayfish
Insects	1	*Neonympha mitchellii mitchellii*	Mitchell's Satyr

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	1	*Pogonomyrmex badius*	Florida Harvester Ant
	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper
Fish	1	*Ambloplites repestries*	Rock Bass
	2	*Cottus carolinae*	Banded Sculpin
	2	*Cyprinella galactura*	Whitetail Shiner
	2	*Cyprinella whipplei*	Steelcolor Shiner
	2	*Etheostoma blennioides*	Greenside Darter
	2	*Etheostoma duryi*	Black Darter
	2	*Etheostoma kennicotti*	Stripetail Darter
	2	*Etheostoma nigripinne*	Blackfin Darter
	1	*Etheostoma zonifer*	Backwater Darter
	2	*Etheostoma zonistium*	Bandfin Darter
	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Moxostoma anisurum*	Silver Redhorse
	2	*Moxostoma carinatum*	River Redhorse
	2	*Moxostoma duquesnei*	Black Redhorse
	2	*Moxostoma macrolepidotum*	Shorthead Redhorse
	2	*Notropis amnis*	Pallid Shiner
	2	*Notropis boops*	Bigeye Shiner
	2	*Percina evides*	Gilt Darter
	2	*Percina phoxocephala*	Slenderhead Darter
	2	*Phenacobius mirabilis*	Suckermouth Minnow
	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
	2	*Rhinichthys atratulus*	Blacknose Dace
	1	*Alosa alabamae*	Alabama Shad
	2	*Ammocrypta meridiana*	Southern Sand Darter
	2	*Crystallaria asprella*	Crystal Darter
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	2	*Cyprinella callistia*	Alabama Shiner
	2	*Etheostoma lachneri*	Tombigbee Darter
	1	*Etheostoma zonifer*	Backwater Darter
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Moxostoma macrolepidotum*	Shorthead Redhorse
	2	*Notropis amnis*	Pallid Shiner
	2	*Notropis candidus*	Silverside Shiner
	2	*Notropis edwardraneyi*	Fluvial Shiner
	1	*Noturus munitus*	Frecklebelly Madtom
	1	*Percina lenticula*	Freckled Darter
	1	*Scaphirhynchus suttkusi*	Alabama Sturgeon
	2	*Stizostedion sp 1**	Southern Walleye
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	2	*Lithobates areolata*	Crawfish Frog
	2	*Plethodon websteri*	Webster's Salamander
	1	*Cryptobranchus alleganiensis*	Hellbender
	2	*Gyrinophilus porphyriticus*	Spring Salamander
Birds	2	*Aquila chrysaetos*	Golden Eagle
	1	*Coturnicops noveboracensis*	Yellow Rail

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Setophaga cerulea*	Cerulean Warbler
	2	*Egretta caerulea*	Little Blue Heron
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Haliaeetus leucocephalus*	Bald Eagle
	1	*Laterallus jamaicensis*	Black Rail
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	2	*Mycteria americana*	Wood Stork
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	1	*Rallus elegans*	King Rail
	1	*Thryomanes bewickii*	Bewick's Wren
	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	*Haliaeetus leucocephalus*	Bald Eagle
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Setophaga cerulea*	Cerulean Warbler
Mammals	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Ursus americanus*	Black Bear
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Zapus hudsonius*	Meadow Jumping Mouse
	2	*Lasiurus intermedius*	Northern Yellow Bat
	2	*Peromyscus polionotus*	Oldfield Mouse

*undescribed species

Northeast MS COA Black Prairie Plant Species of Concern

Bald spikerush
Barrens silky aster
Bighead pygmy cudweed
Blue ash
Bur oak
Earleaf false-foxglove
Great Indian-plantain
Great plains ladies'-tresses
Lance-leaved buckthorn
Narrow flowered beard tongue
Ohio buckeye
Prairie milkweed
Prairie parsley
Prairie-iris
Price's potato bean
Rough rattlesnake-root
Scarlet Indian-paintbrush
Shadow-witch orchid
Shooting star
Southern meadow-rue
Stiff greenthreads
Umbellate bastard toad-flax
Upland swamp privet
White dog's tooth violet
White dog's tooth violet
White heath aster
Wild hyacinth

Potential Conservation Partners

Audubon Mississippi
County and city governments and planning boards
Gulf Coast Joint Venture
Gulf Coastal Plains and Ozarks LCC
Mississippi Department of Wildlife, Fisheries, and Parks
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi Prescribed Fire Council
Mississippi Wildlife Federation
National Park Service
Private landowners
The Nature Conservancy
USArmy Corps of Engineers
US Fish and Wildlife Service
USDA Forest Service
Wildlife Mississippi

Southeast Conservation Opportunity Area

The Southeast COA includes in the Pascagoula River Basin and covers all or parts of 13 counties. It extends south from Clarke and Covington counties following the Leaf and Chickasawhay Rivers down to the coastal counties (Figure 6.3). This area includes not only upland and bottomland habitats but also coastal habitats found in the Northern Gulf of Mexico ecoregion.

The Southeast COA is heavily forested throughout. The central portion is known as the Pine Belt because the forests consist mostly of pine with scattered hardwoods. Near the Gulf Coast, drainage areas are low-lying flatlands, forested wetlands, and marshlands. Further inland, the basin consists primarily of gently rolling hills and broad, flat floodplains. An important aspect of this COA is the role it plays in maintaining the health and diversity of the Mississippi Sound. The sound is an estuary that is largely a product of the rivers that feed it. The Pascagoula River supplies a large portion of the freshwater entering the sound. In so doing, it replenishes nutrients and sediments that play a critical role in maintaining the productivity of the coastal waters.

The Mississippi Forestry Commission's Forest Legacy Program (2007) also lists the southeast Mississippi as a Forest Legacy Area. In the Land Trust for the Mississippi Coastal Plain's (LTMCP) Conservation Strategy for the Mississippi Gulf Coast (2012) a map of potential conservation lands was developed for the Mississippi Gulf Coast (Available at ltmcp.org/conservation-legacy). The map identifies and ranks potential lands for conservation, reflecting environmental/ecological value, cultural and historical value, and proximity to development and existing conservation lands, among other factors. Many of the high priority lands indicated in this strategy lie within the Southeast COA.

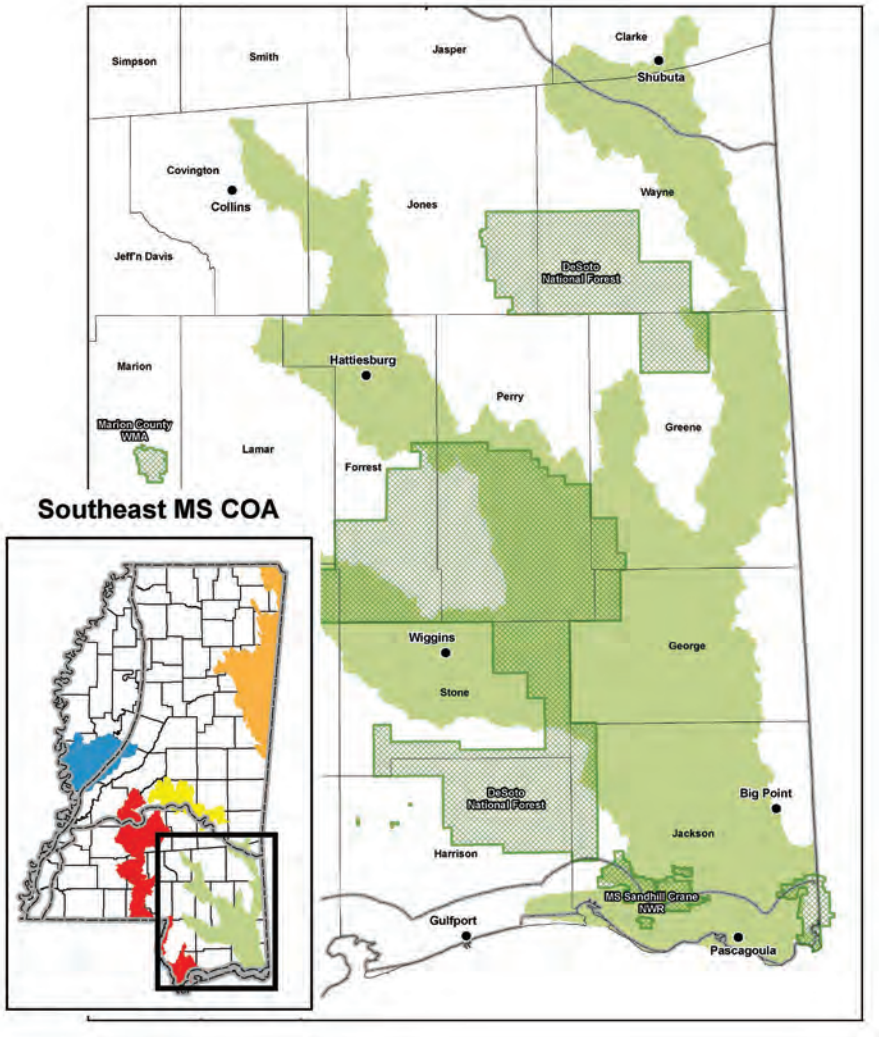


Figure 6.3 Southeast Mississippi Conservation Opportunity Area

Table 6.2: Important Habitats in Southeast COA

Habitat	Ecoregion and SWAP Sections (Chapter 5)
Xeric-mesic upland forests/woodlands	EGCP 1
Mesic upland forests	EGCP 2
Bottomland hardwood forests	EGCP 4
Swamp forests	EGCP 5
Riverfront forests/herblands/sandbars	EGCP 6
Wet pine savannas/flatwoods/bogs	EGCP 7
Lacustrine (lentic) communities	EGCP 9
Upland maritime and estuarine fringe	NGM 1
Estuary and Mississippi Sound	NGM 2
Southeast Mississippi drainages	Streams 4

Threats

Threats to the Southeast COA include significant urban and suburban sprawl from coastal urban development and the City of Hattiesburg, fragmentation, forest conversion, and significant impacts from decades of fire exclusion. Channel modifications and sand/gravel mining are affecting the streams and rivers, and the SGCN within them. Prairie threats include the exclusion of fire, overgrazing, and row-crop agriculture. Multiple invasive species are an issue in this COA, with two of the worst plant invaders being cogongrass and Chinese tallow. Others include wild hogs, fire ants, Asian carp, exotic mussels, and numerous aquatic invasives. For a more complete list of threats refer to specific habitats listed above in Chapter 5.

Priority Conservation Actions

Conservation Action 1 Land/water protection

- Encourage and improve agriculture/forestry/land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.
- Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.
- Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal).

Conservation Action 2 Land/water management

- Coordinate with other agencies, NGOs, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.

Conservation Action 4 Education and awareness

- Educate landowners on the benefits of maintaining a diverse, healthy forest using sound practices.
- Develop informational materials promoting the optimal conditions and management needs of habitats.
- Encourage the increased use and acceptance of prescribed fire through increased communications and partnerships.
- Provide prescribed fire training opportunities for private landowners. Focus on training landowners to achieve fire capacity and application at a large scale.
- Educate landowners, school-aged children/youth, adjacent residents, developers, and the general public about the crucial role of prescribed burning in the management of longleaf pine and other ecosystems.

Conservation Action 6 Livelihood, economic and other incentives

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

For a more complete list of Priority Conservation Actions, refer to specific habitats listed above in Chapter 5.

Southeast COA Species of Greatest Conservation Need

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Mussels	2	*Anodontoides radiatus*	Rayed Creekshell
	1	*Elliptio arctata*	Delicate Spike
	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria unicolor*	Alabama Hickorynut
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
	2	*Uniomerus declivis*	Tapered Pondhorn
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	1	*Fallicambarus burrisi*	Burris' Burrowing Crayfish
	2	*Fallicambarus byersi*	Lavender Burrowing Crayfish
	1	*Fallicambarus danielae*	Speckled Burrowing Crayfish
	1	*Fallicambarus gordoni*	Camp Shelby Burrowing Crayfish
	1	*Hobbseus attenuatus*	Pearl Rivulet Crayfish
	1	*Procambarus fitzpatricki*	Spiny-tailed Crayfish
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Insects	1	*Pogonomyrmex badius*	Florida Harvester Ant
	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Copraphagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Copraphagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
Fish	1	*Acipenser oxyrinchus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Fundulus euryzonus*	Broadstripe Topminnow
	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	2	*Morone saxatilis*	Striped Bass
	1	*Notropis chalybaeus*	Ironcolor Shiner
	1	*Notropis melanostomus*	Blackmouth Shiner
	2	*Pteronotropis welaka*	Bluenose Shiner
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Moxostoma carinatum*	River Redhorse
	1	*Percina aurora*	Pearl Darter
	1	*Percina lenticula*	Freckled Darter
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Pseudotriton montanus*	Mud Salamander
	1	*Amphiuma pholeter*	One-toed Amphiuma
	1	*Lithobates heckscheri*	River Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
Reptiles	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Eumeces anthracinus pluvialis*	Southern Coal Skink

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Farancia erytrogramma*	Rainbow Snake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Graptemys flavimaculata*	Yellow-blotched Map Turtle
	2	*Graptemys gibbonsi*	Pascagoula Map Turtle
	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	1	*Ophisaurus mimicus*	Mimic Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle
	2	*Regina rigida deltae*	Delta Crayfish Snake
	2	*Regina septemvittata*	Queen Snake
	1	*Rhadinaea flavilata*	Pine Woods Snake
Birds	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Ammodramus leconteii*	LeConte's Sparrow
	2	*Ammodramus maritimus*	Seaside Sparrow
	2	*Asio flammeus*	Short-eared Owl
	2	*Calidris canutus*	Red Knot
	1	*Charadrius alexandrines tenuirostris*	Southeastern Snowy Plover
	2	*Charadrius melodus*	Piping Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	2	*Columbina passerina*	Common Ground-Dove
	1	*Coturnicops noveboracensis*	Yellow Rail
	2	*Setophaga cerulea*	Cerulean Warbler
	2	*Egretta caerulea*	Little Blue Heron
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Haematopus palliatus*	American Oystercatcher
	2	*Haliaeetus leucocephalus*	Bald Eagle
	1	*Laterallus jamaicensis*	Black Rail
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Limosa fedoa*	Marbled Godwit
	2	*Mycteria americana*	Wood Stork
	2	*Passerina ciris*	Painted Bunting
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	1	*Rallus elegans*	King Rail
	2	*Rynchops niger*	Black Skimmer
	2	*Setophaga cerulea*	Cerulean Warbler

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Ammodramus nelsoni*	Nelson's Sparrow
	2	*Anas fulvigula*	Mottled Duck
	2	*Caprimulgus carolinensis*	Chuck-will's-widow
	2	*Egretta refescens*	Reddish Egret
Mammals	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Trichechus manatus*	Manatee
	1	*Ursus americanus luteolus*	Louisiana Black Bear

Plant Species of Concern

Atlantic white cedar
Bartram's rose-gentian
Beach rosemary
Bearded grass-pink
Big floating heart
Chapman's butterwort
Climbing fetter-bush
Coast ground-cherry
Crested fringed orchid
Crimson pitcher-plant
Dahoon holly
Dangleberry
Florida flame azalea
Florida pine spurge
Georgia tickseed
Green-fly orchid
Gulf rockrose
Hooker's milkwort
Juneberry holly
Large white fringed orchid
Large-leaved Grass-of-parnassus
Leconte's thistle
Louisiana quillwort
Many-flower grass pink
Myrtle holly
Myrtle-leaved St. Johnswort
Narrow-leaf Barbara's button
Needle palm
Night-flowering ruellia
Nodding clubmoss
Northern burmannia
Pickering's Morning-glory
Pine barren ruellia
Purple bladderwort
Reticulated nutrush
Rose pitcherplant
Rosemary
Scarlet hibiscus
Schwalbea
Silky camellia
Texas pipewort
Tracy's beakrush
Trailing arbutus
Twig rush
Umbrella magnolia
Walter's sedge
White arum

Potential Conservation Partners

Audubon Mississippi
County and city governments and planning boards
Grand Bay NERR
Gulf Coast Joint Venture
Gulf Coastal Plains and Ozarks LCC
Land Trust for the Mississippi Coastal Plain
Mississippi Coast Audubon Society
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Department of Wildlife, Fisheries, and Parks
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi Prescribed Fire Council
Mississippi Wildlife Federation
National Park Service
Partnership for Gulf Coast Land Conservation
Pascagoula River Audubon Society
Private landowners
Sandhill Crane National Wildlife Refuge
The Nature Conservancy
US Army Corps of Engineers
US Fish and Wildlife Service
USDA Forest Service
USM Gulf Coast Research Laboratory
Wildlife Mississippi

Pearl River/Strong River Conservation Opportunity Area

This COA follows the Pearl River from Jackson south to Hancock County. It includes the Strong and Jourdan Rivers, as well as the coastal habitats found in Hancock County (Figure 6.5). It covers portions of 13 counties located in Southwest Mississippi. The Pearl River is one of the most intact river systems in the Southeast U.S. with a great diversity of wildlife species and habitats (TNC 2001). A relatively natural, unleveed system, it supports a large number of SGCN. Wetland systems within this COA provide invaluable ecosystem functions such as controlling erosion, absorbing excess nutrients and helping to reduce flooding. The lower Pearl River supports one of the healthiest marsh complexes in the Southeast (TNC 2004) with high quality examples of fresh, intermediate and brackish marshes.

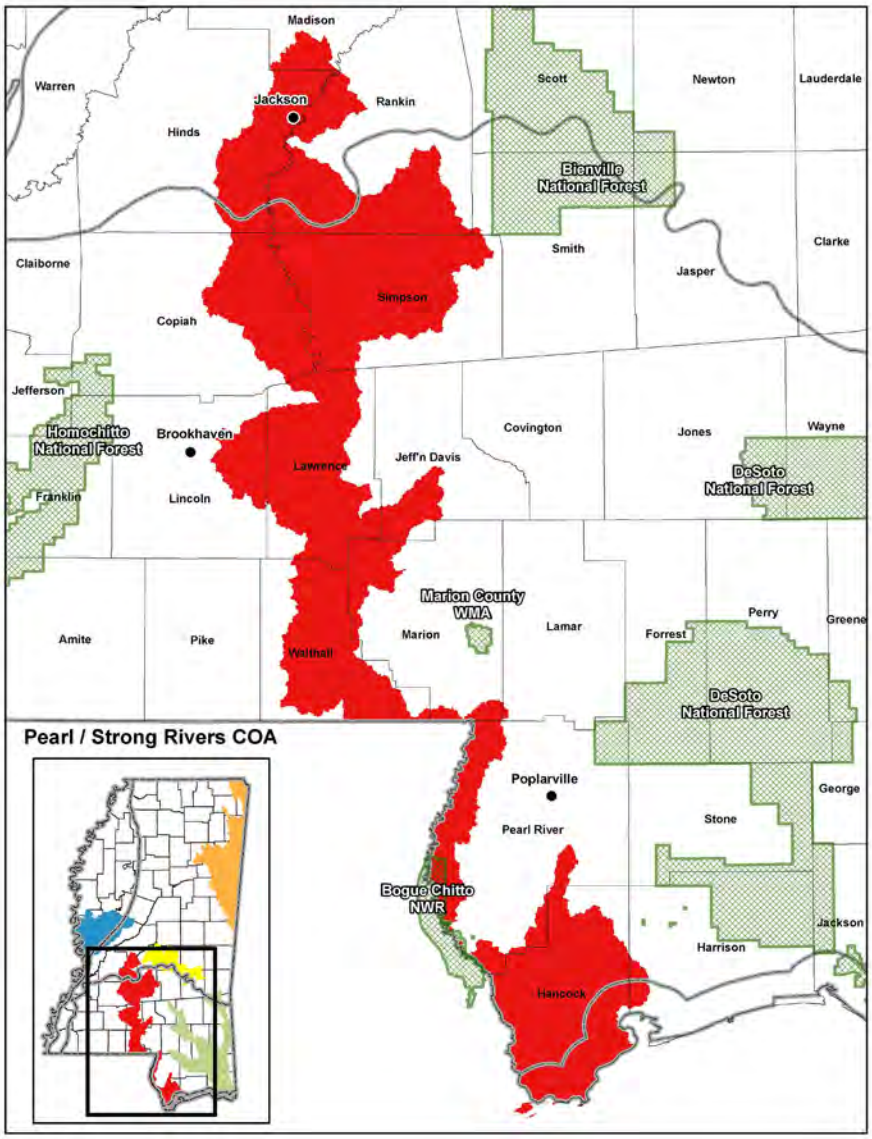


Figure 6.4 Pearl/Strong River Conservation Opportunity Area

Table 6.3: Important Habitats Pearl/Strong River COA

Habitat	Ecoregion and SWAP Sections (Chapter 5)
Xeric-mesic upland forests/woodlands	EGCP and UEGCP 1
Mesic upland forests	EGCP and UEGCP 2
Bottomland hardwood forests	EGCP and UEGCP 4
Swamp forests	EGCP and UEGCP 5
Riverfront forests/herblands/sandbars	EGCP and UEGCP 6
Wet pine savannas/flatwoods/bogs	EGCP 7
Inland freshwater marshes	EGCP and UEGCP 8
Lacustrine (lentic) communities	EGCP and UEGCP 9
Upland maritime and estuarine fringe	NGM 1
Estuary and Mississippi Sound	NGM 2
Lower coastal plain, Pearl River drainage	Streams 3.2
Coastal streams drainage	Streams 4.2

Threats

Threats to the Pearl and Strong River COA include sand and gravel mining operations, incompatible operations of dams and reservoirs and low water sills. These can cause sedimentation and substrate destabilization, altered hydrology, nutrient loading, and create barriers to movement. Upland threats include urban and suburban development, especially around the Jackson area, incompatible forestry practices and invasive species. For a more complete list of threats refer to specific habitats listed above in Chapter 5.

Priority Conservation Actions

Conservation Action 1 Land/water protection

- Encourage and improve agriculture/forestry/land-use planning and BMPs to address nonpoint pollution, erosion, and water quality issues.
- Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.
- Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal).

Conservation Action 2 Land/water management

- Coordinate with other agencies, NGO's, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.

Conservation Action 4 Education and awareness

- Educate landowners on the benefits of maintaining a diverse, healthy forest using sound practices.
- Develop informational materials promoting the optimal conditions and management needs of habitats.

Conservation Action 6 Livelihood, economic and other incentives

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

Conservation Action 7 External capacity building

- Facilitate and support the development of a conservation alliance for the Lower Pearl as a network to deliver information and cultivate understanding and appreciation of the Pearl River.
- Partner with aggregate industry and regulatory agencies to promote BMPs for sand and gravel mining practices by sharing expertise and through workshops.

For a more complete list of Priority Conservation Actions, refer to specific habitats listed above in Chapter 5.

Pearl/Strong River COA Species of Greatest Conservation Need

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Mussels	2	*Anodontoides radiatus*	Rayed Creekshell
	1	*Elliptio arctata*	Delicate Spike
	1	*Obovaria jacksoniana*	Southern Hickorynut
	1	*Obovaria unicolor*	Alabama Hickorynut
	2	*Pleurobema beadleianum*	Mississippi Pigtoe
	2	*Quadrula rumphiana*	Ridged Mapleleaf
	2	*Uniomerus declivis*	Tapered Pondhorn
	1	*Ligumia recta*	Black Sandshell
Crustaceans	2	*Cambarellus diminutus*	Least Crayfish
	2	*Cambarellus lesliei*	Angular Dwarf Crayfish
	1	*Fallicambarus burrisi*	Burris' Burrowing Crayfish
	2	*Fallicambarus byersi*	Lavender Burrowing Crayfish
	1	*Fallicambarus danielae*	Speckled Burrowing Crayfish
	1	*Fallicambarus gordoni*	Camp Shelby Burrowing Crayfish
	1	*Hobbseus attenuatus*	Pearl Rivulet Crayfish
	2	*Procambarus bivittatus*	Ribbon Crayfish
	1	*Procambarus fitzpatricki*	Spiny-tailed Crayfish
	2	*Procambarus penni*	Pearl Blackwater Crayfish
Arachnids	1	*Amblyomma tuberculatum*	Gopher Tortoise Tick
Insects	1	*Neonympha mitchellii mitchellii*	Mitchell's Satyr
	1	*Pogonomyrmex badius*	Florida Harvester Ant
	1	*Aphodius troglodytes*	Coprophagous Beetle
	1	*Chelyoxenus xerobatis*	Tortoise Burrow Hister Beetle
	1	*Eutrichota gopheri*	A Coprophagous Fly
	1	*Machimus polyphemi*	A Robber Fly
	1	*Onthophagus polyphemi sparsisetosus*	A Coprophagous Beetle
	1	*Philonthus testudo*	Western Gopher Tortoise Rove Beetle
Fish	1	*Acipenser oxyrhinus desotoi*	Gulf Sturgeon
	1	*Alosa alabamae*	Alabama Shad
	2	*Crystallaria asprella*	Crystal Darter
	2	*Cycleptus meridionalis*	Southeastern Blue Sucker
	1	*Etheostoma zonifer*	Backwater Darter
	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Fundulus euryzonus*	Broadstripe Topminnow
	2	*Fundulus jenkinsi*	Saltmarsh Topminnow
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	2	*Morone saxatilis*	Striped Bass
	2	*Moxostoma carinatum*	River Redhorse
	2	*Notropis amnis*	Pallid Shiner
	1	*Notropis chalybaeus*	Ironcolor Shiner
	1	*Notropis melanostomus*	Blackmouth Shiner
	1	*Noturus munitus*	Frecklebelly Madtom
	1	*Percina aurora*	Pearl Darter
	1	*Percina lenticula*	Freckled Darter
	2	*Phoxinus erythrogaster*	Southern Redbelly Dace

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Pteronotropis welaka*	Bluenose Shiner
	1	*Ambloplites rupestris*	Rock Bass
	2	*Moxostoma macrolepidotum*	Shorthead Redhorse
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	2	*Lithobates areolatus*	Crawfish Frog
	1	*Lithobates sevosus*	Dusky Gopher Frog
	2	*Plethodon websteri*	Webster's Salamander
	2	*Pseudotriton montanus*	Mud Salamander
	1	*Amphiuma pholeter*	One-toed Amphiuma
	1	*Lithobates heckscheri*	River Frog
	2	*Pseudacris ornata*	Ornate Chorus Frog
Reptiles	2	*Caretta caretta*	Loggerhead Sea Turtle
	2	*Crotalus adamanteus*	Eastern Diamondback Rattlesnake
	2	*Eumeces anthracinus pluvialis*	Southern Coal Skink
	2	*Farancia erytrogramma*	Rainbow Snake
	2	*Gopherus polyphemus*	Gopher Tortoise
	2	*Graptemys flavimaculata*	Yellow-blotched Map Turtle
	2	*Graptemys gibbonsi*	Pascagoula Map Turtle
	2	*Graptemys nigrinoda*	Black-knobbed Map Turtle
	2	*Graptemys oculifera*	Ringed Map Turtle
	2	*Graptemys pearlensis*	Pearl River Map Turtle
	2	*Graptemys pulchra*	Alabama Map Turtle
	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Lampropeltis triangulum syspila*	Red Milk Snake
	1	*Lepidochelys kempii*	Kemp's Ridley Sea Turtle
	2	*Macrochelys temminckii*	Alligator Snapping Turtle
	2	*Malaclemys terrapin pileata*	Mississippi Diamondback Terrapin
	2	*Micrurus fulvius*	Eastern Coral Snake
	2	*Nerodia clarkii clarkii*	Gulf Salt Marsh Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard
	1	*Ophisaurus mimicus*	Mimic Glass Lizard
	2	*Pituophis melanoleucus lodingi*	Black Pine Snake
	2	*Pseudemys alabamensis*	Alabama Red-bellied Turtle
	2	*Regina rigida deltae*	Delta Crayfish Snake
	2	*Regina septemvittata*	Queen Snake
	1	*Rhadinaea flavilata*	Pine Woods Snake
Birds	2	*Ammodramus henslowii*	Henslow's Sparrow
	2	*Ammodramus leconteii*	LeConte's Sparrow
	2	*Ammodramus maritimus*	Seaside Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Calidris canutus*	Red Knot
	1	*Charadrius alexandrines tenuirostris*	Southeastern Snowy Plover
	2	*Charadrius melodus*	Piping Plover
	1	*Charadrius wilsonia*	Wilson's Plover
	2	*Columbina passerina*	Common Ground-Dove

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	1	*Coturnicops noveboracensis*	Yellow Rail
	2	*Egretta caerulea*	Little Blue Heron
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	1	*Grus canadensis pulla*	Mississippi Sandhill Crane
	1	*Haematopus palliatus*	American Oystercatcher
	2	*Haliaeetus leucocephalus*	Bald Eagle
	1	*Laterallus jamaicensis*	Black Rail
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Limosa fedoa*	Marbled Godwit
	2	*Mycteria americana*	Wood Stork
	2	*Passerina ciris*	Painted Bunting
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	1	*Rallus elegans*	King Rail
	2	*Rynchops niger*	Black Skimmer
	2	*Sterna antillarum*	Least Tern
	2	*Sterna maxima*	Royal Tern
	2	*Sterna nilotica*	Gull-billed Tern
	2	*Sterna sandvicensis*	Sandwich Tern
	1	*Thryomanes bewickii*	Bewick's Wren
	2	*Ammodramus nelsoni*	Nelson's Sparrow
	2	*Anas fulvigula*	Mottled Duck
	2	*Caprimulgus carolinensis*	Chuck-will's-widow
	2	*Egretta refescens*	Reddish Egret
	2	*Setophaga cerulea*	Cerulean Warbler
Mammals	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	2	*Lasiurus intermedius*	Northern Yellow Bat
	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Peromyscus polionotus*	Oldfield Mouse
	1	*Spilogale putorius*	Eastern Spotted Skunk
	2	*Trichechus manatus*	Manatee
	2	*Ursus americanus*	Black Bear
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Zapus hudsonius*	Meadow Jumping Mouse
	2	*Myotis septentrionalis*	Northern Long-eared Bat

Plant Species of Concern

Alternate-leaf dogwood
Blackfoot quillwort
Blueberry hawthorn
Eastern leatherwood
Green-fly orchid
Juneberry holly
Louisiana trillium
Pear hawthorn
Piedmont bladderwort
Southern few-fruited sedge

Potential Conservation Partners

Audubon Mississippi
County and city governments and planning boards
Gulf Coast Joint Venture
Gulf Coastal Plains and Ozarks LCC
Land Trust for the Mississippi Coastal Plain
Mississippi Coast Audubon Society
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Department of Wildlife, Fisheries, and Parks
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi Wildlife Federation
Partnership for Gulf Coast Land Conservation
Pearl River Basin Coalition
Private landowners
The Nature Conservancy
US Army Corps of Engineers
US Fish and Wildlife Service
USDA Forest Service
USM Gulf Coast Research Laboratory
Wildlife Mississippi

Jackson Prairie Conservation Opportunity Area

The Jackson Prairie COA incorporates the southern portion of the Blackland Prairie soil region in Mississippi (See Figure 6.2b). This COA covers parts of six counties and includes areas in and around the Bienville National Forest (Figure 6.6). Historic records indicate the Jackson Prairie once covered approximately 48,000 acres with greatest concentrations in Madison and Rankin counties (Jones et al 2007). Due to intense land use changes less than 1000 acres of Jackson Prairie remain in Mississippi, all in small isolated patches from less than 1 acre to 130 acres. Over 40 percent of the land in the area is now used as cropland or pasture mainly for beef production (NRCS 2006). Prairies are dominated by warm season perennial grasses, maintained by regular fires. These fires were historically set by Native American Indians or dry season lightning strikes. Today prescribed burns are used as a management tool.

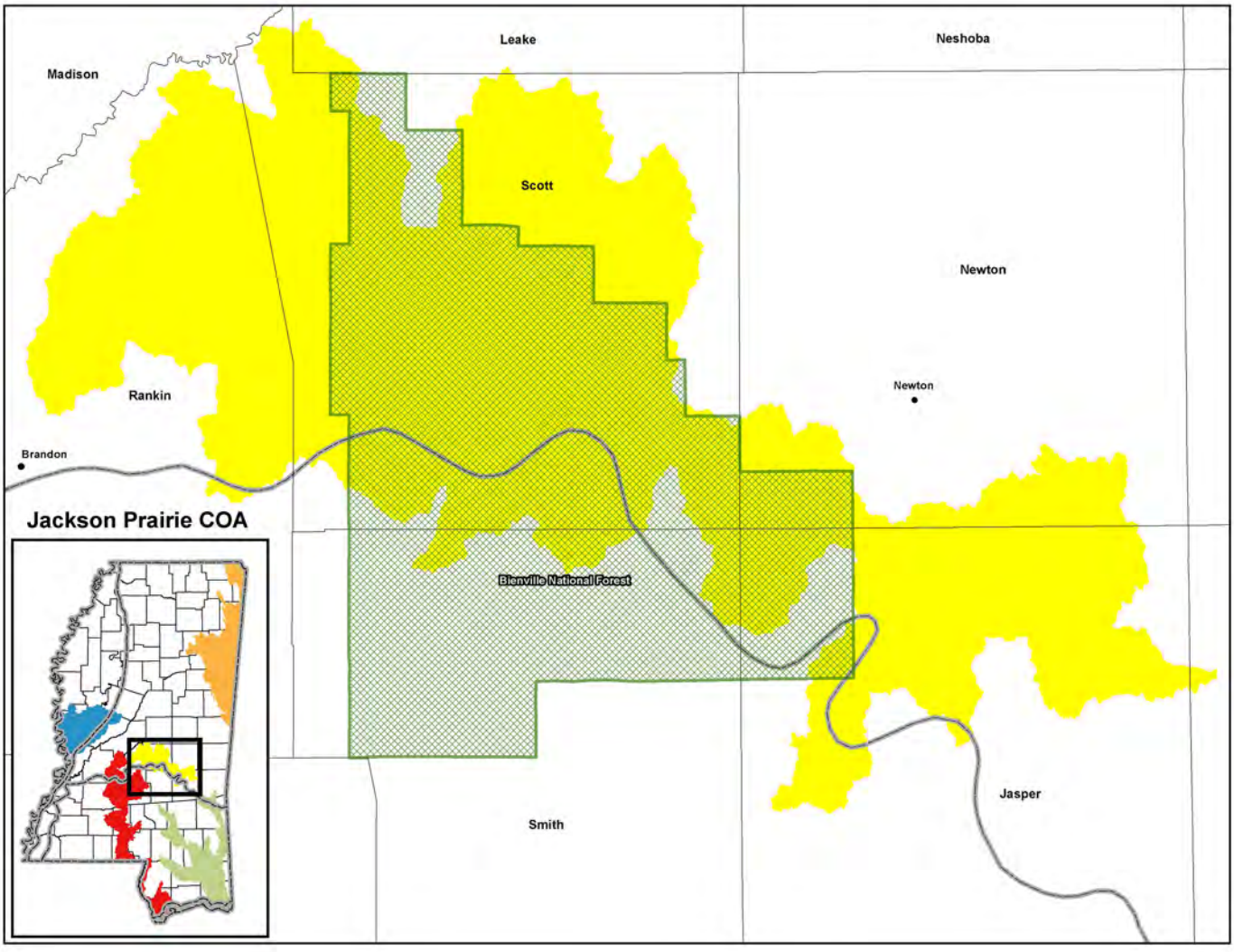


Figure 6.5 Jackson Prairie Conservation Opportunity Area

Table 6.4 Important Habitats in Jackson Prairie COA

Habitat	Ecoregion and SWAP Sections (Chapter 5)
Xeric-mesic upland forests/woodlands	UEGCP 1
Mesic upland forests	UEGCP 2
Prairies and cedar glades	UEGCP 7.2

Threats

Historic threats to Jackson Prairie were in the form of conversion, either to urban/suburban areas or to crop/pasture land. Current threats include lack of proper fire regimes, lack of management and invasive species including cogongrass, non-native legumes introduced for forage, and kudzu. For a more complete list of threats refer to specific habitats listed above in Chapter 5.

Priority Conservation Actions

Conservation Action 1 Land/water protection

- Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.
- Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal).

Conservation Action 2 Land/water management

- Coordinate with other agencies, NGOs, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.

Conservation Action 4 Education and Awareness

- Encourage the increased use and acceptance of prescribed fire through increased communications and partnerships.
- Provide prescribed fire training opportunities for private landowners. Focus on training landowners to achieve fire capacity and application at a large scale.

- Educate landowners, school-aged children/youth, adjacent residents, developers, and the general public about the crucial role of prescribed burning in the management of prairie ecosystems.

Conservation Action 6 Livelihood, economic and other incentives

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

For a more complete list of Priority Conservation Actions, refer to specific habitats listed above in Chapter 5.

Jackson Prairie Species of Greatest Conservation Need

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Amphibians	2	*Hemidactylium scutatum*	Four-toed Salamander
	2	*Lithobates areolatus*	Crawfish Frog
	2	*Plethodon websteri*	Webster's Salamander
Birds	2	*Ammodramus leconteii*	Le Conte's Sparrow
	2	*Ammodramus savannarum*	Grasshopper Sparrow
	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	2	*Columbina passerina*	Common Ground Dove
	2	*Euphagus carolinus*	Rusty Blackbird
	1	*Falco sparverius paulus*	Southeastern American Kestrel
	2	*Limnothlypis swainsonii*	Swainson's Warbler
	2	*Peucaea aestivalis*	Bachman's Sparrow
	2	*Picoides borealis*	Red-cockaded Woodpecker
	2	*Setophaga cerulea*	Cerulean Warbler
	1	*Thryomanes bewickii*	Bewick's Wren
Crustaceans	1	*Procambarus barbiger*	Jackson Prairie Crayfish
Fish	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
Insects	1	*Pogonomyrmex badius*	Florida Harvester Ant
	2	*Pseudopomala brachyptera*	Short-winged Toothpick Grasshopper
Mammals	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	1	*Myotis austroriparius*	Southeastern Myotis
	2	*Myotis grisescens*	Gray Bat
	2	*Myotis lucifugus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Myotis sodalis*	Indiana Bat
	2	*Ursus americanus*	Black Bear
	1	*Ursus americanus luteolus*	Louisiana Black Bear
	2	*Peromyscus polionotus*	Oldfield Mouse
	2	*Spilogale putorius*	Eastern Spotted Skunk
Reptiles	2	*Eumeces anthracinus pluvialis*	Southern Coal Skink
	2	*Lampropeltis calligaster calligaster*	Prairie Kingsnake
	2	*Lampropeltis calligaster rhombomaculata*	Mole Kingsnake
	2	*Lampropeltis triangulum syspila*	Red Milk Snake
	2	*Ophisaurus attenuatus*	Slender Glass Lizard

Plant Species of Concern

Ashe hawthorn
Blackfoot quillwort
Gallion hawthorn
Great Plains ladies'-tresses
Lance-leaved buckthorn
Narrow flowered beard tongue
Oglethorpe Oak
Ohio buckeye
Prairie milkweed
Prairie parsley
Small-toothed sedge
Southern Meadow-rue
Three-flowered hawthorn
Wild hyacinth

Potential Conservation Partners

Audubon Mississippi
County and city governments and planning boards
Gulf Coastal Plains and Ozarks LCC
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Department of Wildlife, Fisheries, and Parks
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi State University
Mississippi Wildlife Federation
Natural Resources Conservation Service
Private landowners
The Nature Conservancy
US Fish and Wildlife Service
USDA Forest Service
Wildlife Mississippi

South Delta Conservation Opportunity Area

The South Delta COA starts near Vicksburg, Mississippi and goes north up the Mississippi River Alluvial Plain to Washington, Humphreys, and Holmes Counties. It covers all or parts of seven counties (Figure 6.7). Historically, the predominant habitat in the South Delta region was forests, primarily hardwoods. Today, the major land use is private cropland and grasslands. Main crops are cotton, soybeans, milo, and corn. Catfish and crawfish are produced commercially on farm ponds in this COA (NRCS 2007).

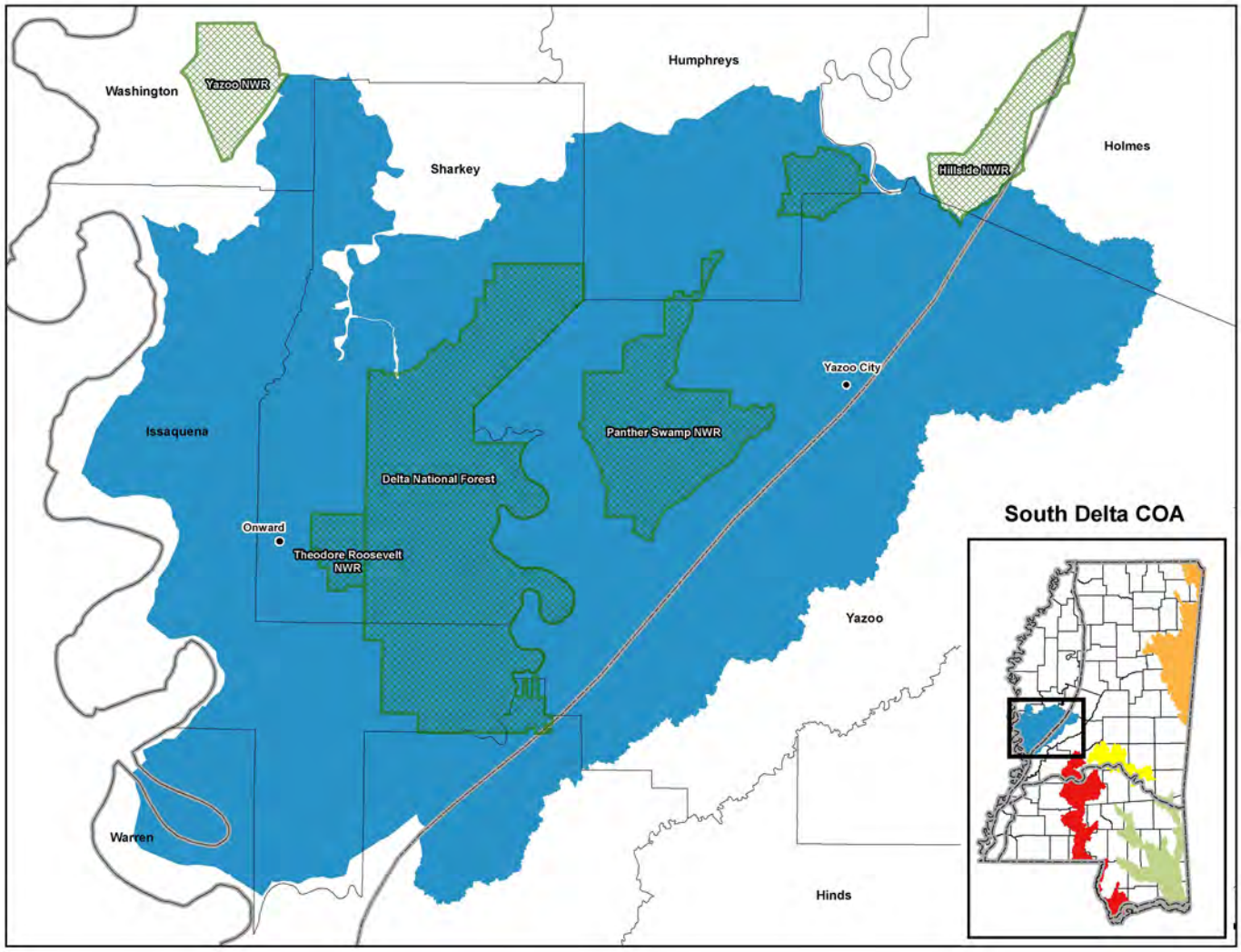


Figure 6.6 South Delta Conservation Opportunity Area

Table 6.5 Important Habitats in South Delta COA

Habitat	Ecoregion and SWAP Sections (Chapter 5)
Bottomland hardwood forests	MSRAP 1
Swamp forests	MSRAP 2
Riverfront forests/herblands/sandbars	MSRAP 3
Inland freshwater marshes	MSRAP 4
Lacustrine (lentic) communities	MSRAP 5
Mississippi river and associated drainages	Streams 1.1 – 1.3

Threats

Many of the threats in this COA are associated with the historic loss of hardwood forest and inappropriate agricultural practices. Nutrient runoff from fields, increased sedimentation, and bank destabilization all contribute to low water quality in the area. The inappropriate use of dams/water control structures has significantly altered the hydrology in the area, causing barriers to fish migration. For a more complete list of threats refer to specific habitats listed above in Chapter 5.

Priority Conservation Actions

Conservation Action 1 Land/water protection

- Encourage retention, preservation, and conservation of remaining natural habitat through purchase, easements or MOAs.
- Limit/discourage the introduction or propagation of exotic and invasive species (plant and animal).

Conservation Action 2 Land/water management

- Coordinate with other agencies, NGOs, conservation groups to establish best practices for monitoring and controlling invasive species: establish monitoring protocols, prioritization of control efforts.
- Maintain/improve/restore hydrologic (depth, hydroperiod, flow) and geomorphic (channel sinuosity, floodplain, microtopography) integrity.
- Encourage buffers and improve land use practices adjacent to streams (Streamside Management Zones) and other aquatic/wetland habitats.
- Encourage protection of large diameter trees and snags with visible cavities for use as dens/roosting sites for bear, squirrel, bats, and cavity nesting birds.

Conservation Action 4 Education and Awareness

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

Conservation Action 5 Law and policy

- Prohibit gravel mining in stream channels, discourage gravel mining in floodplains and improve over sight and planning for such mines on upland sites.

Conservation Action 6 Livelihood, economic and other incentives

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

For a more complete list of Priority Conservation Actions, refer to specific habitats listed above in Chapter 5.

South Delta Species of Greatest Conservation Need

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
Mussels	1	*Actinonaias ligamentina*	Mucket
	2	*Anodontoides radiatus*	Rayed Creekshell
	2	*Ellipsaria lineolata*	Butterfly
	1	*Elliptio dilatata*	Spike
	2	*Lampsilis cardium*	Plain Pocketbook
	1	*Lampsilis hydiana*	Louisiana Fatmucket
	1	*Plethobasus cyphyus*	Sheepnose
	1	*Pleurobema rubrum*	Pyramid Pigtoe
	1	*Potamilus capax*	Fat Pocketbook
	1	*Quadrula cylindrica cylindrica*	Rabbitsfoot
	2	*Quadrula nodulata*	Wartyback
	2	*Strophitus undulatus*	Squawfoot
	2	*Uniomerus declivis*	Tapered Pondhorn
Crustaceans	1	*Hobbseus yalobushensis*	Yalobusha Rivulet Crayfish
	1	*Orconectes hartfieldi*	Yazoo Crayfish
	1	*Procambarus lylei*	Shutispear Crayfish
Fish	2	*Cycleptus elongatus*	Blue Sucker
	2	*Cyprinella whipplei*	Steelcolor Shiner
	1	*Etheostoma raneyi*	Yazoo Darter
	2	*Ichthyomyzon castaneus*	Chestnut Lamprey
	1	*Notorus gladiator*	Piebald Madtom
	2	*Percina phoxocephala*	Slenderhead Darter
	2	*Phoxinus erythrogaster*	Southern Redbelly Dace
	2	*Fundulus dispar*	Northern Starhead Topminnow
	2	*Noturus flavus*	Stonecat
	1	*Scaphirhynchus albus*	Pallid Sturgeon
Reptiles	2	*Macrochelys temminckii*	Alligator Snapping Turtle
Birds	2	*Aquila chrysaetos*	Golden Eagle
	2	*Asio flammeus*	Short-eared Owl
	1	*Coturnicops noveboracensis*	Yellow Rail
	2	*Egretta caerula*	Little Blue Heron
	1	*Elanoides forficatus*	Swallow-tailed Kite
	2	*Eudocimus albus*	White Ibis
	2	*Euphagus carolinus*	Rusty Blackbird
	2	*Haliaeetus leucocephalus*	Bald Eagle
	1	*Laterallus jamaicensis*	Black Rail
	2	*Limnothlypis swaisonii*	Swainson's Warbler
	2	*Mycteria americana*	Wood Stork
	1	*Rallus elegans*	King Rail
	2	*Setophaga cerulea*	Cerulean Warbler
	2	*Sterna antillarum athalassos*	Interior Least Tern
Mammals	2	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat
	2	*Lasiurus cinereus*	Hoary Bat
	1	*Myotis austroriparius*	Southeastern Myotis

GROUP	TIER	SCIENTIFIC NAME	COMMON NAME
	2	*Myotis Lucifigus*	Little Brown Bat
	2	*Myotis septentrionalis*	Northern Long-eared Bat
	2	*Ursus americanus*	Black Bear
	1	*Ursus americanus luteolus*	Louisiana Black Bear

Plant Species of Concern

Arkansas mannagrass
Copper iris
Hooker's enyngo
Mississippi post oak
Pondberry
Sharpsepal beardtongue
Texas spiderlily

Potential Conservation Partners

Audubon Mississippi
BEaR Group of Mississippi
Black Bear Conservation Committee
Delta FARM
Delta Waterfowl
Delta Wildlife
Ducks Unlimited
Gulf Coastal Plains and Ozarks LCC
Lower Delta Partnership
Mississippi Association of Conservation Districts
Mississippi Department of Environmental Quality
Mississippi Department of Wildlife, Fisheries and Parks
Mississippi Farm Bureau Federation
Mississippi Fish and Wildlife Foundation
Mississippi Forestry Commission
Mississippi Land Trust
Mississippi State University
Mississippi State University Extension Service
Mississippi Wildlife Federation
National Wild Turkey Federation
The Nature Conservancy
US Army Corps of Engineers
US Fish and Wildlife Service
US Forest Service
USDA Farm Services Agency
USDA Natural Resources Conservation Service Wildlife Mississippi

Selected References for Chapter 6

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CHAPTER 7

RESEARCH NEEDS, SURVEYS, AND MONITORING

Surveys, research, and monitoring are tools that act synergistically to produce informed, effective and efficient actions geared toward the conservation of species. The nature of each of these tools is largely determined by how complete the knowledge base is for a particular species. For example, biologists know how to monitor presence, population density, demographic structure, health status, habitat condition, and how to calculate sustainable harvest for white-tailed deer. Conservation actions are taken in the form of adaptive management measures that are informed by feedback from regular monitoring. The result generally has been balanced populations that serve both the needs of the ecosystems they dwell in, and the needs of human consumers and economies benefitting from them.

Conversely, conservation actions directed towards SGCN must often address a relative lack of fundamental biological knowledge pertaining to these species. In some cases, relationships between groups of some non-game animals lack understanding to the point that it is not possible to determine whether they represent a population, multiple populations or even different species. The fact that conservation actions benefitting one species may negatively impact another emphasizes the importance of a comprehensive understanding of needs at the species, as well as community levels. Ensuring completion of objectives and implementation of quality control measures represent monitoring that is essential to producing timely and accurate information that fills these knowledge voids.

Monitoring and Adaptive Management

Methodology – Best Practices for State Wildlife Action Plans

Evaluating the effectiveness Mississippi's SWAP 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 SWAP. 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 more data become available and the SWAP 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 SWAP. A list of identified survey and research needs is includes at the end of this chapter.

The US Fish and Wildlife Service lists monitoring of conservation actions as one of the eight elements required in State Wildlife Action Plans. Monitoring the implementation and impact of conservation actions, regardless of at what stage they are implemented, informs subsequent actions so that they better achieve the ultimate objective. This process is known as adaptive management.

As an example of this, we present a hypothetical adaptive management process regarding the Tombigbee darter, *Etheostoma lachneri*, a Mississippi SGCN. Mississippi Department of Wildlife, Fisheries, and Parks have identified knowledge gaps regarding the habitat needs and reproductive biology of this fish. Already existing distributional and status surveys indicate that this species occurs in small to medium sized tributaries of the Tombigbee River.

Knowing this, we may have the ultimate objective of protecting critical habitat of the Tombigbee darter through targeted land acquisitions along these tributaries. Before this conservation action can be carried out however, we must have knowledge of how Tombigbee darter reproductive biology and physical habitat interact to result in successful recruitment. The United States Congress requires three levels of monitoring for State Wildlife Action Plans: Species and Habitat Monitoring, Monitoring Effectiveness of Conservation Actions and Adaptive Management.

Within that framework, our scenario regarding conservation of the Tombigbee darter can be graphically displayed as follows:

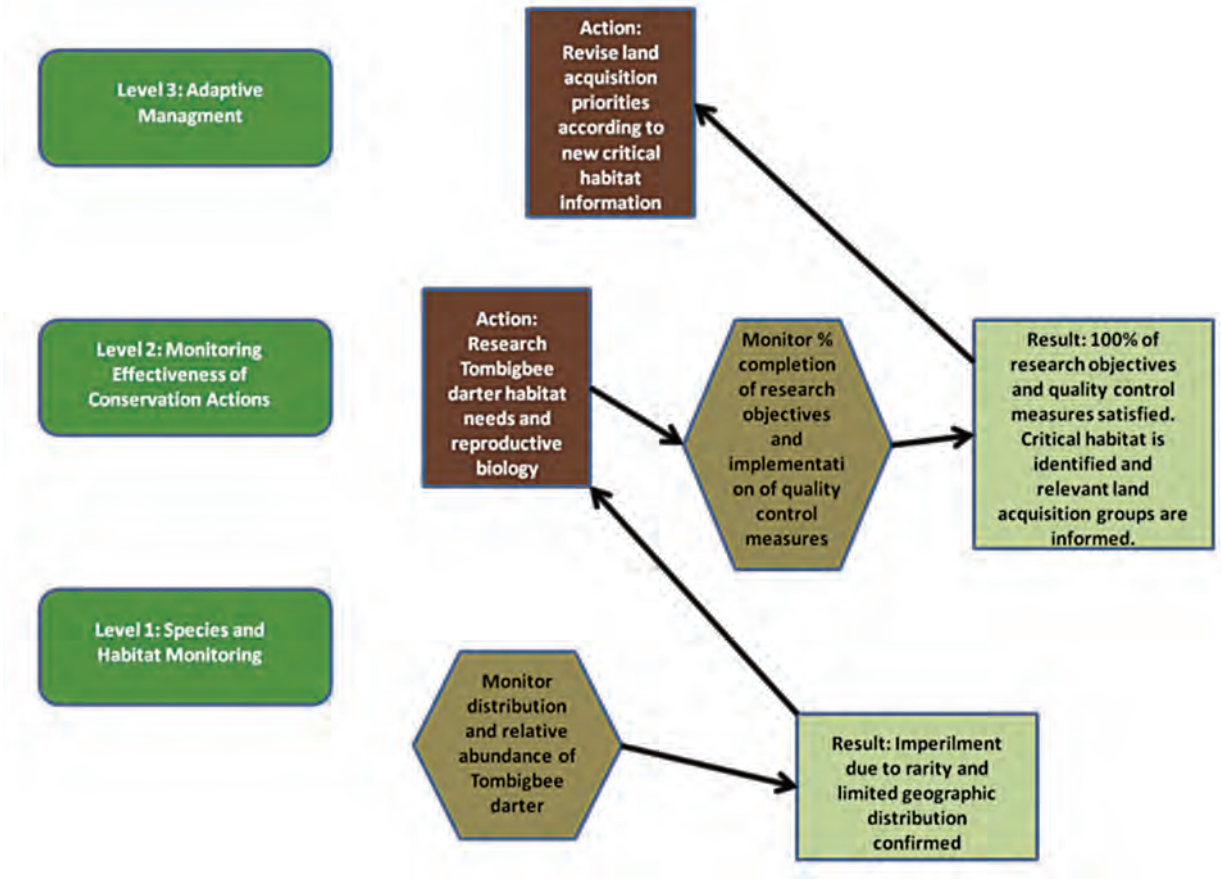

Figure 7.1 Example of research and adaptive management for the Tombigbee Darter.

Monitoring Species

The State Wildlife Action Plan prioritizes habitats in part based on the numbers of SGCN found in different habitats. An important factor in making this determination is understanding a species' distribution within the state. The known ranges of some SGCN are not completely understood in Mississippi. Knowing where animals occur both on a fine scale (habitats occupied) and a broad scale (geographical distribution) is very important for making management decisions. SGCN may be considered vulnerable because of limited distribution within the state, or a species may be rather wide-ranging, but rarely encountered. Surveys not only tell us about an organism's distribution and habitat use, but can also tell us whether changes have occurred over time. These changes in faunal composition may reflect a degradation, or improvement in habitats for a species or assemblage of species.

The Mississippi Natural Heritage Program (MNHP) maintains a database of species occurrence records that is used to track species population trends over time. All records are maintained in Biotics 5 under the guidance of NatureServe, the international heritage program parent organization. The MNHP database serves as a primary centralized repository for information related to Species of Concern and is used for acquiring, managing and disseminating information relative to monitoring SGCN under the SWAP. Information related to species status is 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.

The utility of maintaining species occurrence records through time was recently illustrated by a management proposal involving several Mississippi species. The US Fish and Wildlife Service was petitioned by a private conservation group to list 17 species of crayfish occurring in Mississippi as threatened or endangered under the US Department of Interior's Endangered Species Act. Ten of these species are endemic to Mississippi and the other seven are found only in Mississippi and one bordering state (six shared with Alabama, one shared with Tennessee). The only published scientific information for many of these species was the type description, which usually contained only limited information on the biology of the species. The US Fish and Wildlife Service asked the Mississippi Department of Wildlife, Fisheries, and Parks to review the available information about the habitat and range of the species in Mississippi as well as any relevant taxonomic information that might be pertinent. The Mississippi Department of Wildlife, Fisheries, and Parks, through its Museum of Natural Science, maintains an extensive collection of crayfish from Mississippi and the southeastern United States. Combining the information from specimen records in the agency's collection with specimen records from other museums and information from the scientific literature, the agency produced a document that indicated that 16 of the 17 petitioned species were likely not suitable for listing under the US Endangered Species Act.

Monitoring Habitat

Mississippi's SWAP 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 SWAP, 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 SWAP should be reflected in environmental and community data collected by agencies and organizations such as MDEQ, The Nature Conservancy (TNC), the US Geological Survey (USGS), the US Environmental Protection Agency (EPA), the US Fish and Wildlife Service (USFWS), the USDA Natural Resources Conservation Service (NRCS), the US 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), USGS, 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 SWAP long-term goals. Land cover information must be updated periodically to be useful in tracking long-term changes.

Because the SWAP 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 SWAP will depend on a coordinated effort of all stakeholders. It is critical for success to further strengthen partnerships established through the SWAP 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 SWAP. 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 SWAP 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 SWAP.

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 SWAP 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 2, 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 on the following page.

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

Reporting – Wildlife TRACS

Mississippi Department of Wildlife, Fisheries, and Parks will use the Wildlife Tracking and Reporting Actions for the Conservation of Species system, also known as Wildlife TRACS, for documentation of its monitoring efforts, completion of conservation actions, and resulting adaptive management. Wildlife TRACS is developed and maintained by the US Fish and Wildlife Service as a service to entities employing State Wildlife Grant funds towards species conservation and to the general public. Input of information into the Wildlife TRACS reporting systems follows a standard format and incorporates effectiveness measures approved by the Association of Fish and Wildlife Agencies. By standardizing the reporting process, a more accurate record of conservation progress across participants is generated. Ultimately this provides accountability and transparency while demonstrating the benefits of State Wildlife Grant dollars to the United States Congress and taxpayers.

Survey and Research Needs

Major survey and research 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 IX. 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 fish, estuarine fish, and invertebrate SGCN using the marine faunal inventory developed by the University of Southern Mississippi's Gulf Coast Research Lab.
- Perform status surveys of potential marine fish, estuarine fish, and invertebrate SGCN of greatest conservation need.

Reptiles

- Conduct status surveys of turtles of SGCN.
- 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

- Conduct status surveys throughout the year for SGCN.
- Conduct demographic research including breeding biology, productivity and survival.
- Continue to monitor known populations.
- Assess needs to eradicate introduced species and conduct predator control.

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.
- 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 several of what appear to be species complexes.
- It is recommended that captive propagation be implemented for some mussel species 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.
- Conduct status surveys for other SGCN.

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.
- Rehabilitate potential breeding ponds to provide suitable habitat and develop propagation and re-dispersal program for some amphibian species. Explore potential for management of these species on private lands. Develop methods for controlling effects of certain amphibian diseases, including anuarperkensis and Ranavirsus.

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.
- Determine extent of movement of turtle species from the Tombigbee watershed to and from the Tennessee River watershed via the Tenn-Tom Waterway.
- Study the effects of site preparation and timber harvesting on reptile SGCN.
- Explore the potential for reintroduction of the reptilian species into portions of their former range.

Birds

- Conduct population status surveys.
- Perform studies of breeding, reproduction, nesting success and survival.
- 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 re placement 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 8

IMPLEMENTATION, REVIEW AND REVISION OF MISSISSIPPI'S SWAP

When Congress passed the enabling legislation that mandated each state and territory develop a SWAP, they included a requirement for each lead wildlife agency to establish procedures to review and revise their state SWAP at intervals not to exceed ten years (Required Element 6). The following is description of how MDWFP has and will continue to review and revise this SWAP.

In its original 2005 SWAP, MDWFP proposed to complete a comprehensive revision by 2015. This document fulfills that obligation. Going forward, MDWFP plans to complete a comprehensive revision every ten years as originally proposed, and will make other modifications in accordance with the Association of Fish and Wildlife Agencies Recommended *Best Practices for State Wildlife Action Plans* in the interim periods in collaboration with partners and advisors.

The next comprehensive update of Mississippi's Action Plan will be completed by October 2025 with an interim five-year review for certain species and habitats identified by the MDWFP SWAP Technical Committee and Expert Advisors (see list in Appendix II) that are deemed as likely to benefit from or require a shorter review period. In addition, we recognize that for this Action Plan to meet its intended goal to improve biodiversity in Mississippi we must consider Mississippi's SWAP "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 necessary and possible through our Mississippi Natural Heritage Program (MNHP) housed in MDWFP's Mississippi Museum of Natural Science.

In order to accomplish these planned updates, MDWFP will continue to enlist the assistance of the SWAP Advisors and committees in the review process. The continued engagement of outside advisors and experts will allow the MDWFP SWAP Technical Committee to collaborate with its many existing and potential conservation partners and interested stakeholders in the future iterations and refinement of this Action Plan that should result in better implementation of conservation actions, and ultimately improved health of species of concern and their habitats.

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 SWAP-related activities. Reporting is accomplished through Wildlife TRACS (Tracking and Reporting Actions for the Conservation of Species). TRACS has an online open access area where the public can view limited, state selected data that has been submitted (http://tracs.fws.gov/public/).

New data on species and habitats will continue to be incorporated by MDWFP MNHP database (Biotics) regularly and any changes in status of species and their habitats will be entered annually in this database. The SWG Coordinator and Technical Committee will be responsible for implementing the annual review and evaluation of the SWAP and will report annually to the Executive Director as part of the SWG program.

The SWG Coordinator and SWAP Technical Committee will conduct an annual, five and ten year assessment using the original eight elements, along with other guidance and criteria provided by the US Fish and Wildlife Service. MDWFP's administrative Steering Committee will oversee the review and revision process and will ensure that the SWAP continues to follow the eight elements.

The following is a proposed calendar for review and revision of Mississippi's SWAP for the next cycle due in 2025.

Table 8.1 Mississippi SWAP Review and Revision Calendar 2015- 2025

FEDERAL FISCAL YEAR	MS SWAP ACTIVITY
FY 2015	Approval of comprehensive revision of MS SWAP by USFWS and Congress. Post final approved version on MDWFP website for public use.
FY 2016	Annual review by Technical Committee.
FY 2017	Annual review by Technical Committee.
FY 2018	Annual review by Technical Committee.
FY 2019	Five Year Review by Technical Committee with input from experts and advisors.
FY 2020	Annual review by Technical Committee.
FY 2021	Annual review by Technical Committee.
FY 2022	Annual review by Technical Committee. Frame process for comprehensive update due in 2025.
FY 2023	Technical Committee to begin Ten Year Comprehensive Revision with input from advisors and experts.
FY 2024	Ten year update underway.
FY 2025	Complete and submit Third Version of SWAP.

Plans for Implementation

State Wildlife Action Plan Required Elements 7 and 8 speak to implementation of Mississippi's State Wildlife Action Plan through a variety of partnerships. In carrying out Mississippi's initial CWCS during the past decade, multiple state, tribal, and federal agencies, NGOs, research universities and private landowners operating within the State joined with MDWFP to guide, enable, or directly carry out conservation actions. For example State Wildlife Grant dollars were broadly applied, from funding SGCN-focused research at each of Mississippi's major universities to on-the-ground habitat rehabilitation on public and private lands in the State. The MNHP utilized the SWAP to provide technical guidance on thousands of public and private projects occurring within Mississippi during 2005-2015. These existing partnerships will certainly play a role addressing conservation concerns and actions raised in the 2015-2025 SWAP, but they will also evolve to incorporate emerging, broad-based regional partnerships including relevant Landscape Conservation Cooperatives and Joint Ventures. This document will also provide guidance to the Gulf of Mexico Alliance,

which has been chosen to administer the Gulf of Mexico Research Initiative, a Gulf-wide voluntary research program funded by BP. These coalitions incorporate information from multiple State Wildlife Action Plans and provide states with recommendations for carrying out coordinated conservation actions from a regional perspective. Therefore, implementation of this document over the next decade will address state-wide conservation priorities with greater cognizance of issues occurring throughout the Southeastern US and affecting Mississippi's natural resources.

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 and reducing 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 understory 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.

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 significantportion of its range, as rated and listed by the USFWS (federally endangered) or MDWFP (state endangered).

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 periodicflooding.

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 natural habitat within a mosaic of other forms of land use.

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 todevelop 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; thisactivity 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: sites with a moderate amount of moisture, which support plant communities that require a moderate amount of moisture.

mesophyte: plant that grows under medium conditions of moisture.

mussel: a group of aquatic bivalve mollusks. All native freshwater mussels belong to the family Unionidae.
neotropical migratory birds: birds which migrate to the neotropics (South and Central America and theCaribbean) 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: pine stands that have been artificially regenerated by planting or direct seeding.
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.

References Used to Support the Glossary

Many definitions used in the glossary were derived entirely, or partially, from the following sources. Some definitions were formed by combining definitions from various sources.

Giles, Robert H. Wildlife Management. W.H. Freeman and Company, San Francisco, California, USA, 416 pp.

Groves, Craig R. Drafting a Conservation Blueprint: A Practitioner's Guide to Planning forBiodiversity. The Nature Conservancy: Arlington, Virginia, USA, 445 pp.

Miriachi, R.E., ed. 2004. Alabama Wildlife. Volume 1. A checklist of vertebrates and selected invertebrates: Aquatic mollusks, fishes, amphibians, reptiles, birds and mammals. The University of Alabama Press, Tuscaloosa. 209 pp.

Pennak, Robert W. 1964. Collegiate Dictionary of Zoology. The Ronald Press Company. New York. 567 pp.

Webster's Ninth New Collegiate Dictionary. 1983. Merriam-Webster Inc. Springfield, Massachusetts. www.biology-online.org

ACKNOWLEDGEMENTS

This updated 2015 Mississippi State Wildlife Action Plan is a reflection of the outstanding effort and support of many individuals within and outside of the Mississippi Department of Wildlife, Fisheries and Parks. We especially want to thank Kathy Shelton, MDWFP's 2015 SWAP Revision Coordinator and our 2015 SWAP Technical Committee (below) for their dedication to ensuring this important conservation plan meets the intent and requirements set forth by Congress, incorporates the Best Practices recommended by the Association of Fish and Wildlife Agencies (AFWA), and is a useable tool for Mississippi resource managers, planners and decision-makers.

MDWFP 2015 SWAP Technical Committee

Joelle Carney*	Dennis Riecke
Chad Dacus	Matt Roberts
Sheena Feist	Andy Sanderson*
John Gruchy	Kathy Shelton
Rick Hamrick	Heather Sullivan
Bob Jones	Sherry Surrette*
Tom Mann	Lisa Yager *
Verity Mathis*	Brad Young*
Scott Peyton	Nick Winstead
Larry Pugh	

*No longer on MDWFP staff.

The foundation for this newly revised SWAP was the original 2005 plan which was developed in close collaboration with representatives from several other local, state and federal agencies, non-government organizations, industry and academia. A list of all those serving on the Expert Team or as Advisors are listed in Appendix 2. We are especially grateful for the support of the US Fish and Wildlife Service for aiding in the development of our new and improved habitat maps, and to the Gulf Coast Plains and Ozarks Landscape Conservation Cooperative for their review and input on climate adaptation. Our deepest thanks go to the AFWA and their Teaming with Wildlife Coalition for developing excellent best practices guidance and offering support to our Technical Committee during this revision effort.

This planning effort involved hundreds of people working over a decade. It is impossible to recognize each person who contributed their time, energy, knowledge and resources in the revision and review of this Plan, but we hope you know how grateful we are for your help. Your contributions of data, expert opinion, edits and your patience and devotion to the process have improved the new SWAP immeasurably.

While the SWAP is the culmination of the hard work and long hours of planning, review, writing, editing and collaboration, it is also the result of a long-term commitment by all state wildlife agencies in the U.S. to work together to improve biodiversity. From the first iteration of Mississippi's SWAP to now, this long-term planning effort has resulted in increased collaboration among resource agencies, organizations, business and academia in our state that began with the development of the first Advisory Committee. As we stated in 2005, the ultimate test of this SWAP will be the success of future partnerships that evolve from this planning process to implement the conservation actions recommended herein.

Finally, we want to thank Mississippi Governor Phil Bryant, our Mississippi Senators and Congressmen, the Mississippi Legislature, MDWFP Executive Director Dr. Sam Polles and the Mississippi Commission on Wildlife Fisheries and Parks for their support, commitment to this process, and for all their support and encouragement throughout.

This document was designed by the MDWFP Mississippi Outdoors publication staff. We are grateful for the hard work by Martin Cate, Lauren Doherty, and David Stepro to create a useful and beautiful plan.

Mississippi MDWFP 2015 SWAP Steering Committee

Elizabeth Barber (consultant)
Larry Castle
Elizabeth Hartfield**
Charles Knight
Matt Roberts
Andy Sanderson*
Kathy Shelton
Randy Spencer

** MDWFP Retired

APPENDIX I

2007 Guidance for Wildlife Action Plan Review and Revisions

Guidance for Wildlife Action Plan (Comprehensive Wildlife Conservation Strategy) Review and Revisions

ASSOCIATION of FISH & WILDLIFE AGENCIES

JUL 12 2007

To: State Fish and Wildlife Agencies
Secretary, Department of Natural Resources
of the Commonwealth of Puerto Rico
Governor of Guam
Governor of U.S. Virgin Islands
Governor of American Samoa
Governor of Commonwealth of the Northern Mariana Islands
Mayor of the District of Columbia

The purpose of this letter to is to provide guidance for future Wildlife Action Plan (Comprehensive Wildlife Conservation Strategy) review and revisions.

Congress required that all States commit to reviewing and, if necessary, revising their Wildlife Action Plans within 10 years. Every State made this commitment.

The attached document, drafted by a State and Federal team, identifies the process and requirements that all States must use for the future review and revision of their Wildlife Action Plans. This guidance provides a flexible framework for States to incorporate new information and changing circumstances into their Wildlife Action Plans as easily as possible while providing national consistency.

The Wildlife Action Plans are monumental achievements. We are very encouraged by the early successes and cooperation they have spawned. We hope that this guidance will help to ensure that these excellent plans are a guiding force for conservation for years and even decades to come.

Sincerely,

H Dale Hall

Dale Hall
Director of the U. S. Fish and Wildlife Service

Edward Parker
President of the Association of
Fish and Wildlife Agencies

Enclosure

Purpose

The purpose of this document is to identify the process and requirements that all States/territories must utilize for the future review and revision of their Wildlife Action Plans (Action Plans).

Introduction

The Action Plans were developed by the States to be dynamic, adaptive documents that would guide agency and partner conservation planning for years to come. Each State committed to reviewing or, if necessary, revising (review/revise) their Action Plan within 10 years as per Element 6 of the original legislation. Many States committed to do so at much shorter intervals. The U.S. Fish and Wildlife Service (USFWS), encourages States to review and revise their plans as often as is useful to them and their partners. Recent Congressional report language indicates that Congress expects the USFWS to develop guidance/standards that will be utilized by all States/territories to revise their action plans. The Congress also expects that USFWS will apply the standards consistently in all Regions. (cf. Senate Report 109-275: Department of the Interior, Environment, and Related Agencies Appropriations Bill, 2007. House Report 109-465: Department of the Interior, Environment, and Related Agencies Appropriations Bill, 2007). This guidance document will ensure national consistency while allowing States and their partners flexibility to update their Action Plans without undue burden.

Review Process

Original plan review, with approval recommendations to the Director of the USFWS was provided by a National Advisory Acceptance Team (NAAT) -- the Assistant Director of Wildlife and Sport Fish Restoration, each of the seven USFWS Assistant Regional Directors for Migratory Birds and State Programs (ARD), Assistant Manager (AM) of the California/Nevada Office, a representative State Director from each regional Association of Fish and Wildlife Agencies (AFWA), and a representative of the national AFWA organization. Although a NAAT may be reconvened in the future to consider general policy matters or particularly complex review/revision issues, it is not anticipated that a NAAT will evaluate Action Plan review/revisions. Instead, that task will be accomplished by Regional Review Teams (RRTs). The RRTs were an integral part of the original Action Plan evaluation process and we feel that future evaluations of Action Plan review/revisions will be carried out more effectively using this regional approach. There will be eight RRTs, one within each FWS region. The RRTs are comprised of one ARD, AM or equivalent; and one State Director appointed by each of the four regional associations (e.g. Southeastern, Midwest, Northeast, and Western). State Directors serving on RRTs will not evaluate the Action Plan from their own agency. In such cases, the Action Plan would be sent to another RRT for review. Federal Assistance Program and State staff may assist the RRTs as necessary. RRTs will assist States with guidance on Action Plan revisions and be available for any Action Plan related issues that may arise.

General Requirements

All States must review/revise their Action Plans by October 1, 2015, or the date specified in their original, approved Action Plan and send the updated version and summary documentation to the USFWS. This summary documentation must demonstrate that the entire Action Plan was examined and that all of the original Eight Required Elements (attached) were met, including an up-to-date public review process specified in Elements 7 and 8. If no changes were made, the State must document and explain why no changes were necessary and what process was used to make that determination. For more details, see **Section A**. Once Action Plan review/revisions are approved, States are not obligated to review/revise their Action Plans for another 10 years or until a date specified in the Action Plan.

A State may also revise only a part of its Action Plan without reviewing/revising its entire Action Plan. Some Action Plan revisions, including but not limited to the addition of a species, are defined as "major" (see definition on page 5). As such, States 3must provide documentation that demonstrates all of the original Eight Required Elements are adequately addressed, including an up-to-date public review process as specified in Elements 7 and 8. "Major" revisions must follow the requirements outlined in Section B. All other revisions are considered "minor" and must follow the requirements outlined in Section C.

Specific Requirements

Section A.

Requirements for Planned Review/Revision of Entire Plan

(1) State agency director notifies its Regional USFWS Federal Assistance office by letter of intent to review or revise the Action Plan.

(2) State and USFWS meet to discuss guidance to ensure all elements will be addressed prior to submission of documentation and reviewed/revised Action Plan.

(3) State submits reviewed/revised Action Plan package by October 1, 2015, or the date specified in its original, approved Action Plan to the Regional Federal Assistance office.

This package will include:

- summary of any significant changes and documentation describing how the current version of Action Plan adequately addresses the Required Eight Elements, including an up-to-date public review process specified in Elements 7 and 8;

- "Road map" (summary of location of elements in document) to locate revisions in Action Plan.

(4) States are encouraged to post an electronic version of their most recent Action Plan on the web along with the summary of significant changes and "road map."

(5) RRT reviews Action Plan with input from Federal Assistance staff and determines whether it is approvable or not approvable. The ARD or AM will send a letter to the State Director with documentation of the decision and description of any required action if the Action Plan is not approvable. State Directors can appeal to the Regional Director.

(6) ARDs and AM are responsible for communicating significant issues with members of all the RRTs to ensure consistency among RRTs.

(7) States that specified a review/revision within 10 years (prior to the October 1, 2015, deadline) in their Action Plan and wish to change that date must submit a "minor" revision letter (see **Section C** below) to their Regional Federal Assistance office.

(8) Federal Assistance must track revisions and due dates and maintain an administrative record of Action Plan revisions.

Section B.

Requirements for "Major" Revisions **Prior** to the Planned Review/Revision Date

(1) State agency director notifies its Regional FWS Federal Assistance office by letter of intent to make "major" revisions to the Action Plan (See definition below).

(2) State submits modified Action Plan and includes:
- summary of all significant revisions;
- documentation describing how the revision meets the Required Eight Elements, including an up-to-date public review process specified in Elements 7 and 8;
- "road map" to locate revisions in Action Plan.

(3) States are encouraged to post an electronic version of their most recent Action Plan on the Web with the summary of significant changes and "road map."

(4) RRT reviews Action Plan with input from Federal Assistance staff and determines whether it is approvable or not approvable. The ARD or AM will send a letter to the State Director with documentation of the decision and description of any required action if the Action Plan is not approvable. State Directors can appeal to the Regional Director.

(5) ARDs and AM are responsible for communicating significant issues with members of all the RRTs to ensure consistency among RRTs.

(6) Federal Assistance must track these revisions and maintain an administrative record of Action Plan revisions.

Section C.

Requirements for "Minor" Revisions Prior to the Planned Review/Revision Date

(1) State Director notifies the Regional FWS Federal Assistance office by letter of intent to make minor revisions with a description of the change and why the change is considered a minor revision.

(2) State submits letter that includes:
- summary of all revisions;
- "road map" to locate revisions in Action Plan.

(3) States are encouraged to post an electronic version of their most recent Action Plan on the web along with the summary of significant changes and "road map" (summary of location of elements in document).

(4) Federal Assistance must track these revisions and maintain an administrative record of Action Plan revisions.

Definitions

"Major": A significant change or changes that requires revision of two or more elements in the Action Plan. Any addition of a species of greatest conservation need (SGCN) would be a major revision. This is considered a major revision because it would require the State to substantially address subsequent elements (i.e., habitats, threats, actions). Similarly, a revision of its threat assessments for SGCN species and/or habitats that are essential to conservation of SGCN would be a major change because it would likely result in changes to conservation actions and prioritization of those conservation actions.

"Minor": All revisions not considered "major."

The RRT will determine if a change is minor or major when it is unclear. This decision may be requested by either the State or staff of Federal Assistance. State Directors can appeal decisions to the Regional Director.

Note that States and other eligible jurisdictions that wish to use State Wildlife Grant (SWG) funds to address critical priority issues not identified within an Action Plan should refer to the USFWS *2007 Administrative Guidelines for State Wildlife Grants* (SWG Guidelines), *Section X.H.*

APPENDIX II

Mississippi SWAP Technical, Steering and Expert Teams and Agency/Tribal Coordination

In developing, implementing, reviewing and revising their State Wildlife Action Plan (SWAP), each state lead agency is required by Congress to coordinate with "Federal, State and local agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats" (Required Element 7). The following is a description of the Mississippi Department of Wildlife, Fisheries and Parks' (MDWFP) approach to this requirement. The primary responsibility for developing the original SWAP in 2005 and for this comprehensive update was given to the Mississippi Museum of Natural Science (MMNS) and the Conservation Biology Section where MDWFP's non-game program is housed. Beginning in 2010, MDWFP conservation biologist, Kathy Shelton, coordinated all aspects of this revision.

The original plan was developed with three committees (Technical, Steering and Advisory Committees) and a team of Expert Advisors. The Technical and Steering Committees and Expert Advisors continued to work together through teams and informally and independently on this updated SWAP over the past several years. The following are lists of the committee members instrumental in this 2015 comprehensive update. Agencies and advisors that aided in the development of the original SWAP or this 2015 update are listed below.

2015 MS SWAP Revision Coordinators – Kathy Shelton and Elizabeth Barber

2015 MS SWAP Technical Committee—Mississippi's SWAP Technical Committee (below) was composed of MDWFP wildlife, fisheries, and museum biologists who were responsible for gathering and analyzing new information on Mississippi's species of greatest conservation need, updating habitat descriptions and refining stressor and conservation action recommendations. The Technical Committee coordinated with outside experts (listed on the following page) in their emphasis area.

Joelle Carney*
Chad Dacus
Sheena Feist
John Gruchy
Rick Hamrick
Bob Jones
Tom Mann
Verity Mathis*
Scott Peyton
Larry Pugh
Dennis Riecke
Matt Roberts
Andy Sanderson
Kathy Shelton
Heather Sullivan
Sherry Surrette*
Lisa Yager *
Brad Young*
Nick Winstead

*No longer on MDWFP staff.

2015 MS SWAP Steering Committee – The Steering Committee (below) was composed of MDWFP management (wildlife, fisheries and museum administrators) and the SWAP Revision Coordinators working together to ensure the overall coordination of this comprehensive update continues to meet the eight elements required by Congress and developed the plan for expert, stakeholder and public engagement in this revision process.

Elizabeth Barber (consultant)
Larry Castle
Elizabeth Hartfield**
Charles Knight
** MDWFP Retired

Matt Roberts
Andy Sanderson
Kathy Shelton
Randy Spencer

2015 SWAP Expert Advisors – Scientists in the state and region (below) with expertise on species of greatest conservation need advised MDWFP on needed changes and updates to the original 2005 SWAP. Over the past ten years, they provided additional input on species, habitats, stressors/threats and conservation actions and aided greatly in refining the SWAP.

Amphibians and Reptiles
Matt Hinderliter
Bob Jones
Edmund Keiser
Linda LaClaire
Jen Lamb
Jim Lee
Becky Rosamond
Tom Mann
Kathy Shelton

Birds
Sheri Glowinski
Ali Leggett
Sarah Pacyna
Kathy Shelton
William Vermillion
Nick Winstead
Mark Woodrey

Crustaceans
Susan Adams
Bob Jones

Mammals
Rick Hamrick
Chester Martin
Alison McCartney
Scott Peyton
Richard Rummel
Kathy Shelton

Fishes
Scott Peyton
Matt Roberts
Todd Slack
Matt Wagner

Arthropods
Jason Bried
JoVonn Hill
Tom Mann
Scott Peyton

Mussels
Paul Hartfield
Bob Jones
Scott Peyton

Habitat
Tom Mann
Heather Sullivan
Ryan Theel

Advisors (2005 and 2015 SWAP)

The following is a list of individuals who provided input or served in an advisory capacity during the development of the original 2005 plan and/or the 2015 revision.

Susan Adams
Mary Bruce-Alford
Ebonye Allen
Yvonne Allen
Scott Alls
Ray Aycock
James Austin
Brent Bailey
Jill Bailey
Don Bales
Allison Beasley
Laura Beiser
Jerrold Belant
Pradip Bhowal
Nick Biasini
Patrick Biber
Brandon Bobo
Mike Brainard
Leah Bray
Margaret Bretz
Greg Brinson
Steve Brock
Randy Browning
Jennifer Buchanan
Kelvin Burge
Pat Byington
John Christ
Janet Chapman
Glynda Clardy
Amy Commons-Carson
Trey Cooke
Andi Cooper
James Cummins
Brian Davis
Connie Dickard
Foster Dickard
Rick Dillard
Cynthia Edwards
Ben Elliot
Gregg Elliot
Michelle Erenberg
Kristine Evans
David Felder
Nkrumah Frazier
Mike Freiman
Jeff Gleason
Sheri Glowinski
Kris Godwin
Mike Goff
Steve Grado
Ayesha Gray
Kristyn Gunter
Wendell Haag
Ed Hackett
Jim Hancock
Keith Hancock
Patric Harper
Tyree Harrington
Libby Hartfield
Paul Hartfield
Jill Hendon
John Henry
Scott Hereford
Matt Hinderliter
Jennifer Holcomb
Glenn Hughes
Kevin Hussey
Larry Jarrett
Joe Jewell
Daryl Jones
Jeanne Jones
Michael Jones
Todd Jones-Farrand
Jim Kelly
Ron Killebrew
Steve Krotze
Linda LaClaire
Paul Lago
Jennifer Lamb
Keri Landry
Kara Lankford
Mark LaSalle
Jeffery Lee
Jim Lee
Ali Leggett
Scott Lemmons
Jordan Macha
Dave Marchman
John Marquez
Sam Marter
Chester Martin
Jill Mastrototaro
Brad Maurer
Alison McCartney
Will McDearman
Moira McDonald
Keith McKnight
Lance Middleton
Darren Miller
Jamie Miller
Christina Mohrman
Thomas Mohrman
Ed Moody
Frank Moore
Tom Moorman
Charlie Morgan
Barry Moss
Mike Murphy
David Muth
Paul Necaise
Kevin Nelms
Julia O'Neal
Keith Ouchley
Sarah Pacyna
Kent Parish
G. Parsons
Chris Pease
Coen Perrott
Alice Perry
Barry Pessoney
Mark Peterson
Dan Prevost
Carl Qualls
George Ramseur
Mitzi Reed
Chris Richardson
David Richardson
Steve Ricks
Gary Rikard
Ron Seiss
Will Selman
Stacey Shankle
Cathy Shropshire
Tommy Shropshire
Todd Slack
Robert Smith
Liz Smith-Incer
Bekah Sparks
Judy Steckler
Samantha Stelmack
Wayne Stogsdill
Becky Stowe
Eddie Taylor
Ryan Theel
Stacy Thomas
John Tirpak
Adam Tullos
John Tupy
Dan Twedt
Don Underwood
Will Underwood
Carl Upchurch
Bill Vermillion
David Vigh
Patrick Vowell
Russ Walsh
Clay Ware
Greg Wathen
Malcolm White
Andrew Whitehurst
Amy Whitten
Kay Whittington
Homer Wilkes
Jim Williams
Shaun Williamson
Tim Willis
Cory Wilson
Jeff Wilson
Randy Wilson
Mark Woodrey
James Woods
Janet Wright

Clarence Finley
Robbie Fisher
Trudy Fisher
Pete Floyd
Jim Franks
Larry Lewis
Alex Littlejohn
Kelly Lucas
Kathy Lunceford
Adam Rohnke
Angel Rohnke
Becky Rosamond
Jason Price
Lisa Yager
Brad Young
Jill Zednick
Jason Fortune

Coordination with other Agencies and Tribal Representatives

Development of the original 2005 SWAP was accomplished in coordination with a variety of public wildlife agencies, universities, conservation organizations and land managers in Mississippi, and a list was provided in the original plan. This coordination was ensured in both the original Plan and this update by inclusion of representatives of these agencies and organizations as advisors, through individual and organization briefings and presentations and through contact with the Expert Team and Technical Committee. New conservation planning documents and tools provided by other agencies and updates on species, studies, habitat changes and stressors were gathered and incorporated into this comprehensive update from 2005 – 2015 where possible. Other interested parties also contributed to the process through comments via the MDWFP SWAP website where Plan updates were posted and comments could be made in 2015.

25x25 Alliance
Audubon Mississippi
Bureau of Land Management
Delta Wildlife
Ducks Unlimited
Grand Bay National Estuarine Research Reserve
Gulf Coast Joint Venture
Gulf Coastal Plains & Ozarks Landscape Conservation Cooperative
Gulf Restoration Network
Land Trust for the Mississippi Coastal Plain
Louisiana Department of Wildlife and Fisheries
Lower Mississippi Valley Joint Venture
MDWFP Fisheries Bureau
MDWFP Museum of Natural Science
MDWFP Wildlife Bureau
Mississippi Band of Choctaw Indians
Mississippi Bat Working Group
Mississippi Chapter of The Wildlife Society
Mississippi Department of Environmental Quality
Mississippi Department of Marine Resources
Mississippi Development Authority
Mississippi Forestry Commission
Mississippi Sandhill Crane National Wildlife Refuge
Mississippi Soil and Water Conservation Commission
Mississippi State University
Mississippi State University Extension Service
Mississippi Wildlife Federation
National Park Service
National Wildlife Federation
National Wildlife Refuge Inventory and Monitoring Branch
National Wildlife Turkey Federation
Natural Resource Enterprises
Office of Senator Thad Cochran
Partnership for Gulf Coast Land Conservation/Land Trust Alliance
Pascagoula River Audubon Center
Southern Company
The Nature Conservancy, Mississippi Chapter
The Trust for Public Land
University of Mississippi
University of Southern Mississippi
University of Southern Mississippi Gulf Coast Research Laboratory
US Army Corps of Engineers
US Fish and Wildlife Service
US Fish and Wildlife Service Gulf Restoration Program
US Forest Service
USDA Farm Services Agency
USDA Natural Resources Conservation Service
USDA Wildlife Services
USGS Patuxent Wildlife Research Center
Western Carolina University
Weyerhaeuser
Wild South
Wildlife Mississippi

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 nothing 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 Change 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. Species Distribution and Habitat/Biological Community Assessment

A. Knowledge within the scientific community of distribution and key habitat/com munity 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):

ECOREGION:

___ East Gulf Coastal Plain (EGCP)
___Upper East Gulf Coastal Plain (UEGCP)
___Northern Gulf of Mexico (NGM)
___ MS River Alluvial Plain (MSRAP)
___ Streams

TYPES	SUB-TYPES	
___ **Dry Upland Forests**	___ Dry Hardwoods	___ Mesic hardwoods
	___ Dry Longleaf Pine	___ Dry shortleaf/loblolly pine
___ **Mesic Upland Forests**	___ Southern Mixed Hardwoods	___ Mesic Longleaf Pine Savannah
	___ Lower Slope/High Terrace Hardwoods	
___ **Rock Outcrops and Caves**	___ Rock Outcrops	___ Caves
___ **Bottomland Hardwood Forests**	___ Bottomland Hardwood Forests	
___ **Swamp Forests**	___ Bald Cypress/Gum Swamp	___ Small Stream Swamp Forest
___ **Riverfront Forests**	___ Cottonwood/Black Willow/River Birch	___ Sandbars
___ **Wet Pine Savannas**	___ Wet Pine Savannas	___ Slash Pine Flatwoods
	___ Pitcherplant Bogs	
___ **Prairies and Cedar Glades**	___ Northeast Prairie/Cedar Glades	___ Jackson Prairie
___ **Inland Freshwater Marshes**	___ Freshwater Marshes	
___ **Lacustrine**	___ Oxbow Lakes	___ Reservoirs
	___ Ephemeral Ponds	___ Beaver Ponds
___ **Artificial Habitats**	___ Urban and Suburban Lands	___ Buildings, Bridges, Overpasses, etc.
	___ Utility Right-of-ways	___ Hay and Pasture Lands
	___ Pine Plantations	___ Shrublands
	___ Row Crops	___ Artificial Ponds
___ **Upland Maritime and Estuarine Fringe**	___ Barrier Island Uplands	___ Barrier Island Wetlands
	___ Barrier Island Beaches	___ Mainland Natural Beaches
	___ Shell Middens and Estuarine Shrublands	___ Maritime Woodlands
___ **Estuary and Mississippi Sound**	___ Estuarine Bays, Lakes, and Tidal Streams	___ Estuarine Marshes
	___ Salt Pannes	___ Seagrass Beds
	___ Mollusk Reefs	___ Mississippi Sound
	___ Barrier Island Passes	
___ **Marine Habitats**	___ Marine Habitats (smooth bottom)	___ Hard Bottom and Oceanic Reefs
___ **Artificial Habitats**	___ Man-made Beaches	___ Artificial Reefs
	___ Urban and Suburban Lands	___ Buildings, Bridges, Overpasses, etc.
	___ Utility Right-of-ways	

___ **Streams**

___ Mississippi River
___ Tombigbee Drainage
___ Upper Coastal Plain, Yazoo Drainage
___ Upper Coastal Plain, Pearl River Drainage
___ Lower Coastal Plain, Pearl Drainage
___ Coastal Rivers Drainages
___ Lower Mississippi South Drainage
___ Northeast Hills, Tennessee River Drainage
___ Lower MS North Drainage, Hatchie and Wolf Systems
___ Big Black River Drainage
___ Mississippi Alluvial Plain
___ Pascagoula Drainage
___ Lake Ponchartrain Drainage

Please provide priority number for this species' key habitat/community type in space provided. Limit to top five or fewer. Number 1 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
____Incompatible Resource Extraction Practices
____Incompatible Water Quality
____Industrial Development
____Invasive Species

____Conversion to Pasture
____Forestry Conversion
____Groundwater Withdrawal
____Incompatible Agricultural Practices
____Incompatible Forestry Practices
____Incompatible Grazing Practices
____Over Exploitation/Incidental Capture
____Other _____

____Livestock Feedlots/Operations
____Operation of Dams/Impoundments
____Recreation Activities
____Second Home/Vacation Home Development
____Urban/Suburban Development
____Road Construction/Management

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:

1 _____High Medium Low

2 _____High Medium Low

3 _____High Medium Low

Other _____ High Medium Low

No actions recommended _____: Not Feasible Currently Protected

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:

APPENDIX IV

Public Participation and Outreach

The following is a summary table of the public and stakeholder comments received during the development of the SWAP and the agency responses. Following the table is a list of the press releases and press coverage that illustrate MDWFP's outreach to the public and stakeholders.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Bottomland hardwoods	The bottomland hardwood forest assessment is coarse. Recommend using the Lower MS Valley Joint Venture forest assessment of the MS Alluvial Valley. Add other priority conservation actions such as active management, and reforestation with site appropriate species.	Agree, will incorporate where possible, recommendations on restoration actions for bottomland hardwoods.
Artificial ponds	Add scaup to Artificial Ponds species list.	Added.
Nature Serve Ecological Associations	Associate forest types with NatureServe Classifications of Ecological Associations.	Added. This was not in the draft reviewed by the commenter.
Songbirds	I do not fully understand why "migrant songbirds" are listed as a top tier for Bottomland Hardwood Forest, but then Cerulean Warbler is listed as a lower priority separately as are some of the other songbirds.	Addressed, but not changed. Will consider for next SWAP iteration.
Golden Eagle	I do not think of Golden Eagles as Swamp Forest dwelling species, but as an open grassland species. Bald Eagles potentially use forested wetlands, but not Golden Eagles. We are also not within their current range and I would doubt that we are within their historic range.	Golden Eagles have been observed at Noxubee NWR which is primarily a bottomland hardwood complex.
American Black Duck	I would question whether there may be a better representative of concern. So few are detected and we are not within the core of their range for breeding or winter	Removed from SGCN.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Prothonotary Warbler	Consider moving up to Tier 2 species from Tier 3 for bottomland hardwood and swamp forest. PROW is indicative of Bottomland Hardwood habitat but BBS trends have shown a steady decline since the 1970s. These are also on the North American Continental Landbird Plan as a Watch List species of continental concern. 36% of the population is estimated to breed in the Mississippi Alluvial Valley. So although it is not a rare species, the fact that we support such a significant portion of the population, and that the threats you list include hydrologic alterations, and logging/wood harvesting (improper use of BMPs) – I would argue that they are in timely need of conservation action and more so than Cerulean Warbler for which we are no longer listed as a continental priority by Partners in Flight.	Will consider for next SWAP revision.
Wood Duck	These species typify bottomland hardwood forest and breeding needs really encompass important wetland function. Wood Duck would be a Tier 3 species. I would argue that during the breeding season, they have specialized habitat needs.	Will consider for next SWAP revision.
Bottomland hardwoods	The threats ranking seems good and appropriate for Bottomland Hardwood	Acknowledged.
Golden Eagle	I do not think of Golden Eagles as Swamp Forest dwelling species, but as an open grassland species. Bald Eagles potentially use forested wetlands, but not Golden Eagles. We are also not within their current range and I would doubt that we are within their historic range.	Will consider for next SWAP revision.
American Black Duck	I would question inclusion in Swamp Forest because of the food base. From the habitat description, a lack of oak component would limit habitat use. An alternative might be a different dabbler species that represents buttonbush swamps better.	Removed from SGCN.
Red Headed Woodpecker	Habitat use in Swamp Forest would be limited at best; not typically associated with the cypress-tupelo swamps.	Will consider for next SWAP revision.
Louisiana Waterthrush	Habitat use in Swamp Forest would be limited at best as they prefer some form of clear, running water and small streams	Will consider for next SWAP revision.
Swallow-tailed Kite	I question why STKI is listed as a Tier 1 here but only a Tier 2 in bottomland hardwood. The population trends and threats should be the similar between habitat associations. I do not think that habitat associations can be so fined tuned for STKI to differentiate between Bottomland Hardwood and Swamp Forest in conservation need.	This was a typo that has been corrected.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Species to add - waterfowl	Wood Duck, Gadwall and/or American Wigeon – these would better represent habitat needs, both thermal cover and food base, in button bush swamps. Number of AMWI on Christmas Bird Counts has steadily declined in Mississippi from 2001-2013 (0.8 per party hour to 0.08 per party hour). Gadwall have declined on CBCs as well (20 per party hour to less than 3 per party hour).	Will consider for next SWAP revision.
Swamp forest	The threats ranking seems good and appropriate for Bottomland Hardwood	Acknowledged.
Crayfish	I am coauthor on a paper that just synonymized the crayfish species Procambarus connus, P. cometes, and P. pogum with Procambarus hagenianus vesticeps. That taxonomic change leaves P. h. vesticeps as a more widespread subspecies than previously considered.	Adjusted SGCN to recognize changes.
Crayfish	Spelling error on O. validus common name. Should be “Powerful Crayfish”. Corrected	Corrected
Crayfish	O. wrighti is G2 S1, so why is it a Tier 3 rather than a Tier 1 species given that other species that are G3 S2 are Tier 1 (e.g., F. burrisi)?	All crayfish comments were discussed with agency experts and considered.
Crayfish	Why do global and state ranks differ for some crayfishes endemic to Mississippi (e.g., several Hobbseus spp.?	All crayfish comments were discussed with agency experts and considered.
Crayfish	Consider adding Orconectes compressus – narrowly distributed in state – only in TN River drainage.	All crayfish comments were discussed with agency experts and considered.
Crayfish	Consider adding Orconectes hobbsi – the species description and Hobbs (1989) confine this species to the Lake Ponchartrain drainage. Current museum records show O. hobbsi to be widespread in MS. However, I believe that either a great many O. palmeri have been misidentified as O. hobbsi or there are taxonomic problems – probably both. However, erring on the side of caution would suggest that the species is narrowly distributed in MS.	All crayfish comments were discussed with agency experts and considered.
Crayfish	Procambarus elegans?? This is reported to be in MS though I do not know if it really is. However, I see that it is listed under the Upper Pearl River habitat section even though it is not in the SGCN list.	Removed, does not occur in MS
Insects	Onthophagus polyphemi sparsisetosus – “Coprophagous” misspelled in common name.	Corrected

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Crayfish - research needs	Cambarus rusticiformis may be a species complex. Taxonomic work is needed. The color morph found in MS and vicinity is unique. If the animals in MS are a new species, the global rank will change drastically.	Added into Research and Survey needs.
Crayfish - research needs	Orconectes spinosus – taxonomic work is needed.	Added into Research and Survey needs.
Crayfish - research needs	Fallicambarus danielae – taxonomic work needed. Unclear if F. danielae and F. oryktes should really be considered distinct species.	Added into Research and Survey needs.
Crayfish -research needs	Orconectes etnieri – taxonomic work needed. There is clearly differentiation by drainage within this species complex.	Added into Research and Survey needs.
Crayfish - research needs	H. yalobushensis, and probably all Hobbseus spp., need the following research targeted at intermittent and ephemeral stream habitats: 1) assess the importance of riparian forest cover to the species, 2) determine if the presence/absense of fish predators is the primary determinant of the crayfish presence, 3) assess habitat needs during periods of stream drying; 4) distribution surveys targeting intermittent and ephemeral streams.	Added into Research and Survey needs.
Crayfish -habitat	Some of the burrowing crayfish species should be incorporated into more of the terrestrial habitat chapters the way Fallicambarus spp. are incorporated into the East Gulf Coastal Plain chapter.	Added into Research and Survey needs.
Artificial habitats: urban/ suburban	I receive several contacts per year from people wanting to know how to eradicate crayfish from their yards because the burrows are problematic. Some of these are likely rare burrowing species. Would be nice to develop materials to address this issue with homeowners in a way that is not excessively harmful to crayfish populations.	Education is a priority conservation action, and agency WMA managers and private lands biologists have information and materials on crayfish to use in their work with private landowners.
Artificial habitats: urban/ suburban	Not addressed are roadside right-of-ways. Those are particularly important to some burrowing crayfishes, probably because the mowing creates some functional equivalent of prairie conditions (relative to forests). It is unclear if some of our rare burrowers are most common on mowed roadsides or if that is simply the easiest place to look for them. Regardless, the practice of using concrete to line roadside drainages could be very detrimental to some of our rare burrowers.	Agree. We recommend in Research and Survey Needs some additional survey work for roadside populations before highway projects are conducted within range.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Artificial habitats: Pine Plantations	Pine plantations. Hobbseus yalobushensis have been found in great numbers in intermittent streams within Weyerhaeuser pine plantations – paper in preparation. I guess that species is addressed in the streams chapter though.	Correct.
Artificial habitats: artificial ponds	For Artificial Ponds, I'm not clear what some of the Priority Conservation Actions mean. For example, in "restoring hydrologic integrity", are you suggesting removing the ponds? Because that is the only way to restore the hydrologic integrity. Ponds and small lakes fragment stream animal populations, disrupt sediment patterns, and raise downstream temperatures. So, while they may help some species, they are harming others. The intent of some of the recommended actions should probably be clarified.	Agree. We will work on clarification and refinement of actions regarding hydrologic modifications in next SWAP iteration.
Crayfish	Another issue to address for burrowing crayfishes is groundwater depth. This will be influenced by both channelization/headcutting of rivers and aquifer depletion. While there is no research on this, it stands to reason that lowered water tables would be detrimental to species that burrow down to the water table.	Acknowledged.
Streams - agriculture and aquaculture	For all drainages, I suggest you include fish stocking. This introduces species intentionally in some cases, increases predator abundances, and raises risks of disease introduction and of unintentionally introducing non-target species, including crayfish. This is especially a concern with White Spot Virus present in southern Louisiana and perhaps MS.	Will consider for next SWAP revision.
Streams	I would also like to see the transport of and commerce involving live crayfish included under threats. Crayfish from Mississippi are being exported from the state in the pet trade. Of greater concern is other crayfish species being imported in the pet, bait, nursery (ornamental ponds), and aquaculture trades. Australian Cherax species are currently in Mexico and Alabama in association with aquaculture. It is essential that these issues be brought to the forefront BEFORE we have a huge problem with invasive crayfishes.	Will consider for next SWAP revision.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Streams	I would like to see more attention drawn to ephemeral and intermittent streams. These are critical to a number of crayfish and amphibian species, but I do not think they are included in Mississippi Best Management Practices recommendations. Furthermore, as they have recently lost Clean Water Act protection, it is especially critical that we focus more conservation attention on them. It seems like some of the crayfish should be added to species lists for several sections (e.g., Bottomland hardwoods forests, Riverfront Palustrine Forests) but because I don't understand where rivers are being considered, I don't know where these should be placed. I have a slightly out-of-date, statewide, georeferenced, crayfish database that could be overlaid with your habitat designations if that would be helpful.	Will consider for next SWAP revision.
Streams	Conservation Action - Awareness and communications – maybe add educate people about risks of releasing non-native species.	Will consider for next SWAP revision.
Streams	Conservation Action - Encourage and improve agricultural/forestry/watershed land-use planning and BMP's to address nonpoint pollution, erosion, and water quality issues.	Added under the Conservation Action classification of Policies and Regulations.
Streams	Conservation Action - If not already existing, develop/strengthen BMPs for intermittent/ephemeral streams.	Encourage and Improve BMPs is a recommended conservation action.
Yazoo drainage	Add Orconectes etnieri, Procambarus hagenianus vesticeps	Added.
Yazoo drainage	Threat - "Sedimentation, lack of field borders/buffers, farming in floodplains, erosion, bank destabilization:" This is not listed as a threat in the Yazoo, but seems like it should be a high threat there.	Added.
Yazoo drainage	Threat "Operations of Dams/Impoundment: Direct threat in MS is low but impact from States upstream can be high." I would say that the direct threat in MS is high. Definitely high in the Yazoo.	Added.
Tennessee River drainage	Correct spelling of Orconectes spinosus.	Corrected.
Tennessee River drainage	Add Cambarus girardianus	Added.
Tombigbee Drainage	I believe that a number of the crayfish may be missing from this list.	Added.
Lower Mississippi River North	Add Procambarus ablusus o list.	Added.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Northeast MS drainages	Under "Operations of Dams/Impoundments: Headwater dams on Bear Creek and Cedar Creek (Alabama)." Add Operation of Pickwick Reservoir.	Added.
Mainland beaches	Remove - "Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons." as conservation action. Mainland beaches are not a fire dependent habitat and this was not selected for Barrier Island beaches.	Removed.
Mainland beaches	To threats add "Discourage incompatible recreational uses." We want to discourage incompatible recreational uses on mainland beaches since mainland beaches are classified as imperiled habitats and SGCN found on mainland beaches (e.g. beach nesting birds) are sensitive to disturbance. For example, off-road vehicle use on Graveline Beach caused habitat damage in recent years	Added.
Mainland beaches	Add "Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators. "Since many SGCN for mainland beaches are impacted by nest predation (e.g. beach nesting birds, diamondback terrapins), I would consider this an important conservation action.	Added.
Mainland beaches	Add 2.1 Site/area management - Discourage incompatible recreational uses.	Added.
Mainland beaches	Add 2.2 Invasive/problematic species control- Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons. Control/exclude predators of selected SGCN and discourage intentional or unintentional. supplemental feeding of predators.	Added.
Mainland beaches	Add 2.3 Habitat and natural process restoration - Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	Added.
Mainland beaches	Add 3.1 Species management - Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	Added.
Mainland beaches	Add 4.2 Training - Encourage and improve management of habitat by controlled burning at necessary frequencies and seasons.	Added.
Mainland beaches	Add 4.3 Awareness and communications - Discourage incompatible recreational uses. Control/exclude predators of selected SGCN and discourage intentional or unintentional supplemental feeding of predators.	Added.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Mainland beaches	Add 5.4 Compliance and enforcement -Discourage incompatible recreational uses.	Added.
Mainland beaches	Add 6.2 Substitution - Discourage incompatible recreational uses.	Added.
General	Very clear, organized and written!	Acknowledged.
Chapter 3	Para 1 & 2 confusing, Par 1 says 400 species tracked, para 2 says 1500 species "can be tracked." What's the difference?	Corrected.
Chapter 3	Consistent capitalization – in Para 1 & 2 group names are not capitalized but in para that begins "The list that was evaluated" they are: "A total of 14 species were added (1 Mussel…"	Corrected.
Chapter 3	Para that begins "The SGCN list" has the phrase "or are thought to be declining rapidly" twice. Omit the first one.	Corrected.
Chapter 3	STATE STATUS: Typo, should read "Eighty-five" not "Eight-five" .	Corrected.
Chapter 3	UNDER PRIORITIZATION OF SPECIES - [To be picky, "prioritization" and "prioritization of " are used 4 times in this paragraph; respectfully submit that "prioritizing" or "assigning priority" might be a smoother substitute for some of them] Corrected	Corrected.
Chapter 3	Most of these 7 criteria are very clearly explained, but I didn't understand E (and what would get a high or low score). Corrected	Corrected.
Chapter 3	UNDER ARTHROPODS - 1st paragraph, one typo – "many arthropod" should be "many arthropods" or "many arthropod species."	Corrected.
Chapter 3	Pollinators. Paragraph 2 about Monarch Butterfly. Seems like a couple of typos here, just re-check.	Corrected.
Chapter 3	Habitat Improvement. 1st paragraph, fix "available plant available"	Corrected.
Ecoregions	These are well organized and clearly written (great bedtime reading). I especially appreciate the effort to name a specific location that exemplifies each type and subtype (see also comments on the maps).	Acknowledged.
Ecoregions	I'm not crazy about listing the SGCN groups "alphabetically" as Amphibians, Birds, Insects, Mammals, Reptiles, etc. and would prefer the more logical phylogenetic order used in the Chapter 3 SGCN table.	Will consider for next SWAP revision.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Ecoregions	In the Tables describing the Ecological Communities, vegetation is given only as scientific names, but in the descriptive text, only as common names. Not sure why this was done, but it is confusing. Would have been better to add scientific names after the common names in the text (is there a reference somewhere for the common names that are used in these chapters?).	Will consider for next SWAP revision.
Ecoregions	I understood from the overview that the point of listing Migrant Shorebirds, Migrant Songbirds etc. as part of the SGCN lists is to emphasize the importance of conserving habitat that is used by many species, but it still looks awkward to have these general terms listed and then individual shorebird or songbird species listed along with them. Maybe this rationale could be briefly repeated in the different regional chapters?	Will consider for next SWAP revision.
Northern Gulf of Mexico ecoregion	There's evidence from the last several years that Mainland Beaches and even Artificial Beaches are occasionally used for nesting by Loggerhead Turtle (USFWS should have the data, also Andy Coleman of IMMS). How about adding that species to those two lists?	Added.
Northern Gulf of Mexico ecoregion	Recently there's been a lot of emphasis on coastal marsh creation, by Beneficial Use of dredge material and by other means, and RESTORE projects will increase this emphasis. Some of this effort fits into NGM Priority Conservation Actions as 2.3, habitat and natural process restoration, but much of it goes beyond that category, as building of marshes in places that haven't in recent times been marsh (in most cases this is by impoundment and filling of open water). Seems like this should be acknowledged in some way. In particular, there needs to be care in planning, execution and maintenance of the hydrology of these marshes so that they function as nearly equivalent habitat to natural marsh; that attention be paid to the way these marshes are naturally or artificially vegetated; and effort put into monitoring them over the long term to assess which SWAP goals they support. (I think there is good potential to do good with these projects, but also a lot of potential to create suboptimal habitat that primarily benefits weedy, invasive, nontarget species if we're not careful.)	Added to conservation actions for Estuary and Mississippi Sound.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Stream drainages maps	The "preview maps of stream drainages, ecoregions and associated habitats at http://www.mdwfp.com/seek-study/state-wildlife-action-plan.aspx:I can see that a great deal of work went into these maps but I am not sure in what form they'll be included in the final report or online.	They will be posted online.
Stream drainage maps	I understand the rationale for making all forest types some kind of green, water blue, etc., but I frankly can't tell the legend colors apart. On the maps that have several features together on the map, it's really hard to differentiate the habitat types.	Acknowledged, but not changed. However, maps will be made available as GIS layers to the public for use and color modification.
Stream drainage maps	Most of the maps show fine-grained polygons of the habitat types on a plain background with just county boundaries. This gives a general notion of how much of each habitat type there is, and how fragmented or connected it is, but that's about all one can do with the map as no other related features are shown. I really hope these maps will be made available as interactive ArcGIS Online maps with additional layers and ability to zoom in and out. Without this ability they are just decorative, not really useful. Also I hope the shape files will be available for download.	Will consider for next SWAP revision.
Mississippi River drainage	Dike notching is an important conservation action that has been carried out on the Mississippi River by the U.S. Army Corps of Engineers in cooperation with the Lower Mississippi River Conservation Committee. Notched dikes continue to support navigation functions while also supporting diverse habitats. There are additional opportunities to implement this practice and it could either be mentioned in section 1.1 or in the conservation actions table at the end of the Mississippi River and Associated Drainages section.	Added into conservation actions.
Mississippi River drainage	The classification is not listed for the 5th row within the table. It should be 5 (Biological resource use).	Corrected.
Yazoo drainage	Condition and Conservation Status - Fish passage obstruction due to improper placement of culverts, box culverts, and other road crossing structures is a major problem in this watershed, specifically in relation to the Yazoo Darter. These obstructions present a significant obstacle to the movements and distribution of numerous aquatic species, as well as a potential barrier to genetic exchange.	Added to conservation actions for Mississippi River and Associated Drainages.
Red-bellied turtle	Correct through-out Alabama redbelly to: red-bellied turtle.	Corrected

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
East Gulf Coastal Plain Ecoregion	Correct gopher frog to Lithobates sevosus [if using Lithobates] and correct common name to: dusky gopher frog from Mississippi gopher frog in all locations in document.	Corrected.
East Gulf Coastal Plain Ecoregion	Correct Lithobates Palustris; change to: palustris.	Corrected.
East Gulf Coastal Plain Ecoregion	Black pine snake, correct M to: melanoleucus.	Corrected.
East Gulf Coastal Plain Ecoregion	Mississippi sandhill crane, correct C to: Canadensis.	Corrected.
East Gulf Coastal Plain Ecoregion	6.2 Sandbars: In threats table, classification "5 Biological Resource Use" ADD: Pearl River Map turtle under "Subclass" .	Added.
East Gulf Coastal Plain Ecoregion	9.3 Ephemeral (Temporary) Ponds: This section would benefit from some clarifications in descriptions of types of ephemeral wetlands; forested vs. herbaceous, developed within stream channels (water from stream flow), developed on uplands (water from precipitation only), etc.	Will consider for next SWAP revision.
Northern Long-eared bat	The current status for the Northern Long-eared bat should be updated. Its global status is now G1G2 and its federal status is threatened (LT). State rank and state status may need to be revisited as well.	Addressed.
Tri-colored Bat and Little Brown Bat	The Service is currently conducting Status Assessments on the little brown bat and the tricolored bat. Both of these species have been hit particularly hard by WNS (close but not quite at the levels as NLEB). I did not see the tricolored bat (Perimyotis subflavus) [formerly the Eastern Pip (Pipistrellus subflavus)] listed. Since MS also has tricolored bats, a designation change for these species may be warranted.	Tri-colored bats are currently stable in MS.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Southeastern Myotis, Rafinesque's Big-eared Bat, Hoary Bat	The Southeast Bat Diversity Network recently completed a Status Assessment of the Southeastern Myotis and Rafinesque's big-eared bat. Based on that assessment and the fact that neither species populations appear to be declining from WNS, the Service is not currently pursuing further evaluations for either species. Could you give the rationale for the State designations? Is there something regarding our populations that makes them more vulnerable? The same issue exists with the Hoary bat. As a tree bat it is not likely to be impacted by WNS so the only current threat is wind turbine development. I am not aware of any assessment of this species' status at this time.	Tier 2 is justified in Mississippi at this time for Southeastern Myotis, based on recent surveys in MS.
Southern Dusky Salamander	The paragraph below is from Crother etal 2012, SSAR checklist. According to this, southern dusky salamander lineages would be distributed along Atlantic coastal plain and this determination would not affect species status in Mississippi. D. auriculatus (Holbrook, 1838)—Southern Dusky Salamander. Divergent mitochondrial DNA lineages occur among Atlantic Coastal Plain populations that are morphologically assignable to this species. These lineages do not comprise a monophyletic unit (Beamer and Lamb, 2008, Mol. Phylogenet. Evol. 47:143-153).	Inclusion was based on expert recommendation.
Dusky Gopher Frog	When the Service wrote the critical habitat rule for the Rana sevosa, we did not change the genus name, therefore Lithobates is not consistent with the Federal listing. If you wish to use Lithobates, the correct species name would be: sevosus. We did however change the common name to: dusky gopher frog from Mississippi gopher frog.	Corrected but left as Lithobates.
Alabama Red-bellied Turtle	Common name used in Federal listing is: Alabama red-bellied turtle. I concur with the change from Tier 1 to Tier 2 for this species.	Acknowledged.
Tiers	It can be confusing when the Service and the State designations don't coincide on a given species. In Species of Greatest Concern documents there is no discussion or explanation of the Tier designation and what that means. In a nutshell, a definition of the tier system is needed and a discussion as to why species are given those designations.	Tier explanations are included.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Conservation actions	Within the sections of the plan addressing individual ecoregions, priority conservation actions are listed for the various habitats contained within each ecoregion. However, there is no prioritization of these conservation actions. There is an assessment of threats in terms of high, medium, and low magnitude (which is very useful), but that threat ranking doesn't transfer into a ranking system for the conservation actions. For the xeric longleaf pine forest, for example, there are 50 priority conservation actions identified, with no reference to which are the most important. Unfortunately I fail to see how this is truly an "Action Plan" when 50 different conservation actions are given equal weight. Not sure if I am misunderstanding how this document will be used, but if the threats were evaluated for magnitude, shouldn't the actions identified to address those high magnitude threats be given higher priority?	Will consider for next SWAP revision.
Plants	It should be noted that while plants receive no formal protections within the state, the MSNHP does track numerous rare and federally protected plant species, as it does with animal species. Recommend inclusion of a section for plants, as was done for animals, entitled "Species of Greatest Conservation Need" based on Heritage Program state ranks.	Will consider for next SWAP revision.
Plants	The plan would benefit from including greater emphasis on plants as important components of animal habitats and food.	Will consider for next SWAP revision.
Plants	A variety of rare plants and animals occupy similar habitats, noting these relationships, as appropriate would increase the value of this plan. For example, if a project is proposed to benefit a given animal, it would be useful and informative to know what, if any, rare plants would also benefit (such as federally endangered or threatened plants). Similarly, this information could be used to inform projects intended to benefit animals, but that may also unintentionally prove deleterious to rare plants, particularly those plants receiving Federal protections.	Will consider for next SWAP revision.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Northern Gulf of Mexico Ecoregion	"Overfishing" Comment: The State of Mississippi has never declared any finfish species to be overfished or to have ever experienced overfishing. Our size and possession limits are routinely evaluated and adjusted to prevent overfishing from occurring. The only marine species I know of that have been declared overfished have been done so by federal agencies. These declarations are only applicable for the marine waters of the EEZ, not state territorial waters. I believe the overfishing statement was made due to the increase in effort and license sales over the years; however, declaring a species to be overfished or to be experiencing overfishing involves several factors other than just increased effort in the fishery. Need to consider using another term.	Reworded paragraph using information from MDMR website.
Northern Gulf of Mexico Ecoregion	Pg. 33, second paragraph, last sentence: States commercial fishing has increased, when actually it has decreased in MS waters, especially for trawl and dredge fisheries.	Corrected.
Northern Gulf of Mexico Ecoregion	Pg. 35-36, #5 in table: Lists fishing and harvesting aquatic resources through overexploitation as 'High' threats to estuary and MS Sound communities. I understand about the sea turtles but not use of the word overexploitation for MS fisheries. Take out word unless can provide reference specific to MS.	Overexploitation relates to only those species listed.
Northern Gulf of Mexico Ecoregion	Pg. 41, entire fourth paragraph: States MS marine areas are losing some of their productivity because of overfishing. Take out word throughout and rephrase paragraph unless can provide reference specific to MS.	Corrected.
Northern Gulf of Mexico Ecoregion	Pg. 41, fourth paragraph: Mentions small area of reef habitat but could be pointed out that this is growing due to MDMR AR Bureau.	Addressed.
Northern Gulf of Mexico Ecoregion	Page 43: in the Table Row 3 – Energy production and "Minint" should be Mining.	Corrected.
Northern Gulf of Mexico Ecoregion	Pg. 45, #5 in table: Lists fishing and harvesting aquatic resources through overexploitation as 'High' threat to marine habitats (smooth bottom) and hard bottoms/ oceanic reefs. Again take out word unless can provide reference specific to MS.	Overexploitation relates to only those species listed.
Northern Gulf of Mexico Ecoregion	Pg. 53, #5 in table: Same as above.	Overexploitation relates to only those species listed.

MS SWAP TOPIC	SUMMARY OF PUBLIC AND STAKEHOLDER COMMENTS ON MS SWAP REVISION 2015	AGENCY RESPONSE
Conservation opportunity areas	I wanted to suggest that if the goal of defining those areas is to focus conservation efforts on areas that would best benefit species in decline or to keep common species common, that we should probably consider areas around major complexes of conservation lands as conservation opportunity areas as well. I don't mean areas around any public lands, but there is probably some threshold (>20,000 acres? >50,000 acres? or something else?) where the size of that land base that is managed for conservation purposes makes the site and its surrounding area of special concern for conservationists in the state. These are likely areas where habitats are more likely to be managed with wildlife in mind, where streamside buffers are more likely to be in place, where prescribed fire is most likely to predictably lend its hand to maintaining desired habitat conditions. I don't think this will add a lot of new areas to our conservation opportunity areas in the state, but I can imagine some Wildlife Management Areas, National Forests, and National Wildlife Refuges would emerge as special places that we conservationists in the state should have on our radar.	Proximity to public land was considered when creating COAs.
Maps	Will maps be posted online?	Yes, on the MDWFP website.
Climate change	Did you utilize published vulnerability assessments?	We used some from the GC Vulnerability Assessment, but could use more. Please provide additional information if you have it. We did use a literature search and used maps for MS, and used information from Sun et al (water availability) and Kloset. Used climate wizard (Kloss 1 at 2009). GCVA was cited in the SWAP.
Webinar	Will webinar and powerpoints be posted online?	Yes, on the MDWFP website.

Press Release

1. Mississippi Department of Wildlife Fisheries and Parks Press Release, July 17, 2015 Articles

2. McComb Enterprise Journal, July 26, 2015

3. Clarion Ledger, July 28, 2015

4. GulfLive.com, July 28, 2015

Other Media

5. Creature Comforts Radio Show, Mississippi Public Broadcasting, August 6, 2015

6. MDWFP August Newsletter (email), August 6, 2015

MDWFP
Mississippi Department of Wildlife, Fisheries, and Parks
1505 Eastover Drive, Jackson, MS 39211
601.432.2400

Press Release

FOR IMMEDIATE RELEASE
July 17, 2015

Input Sought on Updated State Wildlife Action Plan & Species of Concern

JACKSON—Mississippi's State Wildlife Action Plan (SWAP) identifies fish and wildlife species of greatest conservation need and assigns conservation actions designed to prevent endangered species listings and spur recovery. The first State Wildlife Action Plan (formerly called the Comprehensive Wildlife Conservation Strategy), was drafted by Mississippi in 2005 as a requirement by Congress for continued participation in the State Wildlife Grants Program, which has provided over $7 million dollars for fish and wildlife conservation in Mississippi since 2001. To ensure the Mississippi Plan remains relevant, it must be revised every ten years. The first revision is underway and is being coordinated by MDWFP's Museum of Natural Science in consultation with bureaus agency-wide.

"We have been coordinating with experts and stakeholders from around the state and want to keep the public informed about this revision," said SWAP Coordinator Kathy Shelton. The updated list of 299 Species of Greatest Conservation need is available for review and public comment at http://www.mdwfp.com/seek-study/swap.aspx. Future updates will detail terrestrial, aquatic, and marine habitats in Mississippi, along with recommended conservation actions and research needs. Updates will be posted as they are completed this summer. MDWFP will host a live public webinar later this year about the changes to the plan. Comments on the updated Species of Greatest Conservation Need list can be submitted by email to SWAP2015@mdwfp.state.ms.us or mailed to State Wildlife Action Plan/MDWFP, Kathy Shelton, MDWFP Museum of Natural Science, 2148 Riverside Dr., Jackson, MS 39202.

For more information regarding conservation, visit us at www.mdwfp.com or call us at 601-432-2400. Follow us on Facebook at www.facebook.com/mdwfp or on Twitter at www.twitter.com/MDWFPonline

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State releases updated list of 'species of concern'

Posted: Sunday, July 26, 2015 8:00 am

Ernest Herndon | Enterprise-Journal |

Did you know Mississippi has nearly 300 "species of concern" — many of them familiar?

The Mississippi Department of Wildlife, Fisheries and Parks first came up with the list in 2005 "as a requirement by Congress for continued participation in the State Wildlife Grants Program, which has provided over $7 million dollars for fish and wildlife conservation in Mississippi since 2001," a news release said.

The state must revise the list every 10 years. "The first revision is under way and is being coordinated by MDWFP's Museum of Natural Science in consultation with bureaus agency-wide."

The news release contained a link to a website listing the species: mdwfp.com/seek-study/swap.aspx.

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First on the list are nearly 50 species of mussel. Native mussels have been declining for decades.

Mississippi waterways used to be loaded with fascinating mussels like the Mucket, Fatmucket, Plain Pocketbook, Alabama Heelsplitter and Mississippi Pigtoe. Nowadays about the only thing found is Asian clams, identifiable by their black, ridged shells.

Kathy Shelton, coordinator of the State Wildlife Action Plan, said mussels are an indicator of water quality.

"The Asian clams can survive in water that's not as pure as our native mussels can, and they're able to out-compete our natural species," she said. "In the past 20 years it's become a huge issue."

So what difference does it make if some obscure species is declining?

"I get that question all the time," she said. "I'm normally a bat biologist and a turtle biologist. My answer is you have to care about it all because it's all interconnected. The mussels are producing food for something else, and that something else may be food for you — if you need a human excuse to care."

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Next on the list were crustaceans — to be specific, 34 species of crayfish. That was followed by one arachnid and 10 insects.

Then came fish — 72 species.

While there are an abundance of little fellers like darters, shiners and minnows, there were also larger species like paddlefish, alligator gar, rock bass and walleye.

The list of 36 reptiles also contained familiar names — alligator snapping turtle, loggerhead sea turtle, Eastern indigo snake, rainbow snake, Southern hognose snake, various king snakes (not the common speckled one), Eastern coachwhip, black pine snake, Eastern diamondback rattlesnake and Eastern coral snake.

Alligator snapping turtles are locally called loggerheads. Fishermen catch them on trotlines.

"Alligator snapping turtle is a big concern," Shelton said. "They're so heavily harvested. We've even changed the state regulations on how many you can take."

Some states want to list the turtles as an endangered species.

"The declines are so marked, and the majority of that is from harvesting," Shelton said.

As for snakes, diamondback rattlers and coral snakes (both poisonous) are definitely familiar.

Coral snakes are so shy it would be hard for an average person to know whether they're declining or not. But rattlesnakes?

"As soon as people hear that, they're like, 'Oh, my Lord, they're everywhere,' " Shelton said of rattlers. "That's another one that you don't realize how much decline there is."

n n n

Which brings us to birds, 70 species of them.

Swallow-tailed kite is on the list, yet lately there have been several reports of them in southwest Mississippi, and this isn't even their range. The large, graceful birds with forked tails live in southeast Mississippi and farther east.

In recent weeks, Warren Adams of Smithdale and David Varnado of the Topisaw Creek area have reported them. Adams, a logger, saw one four miles west of Gloster off Bluff Springs Road. Varnado watches them at his property.

"They have been at our house all summer," Varnado told me. "They must be nesting. I see them every day."

Shelton agreed the kites' range appears to be expanding and said they've even been sighted in the Jackson area. She hopes that's because statewide habitat is improving, rather than problems in their native range forcing the birds to seek new territory.

Regardless, Shelton said the kites, like many other species, are a "region-wide concern" experiencing long-term decline.

"We know from long-term data that their numbers have declined," she said. "It may not be to the point that you would notice it, but range-wide it's a decline. If we don't start doing something now, it's going to end up on the endangered species list."

Other birds listed include waterfowl like Northern pintail, mottled duck, American black duck, lesser scaup, anhinga, brown pelican, snowy egret, white ibis, yellow rail, black rail, purple gallinule and king rail.

"A lot of the issues with these populations are on their breeding grounds, and they winter down here. Of course, we want to keep those areas pristine for them to winter," she said, citing the 2010 Gulf oil spill as an example of threats to habitat.

The list also has birds like osprey, American woodcock, barn owl, chuck-will's-widow, red-headed woodpecker, wood thrush, painted bunting and scarlet tanager.

The bald eagle was a surprise. There are so many reports of sightings in southwest Mississippi these days that they're no longer really news.

"That's one of our success stories," Shelton agreed. "It's been delisted (as an endangered species). We don't want to completely discount it any more. We want to keep that monitoring going on. It's certainly not one of the high priorities any more."

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And finally, mammals — 18 species.

Some you'd expect to see, like the Florida panther. Also black bear and Louisiana black bear, even though bear sightings have been on the rise statewide for the past several years.

The Eastern spotted skunk is there, too. Mississippi seems to have plenty of skunks around here, but most of them are the striped variety.

The long-tailed weasel is listed, another shy species. And there's the upland fox squirrel, a subspecies of fox squirrel.

The presence of familiar animals on the list shouldn't be a surprise, Shelton said,

"Technically, you could pick all but the most common species, like raccoons or possums, and put on there," she said.

The idea behind the list is to focus on creatures too numerous to make the endangered species list but that are nevertheless having problems. Get agencies and researchers on the same page, and pool funding.

"Make sure 20 to 50 years from now we have the right habitat," Shelton said.

She hopes the public will review the list.

"We want to get everybody involved. You might not be an expert, but you might have an idea on something we haven't thought about," she said. "The public really needs to be involved."

People may submit comments on the updated list to State Wildlife Action Plan/MDWFP, Kathy Shelton, MDWFP Museum of Natural Science, 2148 Riverside Drive, Jackson, MS 39202; or email SWAP2015@mdwfp.state.ms.us.

Mississippi 'species of concern' list totals nearly 300

Ernest Herndon 7:29 p.m. CDT July 28, 2015

(Photo: File photo/The Clarion-Ledger)

MCCOMB – Did you know Mississippi has nearly 300 "species of concern" — many of them familiar?

The Mississippi Department of Wildlife, Fisheries and Parks first came up with the list in 2005 and must revise the list every 10 years. The first revision is under way and is being coordinated by MDWFP's Museum of Natural Science.

First on the list are nearly 50 species of mussels.

Mississippi waterways used to be loaded with mussels like the Mucket, Fatmucket, Plain Pocketbook, Alabama Heelsplitter and Mississippi Pigtoe. Nowadays, about the only thing found is Asian clams, identifiable by their black, ridged shells.

Kathy Shelton, coordinator of the State Wildlife Action Plan, said mussels are an indicator of water quality.

"The Asian clams can survive in water that's not as pure as our native mussels can, and they're able to out-compete our natural species," she said. "In the past 20 years it's become a huge issue."

So what difference does it make if some obscure species is declining?

"I get that question all the time," she said. "I'm normally a bat biologist and a turtle biologist. My answer is you have to care about it all because it's all interconnected. The mussels are producing food for something else, and that something else may be food for you — if you need a human excuse to care."

Next on the list were crustaceans — to be specific, 34 species of crayfish. That was followed by one arachnid and 10 insects.

Then came fish — 72 species.

While there are an abundance of tiny fish like shiners and minnows, there were also larger species like paddlefish, alligator gar, rock bass and walleye.

The list of 36 reptiles also contained familiar names — alligator snapping turtle, loggerhead sea turtle, Eastern indigo snake, rainbow snake, Southern hognose snake, various king snakes (not

the common speckled one), Eastern coachwhip, black pine snake, Eastern diamondback rattlesnake and Eastern coral snake.

As for snakes, diamondback rattlers and coral snakes are familiar.

Coral snakes are so shy it would be hard for an average person to know whether they're declining or not. But rattlesnakes?

"As soon as people hear that, they're like, 'Oh, my Lord, they're everywhere,' " Shelton said. "That's another one that you don't realize how much decline there is."

Which brings us to birds — 70 species of them.

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Adams, a logger, saw one four miles west of Gloster off Bluff Springs Road. Varnado watches them at his property.

"They have been at our house all summer," Varnado said. "They must be nesting. I see them every day."

Other birds listed include waterfowl like Northern pintail, mottled duck, American black duck, lesser scaup, anhinga, brown pelican, snowy egret, white ibis, yellow rail, black rail, purple gallinule and king rail.

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Your Gulf Coast Guide

Mississippi outdoors: Here's updated list of 'species of concern'

The Associated Press By **The Associated Press**
on July 28, 2015 at 10:26 AM, updated July 28, 2015 at 10:28 AM

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August News
mdwfp_media
Sent: Thursday, August 06, 2015 10:54 AM

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MDWFP Update

August 2015

A team of six MDWFP Conservation Officers recently participated in the 2015 National LawFit Competition held July 16-18 in Olive Branch. MDWFP earned first place overall in the competition--winning five categories and setting five national records. Those representing MDWFP were Conservation Officers Private Justin Gates, Lt. Chris Reed, Private Derrick Scott, SGM Marcus Christon, SGM Ron McMillan, and Private Justin Adams.

MDWFP's 2015 National LawFit Results:

- Four Man Team--1st place (Chris Reed, Derrick Scott, Marcus Christon, and Justin Gates) with 1599 points for a new National Record
- Two Man Team--1st place (Marcus Christon and Justin Gates) with 819 points for a new National Record
- Two Man Team--3rd place (Derrick Scott and Chris Reed) with 780 points
- Overall Top Male--1st place (Marcus Christon) with 418 points for a new National Record
- Overall Top Male--2nd place (Justin Gates) with 401 points tying 2014's National Record
- Overall Top Male--4th place (Derrick Scott) with 390 points
- Overall Top Male--5th place (Chris Reed) with 390 points
- Bench Press--1st place (Justin Gates) lifting 221% of his body weight for a new National Record
- Pull-Ups--1st place (Marcus Christon) with 67 pull-ups for a new National Record
- Pull-Ups--2nd place (Justin Gates) with 59 pull-ups, breaking his own National Record of 51 he set in 2014

- Sit-Ups --3rd place (Marcus Christon) with 63 sit ups in 1 minute time frame

Dove hunting is an excellent opportunity to introduce youth to hunting and shooting sports. The social atmosphere of dove hunting also introduces youth to the experience of the hunting camp tradition and creates special memories with family and friends. This year, MDWFP is providing unique dove hunting opportunities for youth on two of our WMAs--Black Prairie and Mahannah.

The Black Prairie Youth Dove Hunt will be held on September 7 and the Mahannah Youth Dove Hunt will be held on September 12. These hunts are open to all youth hunters 15 years of age and younger. A parent or guardian over 21 years of age must accompany each youth hunter during the entire hunt. Youth hunters must check in on the day of the hunt at 11 a.m. The hunt will begin at 2 p.m. and conclude at sunset. Special events during the day of the hunt will include skeet shooting, safety discussions by MDWFP Conservation Officers, and a provided lunch.

Participants must register online to attend these hunts. Applications will be accepted from August 3 - August 24. The Black Prairie hunt will be limited to 50 youth, and the Mahannah hunt will be limited to 100 youth.

MDWFP offers public dove hunting opportunities on leased private lands throughout the state. The Private Lands Dove Field Program began in 2004 in an effort to provide additional public dove hunting opportunities. For this hunting season, private land dove fields will be located in Kemper, Panola, Pearl River, Scott, and Webster counties. "Dove hunting is very popular; however, MDWFP has recognized that gaining access to properly prepared, family-friendly dove fields can be difficult," says Houston Havens, MDWFP Waterfowl Program Leader. Havens adds, "MDWFP has partnered with farmers to make their fields available for hunters. Our goal is to have a safe field that offers good hunting for the entire family to enjoy."

Hunting is by permit only for persons 16 years of age and older. Hunters who purchase permits will be granted access to the field on Monday, Wednesday, and Saturday afternoons during the first two dove seasons (North Dove Zone dates are September 5 - October 7 and October 10 - October 31 and the South Dove Zone dates are September 5 - September 13 and October 10 - November 15). Up to two youth hunters 15 years of age or younger may hunt with each permitted adult hunter 21 years of age or older at no additional cost. A limited number of permits are available ranging from $100 - $115 each. Permit fees are used to pay for field preparation. To purchase a permit or for more information on the Private Lands Dove Field Program, including aerial photos of the fields and complete hunting regulations, please visit www.mdwfp.com/dove or contact the Wildlife Bureau at (601) 432-2199.

Duck, merganser, and coot seasons will be November 27 - November 29, 2015; December 4 - December 6, 2015; and December 9, 2015 - January 31, 2016. The duck daily bag limit will be a total of 6 ducks, including no more than 4 mallards (no more than 2 of which may be females), 3 wood ducks, 3 scaup, 2 redheads, 2 pintail, 2 canvasback, 1 mottled duck, and 1 black duck. The merganser daily bag limit will be a total of 5 mergansers, only 2 of which may be hooded mergansers. Coots will have a 15-bird daily bag limit. The possession limit is 3 times the daily bag limit for ducks, mergansers, and coots.

The youth waterfowl hunting days will be November 21, 2015 and February 6, 2016. Late-season Canada, snow, blue, Ross's, white-fronted goose, and brant seasons will occur from November 19, 2015 - January 31, 2016. Late-season Canada geese will have a 3-bird daily bag limit, and brant will have a daily bag limit of 1 bird. The possession limit is 3 times the daily bag limit for Canada geese and brant. Snow, blue, and Ross's geese will have a daily bag limit of 20 birds. White-fronted geese will have a daily bag limit of 3 birds. The possession limit for white-fronted geese is 9, and there is no possession limit for snow, blue, and Ross's geese. In addition to the regular hunting season, there will again be a conservation order for snow, blue, and Ross's geese during the following dates: October 1 - November 18, 2015; February 1 - 5, 2016; and February 7 - March 31, 2016.

Lieutenant Governor Tate Reeves visited Howard Miller Wildlife Management Area (WMA) in Issaquena County today to view progress on habitat and access improvements. Since the WMA was acquired by MDWFP in 2007, it has provided public hunting opportunities for migratory birds and served to demonstrate successful techniques in restoring and managing waterfowl habitat through agriculture and wetland management. "The unique partnership between MDWFP and local agriculture provides excellent waterfowl habitat, hunting, and wildlife viewing opportunities for our sportsmen and women," said Lt. Gov. Reeves. "Hunting and outdoor recreation provides a big boost to the Delta's economy, and I encourage Mississippians to support conservation by passing on this important heritage to the next generation."

MDWFP completed large-scale waterfowl habitat improvements in 2012 and since has developed dove hunting opportunities, and improved access for other WMA users. Ed Penny, MDWFP Director of Conservation Programs said, "MDWFP is proud to showcase our state's public lands for Lt. Gov Reeves. Howard Miller WMA provides important wintering and migration habitat for waterfowl, shorebirds, and other wetland wildlife, and is an extremely popular hunting area. It's a great example of how our Commission on Wildlife, Fisheries, and Parks has strategically acquired lands throughout Mississippi for people to enjoy."

Opening day of dove season is one of the most anticipated and popular hunting days of the year for many Mississippians. Dove season brings the first hunting opportunity of the fall as the long and hot Mississippi summer comes to an end.

One goal of MDWFP is to provide quality outdoor recreation. Providing safe, high quality opportunities for dove hunters on our Wildlife Management Areas (WMAs) is a key part of this goal. Many WMAs are open to dove hunting, and 15 WMAs of these areas have designated, prepared dove fields. These 15 WMAs include Black Prairie, Canal Section, Charles Ray Nix, Copiah County, Divide Section, Hell Creek, Howard Miller, Indianola, Leroy Percy, Mahannah, Muscadine Farms, Okatibbee, O'Keefe, Tuscumbia, and Yockanookany. These fields are intensively managed using selective herbicides, strip disking, and mowing, in addition to planted crops. Plantings in these WMA fields often include mixtures of browntop millet, sunflowers, corn, and milo.

When hunting on WMAs, hunters can be confident that fields were prepared legally. Hunters should read individual WMA regulations prior to hunting, since some areas have specific

regulations that must be followed. All hunters, except those exempt from purchasing an annual hunting license, must purchase and carry a WMA User Permit and appropriate hunting license. WMA User Permits may be purchased wherever hunting and fishing licenses are sold. Permits are valid for one year from date of purchase for all WMAs across the state. Additionally, visitors must complete a Daily Visitor Use Permit before entering the WMA. These permit cards are available at permit stations located at major entrances to the WMA. Visitors must return the Daily Visitor Use Permit before leaving the WMA.

Learn more about our WMA Dove Fields or purchase your WMA User Permit at www.mdwfp.com.

There is no cost to attend a MDWFP Hunter Education course; however, Hunter Education certification is required to purchase a hunting license if you are born on or after January 1, 1972. In order to become certified in Hunter Education, persons must be at least ten years of age, complete the entire course, score 70 percent or higher on the hunter education exam, and demonstrate safety with a firearm.

For more information about Hunter Education or to find a class near you, visit us at www.mdwfp.com.

Mississippi Black Bears on the Move

Photo by Steve Gulledge

In recent weeks, several areas across Mississippi have experienced higher than normal black bear activity. During spring and summer, after a few months of inactivity, these bears resume their normal life cycle and begin roaming in search of food. This seasonal nomadic activity is what is responsible for bear sightings that have been recently documented across Mississippi.

Approximately 90 percent of a black bear's diet is composed of plant material, including fruits, berries, acorns, grasses, nuts, as well as insects, grubs, and occasionally carrion. This time of year, bears can be easily attracted to open garbage containers, pet food, bird feeders, livestock feed, or barbeque grills. Any one of these attractants might keep a bear coming back and could create a nuisance situation. If a bear has been sighted in an area, particularly a suburban or residential area, MDWFP is asking for the public's cooperation in securing or temporarily removing any of the above attractants from around their homes while a bear is present in the vicinity. The best way to avoid problems with black bears is to take precautions that reduce this attraction. Under no circumstance should anyone feed a bear. Not only is it against the law, but bears will quickly lose their natural fear of humans as they learn to associate people with food which can lead to property damage.

It is not the policy of MDWFP to relocate bears that are simply passing through an unfamiliar territory. Trapping and transporting a bear is a costly procedure that puts the bear at considerable risk and if a bear has become accustomed to feeding on unnatural foods it does not solve the problem but only transfers it to another area. Additionally, bears have an amazing homing instinct and will almost always try to return to where they were trapped. Black bears are generally shy of humans and should not be considered a physical threat to human life. As previously mentioned, only when they begin to associate humans with food and lose their fear of humans, do they become a serious nuisance problem.

In Mississippi, black bears are classified as Endangered under State law. Any attempt to harm, injure, or kill a black bear in Mississippi could result in a considerable monetary fine as well as imprisonment.

MDWFP is working in close cooperation with law enforcement agencies across Mississippi regarding black bear movements and sightings. MDWFP appreciates the assistance offered by these agencies and requests the cooperation and patience of residents as these bears travel around the state.

If you would like to report a bear sighting you may call the MDWFP Wildlife Bureau at 601-432-2199 between 8 a.m. and 5 p.m. or 1-800-BE-SMART after hours.

For the first time since alligator hunting began in Mississippi, public water alligator hunting permits went on sale on a first come, first served basis July 14 at 9 a.m.; all permits sold within 45 minutes.

"This just goes to show the growing interest in alligator hunting in Mississippi," said Ricky Flynt, Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) Alligator Program Coordinator. "It is very obvious the people of Mississippi are very passionate about the opportunity to go alligator hunting; it is personally and professionally satisfying for MDWFP to be able to provide this unique opportunity for hunters in Mississippi."

"There were multiple agencies and companies working together today to make this process a success," said Dr. Sam Polles, MDWFP Executive Director. "We would like to thank Mississippi Interactive, Active Network - Outdoors, Department of Public Safety, and our employees at the MDWFP for their hard work to make this event successful today."
The 2015 Mississippi public waters alligator hunting season begins August 28 and runs through September 7. A total of 920 permits were available within seven public water hunting zones across the state.

An Alligator Hunting Training Course will be offered on August 15 at Roosevelt State Park for persons who purchased one of the special permits. Attendance is no longer mandatory, but highly recommended for persons who obtained a special permit. Course topics will include alligator biology, research projects, legal capture and dispatching methods, skinning and processing, proper documentation, and boating safety.

MDWFP Conservation Officers recently rescued Jordan Taylor in a heavily wooded area .5 mile from Hebron Road in Holmes County.

On July 19 at 2:30 p.m., Conservation Officers received a call from the Holmes County Sheriff's Office for assistance in locating Taylor who was last seen by family members early morning of July 18.

Conservation Officers Jason Blaylock, Derrick Scott, and Phillip Fancher initiated an immediate search of Taylor's last known location. During the search, the officers discovered tracks, broken switch cane, and articles of clothing. Later that afternoon Scott located Taylor lying on the ground unable to walk, semiconscious, and dehydrated. Fancher and Scott cleared an access area while Blaylock and EMS medical personnel carried Taylor several hundred yards to an awaiting medical transport. Taylor was transported to a hospital for treatment.

"Due to the extreme heat and other conditions it is highly probable that Mr. Taylor would not have made it through the night," said Col. Steve Adcock, MDWFP Chief of Law Enforcement. "Once again our Officers' determination and training have saved another life," Adcock added.

Public Input Sought on State Wildlife Action Plan & Species of Concern

Mississippi Gopher Frog
Photo Courtesy TNC

Mississippi's State Wildlife Action Plan (SWAP) identifies fish and wildlife species of greatest conservation need and assigns conservation actions designed to prevent endangered species listings. The first State Wildlife Action Plan (formerly called the Comprehensive Wildlife Conservation Strategy), was drafted by Mississippi in 2005 as a requirement by Congress for continued participation in the State Wildlife Grants Program, which has provided over $7 million dollars for fish and wildlife conservation in Mississippi since 2001. To ensure the Mississippi Plan remains relevant, it must be revised every ten years. The first revision is underway and is being coordinated by MDWFP's Museum of Natural Science in consultation with all agency bureaus.

"We have been coordinating with experts and stakeholders from around the state and want to keep the public informed about this revision," said SWAP Coordinator Kathy Shelton. The updated list of 299 Species of Greatest Conservation need is available for review and public comment at www.mdwfp.com. Future updates will detail terrestrial, aquatic, and marine habitats in Mississippi, along with recommended conservation actions and research needs. Updates will be posted as they are completed this summer. MDWFP will host a live public webinar later this year about the changes to the plan. Comments on the updated Species of Greatest Conservation Need list can be submitted by email to SWAP2015@mdwfp.state.ms.us or mailed to State Wildlife Action Plan/MDWFP, Kathy Shelton, MDWFP Museum of Natural Science, 2148 Riverside Dr., Jackson, MS 39202.

APPENDIX V

Checklist of Plants of Mississippi: Introduced Species

Compiled in 2003 by Ronald G. Wieland, Mississippi Natural Heritage Program, with contributions from Charles T. Bryson, Bruce A. Sorrie, Ken L. Gordon, Steve W. Leonard, and John T. Kartesz

The number of vascular plant species found in Mississippi is greater than found in most other states in the United States (NatureServe 2002). The total flora of Mississippi is thought to be around 2,950 species. The Mississippi Natural Heritage Program has built a flora database of Mississippi plants (AFLORA), which includes both introduced and native vascular plants. The list is based on many sources but most importantly that of the Plants Database (USDA, NRCS. 2002). The nomenclature closely follows that developed by the Biota of North America Program (BONAP) (2003), which supports vascular plant treatments for Plants Database. Approximately 630 additional plants have been introduced into the state, some of which are extremely detrimental to the state's ecosystem and its overall economic productivity. The brochure produced by the Bureau of Land Management in cooperation with other governmental agencies and the Mississippi Exotic Pest Plant Council highlights the ten worst weeds of Mississippi. The list includes: alligator weed, Chinese tallow tree, Japanese honeysuckle, Chinese privet, cogongrass, Johnsongrass, kudzu, tropical soda apple, purple loosestrife, and water hyacinth. This list is a sub-set of the Mississippi Flora database, Mississippi Natural Heritage Program, www.mdwfp.com/museum/.

**This list should be not be considered an all inclusive list and should be viewed as a draft "in progress". This list is not without errors; please report any corrections, changes and/or suggestions.*

Fern and Fern Allies

Azollaceae
Azolla caroliniana Willd.
Carolina mosquitofern
Dryopteridaceae
Cyrtomium falcatum (L. f.) K. Presl
Japanese netvein hollyfern
Cyrtomium fortune i J. Sm.
Asian netvein hollyfern
Lygodiaceae
Lygodium japonicum (Thunb.) Sw.
Japanese climbing fern
Marsileaceae
Marsilea mutica Mettenius
Australian waterclover
Parkeriaceae
Ceratopteris thalictroides (L.) Brongn.
watersprite
Pteridaceae
Pteris multifida Poir.
spider brake
Pteris vittata L.
ladder brake
Salviniaceae
Salvinia minima Baker
water spangles
Salvinia molesta Mitch ell
kariba-weed NOXIOUS
Selaginellaceae
Selagin ella uncinata (Desv. ex Poir.) Spring
blue spikemoss
Thelypteridaceae
Macrothelypteris torresiana (Gaud.) Ching
swordfern

Gymnosperms

Araucariaceae
Araucaria araucana (Molina) K. Koch
monkeypuzzle tree
Cupressaceae
Cunninghamia lanceolata (Lamb.) Hook.
Chinese fir

Ginkgoaceae
Ginkgo biloba L.
Maidenhair-Tree

Monocots

Agavaceae
Yucca aloifolia L.
aloe yucca
Alismataceae
Sagittaria calycina Engelm.
hooded arrowhead
Sagittaria kurziana Gluck
spring-tape
Araceae
Colocasia esculenta (L.) Schott
coco yam
Pistia stratiotes L.
water lettuce
Cannaceae
Canna X generalis Bailey (pro sp.)
general canna

Commelinaceae
Commelina caroliniana Walt.
Carolina dayflower
Commelina communis L.
Asiatic dayflower
Murdannia keisak (Hassk.) Hand.-Maz.
wart-removing herb
Murdannia nudiflora (L.) Brenan
nakedstem dewflower

Cyperaceae
Bulbostylis barbata (Rottb.) C.B. Clarke
watergrass
Carex bicknellii Britt. var. opaca F. J. Herm.
Bicknell's sedge
Carex oklahomensis Mackenzie
Oklahoma sedge

Cyperus aggregatus (Willd.) Endl.
inflatedscale flatsedge
Cyperus compressus L.
poorland flatsedge
Cyperus difformis L.
variable flatsedge
Cyperus elegans L.
royal flatsedge
Cyperus entrerianus Boeckl.
woodrush flatsedge
Cyperus eragrostis Lam.
tall flatsedge
Cyperus esculentus L.
chufa flatsedge
Cyperus involucratus Rottb.
umbrella plant
Cyperus iria L.
ricefield flatsedge
Cyperus lanceolatus Poir.
epiphytic flatsedge
Cyperus ochraceus Vahl.
pond flatsedge
Cyperus oxylepis Neesex Steud.
sharpscale flatsedge

Cyperus pilosus Vahl
fuzzy flatsedge
Cyperus polystachyos Rottb.
manyspike flatsedge
Cyperus rotundus L.
nutgrass
Cyperus sanguinolentus Vahl
Louisiana flatsedge
Fimbristylis decipiens Kral
southern fimbry

Fimbristylis littoralis Gaudich.
fimbry
Fimbristylis schoenoides (Retz.) Vahl
ditch fimbry
Fimbristylis tomentosa Vahl
woolly fimbry
Kylling abrevifolia Rottb.
shortleaf spikesedge
Kyllinga gracillima Miq.
pasture spikesedge
Kyllinga odorata Vahl
fragrant spikesedge
Rhynchospora brachychaeta C. Wright
West Indian beaksedge

Dioscoreaceae
Dioscorea bulbifera L.
air potato
Dioscorea oppositifolia L.
Chinese yam

Hydrocharitaceae
Egeria densa Planch.
Brazilian waterweed
Hydrilla verticillata (L. f.) Royle NOXIOUS
waterthyme

Iridaceae
Belam candachinensis (L.) DC.
black berry lily
Crocosmia ×crocosmiiflora (V. Lemoin e) N.E. Br.
montbretia
Gladiolus communis L. ssp. byzantinus (P. Mill.) A. Hamilton
cornflag
Gladiolus italicus P. Mill
Italian gladiolus
Gladiolus papilio Hook f.
goldblotch gladiolus
Iris germanica L.
German iris
Iris pseudacorus L.
paleyellow iris

Juncaceae
Luzula campestris (L.) DC.
field woodrush

Lemnaceae
Spirode la puncta ta (G.F.W. Mey.) C.H. Thompson
dotted duckweed

Liliaceae
Allium ampeloprasum L.
broadleaf wild leek
Allium cepa L.
garden onion
Allium neapolitanum Cirillo
white garlic
Allium sativum L.
serpent garlic
Allium vineale L.
wild garlic
Alstroemeria ?psittacina Lehm.
lily of the Incas
Asparagus officina lis L.
garden asparagus
Hemerocallis fulva (L.) L.
orange daylily
Hemerocallis lilioasphodelus L.
Lemon spiderlily
Leucojum aestivum L.
summer snowflake
Liriope muscari (Dcne.) Bailey
mondo grass
Liriope spicata Lour.
creeping liriopes
Lycoris radiata (L'Hér.) Herbert
magic lily
Muscari botryoides (L.) P. M ill.
common grapehyacinth
Muscari neglectum Guss. ex Ten.
starch grapehyacinth
Narcissus × odorus L.
Camperne lle jonquil
Narcissus jonquilla L.
jonquil
Narcissus poeticus L.
poet's narcissus
Narcissus pseudonarcissus L.
daffodil
Narciss us tazetta L.
paper-white narcissus

Nothoscordum borbonicum Kunth
fragrant false garlic
Nothoscordum gracile (Ait.) Stearn.
slender false garlic
Ornithogalum umbellatum L.
sleepydick
Triteleia uniflorum Lindl.
spring starflower
Zephyranthes candida (Lindl.) Herbert
autumn zephyrlily
Zephyranthes citrina Baker
citron zephyrlily
Zephyranthes simpsonii Chapman
redmargin zephyrlily

Najadaceae

Najas minor All.
brittle waternymph

Poaceae

Agrostis capillaris L.
colonial bentgrass
Agrostis gigantea Roth
redtop
Agrostis stolonifera L.
creeping bentgrass
Aira caryophyllea L.
silver hairgrass
Airaelegans Willd. ex Kunth
aira
Alopecurus myosuroides Huds.
slender meadow foxtail
Anthoxanthum aristatum Boiss.
annual vernalgrass
Anthoxanthum odoratum L.
sweet vernalgrass
Aristida condensata Chapman
piedmont threeawn
Aristida purpurea Nutt.
purple threeawn
Aristida ramosissima Engelm. ex Gray
s-curve threeawn
Arrhenatherum elatius (L.) Beauv. ex J. & K. Presl
tall oatgrass
Arthraxon hispidus (Thunb.) Makino
small carpgrass
Arundo donax L.
giantreed
Avena fatua L.
oats
Avena sativa L.
common oat
Axonopus fissifolius (Raddi) Kuhlm.
common carpetgrass
Bothriochloa pertusa (L.) A. Camus
pitted beardgrass
Brachiaria eruciformis (Sm.) Griseb.
sweet singnal grass
Briza minor L.
little quakinggrass
Bromus catharticus Vahl
rescuegrass
Bromus commutatus Schrad.
meadow brome
Bromus inermis Leyss.
smooth brome
Bromus japonicus Thunb. ex Murr.
Japanese brome
Bromus madriten sis L.
compact brome
Bromus racemosus L.
bald brome
Bromus ramosus Huds.
hairy brome
Bromus secalinus L.
rye brome
Bromus sterilis L.
poverty brome
Bromus tectorum L.
cheatgrass
Chloris elata Desv.
tall windmill grass
Chloris gayana Kunth
Rhodes grass
Chloris verticillata Nutt.
tumble windmill grass
Chloris virgata Sw.
feather fingergrass
Cynodon dactylon (L.) Pers.
bermudagrass
Cynosurus echinatus L.
prickly dogtail

Dactylis glomera ta L.
orchardgrass
Dactyloctenium aegyptium (L.) Willd.
Durban crowsfoot grass
Desmazeria rigida (L.) Tutin
ferngrass
Dichanthelium sericeum (R. Br.) A. Camus
silky bluestem
Digitaria bicornis (Lam.) Roemer & J.A. Schultes ex Loud.
Asian crabgrass
Digitaria ciliaris (Retz .) Koe l.
southern crabgrass
Digitaria ischaemum (Schreb.) Schreb. ex Muhl.
smooth crabgrass
Digitar iasanguinalis (L.) Scop.
hairy crabgrass
Digitaria violascens Link
violet crabgrass
Echinochloa colona (L.) Link
jungle rice
Echinochloa crus-galli (L.) Beauv.
barnyardgrass
Echinochloa crus-pavonis (Kunth) J. A. Schultes
gulf cockspur grass
Eleusine indica (L.) Gaertn.
Indian goosegrass
Elymus repens (L.) Gould
quackgrass
Eragrostis cilianen sis (All.) Vign. ex Janchen
stinkgrass
Eragrostis curvula (Schrad.) Nees
weeping lovegrass
Eragrostis gangetica (Roxb.) Steud.
slimflower lovegrass
Eragrostis japonica (Thunb.) Trin.
pond lovegrass
Eragrostis minor Host
little lovegrass
Eragrostis pilosa (L.) Beauv.
Indian lovegrass
Eragrostis tenella (L.) Beauv. ex Roemer & J.A. Schultes
Japanese lovegrass
Eremochloa ophiuroides (Munro) Hack.
centipede grass
Eriochloa acuminata (J. Presl) Kunth
tapertip cupgrass
Eriochloa aristata Vasey
bearded cupgrass
Eriochloa contracta A.S. Hitchc.
prairie cupgrass
Eriochloa fatmensis (Hochst. & Steud.) W.D. Clayton
tropical cupgrass
Eriochloa polystachya Kunth
caribgrass
Eriochloa villosa (Thunb.) Kunth
hairy cupgrass
Eustachys caribaea (Spreng.) Herter
Caribbean fingergrass
Eustachys petraea (Sw.) Desv.
pinewoods fingergrass
Festuca arundinacea Schreb.
Tall fescue
Festu cafiliform is Pourret
fineleaf sheep fescue
Festuca subverticillata (Pers.) Alexeev
nodding fescue
Gastridium phleoides (Nees & Meyen) C.E. Hubbard
nit grass
Hackeloch loagranularis (L.) Kuntze
pitscale grass
Holcus lanatus L.
common velvetgrass
Hordeum brachyantherum Nevski
meadow barley
Hordeum jubatum L.
squirrel-tail grass
Hordeum vulgare L.
cultivated barley
Imperata brasiliensis Trin. NOXIOUS
Brazilian satin tail
Imperata cylindrica (L.) Beau v. NOXIOUS
cogongrass
Leptochloa decipiens (R.Br.) Stapf ex Maiden
Australian sprangletop
Leptochloa panicoides (J. Presl) A.S. Hitchc.
Amazon sprangletop

Lolium perenne L.
perennial ryegrass
Lolium pratense (Huds.) S.J. Da rbyshire
meadow fescue
Lolium rigidum Gaudin
Wimmera ryegrass
Lolium temulentum L.
Darnel ryegrass
Luzio labahiensis (Steud.) A.S. Hitchc.
Brazilian watergrass
Microstegium vimineum (Trin.) A. Camus
Nepalese browntop
Miscanthus sinensis Anderss.
Chinese silvergrass
Muhlenbergia frondosa (Poir) Fern.
wirestem muhly
Oryza sativa L.
rice
Panicum miliaceum L.
broomcorn millet
Panicum repens L.
torpedo grass
Parapholis incurva (L.) C.E. Hubb ard
curved sicklegrass
Paspalum convexum Humb. & Bonpl. ex Flueggé
Latin American crowngrass
Paspalum dilatatum Poir.
Dallasgrass
Paspalum notatum Flueggé
bahiagrass
Paspalum urvillei Steud.
Vasey's grass
Pennisetum ciliare (L.) Link
buffelgrass
Pennisetum glaucum (L.) R.Br.
pearl millet
Phalaris aquatica L.
bulbous canarygrass
Phalaris canariens is L.
common canarygrass
Phleum pratense L.
timothy
Phragmites australis (Cav.) Trin. ex Steud.
common reed
Phyllostachys aurea Carr. ex A .& C. Riviere
golden bamboo
Phyllostachys aureosulcata McClure
yellow grove bamboo
Phyllostachys bambusoides Sieb. & Zucc.
Japanese timber bamboo
Phyllostachys flexuosa A.& C. Rivière
drooping timber bamboo
Phyllostachys meyeri McClure
Meyer's bamboo
Phyllostachys nigra (Lodd.) Munro
black bamboo
Poa annua L.
annual bluegrass
Poa bulbosa L.
bulbous bluegrass
Poa compressa L.
Canada bluegrass
Poa palustris L.
fowl bluegrass
Poa secunda J. Presl
Sandberg bluegrass
Polypogon monspeliensis (L.) Desf.
annual rabbitsfoot grass
Rottboellia cochinc hinensis (Lour.) W.D. Clayton
itchgrass NOXIOUS
Saccharum officinarum L.
sugarcane
Sacciolepis indica (L.) Chase
glenwood grass
Schedono ruspratensis (Huds.) Beauv.
meadow fescue
Sclerochloa dura (L.) Beauv.
an introduced grass
Secale cereale L.
cultivated rye
Setaria barbata (Lam.) Kunth
East Indian bristlegrass
Setaria faberii Herrm.
Japanese bristlegrass
Setaria italica (L.) Beauv.
foxtail millet
Setaria pumila (Poir.) Roemer & J.A. Schultes spp. pumila
yellow foxtail
Setaria viridis (L.) Beauv.
green bristlegrass

Sorghum almum Parodi
Columbus grass
Sorghum bicolor (L.) Moench
broomcorn
Sorghum halepense (L.) Pers.
Johnsongrass
Spartina maritima (M.A. Curtis) Fern.
small cordgrass
Sporobolus indicus (L.) R. Br.
smut grass
Stenotaphrum secundatum (Walt.) Kuntze
St. Augustine grass
Trisetum flavescens (L.) Beauv.
yellow oatgrass
Triticum aestivum L.
common wheat
Urochloa arizonica (Scribn. & Merr.) O. Morrone & F. Zuloaga
Arizona signalgrass
Urochloa plantaginea (Link) R. Webster
plantain signalgrass
Urochloa ramosa (L.) Nguyen
dixie signalgrass
Urochloa texana (Buckl.) R. Webster
Texas signalgrass
Vulpia myuros (L.) K.C . Gmel.
rattail fescue
Zea mays L.
corn

Pontedariaceae
Eichhornia crassipes (Mart.) Solms
common water hyacinth

Potamogetonaceae
Potamogeton crispus L.
curly pondweed

Dicots

Acanthaceae
Ruellia brittoniana Leonard
Britton‘s wild petunia

Aizoaceae
Trianthema portulacastrum L.
desert horsepurslane

Amaranthaceae
Alternanthera caracasana Kunth
washerwoman
Alternanthera paronichyoides St.-Hil.
smooth joyweed
Alternanthera philoxeroides (Mart.) Griseb.
alligatorweed
Alternanthe rasessilis (L.) R. Br. ex DC. NOXIOUS
sessile joyweed
Amaranthus albus L.
prostrate pigweed
Amaranthus hybridus L.
slim amaranth
Amaranthus powellii S. Wats.
Powell’s amaranth
Amaranthus retroflexus L.
redroot amaranth
Amaranthus rudis Sauer
tall amaranth
Amaranthus spinosus L.
spiny amaranth
Amaranthus viridis L.
slender amaranth
Celosia argentea L.
silver cock’s comb
Froelic hiagra cilis (Hook.) Moq.
slender snakecotton

Apiaceae
Ammoselinum butleri (Engelm. exS. Wats) Coult. & Rose
sand parsley
Apium graveolens L.
wild celery
Bowlesia incana Ruiz & Pavon
hoary bowlesia
Conium maculatum L.
poison hemlock

Cyclospermum leptophyllum (Pers.) Sprag. ex Britt. & Wilson
marsh parsley
Daucus carota L.
Queen Anne's lace
Hydrocotyle sibthorpioides Lam.
lawn marshpennywort
Petroselinum crispum (P. Mill.) Nyman ex A.W. Hill
parsley
S*candix pecten-veneris* L.
shepherds needle
Torilis arvensis (Huds.) Link
spreading hedgeparsley
Torilis japonica (Houtt.) DC.
erect hedgeparsley
Torilis nodosa (L.) Gaertn.
knotted hedgeparsley

Apocynaceae
Catharanthus roseus (L.) G. Don
periwinkle
Nerium oleander L.
oleander
Vinca major L.
bigleaf periwinkle
Vinca minor L.
common periwinkle

Araliaceae
Hedera helix L.
English ivy

Asteraceae
Acanthospermum australe (Loefl.) Kuntze
Paraguayan starburr
Achillea millefolium L.
common yarrow
Ageratum conyzoides L.
tropical whiteweed
Amphiachyris dracunculoides (DC.) Nutt.
prairie broomweed
Anthemis cotula L.
stinking chamomile
Arctium minus Bernh.
lesser burrdock
Artemisia annua L.
sweet sagewort
Artemisia ludoviciana Nutt.
Louisiana sagewort
Bidens pilosa L.
beggarticks
Bidens tripartita L.
threelobe beggarticks
Calyptocarpus vialis Less.
straggler daisy
Carduus nutans L.
nodding plumeless thistle
Centaurea cyanus L.
garden cornflower
Centaurea stoebe L. ssp. micranthos (Gugler) Hayek
spotted knapweed
Cichorium intybus L.
chicory
Cirsium vulgare (Savi) Ten.
bull thistle
Cnicus benedictus L.
blessed thistle
Conyza bonariensis (L.) Cronq.
asthmaweed
Coreopsis tinctoria Nutt.
golden tickseed
Crepis pulchra L.
smallflower hawksbeard
Facelis retusa (Lam.) Schultz-Bip.
annual trampweed
Gymnosty lesanthemifolia Juss.
button burrweed
Helianthus annuus L.
common sunflower
Hypochaerisbras iliensis (Less.) Griseb.
Brazilian catsear
Hypoch aerisglabra L.
smooth catsear
Hypochaeris radicata L.
hairy catsear
Lactuca saligna L.
willowleaf lettuce
Lactuca serriola L.
prickly lettuce
Leucanthemum vulgare Lam.
oxeye daisy

Matricaria discoidea DC.
disc mayweed
Parthenium hysterophorus L.
Santa Maria feverfew
Pluchea yucatanensis Nesom
Yucatan camphorweed
Senecio vulgaris L.
old-man-in-the-spring
Silybum marianum (L). Gaertn
blessed milkthistle
Soliva sessilis Ruiz & Pavón
burweed
Sonchus arvensis L.
field sowthistle
Sonchus asper (L.) Hill
spiny sowthistle
Sonchus oleraceus L.
common sowthistle
Sphagneticola trilobata (L.C. Rich.) Pruski
Bay Biscayne creeping-oxeye
Tanacetum parthenium (L.) Schultz-Bip.
feverfew
Tanacetum vulgare L.
common tansy
Taraxacum officinale G.H. Weber ex Wiggers
common dandelion
Thymophylla tenuiloba (DC.) Small
bristleleaf pricklyleaf
Xanthium spinosum L.
spiny cockleburr
Youngia japonica (L.) DC.
oriental false hawksbeard

Berberidaceae
Mahonia bealei (Fortune) Carr.
Beale's barberry
Nandina domestica Thunb.
nandina

Bignoniaceae
Catalpa speciosa (Warder) Warder ex Engelm.
northern catalpa
Macfa dyenaunguis-cati (L.) A.H. Gentry
catclawvine

Boraginaceae
Amsinckia lycopsoides Lehm.
tarweed fiddleneck
Buglossoides arvensis (L.) I.M. Johnston
corn gromwell
Cynoglossum zeylanicum (Vahl) Thunb. ex Lehm.
Ceylon hound's tongue
Heliotropium amplexicaule Vahl
clasping heliotrope
Heliotropium curassavicum L.
salt heliotrope
Heliotropium europaeum L.
European heliotrope
Heliotropium indicum L.
Indian heliotrope

Brassicaceae
Arabidopsis thaliana (L.) Heynh.
mouseear cress
Barbarea verna (P. Mill.) Aschers.
early yellowrocket
Brassica juncea (L.) Czern.
India mustard
Brassica napus L.
rape
Brassica nigra (L.) W.D.J. Koch
black mustard
Brassica rapa L.
field mustard
Capsella bursa-pastoris (L.) Medik.
shepherd's purse
Cardamine hirsuta L.
hairy bittercress
Chorispora tenella (Pallas) DC.
crossflower
Conringia orientalis (L.) Dum ort.
hare's ear mustard
Coronopus didymus (L.) Sm.
lesser swinecress
Descurainia sophia (L.) Webb ex Prantl
herb sophia
Draba verna L.
spring whitlowgrass
Erysimum cheiranthoides L.
wormseed wallflower

Erysimum repandum L.
spreading wallflower
Lepidium austrinum Small
southern pepperwort
Lepidium campestre (L.) Ait. f.
field pepperweed
Lepidium densiflorum Schrad.
common pepperweed
Lepidium oblongum Small
veiny pepperweed
Lepidium perfoliatum L.
clasping pepperweed
Lobularia maritima (L.) Desv.
seaside lobularia
Raphanus raphanistrum L.
wild radish
Rorippa indica (L.) Hiern
variableleaf yellowcress
Rorippa microphylla (Boenn. ex Reichenb.) Hyl. ex A.& D. Löve
onerow yellowcress
Rorippa nasturtium-aquaticum (L.) Hayek
watercress
Rorippa sylvestris (L.) Bess.
creeping yellowcress
Sinapis alba L.
white mustard
Sinapis arvensis L.
charlock mustard

Sisymbrium altissimum L.
tall tumblemustard
Sisymbrium officinale (L.) Scop.
hedgemustard
Thlaspi arvense L.
field pennycress

Buddlejaceae
Buddleja lindleyana Fortune ex Lindl.
butterfly bush

Cactaceae
Opuntia monacantha (Willd.) Haw.
common pricklypear
Opuntia pusilla (Haw.) Nutt.
cockspur pricklypear

Callitrichaceae
Callitriche stagnalis Scop.
pond water-starwort

Campanulaceae
Wahlenbergia marginata (Thunb.) A. DC.
southern rockbell

Cannabaceae
Cannabis sativa L.
marijuana

Capparaceae
Cleome hassleriana Chod.
pinkqueen
Cleome spinosa Jacq.
spiny spiderflower

Caprifoliaceae
Abelia ×grandiflora (Rovelli ex André) Rehd.
glossy abelia
Lonicera japonica Thunb.
Japanese honeysuckle
Lonicera maackii (Rupr.) Maxim.
Amur honeysuckle

Caryophyllaceae
Agrostemma githago L.
common corncockle
Arenaria serpyllifolia L.
thymeleaf sandwort
Cerastium fontanum Baumg.
common chickweed
Cerastium glomeratum Thuill.
sticky chickweed
Dianthus armeria L.
Deptford pink
Holosteum umbellatum L.
jagged chickweed
Saponaria officinalis L.
bouncingbet
Scleranthus annuus L.
German knotgrass
Silene noctiflora L.
night flowering catchfly
Spergula arvense L.
corn spurry

Spergularia maritima (All.) Chiov.
media sandspurry
Stellaria media (L.) Vill.
common chickweed
Vaccaria hispanica (P. Mill.) Rauschert
cow soapwort

Celastraceae
Euonymus europaea L.
European spindletree
Euonymus fortunei (Turcz.) Hand.-Maz.
wintercreeper spindlebush
Euonymus japonica Thunb.
evergreen euonymous

Chenopodiaceae
Chenopodium album L.
lambsquarters
Chenopodium ambrosioides L.
Mexican tea
Chenopo diumpratericola Rydb.
desert goosefoot
Chenopodium pumilio R. Br.
clammy goosefoot
Chenopodium standleyanum Aellen
Standley's goosefoot
Kochia scoparia (L.) Schrad.
common kochia
Salicornia maritima Wolff & Jefferies
slender grasswort
Salso lakali L.
Russian thistle
Salsola tragus L.
prickly Russian thistle

Cistaceae
Lechea racemulosa Michx.
Illinois pinweed

Clusiaceae
Hypericum patulum Thunb.
Hypericum perforatum L.
common St. Johnswort

Convolvulaceae
Calystegia sepium (L.) R. Br.
hedge false bindweed
Calystegia silvatica (Kit.) Griseb.
shortstalk false bindweed
Convolvulus arvensis L.
field bindweed
Ipomoea batatas (L.) Lam.
sweet potato
Ipomoea cairica (L.) Sweet
mile a minute vine
Ipomoea hederacea Jacq.
ivyleaf morning glory
Ipomoea hederifolia L.
scarletcreeper
Ipomoea nil (L.) Roth
whiteedge morning glory
Ipomoea purpurea (L.) Roth
tall morning glory
Ipomoea quamoclit L.
cypressvine
Ipomoea setosa Ker-G awl.
Brazilian morning glory
Ipomoea turbinata Lag.
lilacbell
Ipomoea wrightii Gray
Wright's morning glory
Jacquemontia tamnifolia (L.) Griseb.
hairy clustervine
Merremia dissecta (Jacq.) Hallier f.
noyau vine

Crassulaceae
Hylotelephium telephioides (Michx.) H. Ohba.
Allegheny stonecrop
Sedum sarmentosum Bunge
stringy stonecrop

Cucurbitaceae
Citrullus lanatus (Thunb.) Matsumura & Nakai
watermelon
Cucumis melo L.
cantaloupe
Cucumis sativus L.
cucumber
Cucurbita pepo L.
field pumpkin
Lagenaria siceraria (Molina) Standl.
bottle gourd

Dipsacaceae

Dipsacus fullonum L.
Fuller's teasel

Elaeagnaceae

Elaeagnus pungens Thunb.
thorny elaeagnus
Elaeagnus umbellata Thunb.
autumn elaeagnus

Euphorbiaceae

Acalypha setosa A. Rich.
Cuban copperleaf
Caperonia palustris (L.) St.-H il.
sacatrapo
Chamaesyce nutans (Lag.) Small
eyebane
Chamaesyce prostrata (Ait.) Small
prostrate sandmat
Euphorbia cyathophora Murr.
fire on the mountain
Euphorbiam arginata Pursh
snow on the mountain
Manihot esculenta Crantz
cassava
Manihot grahamii Hook
Graham's manihot
Phyllanthus acidus (L.) Skeels
gooseberry tree
Phyllanthus fraternus G.L. Webster
gulf leafflower
Phyllanthus tenellus Roxb.
Mascarene Island leaf-flower
Phyllanthus urinaria L.
chamber bitter
Ricinus communis L.
castorbean
Triadica sebiferum (L.) Small
tallowtree
Vernicia fordii (Hemsl.) Airy-Shaw
tungoil tree

Fabaceae

Acacia macracantha Humb. & Bonpl. ex Willd.
porknut
Albizia julibrissin Durazz.
silktree
Alysicarpus ovalifolius (Schum acher) J. Leonard
alyce clover
Alysicarpus vaginalis (L.) DC.
white moneywort
Arachis hypogaea L.
peanut
Canavalia ensiformis (L.) DC.
wonderbean
Coronilla varia L.
purple crownvetch
Crotalaria brevidens Benth.
Ethiopian rattlebox
Crotalaria ochroleuca G. Don
slender leaf rattlebox
Crotalaria pallida Ait.
smooth rattlebox
Crotalaria retusa L.
rattleweed
Crotalaria spectabilis Roth
showy rattlebox
Cullen americana (L.) Rydb.
American scurfpea
Desmodium tortuosum (Sw.) DC.
dixie ticktrefoil
Erythrina crista-galli L.
crybaby tree
Glycine max (L.) Merr.
soybean
Indigofera suffruticosa P. Mill.
anil de pasto
Kummerowia stipulacea (Maxim.) Makino
Korean clover
Kummerowia striata (Thun b.) Schindl.
Japanese clover
Lathyrus aphaca L.
yellow peavine
Lathyrus hirsutus L.
singletary peavine
Lathyrus latifolius L.
perennial peavine
Lathyrus pusillus Ell.
tiny peavine
Lathyrus sylvestris L.
flat peavine
Lespedeza bicolor Turcz.
shrubby lespedeza

Lespedeza cuneata (Dum.-Cours.) G. Don
Chinese lespedeza
Lespedeza thunbergii (DC.) Nakai
Thunberg's lespedeza
Lotus tenuis Waldst. & Kit. ex Willd.
birdsfoot trefoil
Medicago arabica (L.) Huds.
spotted medick
Medicago lupulina L.
black medick
Medicago minima (L.) L.
burr medick
Medicago orbicularis (L.) Bartalini
blackdisk medick
Medicago polymorpha L.
burclover
Medicago sativa L.
alfalfa
Melilotus indicus (L.) All.
annual yellow sweetclover
Melilotus officinalis (L.) Lam.
yellow sweetclover
Parkinsonia aculeata L.
Jerusalem thorn
Phaseolus lunatus L.
lima bean
Pisum sativum L.
English pea
Pueraria montana (Lour.) Merr.
kudzu
Rhynchosia minima (L.) DC.
least snoutbean
Robinia hispida L.
bristly locust
Senna alata (L.) Roxb.
emperor's candlesticks
Senna corymbosa (Lam.) Irwin & Barneby
Argentine wild sensitive plant
Senna obtusifolia (L.) Irwin & Barneby
coffeeweed
Senna occidentalis (L.) Link
septicweed
Senna tora (L.) Roxb.
sicklepod
Sesbania punicea (Cav.) Benth.
rattlebox
Sesbania virgata (Cav.) Poir.
wand riverhemp
Sophora secundiflora (Ortega) Lag. ex DC.
mescal bean
Trifolium arvense L.
rabbitfoot clover
Trifolium campestre Schreb.
field clover
Trifolium dubium Sibthorp
suckling clover
Trifolium hybridum L.
alsike clover
Trifolium incarnatum L.
crimson clover

Trifolium lappaceum L.
burdock clover
Trifolium nigrescens Viviani
small white clover
Trifolium pratense L.
red clover
Trifolium repens L.
white clover
Trifolium resupinatum L.
reversed clover
Trifolium subterraneum L.
subterranean clover
Trifolium vesiculosum Savi
arrowleaf clover
Vicia disperma DC.
European vetch
Vicia grandiflora Scop.
large yellow vetch
Vicia hirsuta (L.) S.F. Gray
tiny vetch
Vicia lathyroides L.
spring vetch
Vicia sativa L.
common vetch
Vicia tetrasperma (L.) Schreb.
lentil vetch
Vicia villosa Roth
winter vetch
Vigna angularis (Willd.) Ohwi & Ohashi
azuki bean
Vigna unguiculata (L.) Walp.
blackeyed pea

Wisteria floribunda (Willd.) DC.
Japanese wisteria
Wisteria sinensis (Sims) DC.
Chinese wisteria

Fagaceae
Castanea mollissima Blume
Chinese chestnut
Quercus acutissima Carruthers
sawtooth oak

Fumariaceae
Fumaria officinalis L.
drug fumitory

Gentianaceae
Centaurium pulchellum (Sw.) Druce
branched centaury

Geraniaceae
Geranium dissectum L.
cutleaf geranium

Haloragaceae
Myriophyllum aquaticum (Vell.) Verdc.
parrot feather watermilfoil
Myriophyllum spicatum L.
Eurasian watermilfoil

Hydrangeaceae
Philadelphus pubescens Loise l.
hoary mock orange

Illiciaceae
Illicium verum Hook. f.
staranise tree

Lamiaceae
Ajuga reptans L.
creeping bugleweed
Calamintha nepeta (L.) Savi
lesser calamint
Clinopodiumgracile (Benth.) Kuntze
slender wild basil
Glechoma hederacea L.
groundivy
Hyptis mutabilis (A. Rich.) Briq.
tropical bushmint
Lamium album L.
white dead nettle
Lamium amplexicaule L.
henbit dead nettle
Lamium purpureum L.
purple dead nettle
Leonotis nepetifolia (L.) Ait. f.
Christmas candlestick
Leonurus cardiaca L.
common motherwort
Lycopus europaeus L.
gypsywort
Marrubium vulgare L.
horehound
Mentha spicata L.
spearmint
Mentha X piperita L.
peppermint
Mentha X rotundifolia (L.) Huds.
mint
Nepeta cataria L.
catnip
Perilla frutescens (L.) Britt.
beefsteakplant
Prunella vulgaris L.
common selfheal
Salvia coccinea P.J. Buchoz ex Etlinger
blood sage
Scutellaria racemosa Pers.
South American skullcap
Stachys floridana Shuttlw. ex Benth.
Florida hedgenettle
Thymus praecox Opiz
mother of thyme

Lauraceae
Cinnamomum camphora (L.) J. Presl
camphor-tree

Linaceae
Linum usitatissimum L.
common flax

Lythraceae

Cuphea carthagenensis (Jacq.) J.F. Mac br.
Colombian waxweed
Lagerstroemia indica L.
crape myrtle
Lythrum salicaria L.
purple loosestrife

Malvaceae

Abelmoschus esculentus (L.) Moench
okra
Abutilon theophrasti Medik.
velvetleaf
Alcea rosea L.
hollyhock
Anoda cristata (L.) Schlecht.
crested anoda
Gossypium hirsutum L.
upland cotton
Hibiscus syriacus L.
rose of Sharon
Hibiscus trionum L.
flower of an hour
Malvaviscus arboreus Dill. ex Cav.
wax mallow
Sida spinosa L.
prickly fanpetals

Meliaceae

Melia azedarach L.
Chinaberrytree

Menyanthaceae

Nymphoide speltata (Gmel.) Kuntze
yellow floatingheart

Molluginaceae

Mollugo verticillata L.
green carpetweed

Moraceae

Broussonetia papyrifera (L.) L'Her. ex Vent.
paper mulberry
Fatoua villosa (Thunb.) Nakai
hairy crabweed
Ficus carica L.
common fig
Maclura pomifera (Raf.) Schneid.
osage orange
Morus alba L.
white mulberry

Nelumbonaceae

Nelumbo nucifera Gaertn.
sacred lotus

Nyctaginaceae

Mirabilis jalapa L.
marvel of Peru

Oleaceae

Fraxinus berlandieriana DC.
Mexican ash
Jasminum nudiflorum Lindl.
winter jasmine
Ligustrum japonicum Thunb.
Japanese privet
Ligustrum lucidum Ait. f.
glossy privet
Ligustrum sinense Lour.
Chinese privet

Onagraceae

Ludwigia bonariensis (M. Micheli) Hara
Carolina primrose-willow
Ludwigia peploides (Kunth) Raven
floating primrosewillow
Ludwigia peruviana (L.) Hara
Peruvian primrosewillow
Ludwigia uruguayensis (Camb.) Hara
Uruguayan primrosewillow
Oenothera speciosa Nutt.
pinkladies

Oxalidaceae

Oxalis corniculata L.
creeping woodsorrel
Oxalis debilis Kunth
pink woodsorrel
Oxalis rubra St.-Hil.
windowbox woodsorrel

Papaveraceae
Argemone mexicana L.
Mexican pricklypoppy

Pedaliaceae
Ibicella lutea (Lindl.) Van Eselt.
yellow unicorn-plant

Plantaginaceae
Plantago hookeriana Fisch. & C.A. Mey.
California plantain
Plantago lanceolata L.
narrow leaf plantain
Plantago major L.
common plantain
Plantago wrightiana Dcne.
Wright's plantain

Polemoniaceae
Phlox paniculata L.
fall phlox
Phlox subulata L.
moss pink

Polygonaceae
Antigonon leptopus Hook. & Arn.
coralvine
Fagopyrum esculentum Moench
buckwheat
Polygonum amphibium L.
longroot smartweed
Polygonum arenastrum Jord. ex Boreau
oval-leaf knotweed
Polygonu maviculare L.
prostrate knotweed
Polygonum cespitosum Blume
oriental ladysthumb
Polygonum convolvulus L.
black bindweed
Polygonum cuspidatum Sieb. & Zucc.
Mexican bamboo (Japanese knotweed)
Polygonum orientale L.
kiss me over the garden gate
Polygonum perfoliatum L.
Asiatic tearthumb
Polygonum persicaria L.
spotted ladysthumb
Rumex acetosella L.
common sheep sorrel
Rumex conglomeratus Murr.
clustered dock
Rumex crispus L.
curly dock
Rumex obtusifolius L.
bitter dock
Rumex pulcher L.
fiddle dock

Portulacaceae
Montia linearis (Dougl. ex Hook.) Greene
narrowleaf miners lettuce
Portulacagran diflora Hook.
rose moss
Portulaca oleracea L.
little hogweed

Primulaceae
Anagallis arvensis L.
scarlet pimpernel
Anagallis minima (L.) Krause
chaffweed
Lysimachia nummularia L.
creeping jenny

Ranunculaceae
Clematis terniflora DC.
sweet autumn virginsbower
Consolida ajacis (L.) Schur
doubtful knight's spur
Ranunculus acris L.
showy buttercup
Ranunculus arvensis L.
corn buttercup
Ranunculus bulbosus L.
St. Anthony's turnip
Ranunculus muricatus L.
spinyfruit buttercup
Ranunculus parviflorus L.
smallflower buttercup
Ranunculus platensis Spreng.
prairie buttercup
Ranunculus sardous Crantz
hairy buttercup

Rosaceae

Aphanes microcarpa (Boiss. & Reut.) Rothm.
parsley-piert
Chaenomeles japonica (Thunb.) Lindl. ex Spach
Maule's quince
Duchesnea indica (Andr.) Focke
Indian strawberry
Exochorda racemosa (Lindl.) Rehd.
pearlbrush
Kerria japonica (L.) DC.
Japanese rose
Malus pumila P. Mill.
crabapple
Photinia × *fraseri* Dress
Fraser's photinia
Photinia glabra (Thunb.) Maxim.
Japanese photinia
Photinia serratifolia (Desf.) Kalkm.
Chinese photinia
Potentilla recta L.
sulphur cinquefoil
Prunus hortulana Bailey
hortulan plum
Prunus persica (L.) Batsch
peach
Pyracantha coccinea M. Roemer
scarlet firethorn
Pyrus calleryana Dcne.
Callery pear
Pyrus communis L.
common pear
Rosa bracteata J.C. Wendl.
Macartney rose
Rosa chinensis Jacq.
Chinese rose
Rosa eglanteria L.
sweetbriar rose
Rosa gallica L.
French rose
Rosa laevigata Michx.
Cherokee rose
Rosa multiflora Thunb. ex Murr.
multiflora rose
Rosa wichuraiana Crépin
memorial rose
Rubus bifrons Vest ex Tratt.
Himalayan berry
Spiraea hypericifolia L.
Iberian spirea
Spiraea prunifolia Sieb. & Zucc.
bridle wreath
Spiraea salicifolia L.
willowleaf meadowsweet
Spiraea thunbergii Sieb. ex Blume
thunberg's meadowsweet

Rubiaceae

Cruciata pedemontana (Bellardi) Ehrend.
piedmont bedstraw
Galium divaricatum Pourret ex Lam.
bedstraw
Galium orizabense Hem sl.
bald bedstraw
Galium parisiense L.
wall bedstraw
Mitracarpus hirtus (L.) DC.
tropical girdlepod
Oldenlandia corymbosa L.
flattop mille graines
Richardia brasiliensis Gomes
tropical Mexican clover
Richardia humistrata (Cham. & Schlct.) J.A. & J.H. Schult.
South American Mexican clover
Richardia scabra L.
rough Mexican clover
Sherardia arvensis L.
blue fieldmadder
Spermacoce prostrata Aubl.
prostrate false buttonweed
Spermacoce tenuior L.
slender false buttonweed

Rutaceae

Ponciru s trifoliata (L.) Raf.
hardy orange

Salicaceae

Populus alba L.
white poplar

Sapindaceae

Cardiospermum halicacabum L.
love in a puff
Koelreuteria elegans (Seem.) A. C. Sm.
flame gold

Scrophulariaceae

Linaria vulgaris P. Mill.
butter and eggs
Lindernia crustacea (L.) F. Muell.
Malaysian false pimpernel
Mazus pumilus (Burm. f.) Steenis
Japanese mazus
Parentucellia viscosa (L.) Caruel
yellow glandweed
Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud.
princess tree
Scoparia dulcis L.
licorice weed
Verbascum blattaria L.
moth mullein
Verbascum thapsus L.
common mullein
Veronica agrestis L.
green field speedwell
Veronica arvensis L.
corn speedwell
Veronica hederifolia L.
ivyleaf speedwell

Simaroubaceae

Ailanthus altissima (P. Mill.) Swingle
tree of heaven

Solanaceae

Bouchetia erecta DC.
painted tongue
Calibrachoa parviflora (Juss.) D'Arcy
seaside petunia
Capsicum annuum L.
cayenne pepper
Datura stramonium L.
jimsonweed
Nicandra physalodes (L.) Gaertn.
apple of Peru
Nicotiana longiflora Cav.
longflower tobacco
Petunia × *atkinsiana* D. Don ex Loud.
petunia
Petunia axillaris (Lam.) B.S.P.
petunia
Physalis cordata P. Mill.
heartleaf ground cherry
Physalis pruinosa L.
strawberry tomato
Solanum capsicoides All.
cockroach berry
Solanum gracilius Herter
graceful nightshade
Solanum lycopersicum L.
garden tomato
Solanum mammosum L.
nipple fruit
Solanum melongena L.
eggplant
Solanum pseudocapsicum L.
Jerusalem cherry
Solanum pseudogracile Heiser
glowing nightshade
Solanum rostratum Dunal
buffalobur nightshade
Solanum sisymbriifolium Lam.
sticky nightshade
Solanum tampicense Dunal
scrambling nightshade
Solanum tuberosum L.
white potato
Solanum viarum Dunal NOXIOUS
tropical soda apple

Sphenocleaceae

Sphenoclea zeylanica Gaertn.
sphenoclea

Sterculiaceae

Firmiana simplex (L.) W. Wight
Chinese parasoltree
Melochia corchorifolia L.
chocolateweed

Tamaricaceae

Tamarix parviflora DC.
smallflower tamarisk

Tamarix ramosissima Ledeb.
salt cedar

Thymelaeaceae
Thymelaea passerina (L.) Coss. & Germ.
mezereon

Urticaceae
Boehmeria nivea (L.) Gaud.
Chinese grass

Valerianaceae
Valerian ellalocusta (L.) Lat.
Lewiston cornsalad

Verbenaceae
Clerodendrum bungei Steud.
rose glorybower
Clerodendrum indicum (L.) Kuntze
turk's turbin
Glandularia pulchella (Sweet) Troncoso
South American mock vervain
Lantana camara L.
lantana
Lantana urticoides Hayek
West Indian shrub verbena
Verbena bonariensis L.
purple top vervain
Verbena brasiliensis Vell.
Brazilian vervain
Verbena officinalis L.
herb of the cross
Verbena rigida Spreng.
tuberousvervain
Vitex agnus-castus L.
lilac chastetree

Violaceae
Viola arvensis Murr.
field pansy
Viola bicolor Pursh
field pansy

Zygophyllaceae
Kallstroemia parviflora J.B.S. Norton
warty caltrop
Tribulu s terrestris L.
puncturevine
Zoysia japonica Steud.
Korean lawngrass

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APPENDIX VI

Mississippi SGCN By Ecoregion

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
1	Mussels	*ACTINONAIAS LIGAMENTINA*	MUCKET					X
1	Mussels	*CYCLONAIAS TUBERCULATA*	PURPLE WARTYBACK					X
1	Mussels	*ELLIPTIO ARCA*	ALABAMA SPIKE					X
1	Mussels	*ELLIPTIO ARCTATA*	DELICATE SPIKE					X
1	Mussels	*ELLIPTIO DILATATA*	SPIKE					X
1	Mussels	*EPIOBLASMA BREVIDENS*	CUMBERLANDIAN COMBSHELL					X
1	Mussels	*EPIOBLASMA PENITA*	SOUTHERN COMBSHELL					X
1	Mussels	*EPIOBLASMA TRIQUETRA*	SNUFFBOX					X
1	Mussels	*PLEURONAIA BARNESIANA*	TENNESSEE PIGTOE					X
1	Mussels	*LAMPSILIS HYDIANA*	LOUISIANA FATMUCKET					X
1	Mussels	*HAMIOTA PEROVALIS*	ORANGE-NACRE MUCKET					X
1	Mussels	*LASMIGONIA ALABAMENSIS*	ALABAMA HEELSPLITTER					X
1	Mussels	*PLEURONAIA DOLABELLOIDES*	SLABSIDE PEARLYMUSSEL					X
1	Mussels	*LIGUMIA RECTA*	BLACK SANDSHELL					X
1	Mussels	*MEDIONIDUS ACUTISSIMUS*	ALABAMA MOCCASINSHELL					X
1	Mussels	*OBOVARIA JACKSONIANA*	SOUTHERN HICKORYNUT					X
1	Mussels	*OBOVARIA SUBROTUNDA*	ROUND HICKORYNUT					X
1	Mussels	*OBOVARIA UNICOLOR*	ALABAMA HICKORYNUT					X
1	Mussels	*PLETHOBASUS CYPHYUS*	SHEEPNOSE					X
1	Mussels	*PLERUOBEMA DECISUM*	SOUTHERN CLUBSHELL					X
1	Mussels	*PLERUOBEMA PEROVATUM*	OVATE CLUBSHELL					X
1	Mussels	*PLERUOBEMA RUBRUM*	PYRAMID PIGTOE					X
1	Mussels	*POTAMILUS CAPAX*	FAT POCKETBOOK					X
1	Mussels	*POTAMILUS INFLATUS*	INFLATED HEELSPLITTER					X
1	Mussels	*QUADRULA CYLINDRICA CYLINDRICA*	RABBITSFOOT					X
1	Mussels	*STROPHITUS CONNASAUGAENSIS*	ALABAMA CREEKMUSSEL					X
2	Mussels	*ANODONTOIDES RADIATUS*	RAYED CREEKSHELL					X
2	Mussels	*ELLIPSARIA LINEOLATA*	BUTTERFLY					X

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
2	Mussels	*LAMPSILIS CARDIUM*	PLAIN POCKETBOOK					X
2	Mussels	*LAMPSILIS STRAMINEA STRAMINEA*	ROUGH FATMUCKET					X
2	Mussels	*PLEUROBEMA BEADLEIANUM*	MISSISSIPPI PIGTOE					X
2	Mussels	*QUADRULA NODULATA*	WARTYBACK					X
2	Mussels	*QUADRULA RUMPHIANA*	RIDGED MAPLELEAF		X			X
2	Mussels	*STROPHITUS SUBVEXUS*	SOUTHERN CREEKMUSSEL					X
2	Mussels	*STROPHITUS UNDULATUS*	CREEPER					X
2	Mussels	*UNIOMERUS DECLIVIS*	TAPERED PONDHORN					X
3	Mussels	*ARCIDENS CONFRAGOSUS*	ROCK POCKETBOOK					X
3	Mussels	*LAMPSILIS SILIQUOIDEA*	FATMUCKET					X
3	Mussels	*LASMIGONA COMPLANATA*	WHITE HEELSLPITTER					X
3	Mussels	*POTAMILUS ALATUS*	PINK HEELSPLITTER		X			X
3	Mussels	*ANODONTA HARTFIELDORUM*	CYPRESS FLOATER	X	X			X
3	Mussels	*PTYCHOBRANCHUS FASCIOLARIS*	KIDNEYSHELL					X
3	Mussels	*TRUNCILLA TRUNCATA*	DEERTOE					X
4	Mussels	*CYPROGENIA ABERTI*	WESTERN FANSHELL					X
4	Mussels	*PLEUROBEMA CURTUM*	BLACK CLUBSHELL					X
4	Mussels	*PLEUROBEMA MARSHALLI*	FLAT PIGTOE					X
4	Mussels	*PLEUROBEMA TAITIANUM*	HEAVY PIGTOE					X
4	Mussels	*QUADRULA METANEVRA*	MONKEYFACE					X
4	Mussels	*QUADRULA STAPES*	STIRRUPSHELL					X
1	Crustaceans	*FALLICAMBARUS BURRISI*	BURRIS' BURROWING CRAYFISH	X				
1	Crustaceans	*FALLICAMBARUS DANIELAE*	SPECKLED BURROWING CRAYFISH	X				
1	Crustaceans	*FALLICAMBARUS GORDONI*	CAMP SHELBY BURROWING CRAYFISH	X				
1	Crustaceans	*HOBBSEUS ATTENUATUS*	PEARL RIVULET CRAYFISH					X
1	Crustaceans	*HOBBSEUS CRISTATUS*	CRESTED RIVULET CRAYFISH		X			
1	Crustaceans	*HOBBSEUS ORCONECTOIDES*	OKTIBBEHA RIVULET CRAYFISH		X			X
1	Crustaceans	*HOBBSEUS PETILUS*	TOMBIGBEE RIVULET CRAYFISH		X			X
1	Crustaceans	*HOBBSEUS VALLECULUS*	CHOCTAW RIVULET CRAYFISH					X
1	Crustaceans	*HOBBSEUS YALOBUSHENSIS*	YALOBUSHA RIVULET CRAYFISH					X
1	Crustaceans	*ORCONECTES HARTFIELDI*	YAZOO CRAYFISH					X
1	Crustaceans	*ORCONECTES MISSISSIPPIENSIS*	MISSISSIPPI CRAYFISH		X			X
1	Crustaceans	*PROCAMBARUS BARBIGER*	JACKSON PRAIRIE CRAYFISH	X	X			
1	Crustaceans	*PROCAMBARUS FITZPATRICKI*	SPINY-TAILED CRAYFISH	X				

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
1	Crustaceans	*PROCAMBARUS LAGNIAPPE*	LAGNIAPPE CRAYFISH					X
1	Crustaceans	*PROCAMBARUS LYLEI*	SHUTISPEAR CRAYFISH					X
2	Crustaceans	*CAMBARELLUS DIMINUTUS*	LEAST CRAYFISH	X				X
2	Crustaceans	*CAMBARELLUS LESLIEI*	ANGULAR DWARF CRAYFISH	X				X
2	Crustaceans	*FALLICAMBARUS BYERSI*	LAVENDER BURROWING CRAYFISH	X				
2	Crustaceans	*HOBBSEUS PROMINENS*	PROMINENCE RIVULET CRAYFISH		X			X
2	Crustaceans	*ORCONECTES ETNIERI*	ETS CRAYFISH					X
2	Crustaceans	*ORCONECTES JONESI*	SUCARNOOCHEE RIVER CRAYFISH					X
2	Crustaceans	*PROCAMBARUS ABLUSUS*	HATCHIE RIVER CRAYFISH					X
2	Crustaceans	*PROCAMBARUS BIVITTATUS*	RIBBON CRAYFISH					X
2	Crustaceans	*PROCAMBARUS HAGENIANUS VESTICEPS*	EGYPTIAN CRAYFISH		X			X
2	Crustaceans	*PROCAMBARUS LECONTEI*	MOBILE CRAYFISH					X
2	Crustaceans	*PROCAMBARUS PENNI*	PEARL BLACKWATER CRAYFISH					X
3	Crustaceans	*CAMBARUS GIRARDIANUS*	TANBACK CRAYFISH					X
3	Crustaceans	*CAMBARUS RUSTICIFORMIS*	DEPRESSION CRAYFISH					X
3	Crustaceans	*ORCONECTES SPINOSUS*	COOSA RIVER SPINY CRAYFISH					X
3	Crustaceans	*ORCONECTES VALIDUS*	POWERFUL CRAYFISH					X
3	Crustaceans	*ORCONECTES WRIGHTII*	HARDIN CRAYFISH					X
3	Crustaceans	*PROCAMBARUS SHERMANI*	GULF CRAYFISH	X				
1	Arachnids	*AMBLYOMMA TUBERCLUATUM*	GOPHER TORTOISE TICK	X				
1	Insects	*CHELYOXENUS XEROBATIS*	TORTOISE BURROW HISTER BEETLE	X				
1	Insects	*EUTRICHOTA GOPHERI*	A COPRAPHAGOUS FLY	X				
1	Insects	*MACHIMUS POLYPHEMI*	A ROBBER FLY	X				
1	Insects	*NEONYMPHA MITCHELLI MITCHELLI*	MITCHELL'S SATYR		X			
1	Insects	*ONTHOPHAGUS POLYPHEMI SPARSISETOSUS*	A COPRAPHAGOUS BEETLE	X				
1	Insects	*PHILONTHUS TESTUDO*	WESTERN GOPHER TORTOISE ROVE BEETLE	X				
1	Insects	*POGONOMYRMEX BADIUS*	FLORIDA HARVESTER ANT	X	X		X	
1	Insects	*APHODIUS TROGLODYTES*	COPROPHAGOUS BEETLE	X				
2	Insects	*PSEUDOPOMALA BRACHYPTERA*	SHORT-WINGED TOOTHPICK GRASSHOPPER	X	X			

Mississippi Species of Greatest Conservation Need				Ecoregions				
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4	Insects	*GRYLLOTALPA MAJOR*	PRAIRIE MOLE CRICKET		X			
1	Fishes	*ACIPENSER OXRINCHUS DESOTOI*	GULF STURGEON				X	X
1	Fishes	*ALOSA ALABAMAE*	ALABAMA SHAD				X	X
1	Fishes	*AMBLOPLITES RUPESTRIS*	ROCK BASS		X			X
1	Fishes	*ETHEOSTOMA RANEYI*	YAZOO DARTER					X
1	Fishes	*ETHEOSTOMA RUBRUM*	BAYOU DARTER					X
1	Fishes	*ETHEOSTOMA ZONIFER*	BACKWATER DARTER		X			X
1	Fishes	*NOTROPIS CHALYBAEUS*	IRONCOLOR SHINER	X				X
1	Fishes	*NOTROPIS MELANOSTOMUS*	BLACKMOUTH SHINER	X				X
1	Fishes	*NOTURUS MUNITUS*	FRECKLEBELLY MADTOM					X
1	Fishes	*NOTURUS GLADIATOR*	PIEBALD MADTOM					X
1	Fishes	*PERCINA AURORA*	PEARL DARTER					X
1	Fishes	*PERCINA LENTICULA*	FRECKLED DARTER					X
1	Fishes	*PERCINA TANASI*	SNAIL DARTER					X
1	Fishes	*SCAPHIRHYNCHUS ALBUS*	PALLID STURGEON					X
1	Fishes	*SCAPHIRHYNCHUS SUTTKUSI*	ALABAMA STURGEON					X
2	Fishes	*AMMOCRYPTA MERIDIANA*	SOUTHERN SAND DARTER					X
2	Fishes	*COTTUS CAROLINAE*	BANDED SCULPIN					X
2	Fishes	*CRYSTALLARIA ASPRELLA*	CRYSTAL DARTER					X
2	Fishes	*CYCLEPTUS ELONGATUS*	BLUE SUCKER					X
2	Fishes	*CYCLEPTUS MERIDIONALIS*	SOUTHERN BLUE SUCKER					X
2	Fishes	*CYPRINELLA CALLISTIA*	ALABAMA SHINER					X
2	Fishes	*CYPRINELLA GALACTURA*	WHITETAIL SHINER					X
2	Fishes	*CYPRINELLA WHIPPLEI*	STEELCOLOR SHINER					X
2	Fishes	*ETHEOSTOMA BLENNIOIDES*	GREENSIDE DARTER					X
2	Fishes	*ETHEOSTOMA DURYI*	BLACK DARTER					X
2	Fishes	*ETHEOSTOMA KENNICOTTI*	STRIPETAIL DARTER					X
2	Fishes	*ETHEOSTOMA LACHNERI*	TOMBIGBEE DARTER					X
2	Fishes	*ETHEOSTOMA NIGRIPINNE*	BLACKFIN DARTER					X
2	Fishes	*ETHEOSTOMA ZONISTIUM*	BANDFIN DARTER					X
2	Fishes	*FUNDULUS DISPAR*	NORTHERN STARHEAD TOPMINNOW	X	X	X		X
2	Fishes	*FUNDULUS EURYZONUS*	BROADSTRIPE TOPMINNOW	X				X
2	Fishes	*FUNDULUS JENKINSI*	SALTMARSH TOPMINNOW				X	
2	Fishes	*ICHTHYOMYZON CASTANEUS*	CHESTNUT LAMPREY	X	X			X
2	Fishes	*MOXOSTOMA ANISURUM*	SILVER REDHORSE					X

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
2	Fishes	*MOXOSTOMA CARINATUM*	RIVER REDHORSE					X
2	Fishes	*MOXOSTOMA DUQUESNEI*	BLACK REDHORSE					X
2	Fishes	*MOXOSTOMA MACROLEPIDOTUM*	SHORTHEAD REDHORSE		X			X
2	Fishes	*NOTROPIS AMNIS*	PALLID SHINER		X			
2	Fishes	*NOTROPIS BOOPS*	BIGEYE SHINER					X
2	Fishes	*NOTROPIS CANDIDUS*	SILVERSIDE SHINER					X
2	Fishes	*NOTROPIS EDWARDRANEYI*	FLUVIAL SHINER					X
2	Fishes	*NOTROPIS MICROPTERYX*	HIGHLAND SHINER					X
2	Fishes	*NOTURUS FLAVUS*	STONECAT					X
2	Fishes	*PERCINA EVIDES*	GILT DARTER					X
2	Fishes	*PERCINA PHOXOCEPHALA*	SLENDERHEAD DARTER					X
2	Fishes	*PHENACOBIUS MIRABILIS*	SUCKERNOUTH MINNOW					X
2	Fishes	*PHOXINUS ERYTHROGASTER*	SOUTHERN REDBELLY DACE		X			X
2	Fishes	*PTERONOTROPIS WELAKA*	BLUENOSE SHINER					X
2	Fishes	*RHINICHTHYS ATRATULUS*	BLACKNOSE DACE					X
2	Fishes	*SANDER SP1*	SOUTHERN WALLEYE					X
2	Fishes	*SCAPHIRHYNCHUS PLATORYNCHUS*	SHOVELNOSE STURGEON					X
3	Fishes	*ATRACTOSTEUS SPATULA*	ALLIGATOR GAR		X	X	X	X
3	Fishes	*CLINOSTOMUS FUNDULOIDES*	ROSYSIDE DACE					X
3	Fishes	*CYPRINELLA SPILOPTERA*	SPOTFIN SHINER					X
3	Fishes	*ENNEACANTHUS GLORIOSUS*	BLUESPOTTED SUNFISH	X	X		X	X
3	Fishes	*ETHEOSTOMA ASPRIGENE*	MUD DARTER		X	X		X
3	Fishes	*ETHEOSTOMA FLABELLARE*	FANTAIL DARTER					X
3	Fishes	*ETHEOSTOMA RUFILINEATUM*	REDLINE DARTER					X
3	Fishes	*ETHEOSTOMA RUPESTRE*	ROCK DARTER					X
3	Fishes	*HETERANDRIA FORMOSA*	LEAST KILLIFISH	X	X		X	X
3	Fishes	*HYPENTELIUM ETOWANUM*	ALABAMA HOG SUCKER					X
3	Fishes	*ICTIOBUS NIGER*	BLACK BUFFALO		X	X		X
3	Fishes	*LYTHRURUS FASCIOLARIS*	ROSEFIN SHINER					X
3	Fishes	*MOXOSTOMA ERYTHRURUM*	GOLDEN REDHORSE					X
3	Fishes	*NOTROPIS SABINAE*	SABINE SHINER					X
3	Fishes	*PERCINA KATHAE*	MOBILE LOGPERCH					X
3	Fishes	*POLYODON SPATHULA*	PADDLEFISH	X	X	X		X
3	Fishes	*SANDER CANADENSE*	SAUGER		X	X		X
3	Fishes	*SANDER VITREUM*	WALLEYE	X	X	X		X

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
4	Fishes	*AMMOCRYPTA CLARA*	WESTERN SAND DARTER					X
4	Fishes	*LEPTOLUCANIA OMMATA*	PYGMY KILLIFISH	X			X	X
4	Fishes	*MACRHYBOPSIS GELIDA*	STURGEON CHUB					X
4	Fishes	*MACRHYBOPSIS MEEKI*	SICKLEFIN CHUB					X
4	Fishes	*NOTURUS EXILIS*	SLENDER MADTOM					X
4	Fishes	*PLATGOBIO GRACILIS*	FLATHEAD CHUB					X
1	Amphibians	*AMPHIUMA PHOLETER*	ONE-TOED AMPHIUMA					
1	Amphibians	*CRYPTOBRANCHUS ALLEGANIENSIS*	HELLBENDER					X
1	Amphibians	*LITHOBATES HECKSCHERI*	RIVER FROG	X				X
1	Amphibians	*LITHOBATES SEVOSUS*	DUSKY GOPHER FROG	X				
2	Amphibians	*ANEIDES AENEUS*	GREEN SALAMANDER		X			
2	Amphibians	*EURYCEA LUCIFUGA*	CAVE SALAMANDER		X			
2	Amphibians	*GYRINOPHILUS PORPHYRITICUS*	SPRING SALAMANDER		X			X
2	Amphibians	*HEMIDACTYLIUM SCUTATUM*	FOUR-TOED SALAMANDER	X	X			
2	Amphibians	*PLETHODON VENTRALIS*	SOUTHERN ZIGZAG SALAMANDER		X			
2	Amphibians	*PLETHODON WEBSTERI*	WEBSTER'S SALAMANDER	X	X			
2	Amphibians	*PSEUDACRIS ORNATA*	ORNATE CHORUS FROG	X				
2	Amphibians	*PSEUDOTRITON MONTANUS*	MUD SALAMANDER	X	X			X
2	Amphibians	*LITHOBATES AREOLATUS*	CRAWFISH FROG	X	X			
3	Amphibians	*AMBYSTOMA TEXANUM*	SMALL-MOUTHED SALAMANDER	X	X	X		
3	Amphibians	*LITHOBATES PALUSTRIS*	PICKEREL FROG	X	X	X		
3	Amphibians	*PSEUDACRIS BRACHYPHONA*	MOUNTAIN CHORUS FROG		X			
3	Amphibians	*PSEUDOTRITON RUBER*	RED SALAMANDER					X
4	Amphibians	*AMBYSTOMA TIGRINUM*	TIGER SALAMANDER	X	X			
1	Reptiles	*LEPIDOCHELYS KEMPII*	KEMP'S RIDLEY SEA TURTLE				X	
1	Reptiles	*OPHISAURUS MIMICUS*	MIMIC GLASS LIZARD	X				
1	Reptiles	*RHADINAEA FLAVILATA*	PINE WOODS SNAKE				X	
2	Reptiles	*CARETTA CARETTA*	LOGGERHEAD SEA TURTLE				X	
2	Reptiles	*CROTALUS ADAMANTEUS*	EASTERN DIAMONDBACK RATTLESNAKE	X				
2	Reptiles	*PLESTIODON ANTHRACINUS PLUVIALIS*	SOUTHERN COAL SKINK	X	X			
2	Reptiles	*FARANCIA ERYTROGRAMMA*	RAINBOW SNAKE					X
2	Reptiles	*GOPHERUS POLYPHEMUS*	GOPHER TORTOISE	X				
2	Reptiles	*GRAPTEMYS FLAVIMACULATA*	YELLOW-BLOTCHED MAP TURTLE	X				X

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
2	Reptiles	*GRAPTEMYS GIBBONSI*	PASCAGOULA MAP TURTLE	X	X			X
2	Reptiles	*GRAPTEMYS NIGRINODA*	BLACK-KNOBBED MAP TURTLE		X			X
2	Reptiles	*GRAPTEMYS OCULIFERA*	RINGED MAP TURTLE	X	X			X
2	Reptiles	*GRAPTEMYS PEARLENSIS*	PEARL RIVER MAP TURTLE	X	X			X
2	Reptiles	*GRAPTEMYS PULCHRA*	ALABAMA MAP TURTLE		X			X
2	Reptiles	*LAMPROPELTIS CALLIGASTER CALLIGASTER*	PRAIRIE KINGSNAKE		X	X		
2	Reptiles	*LAMPROPELTIS CALLIGASTER RHOMBOMACULATA*	MOLE KINGSNAKE	X	X			
2	Reptiles	*LAMPROPELTIS TRIANGULUM SYSPILA*	RED MILK SNAKE		X			
2	Reptiles	*MACROCHELYS TEMMINCKII*	ALLIGATOR SNAPPING TURTLE	X	X	X		X
2	Reptiles	*MALACLEMYS TERRAPIN PILEATA*	MISSISSIPPI DIAMONDBACK TERRAPIN				X	
2	Reptiles	*MICRURUS FULVIUS*	EASTERN CORAL SNAKE	X				
2	Reptiles	*NERODIA CLARKII CLARKII*	GULF SALT MARSH SNAKE				X	
2	Reptiles	*OPHISAURUS ATTENUATUS*	SLENDER GLASS LIZARD	X	X			
2	Reptiles	*PITUOPHIS MELANOLEUCUS LODINGI*	BLACK PINE SNAKE	X				
2	Reptiles	*PSEUDEMYS ALABAMENSIS*	ALABAMA RED-BELLIED TURTLE				X	X
2	Reptiles	*REGINA RIGIDA DELTAE*	DELTA CRAYFISH SNAKE	X				
2	Reptiles	*REGINA SEPTEMVITTATA*	QUEEN SNAKE					X
3	Reptiles	*CHELONIA MYDAS*	GREEN SEA TURTLE				X	
3	Reptiles	*DEIROCHELYS RETICULARIA MIARIA*	WESTERN CHICKEN TURTLE			X		
3	Reptiles	*DERMOCHELYS CORIACEA*	LEATHERBACK SEA TURTLE				X	
3	Reptiles	*LAMPROPELTIS GETULA NIGRA*	BLACK KINGSNAKE		X			
3	Reptiles	*MASTICOPHIS FLAGELLUM*	EASTERN COACHWHIP	X	X		X	
3	Reptiles	*PITUOPHIS MELANOLEUCUS MELANOLEUCUS*	NORTHERN PINE SNAKE		X			
3	Reptiles	*REGINA RIGIDA SINICOLA*	GULF CRAYFISH SNAKE	X				
4	Reptiles	*DRYMARCHON COUPERI*	EASTERN INDIGO SNAKE	X				
4	Reptiles	*ERETMOCHELYS IMBRICATA*	HAWKSBILL SEA TURTLE				X	
4	Reptiles	*HETERODON SIMUS*	SOUTHERN HOGNOSE SNAKE	X			X	
1	Birds		Migrant Songbirds	X	X	X	X	
1	Birds		Pelagic Birds				X	
1	Birds	*CHARADRIUS NIVOSUS*	SOUTHEASTERN SNOWY PLOVER				X	
1	Birds	*CHARADRIUS WILSONIA*	WILSON'S PLOVER				X	

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
1	Birds	*COTURNICOPS NOVEBORACENSIS*	YELLOW RAIL	X	X	X	X	
1	Birds	*ELANOIDES FORFICATUS*	SWALLOW-TAILED KITE	X	X	X		
1	Birds	*FALCO SPARVERIUS PAULUS*	SOUTHEASTERN AMERICAN KESTREL	X	X		X	
1	Birds	*GRUS CANADENSIS PULLA*	MISSISSIPPI SANDHILL CRANE	X			X	
1	Birds	*HAEMATOPUS PALLIATUS*	AMERICAN OYSTERCATCHER				X	
1	Birds	*LATERALLUS JAMAICENSIS*	BLACK RAIL	X	X	X	X	
1	Birds	*RALLUS ELEGANS*	KING RAIL	X	X	X	X	
1	Birds	*THRYOMANES BEWICKII*	BEWICK'S WREN	X	X	X		
2	Birds	*AQUILA CHRYSAETOS*	GOLDEN EAGLE	X	X	X		
2	Birds	*PEUCAEA AESTIVALIS*	BACHMAN'S SPARROW	X	X		X	
2	Birds	*AMMODRAMUS HENSLOWII*	HENSLOW'S SPARROW	X			X	
2	Birds	*AMMODRAMUS LECONTEII*	LE CONTE'S SPARROW	X	X	X		
2	Birds	*AMMODRAMUS MARITIMUS*	SEASIDE SPARROW				X	
2	Birds	*AMMODRAMUS NELSONI*	NELSON'S SPARROW				X	
2	Birds	*AMMODRAMUS SAVANNARUM*	GRASSHOPPER SPARROW	X	X	X		
2	Birds	*ANAS FULVIGULA*	MOTTLED DUCK	X			X	
2	Birds	*ASIO FLAMMEUS*	SHORT-EARED OWL	X	X	X	X	
2	Birds	*CALIDRIS CANUTUS*	RED KNOT				X	
2	Birds	*CHARADRIUS MELODUS*	PIPING PLOVER				X	
2	Birds	*COLUMBIA PASSERINA*	COMMON GROUND-DOVE	X	X	X	X	
2	Birds	*SETOPHAGA CERULEA*	CERULEAN WARBLER	X	X	X	X	
2	Birds	*EGRETTA CAERULEA*	LITTLE BLUE HERON	X	X	X	X	
2	Birds	*EGRETTA RUFESCENS*	REDDISH EGRET				X	
2	Birds	*EUDOCIMUS ALBUS*	WHITE IBIS	X	X	X	X	
2	Birds	*EUPHAGUS CAROLINUS*	RUSTY BLACKBIRD	X	X	X		
2	Birds	*HALIAEETUS LEUCOCEPHALUS*	BALD EAGLE	X	X	X	X	X
2	Birds	*LIMOTHLYPIS SWAINSONII*	SWAINSON'S WARBLER	X	X	X	X	
2	Birds	*LIMOSA FEDOA*	MARBLED GODWIT				X	
2	Birds	*MYCTERIA AMERICANA*	WOOD STORK	X	X	X		
2	Birds	*PASSERINA CIRIS*	PAINTED BUNTING	X	X	X	X	
2	Birds	*PICOIDES BOREALIS*	RED-COCKADED WOODPECKER	X	X			
2	Birds	*RYNCHOPS NIGER*	BLACK SKIMMER				X	
2	Birds	*STERNA ANTILLARUM*	LEAST TERN				X	
2	Birds	*STERNA ANTILLARUM ATHALASSOS*	INTERIOR LEAST TERN			X		X
2	Birds	*THALASSEUS MAXIMUS*	ROYAL TERN				X	

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
2	Birds	*GELOCHELIDON NILOTICA*	GULL-BILLED TERN				X	
2	Birds	*THALASSEUS SANDVICENSIS*	SANDWICH TERN				X	
3	Birds	*PELECANUS OCCIDENTALIS*	BROWN PELICAN				X	
3	Birds	*ANHINGA ANHINGA*	ANHINGA	X	X	X		
3	Birds	*AYTHYA AFFINIS*	LESSER SCAUP	X	X	X	X	
3	Birds	*BOTAURUS LENTIGINOSUS*	AMERICAN BITTERN	X	X	X	X	
3	Birds	*CALIDRIS ALPINA*	DUNLIN	X	X	X	X	
3	Birds	*CALIDRIS MAURI*	WESTERN SANDPIPER	X	X	X	X	
3	Birds	*ANTROSTOMUS CAROLINENSIS*	CHUCK-WILL'S-WIDOW	X	X	X	X	
3	Birds	*COLINUS VIRGINIANUS*	NORTHERN BOBWHITE	X	X	X		
3	Birds	*SETOPHAGA DISCOLOR*	PRAIRIE WARBLER	X	X	X	X	
3	Birds	*EGETTA THULA*	SNOWY EGRET	X	X	X	X	
3	Birds	*EGRETTA TRICOLOR*	TRICOLORED HERON	X	X	X	X	
3	Birds	*FALCO PEREGRINUS*	PEREGRINE FALCON				X	
3	Birds	*HELMITHEROS VERMIVORUS*	WORM-EATING WARBLER	X	X		X	
3	Birds	*HYLOCICHLA MUSTELINA*	WOOD THRUSH	X	X	X	X	
3	Birds	*IXOBRYCHUS EXILIS*	LEAST BITTERN	X	X	X	X	
3	Birds	*LANIUS LUDOVICIANUS*	LOGGERHEAD SHRIKE	X	X	X	X	
3	Birds	*MELANERPES ERYTHROCEPHALUS*	RED-HEADED WOODPECKER	X	X	X	X	
3	Birds	*NYCTICORAX NYCTICORAX*	BLACK-CROWNED NIGHT-HERON	X	X	X	X	
3	Birds	*NYCTANASSA VIOLACEUS*	YELLOW-CROWNED NIGHT-HERON	X	X	X	X	
3	Birds	*GEOTHLYPIS FORMOSUS*	KENTUCKY WARBLER	X	X	X	X	
3	Birds	*PANDION HALIAETUS*	OSPREY	X	X	X	X	X
3	Birds	*PIRANGA OLIVACEA*	SCARLET TANAGER	X	X		X	
3	Birds	*PORPHYRULA MARTINICA*	PURPLE GALLINULE	X	X	X	X	
3	Birds	*PROTONOTARIA CITREA*	PROTHONOTARY WARBLER	X	X	X	X	
3	Birds	*SCOLOPAX MINOR*	AMERICAN WOODCOCK	X	X	X	X	
3	Birds	*PARKESIA MOTACILLA*	LOUISIANA WATERTHRUSH	X	X	X	X	
3	Birds	*SITTA PUSILLA*	BROWN-HEADED NUTHATCH	X	X			
3	Birds	*TYTO ALBA*	BARN OWL	X	X	X	X	
4	Birds	*CAMPEPHILUS PRINCIPALIS*	IVORY-BILLED WOODPECKER					
4	Birds	*VERMIVORA BACHMANII*	BACHMAN'S WARBLER		X	X		
1	Mammals	*MYOTIS AUSTRORIPARIUS*	SOUTHEASTERN MYOTIS	X	X	X	X	
1	Mammals	*SPILOGALE PUTORIUS*	EASTERN SPOTTED SKUNK	X	X			
1	Mammals	*URSUS AMERICANUS LUTEOLUS*	LOUISIANA BLACK BEAR	X	X	X		

Mississippi Species of Greatest Conservation Need				Ecoregions				
TIER	GROUP	SCIENTIFIC NAME	COMMON NAME	EGCP	UEGCP	MSRAP	NGM	STREAMS
2	Mammals	*CORYNORHINUS RAFINESQUII*	RAFINESQUE'S BIG-EARED BAT	X	X	X		
2	Mammals	*LASIURUS CINEREUS*	HOARY BAT	X	X	X		
2	Mammals	*LASIURUS INTERMEDIUS*	NORTHERN YELLOW BAT	X	X		X	
2	Mammals	*MYOTIS GRISESCENS*	GRAY BAT		X			
2	Mammals	*MYOTIS LUCIFUGUS*	LITTLE BROWN BAT	X	X	X		
2	Mammals	*MYOTIS SEPTENTRIONALIS*	NORTHERN LONG-EARED BAT	X	X	X		
2	Mammals	*PEROMYSCUS POLIONOTUS*	OLDFIELD MOUSE	X	X			
2	Mammals	*TRICHECHUS MANATUS*	MANATEE				X	X
2	Mammals	*URSUS AMERICANUS*	BLACK BEAR		X	X		
2	Mammals	*ZAPUS HUDSONIUS*	MEADOW JUMPING MOUSE		X			
2	Mammals	*MYOTIS SODALIS*	INDIANA BAT		X			
3	Mammals	*MUSTELA FRENATA*	LONG-TAILED WEASEL	X	X			
3	Mammals	*SCIURUS NIGER BACHMANI*	BACHMAN FOX SQUIRREL	X	X			
4	Mammals	*LASIONYCTERIS NOCTIVAGANS*	SILVER-HAIRED BAT	X	X	X		
4	Mammals	*PUMA CONCOLOR CORYI*	FLORIDA PANTHER					

APPENDIX VII

Pelagic and Migratory Bird Species of Concern Included as Groups in Mississippi's Wildlife Habitat Subtype

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 SWAP. 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 River Alluvial Plain Ecoregion.

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 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

Great 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 VIII

Crosswalk of SWAP Habitat Types and Subtypes with Ecological Community Types

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Xeric Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.492	East Gulf Coastal Plain Dry Chalk Bluff
Xeric Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.502	Southern Coastal Plain Limestone Forest
Xeric Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.483	East Gulf Coastal Plain Northern Dry Upland Hardwood Forest
Xeric Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.482	East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland
Xeric Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.560	Southern Coastal Plain Dry Upland Hardwood Forest
Xeric Longleaf Pine Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.496	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland
Xeric-Mesic Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.502	Southern Coastal Plain Limestone Forest
Xeric-Mesic Hardwood Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.477	East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest
Xeric-Mesic Shortleaf/ Loblolly Pine Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.506	East Gulf Coastal Plain Interior Shortleaf Pine- Oak Forest
Xeric-Mesic Shortleaf/ Loblolly Pine Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.557	East Gulf Coastal Plain Interior Shortleaf Pine- Oak Forest
Xeric-Mesic Shortleaf/ Loblolly Pine Forests	Xeric-Mesic Upland Forests/Woodlands	CES203.557	East Gulf Coastal Plain Southern Loblolly- Hardwood Flatwoods
Southern Mixed Hardwood Forests	Mesic Upland Forests	CES203.556	East Gulf Coastal Plain Southern Loess Bluff Forest
Southern Mixed Hardwood Forests	Mesic Upland Forests	CES203.476	Southern Coastal Mesic Slope Forest
Mesic Longleaf Pine Savanna/ Forests	Mesic Upland Forests	CES203.496	East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland
Loess Hardwood Forests	Mesic Upland Forests	CES203.481	East Gulf Coastal Plain Northern Loess Bluff Forest
Lower Slope/High Terrace Hardwood Forests	Mesic Upland Forests	CES203.196	Mississippi River High Floodplain (Bottomland) Forest

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Lower Slope/High Terrace	Mesic Upland Forests	CES203.501	Southern Coastal Plain Hydric Hammock
Rock Outcrops	Rock Outcrops and Caves	CE203.398	Southeastern Coastal Plain Cliff
Caves	Rock Outcrops and Caves	NOEQUIV	NO EQUIVALENT
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
Bald Cypress/Gum Swamp Forests	Swamp Forests	CES203.558	East Gulf Coastal Plain Depression Pond
Bald Cypress/Gum Swamp Forests	Swamp Forests	CES203.490	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
Cottonwood/Black Willow/ River Birch Woodlands	Riverfront Forests/ Sandbars	CES203.190	Mississippi River Riparian Forest
Sandbars	Riverfront Forests/ Sandbars	NOEQUIV	NO EQUIVALENT
Northeast Prairie/Cedar Glades	Prairies	CES203.478	Southern Coastal Plain Blackland Prairie and Woodland
Jackson Prairie	Prairies	CES203.478	Southern Coastal Plain Blackland Prairie and Woodland
Wet Pine Savannas	Wet Pine Savannas/Flatwoods./Bogs	CES203.192	East Gulf Coastal Plain Savanna and Wet Prairie
Slash Pine Flatwoods	Wet Pine Savannas/Flatwoods/Bogs	CES203.192	East Gulf Coastal Plain Savanna and Wet Prairie
Pitcherplant Flat/Bogs	Wet Pine Savannas/Flatwoods./Bogs	CES203.385	East Gulf Coastal Plain Interior Shrub Bog
Pitcherplant Flat/Bogs	Wet Pine Savannas/Flatwoods./Bogs	CES203.078	Southern Coastal Plain Herbaceous Seepage Bog
Freshwater Marshes	Inland Freshwater Marshes	CES203.558	East Gulf Coastal Plain Depression Pond
Oxbow Lakes	Lacustrine Communities	CES203.490	Mississippi River Bottomland Depression
Reservoirs	Lacustrine Communities	NOEQUIV	NO EQUIVALENT

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
Ephemeral (Temporary) Ponds	Lacustrine Communities	CES203.558	East Gulf Coastal Plain Depression Pond
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	NOEQUIV	NO EQUIVALENT
Northeast Hills, Tennessee River Drainage	Streams	NOEQUIV	NO EQUIVALENT
Tombigbee Drainage	Streams	NOEQUIV	NO EQUIVALENT
Lower Mississippi North Drainage (LMND) Hatchie And Wolf Systems	Streams	NOEQUIV	NO EQUIVALENT
Upper Coastal Plain, Yazoo Drainage	Streams	NOEQUIV	NO EQUIVALENT
Big Black River Drainage	Streams	NOEQUIV	NO EQUIVALENT
Upper Coastal Plain, Pearl River Drainage	Streams	NOEQUIV	NO EQUIVALENT
Mississippi Alluvial Plain (MAP)	Streams	NOEQUIV	NO EQUIVALENT
Lower Coastal Plain, Pearl Drainage	Streams	NOEQUIV	NO EQUIVALENT
Pascagoula Drainage	Streams	NOEQUIV	NO EQUIVALENT
Coastal Rivers Drainage	Streams	NOEQUIV	NO EQUIVALENT
Lake Ponchartrain Drainage	Streams	NOEQUIV	NO EQUIVALENT
Lower Mississippi South Drainage	Streams	NOEQUIV	NO EQUIVALENT
Barrier Island Uplands	Upland Maritime and Estuarine Fringe Habitats	CES203.500	East Gulf Coastal Plain Dune and Coastal Grassland
Barrier Island Wetlands	Upland Maritime and Estuarine Fringe Habitats	CES203.500	East Gulf Coastal Plain Dune and Coastal Grassland
Barrier Island Wetlands	Upland Maritime and Estuarine Fringe Habitats	CES203.503	East Gulf Coastal Plain Maritime Forest
Barrier Island Wetlands	Upland Maritime and Estuarine Fringe Habitats	CES203.258	Southeastern Coastal Plain Interdunal Wetland
Barrier Island Beaches	Upland Maritime and Estuarine Fringe Habitats	CES203.266	Florida Panhandle Beach Vegetation
Mainland Natural 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	North-Central Gulf of Mexico Salt and Brackish Tidal Marsh
Maritime Woodlands	Upland Maritime and Estuarine Fringe Habitats	CES203.375	East Gulf Coastal Plain Near-Coast Pine

SUBTYPE NAME	HABITAT NAME	ES CODE	ECOLOGICAL SYSTEM NAME
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	Estuary and Mississippi Sound (Inside or Associated with Barrier Islands)	NOEQUIV	NO EQUIVALENT
Estuarine Marshes	Estuarine Habitats incl. Mississippi Sound	CES203.299	East Gulf Coastal Plain Freshwater Tidal Wooded Swamp
Estuarine Marshes	Estuarine Habitats incl. Mississippi Sound	CES203.303	North-central Gulf of Mexico Salt and Brackish Tidal
Estuarine Marshes	Estuarine Habitats incl. Mississippi Sound	CE203.067	Mississippi Sound Fresh and Oligohaline Tidal Marsh
Salt Pannes	Estuarine Habitats incl. Mississippi Sound	CES203.303	North-central Gulf of Mexico 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
Mississippi Sound (Smooth Bottom)	Estuarine Habitats incl. Mississippi Sound	NOEQUIV	NO EQUIVALENT
Barrier Island Passes	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
Man-Made Beaches	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Artificial Reefs	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Urban And Suburban Lands	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Buildings, Bridges, Overpasses, Etc.	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Utility Right-of-ways	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Hay and Pasture Lands	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Pine Plantations	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Shrublands	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Row Crops	Artificial Habitats	NOEQUIV	NO EQUIVALENT
Artificial Ponds	Artificial Habitats	NOEQUIV	NO EQUIVALENT

APPENDIX IX

Habitat Reference Sites in Mississippi

The habitat reference sites used in Chapter 5 of Mississippi's SWAP are summarized below for the Upper East Gulf Coastal Plain, East Gulf Coastal Plain and Mississippi River Alluvial Plain ecoregions. The purpose is to provide a representative example of most habitats described in the state plan. This is not a comprehensive list of the habitats found on each reference site. Column 1 lists the habitat subtype, column 2 lists the ecological community, and column 3, if present, lists a specific area.

Upper East Gulf Coastal Plain Ecoregion Habitat Reference Sites

Bienville National Forest

7.2 Jackson Prairie	Jackson Prairie	Harrell Hill Botanical Area
7.2 Jackson Prairie	Cedar glades/barrens	

Chitlin Corners, in Lowndes and Noxubee Counties

1.1 Xeric Hardwood Forests	Dry oak-hickory forest/woodland with pine

Clark Creek Natural Area in Wilkinson County

2.2 Loess Hardwood Forests	Coastal plain loess forest
3.1 Rock Outcrops	

Columbus Lake in Clay and Lowndes counties

5.1 Bald Cypress/Gum Swamp Forests	Bald cypress-black gum swamp forests

Coonewah Creek Chalk Bluffs, a TNC holding in Lee County

2.3 Lower Slope/High Terrace Hardwood Forests	Mesic calcareous bluff forests

Crawford Lake in Noxubee County

5.1 Bald Cypress/Gum Swamp Forests	Bald cypress-black gum swamp forests

Enid Lake [Reservoir] in Yalobusha County

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric upper slope shortleaf pine forests
9.2 Reservoirs	

George P. Cossar State Park in Yalobusha County

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Lower slope mixed hardwood –pine forests
2.3 Lower Slope/High Terrace Hardwood Forests	Lower slope mixed hardwood—pine forests

Grenada Lake [Reservoir] in Grenada County

1.2 Xeric to Mesic Hardwood and Hardwood/Pine Forests	Xeric-mesic mixed oak-pine Forests	Richmond Mound Natural Area
4.1 Bottomland Hardwood Forests	Wet hardwood bottom forests	
9.2 Reservoirs		

Hell Creek WMA in Tippah County

1.1 Xeric Hardwood Forests	Dry upper slope oak forest

Holly Spring National Forest

1.1 Xeric Hardwood Forests	Dry oak-hickory forest/woodland with pine
1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric-mesic pine forest
2.3 Lower Slope/High Terrace Hardwood Forests	Mesic lowland hardwood forests
2.3 Lower Slope/High Terrace Hardwood Forests	Wooded seeps/spring seeps/wet terraces
6.1 Cottonwood/Black Willow/River Birch Woodlands	Native vinelands

Hugh White State Park, in Grenada County

1.2 Xeric to Mesic Hardwood and Hardwood/Pine Forests	Xeric-mesic mixed oak forests	Little Mountain Natural Area

J.P. Coleman State Park Tishomingo County

1.1 Xeric **Hardwood Forests**	Chestnut oak slope and ridge forests
1.1 Xeric **Hardwood Forests**	Wet calcareous cliffs

Jeff Busby State Park, in Choctaw County

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric upper slope pine-oak forests

John Kyle State Park in Panola County

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Lower slope mixed hardwood –pine forest

John W. Starr Memorial Forest

1.2 Xeric to Mesic Hardwood and Hardwood/Pine Forests	Interior flatwoods forests
4.1 Bottomland Hardwood Forests	Sweetgum – mixed oak bottomland forests

LeFleur's Bluff State Park in Hinds County

4.1 Bottomland Hardwood Forests	Sugarberry - American elm - green ash bottomland forests
4.1 Bottomland Hardwood Forests	Silver maple - mixed floodplain forest
6.1 Cottonwood/Black Willow/River Birch Woodlands	Black willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	Eastern cottonwood-willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	River birch-sycamore riverfront forests

Natchez Trace Parkway

3.1 Rock Outcrops		Owens Creek area in Claiborne County
3.1 Rock Outcrops		Cave Springs in Tishomingo County
3.1 Rock Outcrops		Eastern side of Lindsey Creek in Hinds County
7.1 Black Belt Prairie	Cedar glades/barrens	Blackbelt pullout Lee County
9.3 Ephemeral (Temporary) Ponds	Ephemeral ponds	Natchez Trace Parkway in Hinds County:

Sam D. Hamilton Noxubee National Wildlife Refuge in Noxubee, Oktibbeha, and Winston Counties

1.1 Xeric Hardwood Forests	Oak-cedar forests	Morgan Hill Research Natural Area
1.2 Xeric to Mesic Hardwood and Hardwood/Pine Forests	Interior flatwoods forests	
1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Lower slope pine forest	
2.3 Lower Slope/High Terrace Hardwood Forests	Forested canebrakes	
2.3 Lower Slope/High Terrace Hardwood Forests	Wooded seeps/spring seeps/wet terraces	
4.1 Bottomland Hardwood Forests	Oak - mixed hardwood ridge bottom forests	
4.1 Bottomland Hardwood Forests	Sweetgum – mixed oak bottomland forests	
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress swamp	
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress-water tupelo swamp	
5.1 Bald Cypress/Gum Swamp Forests	Tupelo swamps	
6.1 Cottonwood/Black Willow/River Birch Woodlands	River birch-sycamore riverfront forests	
9.4 Beaver Ponds	Beaver ponds	

Osborn Prairie near Starkville

7.1 Black Belt Prairie	Chalk bluff Black Belt prairie
7.1 Black Belt Prairie	Vertisol Black Belt prairie

Pearl River around the Ross Barnett Reservoir in Rankin, Scott, and Leake Counties

2.3 Lower Slope/High Terrace Hardwood Forests	Mixed hardwoods forest – spruce pine

Ross Barnett Reservoir in Madison and Hinds Counties

4.1 Bottomland Hardwood Forests	Bottomland hardwood – pine forests	
4.1 Bottomland Hardwood Forests	Oak - mixed hardwood ridge bottom forests	Mule Jail Multi-use trail
8.1 Freshwater Marshes	Semi-permanently flooded marsh	Pearl River Wildlife Management Area, Madison County
9.1 Oxbow Lakes	Oxbow lakes	Pearl River Wildlife Management Area of Rankin County

Sardis Lake [Reservoir] in Panola and Lafayette Counties

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric upper slope shortleaf pine forests
8.1 Freshwater Marshes	Freshwater marsh
9.2 Reservoirs	

Shelton Mountain, a Weyerhauser property in Webster County

1.1 Xeric Hardwood Forests	Dry oak-hickory forest/woodland with pine

Strawberry Plains Audubon Center in Marshall County

1.1 Dry Hardwood Forests	Dry oak-hickory forest/woodland with pine
6.1 Cottonwood/Black Willow/River Birch Woodlands	Black willow riverfront pioneer forests

Tishomingo State Park, in Tishomingo County

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric upper slope pine-oak forests
3.1 Rock Outcrops	

Tombigbee National Forest in Winston County

2.1 Southern Mixed Hardwood Forests	Beech-magnolia forests	Noxubee Crest Natural Research Area
2.1 Southern Mixed Hardwood Forests	Wooded/spring seeps	Noxubee Crest Natural Research Area
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress-black gum swamp forests	Choctaw Lake Recreational Area
5.1 Bald Cypress/Gum Swamp Forests	Buttonbush-swamp privet shrub wetlands	Choctaw Lake Recreational Area
5.2 Small Stream Swamp Forests	Coastal plain small stream swamp forest	Choctaw Lake Recreational Area

Tombigbee State Park

2.3 Lower Slope/High Terrace Hardwood Forests	Lower slope mixed hardwood forests

Wall Doxey State Park, in Marshall County: Dry oak – hickory forest

1.3 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric upper slope pine-oak forests

Yockanookany Wildlife Management Area in Attala County

4.1 Bottomland Hardwood Forests	Bottomland hardwood – pine forests
4.1 Bottomland Hardwood Forests	Diamondleaf oak - willow oak - water oak forests

Notes:
To limit disturbance no reference sites are listed for caves.
No reference sites are listed for sandbars. They are common and widespread.

East Gulf Coastal Plain Ecoregion Habitat Reference Sites

Bienville National Forest

2.3 Lower Slope/High Terrace Hardwood Forests	Lower slope mixed hardwood—pine forest	Swaggart's Bluff in Smith County
3.1 Rock Outcrops		Swaggart's Bluff in Smith County
4.1 Bottomland Hardwood Forests	Bottomland hardwood – pine forests	
4.1 Bottomland Hardwood Forests	Oak – mixed hardwood ridge bottom forests	Pineville Natural Area in Smith County
4.1 Bottomland Hardwood Forests	Diamondleaf oak - willow oak - water oak forests	

Bogue Homa in Jones County

9.2 Reservoirs	

MDWFP's Calling Panther Lake property in Copiah County

3.1 Rock Outcrops	

Cat's Den Cave, a TNC holding, in Smith County

2.3 Lower Slope/High Terrace Hardwood Forests	Mesic calcareous bluff forest
3.1 Rock Outcrops	

Copiah County Wildlife Management Area

1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric- mesic pine forests

De Soto National Forest

1.1 Dry Hardwood Forests	Turkey oak – sand post oak woodlands	Mars Hill Sandhill, in Perry County
1.2 Dry Longleaf Pine Forests	Sandhill longleaf forests	Little Florida area, in Harrison County
1.2 Dry Longleaf Pine Forests	Longleaf – saw palmetto woodlands	Harrison Experimental Forest Research Natural Area in Harrison County
1.4 Xeric to Mesic Shortleaf/ Loblolly Pine Forests	Xeric- mesic pine forests	
1.4 Xeric to Mesic Shortleaf/ Loblolly Pine Forests	Lower slope pine forests	
2.2 Mesic Longleaf Pine Savanna/ Forests	Longleaf pine clay savanna and glades	East Sandy Creek Natural Area in Stone County :
2.2 Mesic Longleaf Pine Savanna/ Forests	Dry longleaf pine forest	Deep Creek, Forest in Perry County
2.2 Mesic Longleaf Pine Savanna/ Forests	Pine seeps	Buttercup Flats Natural Area, in Stone County
2.3 Lower Slope/High Terrace Hardwood Forests	Lower slope mixed hardwood forests	Long Branch Ravine Natural Area in Stone County
2.3 Lower Slope/High Terrace Hardwood Forests	Mixed hardwoods forest with spruce pine	Wyatt Hills in George County
5.2 Small Stream Swamp Forests	Coastal plain small stream swamp forests	Deep Creek drainage
5.2 Small Stream Swamp Forests	Bayhead forest habitat	Deep Creek and Mars Hill Area in southeastern Perry County
5.2 Small Stream Swamp Forests	Shrub bogs	Railroad Creek Natural Area
7.3 Pitcherplant Flat/Bogs	Pitcherplant flat/ bog/ wet savanna	Buttercup Flats Natural Area, in Stone County
7.3 Pitcherplant Flat/Bogs	Quaking bogs	Larue quaking bogs in Jackson County
9.3 Ephemeral (Temporary) Ponds	Ephemeral ponds	Mars Hill area

Grand Bay National Estuarine Research Reserve in Jackson County

5.1 Bald Cypress/Gum Swamp Forests	Wet pond cypress depressions
7.1 Wet Pine Savannas	Wet slash (longleaf) pine savanna/forest/flatwoods
7.1 Wet Pine Savannas	Wet pine - pond cypress savannas

The Nature Conservancy's Harvell and Pellerree Jackson Sandhills Preserve in George County

1.2 Dry Longleaf Pine Forests	Longleaf pine forests with beach rosemary

Homochitto National Forest

1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric-mesic pine forests
1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Lower slope pine forests
9.2 Reservoirs	Lake Okhissa in Franklin County
9.4 Beaver Ponds	Clear Springs Recreational Area in Franklin County

Jasper County Longleaf Pine Natural Area, south of Bay Springs, MS

1.2 Dry Longleaf Pine Forests	Longleaf pine – blackjack oak woodlands

Mars WMA in Pearl River County

5.2 Small Stream Swamp Forests	White cedar swamp forests

Mississippi Sandhill Crane National Wildlife Refuge in Jackson County

7.1 Wet Pine Savannas	Wet slash (longleaf) pine savanna/forest/flatwoods
7.1 Wet Pine Savannas	Wet pine - pond cypress savannas
7.2 Slash Pine Flatwoods	Slash pine flatwoods/savanna with wiregrass
7.3 Pitcherplant Flat/Bogs	pitcherplant flat/ bog/ wet savanna

Old Fort Bayou, a TNC holding, in Jackson County

9.3 Ephemeral (Temporary) Ponds	Grady ponds

Old River Wildlife Management Area in Pearl River County

2.3 Lower Slope/High Terrace Hardwood Forests	Forested canebrakes
5.1 Bald Cypress/Gum Swamp Forests	Buttonbush - swamp privet shrub wetlands
6.1 Cottonwood/Black Willow/River Birch Woodlands	Black willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	Eastern cottonwood - willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	River birch - sycamore riverfront forests
6.2 Sandbars	
9.1 Oxbow Lake	Floodplain pool

Pascagoula WMA in Jackson and George Counties

1.1 Xeric Hardwood Forests	Dry oak-hickory forest/woodland with pine
2.1 Southern Mixed Hardwood Forests	Beech-magnolia forest
4.1 Bottomland Hardwood Forests	Wet hardwood bottom forests
4.1 Bottomland Hardwood Forests	Sweetgum with mixed oak bottomland forests
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress swamps
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress - water tupelo swamps
5.1 Bald Cypress/Gum Swamp Forests	Tupelo swamps
5.1 Bald Cypress/Gum Swamp Forests	Bald cypress-black gum swamp forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	Black willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	Eastern cottonwood - willow riverfront pioneer forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	River birch - sycamore riverfront forests
6.1 Cottonwood/Black Willow/River Birch Woodlands	Native vinelands
6.2 Sandbars	
9.1 Oxbow Lake	Floodplain pool

Paul B. Johnson State Park in Forrest County

2.2 Mesic Longleaf Pine Savanna/Forests	Loamy hills longleaf –slash pine forests
8.1 Freshwater Marshes	White waterlily - jointed spikesedge herbaceous vegetation
8.1 Freshwater Marshes	Freshwater marsh
8.1 Freshwater Marshes	Semipermanently flooded marsh

The Nature Conservancy's Red Creek Mitigation Bank in Jackson County

1.3 Xeric to Mesic Hardwood and Hardwood/Pine Forests	Xeric-mesic mixed oak - pine forests
5.2 Small Stream Swamp Forests	bay forest swamp habitat
5.2 Small Stream Swamp Forests	Titi thickets

Roosevelt State Park in Scott County

1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Xeric- mesic pine forests
1.4 Xeric to Mesic Shortleaf/Loblolly Pine Forests	Lower slope pine forests

Ward Bayou Wildlife Management Area in Jackson and George Counties

1.1 Dry Hardwood Forests	Dry oak-hickory forest/woodland with pine
2.1 Southern Mixed Hardwood Forests	Beech-magnolia forest
4.1 Bottomland Hardwood Forests	Silver maple - mixed floodplain forests

West Tallahalla Creek floodplain bordering Cat's Den Cave site in Smith County

4.1 Bottomland Hardwood Forests	Sweetgum with mixed oak bottomland forests

Note: To limit disturbance, no reference sites are listed for caves.

Mississippi River Alluvial Plain Ecoregion Habitat Reference Sites

Delta National Forest

1.1 Bottomland Hardwood Forest	Wet hardwood bottom forest	
1.1 Bottomland Hardwood Forest	Sugarberry-American elm-green ash bottomland forest	
1.1 Bottomland Hardwood Forest	Sweetgum with mixed oak bottomland forest	Red Gum Research Natural Area

Great River Road State Park, Bolivar County

3.1 Cottonwood/Black Willow/River Birch Woodlands	Mississippi River sandfield mixed herbland.

Indianola Wildlife Management Area

4.1 Freshwater Marsh	Semi-permanently flooded marshes

Malmaison Wildlife Management Area, Grenada, Carroll, and Leflore counties

1.1 Bottomland Hardwood Forest	Oak-mixed hardwood ridge bottom forest
1.1 Bottomland Hardwood Forest	Sweetgum with mixed oak bottomland forest

Mahannah Wildlife Management Area, Issaquena County

1.1 Bottomland Hardwood Forest	Diamondleaf oak-willow oak-water oak forest

O'Keefe Wildlife Management Area, Quitman County

1.1 Bottomland Hardwood Forest	Sweetgum with mixed oak bottomland forest

Shipland Wildlife Management Area in Issaquena County

1.1 Bottomland Hardwood Forest	Silver maple-mixed floodplain forest
3.1 Cottonwood/Black Willow/River Birch Woodlands	Black willow riverfront pioneer forest
3.1 Cottonwood/Black Willow/River Birch Woodlands	Native vinelands
5.1 Oxbow Lake	Floodplain pool

Sky Lake Wildlife Management Area, Humphries County

2.1 Bald Cypress/Gum Swamp Forest	Bald cypress-swamp tupelo swamp forest

St. Catherine's Creek National Wildlife Refuge, Adams County

2.1 Bald Cypress/Gum Swamp Forest	Bald cypress swamp
2.1 Bald Cypress/Gum Swamp Forest	Bald cypress-water tupelo swamp
2.1 Bald Cypress/Gum Swamp Forest	Tupelo swamps
2.1 Bald Cypress/Gum Swamp Forest	Bald cypress-hardwood swamp forest
2.1 Bald Cypress/Gum Swamp Forest	Buttonbush-swamp privet shrub wetlands
3.1 Cottonwood/Black Willow/River Birch Woodlands	Eastern Cottonwood-willow riverfront pioneer forest
3.1 Cottonwood/Black Willow/River Birch Woodlands	Native vinelands

Swan Lake, Clarksdale

4.1 Freshwater Marsh	Semipermanently flooded marshes

Note: No reference site is included for ephemeral ponds 5.2

APPENDIX X

Interpreting NatureServe Conservation Status Ranks

Conservation Status Ranks are mentioned in the descriptions of conditions for each Habitat Subtype in Chapter 5. 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.

APPENDIX XI

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.

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)
- MEDIUM Plan and conduct species status surveys

CYPROGENIA ABERTI (WESTERN FANSHELL)
- LOW Plan and conduct species status surveys to determine if this species still occurs in Mississippi

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
- HIGH Monitor extant population.
- HIGH Plan for release of hatchery reared juveniles into East Fork Tombigbee River and tributaries.

EPIOBLASMA TRIQUETRA (SNUFFBOX)

HIGH Conduct status survey to determine whether this species still occurs in Mississippi

HAMIOTA PEROVALIS (ORANGE-NACRE MUCKET)

MEDIUM Plan and conduct species status surveys

LAMPSILIS HYDIANA (LOUISIANA FATMUCKET)

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 to determine relationship between this taxon and *L.s. claibornensis*

MEDIUM Plan and conduct species status surveys

LASMIGONA ALABAMENSIS (ALABAMA HEELSPLITTER)

MEDIUM Conduct species status surveys

LASMIGONA COMPLANATA (WHITE HEELSPLITTER)

MEDIUM Conduct species status surveys

LIGUMIA RECTA (BLACK SANDSHELL)

HIGH Conduct species status survey to determine whether this species still exists in streams other than the East Fork Tombigbee River.

MEDIONIDUS ACUTISSIMUS (ALABAMA MOCCASINSHELL)

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

OBOVARIA UNICOLOR (ALABAMA HICKORYNUT)

HIGH Additional genetic research (conduct phylogenetic analysis of the *Obovania subrotunda/ unicolor/jacksoniana* complex)

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 Plan and conduct species status surveys

PLEUROBEMA CURTUM (BLACK CLUBSHELL)

LOW Plan and conduct species status surveys to determine whether this species still occurs in Mississippi

PLEUROBEMA DECISUM (SOUTHERN CLUBSHELL)

MEDIUM Plan and conduct species status surveys

PLEUROBEMA MARSHALLI (FLAT CLUBSHELL)

LOW Plan and conduct species status surveys to determine whether this species still occurs in Mississippi

PLEUROBEMA PEROVATUM (OVATE CLUBSHELL)

HIGH 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 taxonomic research to determine if the highly similar P. cordatum is also present.

HIGH Additional survey work: surveys in large Delta rivers (e.g.Coldwater)

MEDIUM Plan and conduct species status surveys

PLEUROBEMA TAITIANUM (HEAVY PIGTOE)

Plan and conduct species status surveys to determine whether this species still occurs in Mississippi.

PLEURONAIA BARNESIANA (TENNESSEE PIGTOE)

MEDIUM Plan and conduct species status surveys

PLEURONAIA DOLABELLOIDES (SLABSIDE PEARLYMUSSEL)

MEDIUM Plan and conduct species status surveys

POTAMILUS ALATUS (PINK HEELSPLITTER)

LOW Plan and conduct species status surveys, particularly in the Mississippi River.

POTAMILUS INFLATUS (INFLATED HEELSPLITTER)

MEDIUM Plan and conduct species status surveys

MEDIUM Conduct additional survey work in lower Pearl River

POTAMILUS CAPAX (FAT POCKETBOOK)

MEDIUM Plan and conduct species status surveys

QUADRULA CYLINDRICA CYLINDRICA (RABBITSFOOT)
HIGH Plan and conduct species status surveys

QUADRULA NODULATA (WARTYBACK)
MEDIUM Plan and conduct species status surveys

QUADRULA METANEVRA (MONKEYFACE)
LOW Plan and conduct species status surveys to determine whether this species still occurs in Mississippi

QUADRULA RUMPHIANA (RIDGED MAPLELEAF)
MEDIUM Plan and conduct species status surveys

QUADRULA STAPES (STIRRUPSHELL)
LOW Plan and conduct status surveys to determine whether this species still occurs in Mississippi

STROPHITUS CONNASAUGAENSIS (ALABAMA CREEKMUSSEL)
HIGH Genetic research to determine relationship between this species, *Strophitus subvexus, Strophitus undulatus*, and the *Strophitus* in the upper Pascagoula watershed.
MEDIUM Plan and conduct species status surveys

STROPHITUS SUBVEXUS (SOUTHERN CREEKMUSSEL)
HIGH Genetic research to determine relationship between this species, *Strophitus subvexus, Strophitus undulatus*, and the *Strophitus* in the upper Pascagoula watershed.
MEDIUM Plan and conduct species status surveys

STROPHITUS UNDULATUS (Creeper)
HIGH Genetic research to determine relationship between this species, *Strophitus subvexus, Strophitus undulatus*, and the *Strophitus* in the upper Pascagoula watershed.
MEDIUM Plan and conduct species status surveys

UNIOMERUS DECLIVIS (TAPERED PONDHORN)
HIGH Conduct phylogenetic analysis of genus *Uniomerus*)
MEDIUM Plan and conduct species status surveys

Insects

NEONYMPHA MITCHELLI (MITCHELL'S SATYR)
HIGH Plan and conduct species status surveys
HIGH Additional research appropriate to understand species and habitats
HIGH Conduct genetic studies to determine relationships between Mitchell's Satyrs in Mississippi and Mitchell's Satyrs throughout the known range of the species.

POGONOMYRMEX BADIUS (FLORIDA HARVESTER ANT)

MEDIUM Research on competitive/agonistic impact of red imported fire ants on harvester ants in MS
MEDIUM Evaluate relationship of burn phenology to persistence of this species on forested property
MEDIUM Evaluate impact of herbicide on habitats (e.g. ROWs) occupied by this (and other) sandhill species
MEDIUM Research dispersal abilities of harvester ants in MS. Model recolonization probablilty following local extirpation

PSEUDOPOMALA BRACHYPTERA (SHORT WINGED TOOTHPICK GRASSHOPPER)

MEDIUM Research on patch size necessary to support a viable population of this low-vagility species
MEDIUM Research on optimal management (including burn regimen) necessary to sustain this species
MEDIUM Research on habitat characteristics of high quality vs. low quality (but adequate) habitat
MEDIUM Research on metapopulation dynamics of this species.

*APHODIUS TROGLODYTES** (A COPROPHAGOUS BEETLE)
*CHELYOXENUS XEROBATIS**(TORTOISE BURROW HISTER BEETLE)
*ONTHOPHAGUS POLYPHEMI SPARSISETOSUS**(COPROPHAGOUS BEETLE)
*PHILONTHUS TESTUDO** (STAPHYLINID BEETLE)
*EUTRICHOTA GOPHERI**(A COPROPHAGOUS FLY)
*MACHIMUS POLYPHEMI**(A ROBBER FLY)
*AMBYLOMMA TUBERCULATUM** (GOPHER TORTOISE TICK)

*MEDIUM: Survey work to better understand the current distribution of each
*MEDIUM: Research dispersal abilities of each, and model recolonization likelihood following local extirpation

Crustaceans

CAMBARELLUS DIMINUTUS (LEAST CRAYFISH)

MEDIUM Plan and conduct species status surveys

CAMBARELLUS LESLIEI (ANGULAR DWARF CRAYFISH)

MEDIUM Plan and conduct species status surveys

CAMBARUS GIRARDIANUS (TANBACK CRAYFISH)

HIGH Plan and conduct species status surveys
HIGH Genetics study to assess isolation of population

CAMBARUS RUSTICIFORMIS (DEPRESSION CRAYFISH)

HIGH Plan and conduct species status surveys
HIGH Genetics study to assess isolation of population

FALLICAMBARUS BURRISI (BURROWING BOG CRAYFISH)

MEDIUM Plan and conduct species status surveys

FALLICAMBARUS BYERSI (LAVENDER BURROWING CRAYFISH)

HIGH Plan and conduct species status surveys
HIGH Determine if this species actually occurs in Mississippi

FALLICAMBARUS DANIELAE (SPECKLED BURROWING CRAYFISH)

HIGH Population genetics and taxonomy study to clarify range; a closely related, undescribed species may exist or this may be synonymous with Fallicambarus oryktes.
HIGH Plan and conduct species status surveys

FALLICAMBARUS GORDONI (CAMP SHELBY BURROWING CRAYFISH)

HIGH Additional population monitoring
HIGH Population genetics study to identify potential/concerns for reintroductions/translocations
HIGH Additional survey work: survey for roadside populations before highway projects are conducted within range.

HOBBSEUS ATTENUATUS (PEARL RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS CRISTATUS (CRESTED RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS ORCONECTOIDES (OKTIBBEHA RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS PETILUS (TOMBIGBEE RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS PROMINENS (PROMINENCE RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS VALLECULUS (CHOCTAW RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

HOBBSEUS YALOBUSHENSIS (YALOBUSHA RIVULET CRAYFISH)

HIGH Plan and conduct species status surveys

ORCONECTES ETNIERI (ETS CRAYFISH)

MEDIUM Taxonomy study to clarify limits of range and distinguish from neighboring undescribed species.

ORCONECTES HARTFIELDI (YAZOO CRAYFISH)

HIGH Plan and conduct species status surveys
HIGH Taxonomy study to clarify limits of range and possibly neighboring undescribed species.

ORCONECTES JONESI (SUCARNOOCHEE RIVER CRAYFISH)
HIGH Plan and conduct species status surveys
HIGH Conduct taxonomy study to clarify limits of range and neighboring undescribed species.
MEDIUM Habitat management, including testing for aquatic contaminants.

ORCONECTES MISSISSIPPIENSIS (MISSISSIPPI CRAYFISH)
HIGH Plan and conduct species status surveys

ORCONECTES SPINOSUS (COOSA RIVER SPINY CRAYFISH)
HIGH Plan and conduct species status surveys
HIGH Conduct taxonomy study to clarify identification as *O. spinsosus* vs. *O. putnami*.
HIGH Genetics study to assess isolation of population.

ORCONECTES VALIDUS (POWERFUL CRAYFISH)
HIGH Plan and conduct species status surveys

ORCONECTES WRIGHTI (HARDIN CRAYFISH)
HIGH Plan and conduct species status surveys
MEDIUM Habitat management
MEDIUM Plan and conduct species status surveys

PROCAMBARUS ABLUSUS (HATCHIE RIVER CRAYFISH)
MEDIUM Plan and conduct species status surveys

PROCAMBARUS BARBIGER (JACKSON PRAIRIE CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS BIVITTATUS (RIBBON CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS ELEGANS (ELEGANT CREEK CRAYFISH)
HIGH Conduct search of literature and museum specimens to determine whether there are any valid records of this species from Mississippi
HIGH Plan and conduct species status surveys if there are valid records of this species from Mississippi

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

PROCAMBARUS HAGENIANUS VESTICEPS (EGYPTIAN CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS LAGNIAPPE (LAGNIAPPE CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS LECONTEI (MOBILE CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS LYLEI (SHUTISPEAR CRAYFISH)
HIGH Plan and conduct species status surveys

PROCAMBARUS PENNI (PEARL BLACKWATER CRAYFISH)
MEDIUM Plan and conduct species status surveys

PROCAMBARUS SHERMANI (GULF CRAYFISH)
HIGH Plan and conduct species status surveys

Fishes

ACIPENSER OXYRINCHUS DESOTOI (GULF STURGEON)
HIGH Additional survey work: identify & protect spawning sites
HIGH Additional research appropriate to understand species and habitats, especially making use of the existing acoustic telemetry array in the Pascagoula Estuary and Mississippi Sound
MEDIUM Plan and conduct species status surveys

ALOSA ALABAMAE (ALABAMA SHAD)
HIGH Additional research appropriate to understand species and habitats
HIGH Plan and conduct species status surveys
HIGH 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 (contemporary targeted survey data are especially lacking for the Tombigbee River Drainage)
MEDIUM Studies to determine the importance of old river bends as nursery habitat

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
HIGH Determine population structure for individuals present in the Tennessee-Tombigbee Waterway

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

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)

HIGH Determine taxonomic status Yocona River Population
HIGH Continue monitoring population responses to habitat improvements in the Yazoo River Drainage

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)
MEDIUM Plan and conduct species status surveys

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)
HIGH Plan and conduct species status surveys
HIGH Determine habitat characteristics/species habitat needs (following re-discovery in the Escatawpa River)

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)

HIGH Additional research appropriate to understand species and habitats
HIGH 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
HIGH Determine habitat characteristics/ species habitat needs

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

PERCINA TANASI (SNAIL DARTER)

HIGH Plan and conduct species status surveys in Bear Creek
HIGH Determine habitat characteristics/ species habitat needs (quantity, condition and context of suitable habitat)
HIGH Additional genetic research (to determine source population)
HIGH Assess species population demographics
MEDIUM Additional survey work: trawl Bear Creek arm of Tennessee River

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 strains are genetically extinct)
MEDIUM Additional survey work: creek surveys in large river systems to assess population; survey commercial fisherman
MEDIUM Studies to determine the importance of old river bends as nursery habitat

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
HIGH Continue investigations related to population structure and taxonomic relationship to Scaphirhynchus platorynchus
MEDIUM Determine habitat characteristics/ species habitat needs

SCAPHIRHYNCHUS PLATORYNCHUS (SHOVELNOSE STURGEON)

HIGH Continue investigations related to population structure and taxonomic relationship to Scaphirhynchus albus

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)
HIGH Plan and conduct species status surveys

ANEIDES AENEUS (GREEN SALAMANDER)
HIGH Plan and conduct species status surveys

CRYPTOBRANCHUS ALLEGANIENSIS (EASTERN HELLBENDER)
HIGH Plan and conduct species status surveys

EURYCEA LUCIFUGA (CAVE SALAMANDER)
HIGH Conduct population estimates
HIGH Plan and conduct species status surveys

GYRINOPHILUS PORPHYRITICUS (SPRING SALAMANDER)
HIGH Plan and conduct species status surveys

HEMIDACTYLIUM SCUTATUM (FOUR-TOED SALAMANDER)
HIGH 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)

LITHOBATES AREOLATUS (CRAWFISH FROG)
HIGH Plan and conduct species status surveys (areas species previously reported)

LITHOBATES HECKSCHERI (RIVER FROG)
HIGH Additional survey work needed

LITHOBATES SEVOSUS (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

Reptiles

CARETTA CARETTA (LOGGERHEAD)
HIGH Plan and conduct species status surveys
HIGH Forensics (evaluate causes of death)

CROTALUS ADAMANTEUS (EASTERN DIAMONDBACK RATTLESNAKE)
HIGH Conduct population estimates
MEDIUM Plan and conduct species status surveys

DEIROCHELYS RETICULARIA MIARIA (WESTERN CHICKEN TURTLE)
HIGH Plan and conduct species status surveys

DERMOCHELYS CORIACEA (LEATHERBACK)
HIGH Forensics (evaluate causes of death)
HIGH Additional survey work: identify nesting sites

PLESTIODON ANTHRACINUS PLUVIALIS (SOUTHERN COAL SKINK)
MEDIUM Plan and conduct species status surveys

FARANCIA ERYTROGRAMMA (RAINBOW SNAKE)
HIGH Plan and conduct species status surveys
MEDIUM Develop better survey techniques to assay populations

GRAPTEMYS FLAVIMACULATA (YELLOW-BLOTCHED MAP TURTLE)
HIGH Plan and conduct species status surveys
HIGH Specific research on causes of low reproductive output.

GRAPTEMYS GIBBONSI (PASCAGOULA MAP TURTLE)
HIGH Plan and conduct species status surveys

GRAPTEMYS NIGRINODA (BLACK-KNOBBED MAP TURTLE)
HIGH Determine habitat characteristics/ species habitat needs
HIGH Conduct population estimates, particularly in Tenn-Tom Waterway.
MEDIUM Survey work to determine extent of movement of species upstream in Tenn-Tom Waterway.

GRAPTEMYS OCULIFER (RINGED SAWBACK TURTLE)
MEDIUM Continue monitoring five marked populations in the Pearl River

GRAPTEMYS PEARLENSIS (PEARL RIVER MAP TURTLE)
HIGH Plan and conduct species status surveys

GRAPTEMYS PULCHRA (ALABAMA MAP TURTLE)
HIGH Conduct population estimates
HIGH Additional survey work, particularly in Noxubee and Buttahatchee Rivers, in smaller streams of the Tombigbee River watershed, and in the Tenn-Tom Waterway.
MEDIUM Determine habitat characteristics/ species habitat needs

LAMPROPELTIS CALLIGASTER RHOMBOMACULATA (MOLE KINGSNAKE)
MEDIUM Plan and conduct species status surveys

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
HIGH Plan and conduct species status surveys
HIGH Determine in shore habitat requirements and frequency of occurrence in those habitats

MACROCHELYS TEMMINCKII (ALLIGATOR SNAPPING TURTLE)
HIGH Plan and conduct species status surveys: abundance, distribution and survival
HIGH Conduct population estimates

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 (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

AMMODRAMUS HENSLOWII (HENSLOW'S SPARROW)
HIGH Plan and conduct species status surveys

AMMODRAMUS LECONTEII (LE CONTE'S SPARROW)
MEDIUM Plan and conduct species status surveys

AMMODRAMUS MARITIMUS (SEASIDE SPARROW)
HIGH Plan and conduct species status surveys

AMMODRAMUS NELSONI (NELSON'S SHARP-TAILED SPARROW)
MEDIUM Plan and conduct species status surveys

AMMODRAMUS SAVANNARUM (GRASSHOPPER SPARROW)
HIGH Specific research: relationship of field border management to birds during breeding season
MEDIUM Plan and conduct species status surveys

ANAS FULVIGULA (MOTTLED DUCK)
HIGH Plan and conduct species status surveys
HIGH Specific research on habitat use, reproduction, movement in Mississippi

ASIO FLAMMEUS (SHORT-EARED OWL)
MEDIUM Plan and conduct species status surveys
MEDIUM Determine quantity, condition and context of suitable habitat

CAMPEPHILUS PRINCIPALIS (IVORY-BILLED WOODPECKER)
MEDIUM Plan and conduct species status surveys

CHARADRIUS ALEXANDRINUS TENUIROSTRIS (SOUTHEASTERN SNOWY PLOVER)
HIGH Plan and conduct species status surveys

CHARADRIUS MELODUS (PIPING PLOVER)
HIGH Determine quantity, condition and context of suitable habitat
HIGH Plan and conduct species status surveys

CHARADRIUS WILSONIA (WILSON'S PLOVER)
HIGH Plan and conduct species status surveys
HIGH Studies of reproduction and survival

COLINUS VIRGINIANUS (NORTHERN BOBWHITE)
HIGH Plan and conduct species status surveys

COLUMBINA PASSERINA (COMMON GROUND-DOVE)
HIGH Plan and conduct species status surveys

DENDROICA DISCOLOR (PRAIRIE WARBLER)
MEDIUM Plan and conduct species status surveys

EGRETTA CAERULEA (LITTLE BLUE HERON)
HIGH Plan and conduct species status surveys
MEDIUM Determine quantity, condition and context of suitable habitat (colonial waterbird nesting sites)

EGRETTA RUFESCENS (REDDISH EGRET)
HIGH Plan and conduct species status surveys

ELANOIDES FORFICATUS (SWALLOW-TAILED KITE)
HIGH Plan and conduct species status surveys

EUDOCIMUS ALBUS (WHITE IBIS)
MEDIUM Plan and conduct species status surveys

FALCO SPARVERIUS PAULUS (SOUTHEASTERN AMERICAN KESTREL)
HIGH Plan and conduct species status surveys

FALCO PEREGRINUS (PEREGRINE FALCON)
MEDIUM Plan and conduct species status surveys

GRUS CANADENSIS PULLA (MISSISSIPPI SANDHILL CRANE)
HIGH Additional research appropriate to understand species and habitats (continue on-going research)
HIGH Study reintroduction techniques that improve reproductive success

HALIAEETUS LEUCOCEPHALUS (BALD EAGLE)
MEDIUM Breeding status surveys
LOW Plan and conduct species status surveys during midwinter

HELMITHEROS VERMIVORUS (WORM-EATING WARBLER)
MEDIUM Plan and conduct species status surveys

HAEMATOPUS PALLIATUS (AMERICAN OYSTERCATCHER)
MEDIUM Plan and conduct species status surveys

LATERALLUS JAMAICENSIS (BLACK RAIL)
HIGH Plan and conduct species status surveys

LIMNOTHLYPIS SWAINSONII (SWAINSON'S WARBLER)
HIGH Plan and conduct species status surveys

MELANERPES ERYTHROCEPHALUS (RED-HEADED WOODPECKER)
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 ospreys

PASSERINA CIRIS (PAINTED BUNTING)
MEDIUM Determine quantity, condition and context of suitable habitat
MEDIUM Plan and conduct species status surveys

PELECANUS OCCIDENTALIS (BROWN PELICAN)
- MEDIUM Determine where Mississippi birds come from and breed
- MEDIUM Plan and conduct species status surveys

PEUCAEA AESTIVALIS (BACHMAN'S SPARROW)
- HIGH Plan and conduct species status surveys

PICOIDES BOREALIS (RED-COCKADED WOODPECKER)
- HIGH 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

RYNCHOPS NIGER (BLACK SKIMMER)
- HIGH Plan and conduct species status surveys
- HIGH Baseline research on reproduction, survival and movement in Mississippi

SETOPHAGA CERULEA (CERULEAN WARBLER)
- MEDIUM Plan and conduct species status surveys
- HIGH Determine quantity, condition and context of suitable habitat

SITTA PUSILLA (BROWN-HEADED NUTHATCH)
- MEDIUM Plan and conduct species status surveys

STERNA ANTILLARUM ATHALASSOS (INTERIOR LEAST TERN)
- HIGH Determine quantity, condition and context of suitable habitat
- HIGH Specific research: effects of flow management on connectivity of sandbars to mainland
- HIGH Plan and conduct species status surveys
- HIGH Specific research on reproduction, movement and survival in Mississippi

STERNA ANTILLARUM (LEAST TERN)
- HIGH Determine quantity, condition and context of suitable habitat
- HIGH Additional survey work: demography study of mainland and island colonies
- HIGH Breeding status surveys: information on reproduction, movements and 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 Plan and conduct species status surveys

THRYOMANES BEWICKII (BEWICK'S WREN)
MEDIUM Determine quantity, condition and context of suitable habitat (monitor nests and identify food brought to young, nest success, cowbird susceptibility)
HIGH Plan and conduct species status surveys

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

SPILOGALE PUTORIUS (EASTERN SPOTTED SKUNK)
HIGH 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

MUSTELA FRENATA (LONG-TAILED WEASEL)
HIGH Plan and conduct species status surveys