United States Department of Agriculture
Forest Service
Southern Region

Biological Assessment

National Forests in Mississippi

Land and Resource Management Plan

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Summary

Objectives of this Biological Assessment are to:

- Comply with requirements of the Endangered Species Act (ESA), as amended, so that actions by federal agencies do not jeopardize the existence of federally listed species, or destroy, or adversely modify their critical habitat.
- Assess the effects that implementation of the National Forests in Mississippi Land and Resource Management Plan will have on threatened and endangered species known to exist on or near the Forest.
- Provide biological input to ensure Forest Service compliance with the National Forest Management Act (NFMA), and Forest Service Manual (FSM) 2670.

Summary of Determination of Effect

This analysis addresses ten endangered and threatened species and one species' designated critical habitat (Table 1).

Table 1 Summary of Effects Determinations

Species	Taxon	Status	Determination
Dusky Gopher Frog (*Rana sevosa*)	Amphibian	Endangered	Likely to Adversely Affect
Dusky Gopher Frog Critical Habitat Effects	Habitat	Endangered	Not Likely to Adversely Affect
Mississippi Sandhill Crane (*Grus Canadensis pula*)	Bird	Endangered	Not Likely to Adversely Affect
Red-cockaded Woodpecker (*Picoides borealis*)	Bird	Endangered	Not Likely to Adversely Affect
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	Fish	Threatened	Not Likely to Adversely Affect
Pallid Sturgeon (*Scaphirhynchus albus*)	Fish	Endangered	Not Likely to Adversely Affect
Indiana Bat (*Myotis sodalis*)	Mammal	Endangered	Likely to Adversely Affect
The revised National *Forests in Mississippi Land and Resource Management Plan* has the potential to adversely affect the	Mammal	Threatened	Not Likely to Adversely Affect

Species	Taxon	Status	Determination
Indiana bat through the possible "take" (as defined by Endangered Species Act) of individual bats. Although levels of vegetation management are not likely to diminish summer roosting in a significant way, the possibility for an adverse effect cannot be completely eliminated with the implementation of any level of management. Foraging and roosting habitat will be improved and increased by implementation of active prescribed fire and timber harvest programs that decrease overstory cover and canopy closure plus increase the number and quality of potential roost trees such as hickory and oak. Forest-wide standards, guidelines and prescriptions specific to Indiana bats will greatly reduce the potential for adverse effects, but the possibility for "take" still exists. Therefore the determination of effect is **likely to adversely affect**.			
Louisiana Black Bear			

Species	Taxon	Status	Determination
(*Ursus americanus luteolis*)			
Gopher Tortoise (*Gopherus polyphemus*)	Reptile	Threatened	Not Likely to Adversely Affect
Louisiana Quillwort (Isoetes louisianensis)	Plant	Endangered	Not Likely to Adversely Affect
Pondberry (*Lindera melissifolia*)	Plant	Endangered	Not Likely to Adversely Affect

The Determination of Effect for the Indiana bat and dusky gopher frog is "likely to adversely affect."

Although levels of vegetation management associated with the Land and Resource Management Plan are not likely to diminish Indiana bat summer roosting significantly, the possibility for an adverse effect cannot be completely eliminated. Foraging and roosting habitat will be both improved and increased by prescribed fire and timber harvest programs that decrease overstory cover and canopy closure, plus increase the number and quality of potential roost trees. Vegetation manipulation, ecosystem restoration, and prescribed fire used to achieve desired habitat conditions for the dusky gopher frog, although beneficial, may also directly affect the species. Forestwide guidelines and management prescriptions specific to these species and their habitat will reduce the potential for adverse effects to levels that are likely insignificant and discountable, but the possibility for "take" still exists.

Formal consultation with United Stated Department of Interior (USDI) Fish and Wildlife Service is required for each species.

The Determinations of Effect for the red-cockaded woodpecker, gopher torotoise, dusky gopher frog critical habitat, Louisiana quillwort, pondberry, Missisippi sandhill crane, gulf sturgeon, and pallid sturgeon are "not likely to adversely affect." Informal consultation with the USDI Fish and Wildlife Service is required.

Introduction

This programmatic Biological Assessment (BA) assesses the effects of implementing the management activities proposed in the revised National Forests in Mississippi Land and Resource Management Plan (LRMP or Forest Plan). The planning area includes all federal land managed or administered by the National Forests in Mississippi in Tippah, Benton, Marshall, Lafayette, Union, Pontotoc, Chickasaw, Yalobusha, Choctaw, Oktibbeha, Winston, Sharkey, Issaquena, Scott, Newton, Smith, Jasper, Jefferson, Copiah, Lincoln, Franklin, Adams, Wilkinson, Amite, Jones, Wayne, Greene, Pearl River, Forrest, Perry, George, Stone, Jackson, and Harrison Counties, Mississippi. The purpose of this analysis is to assess potential effects on federally listed threatened and endangered species, and critical habitat, which occur within the National Forests in Mississippi.

National Forest Land and Resource Management Plans provide broad guidance and information for project and activity decision making for each national forest. The original National Forests in

Mississippi Land and Resource Management Plan (Forest Plan) was adopted in 1985. The National Forest Management Act (NFMA) calls for plans to be revised every 10 to 15 years, to incorporate new information, to account for changed national policy and direction, and to address new issues and opportunities. This revision of the Forest Plan incorporates new information, addresses evolving issues and trends, accounts for changes in national policies and direction, and includes updated views from public users and stakeholders.

This revised Forest Plan is the result of a multi-year planning process and collaboration with the public and other agencies, groups, and interested parties. It differs from the previous plan in focusing more on an integrated vision of how the national forests are to look and function in the future rather than how individual projects would be implemented. This plan uses a new format and emphasizes an adaptive management approach that will continue to include public input and technical adjustments as changes are needed.

From the pine forests of the Gulf Coastal Plain to the upland hardwoods in the northern part of the state, the National Forests in Mississippi cover 1.2 million acres of diverse natural resources and valued public lands. The revised Forest Plan has been developed to guide the general management direction of the National Forests in Mississippi over the next 15 years. Over the years, some aspects of the original plan remained valid, but most issues, conditions, and practices changed. This revision of the Forest Plan incorporates new information, addresses evolving issues and trends, accounts for changes in national policies and direction, and includes updated views from public users and stakeholders.

Distributed across the State of Mississippi, National Forest System lands include an array of ecological systems that are representative of the ecological diversity of the different portions of the state. Forest-wide, pine-dominated stands (many of which resulted from reforestation efforts in the 1930s) are the most common forest communities. Large tracts of loblolly pine represent the most prevalent forest type, but fire-dependent stands of native longleaf pines along the lower Gulf Coastal Plain still occupy a portion of their historic range. Oaks and hickories dominate the dry slopes and ridges in the northern half of the state, where sheltered bluffs and mesic ravines contain a mix of hardwoods that includes American beech, white oak, and Southern magnolia. Along the Mississippi River Delta, approximately 60,000 acres of forested wetlands constitute the only bottomland hardwood National Forest in the National Forest System.

This Biological Assessment was prepared in accordance with United States Department of Agriculture (USDA) Forest Service (USDA-FS) manual 2670 and is guided by requirements set forth in the National Forest Management Act. Determinations of effects by habitat and species are made based on best available information.

Consultation with USDI Fish and Wildlife Service

Interagency cooperation between the Forest Service and USDI Fish and Wildlife Service regarding proposed, endangered, or threatened species is described in Section 7 of the Endangered Species Act. USDI Fish and Wildlife Service personnel reviewed the effects of this project on these species, and a signature indicating USDI Fish and Wildlife Service concurrence is attached to this BA. The USDA Forest Service will request further section 7 consultations with the USDI Fish and Wildlife Service for all exceptions, modifications, and waivers.

Proposed Management Action

The proposed action is the implementation of a revised Forest Plan based upon the Preferred Alternative (Alternative C) analyzed in the *Final Environmental Impact Statement Land and Resource Management Plan National Forests in Mississippi* (2013). The purpose of the revised Forest Plan is to provide long-term, strategic direction for natural resource management on the National Forests in Mississippi. Projects designed to implement the direction of the revised Forest Plan are undertaken only after additional project-specific environmental consideration and public involvement.

The revised Forest Plan is the result of collaboration with partner agencies, interested user groups, and private citizens. Existing habitat conditions are different from those found in the pre-settlement forests. Objectives in the revised Forest Plan are designed to restore major forest communities, especially habitat structure, composition, and distribution, to a condition needed to maintain the viability of species associated with these communities. The desired conditions and objectives for ecological diversity and species diversity are more fully described in Chapters 2 and 3 for the revised Forest Plan.

Specific proposed vegetation management activities for restoration include prescribed fire, timber harvest, wildlife habitat improvements and herbicide use. Prescribed fire is the tool that provides for restoration on the most acreage of the National Forests in Mississippi. Historically, the role of fire in shaping the native plant and animal communities in Mississippi was not well understood, and the use of prescribed burning as a tool for reversing the loss of habitat and native communities was not widely practiced. Today, an aggressive prescribed fire program on the Forests is returning the national forests to a more historic fire regime and at the same time maintaining human safety as the highest priority. While the prescribed burning program in 1985 averaged 124,000 acres annually, the average in recent years was over 200,000 acres. The revised Forest Plan estimates that approximately 220,000 acres will be treated by prescribed burning annually across the Forest. Control lines will generally consist of existing roads, trails, and streams wherever possible. In areas where control lines need to be constructed, methods will include use of hand tools and/or bulldozer. Lines will consist of 2-5 foot wide strips dug to mineral soil. Some smaller trees (9" diameter at breast height [dbh] or less) will be felled during construction, but larger trees will usually be avoided with the line going around and between them. Snags (standing dead trees) near the line will be felled which pose a hazard to personnel or may burn and fall thus spreading fire across the line into areas not scheduled for burning.

Timber sales, which include regeneration cuts, thinning, and salvage are another important management activity that alters and/or disturbs the greatest acreage of forested habitat on the National Forests in Mississippi. The total projected annual harvests include regeneration (2,522 acres), and thinning (14,119 acres). Timber sales are offered through a competitive bid process to achieve various objectives, which include restoration of the structure and composition of the forest, stand regeneration for wildlife habitat improvement, and commodity production in support of local economies.

Timber harvest operations include the clearing of skid trails, log landings, and temporary roads to access timber harvest units. These roads will be closed and seeded after use. Timber stand improvement activities may also be implemented. This would involve mechanical or chemical treatment to remove competing trees that are generally 5 inches or less in diameter.

Salvage harvest is included in the previous estimates of acreage of timber harvest. The objective is to salvage trees for use as wood products following natural disasters such as wind storms, tornados, heavy snow/ice, and floods or insect outbreaks (e.g. gypsy moth, southern pine beetle). Although salvage sales are similar to other timber sales, they differ by being implemented quickly to recover dead or damaged trees for forest products (before they decay or become unsuitable for such commercial use) and to reduce spread of insects and disease. It is impossible to accurately project future amounts of salvage. Potential salvage depends on the amount and severity of future tree mortality and damage resulting from events such as insect outbreaks, ice storms, and windstorms.

Wildlife habitat improvement activities include the maintenance of existing grassland openings, the creation of new temporary openings in the form of seeding log landings and temporary roads, and generally ecosystem restoration projects. Stream habitat enhancement activities are used to enhance streams and sometimes involve the felling of individual trees for use as fisheries structures.

The National Forests in Mississippi utilizes herbicides to accomplish several objectives including non-native invasive plant control, wildlife habitat improvement, timber stand improvement, and control of roadside vegetation. Herbicides applied on the forest require comprehensive risk assessments that analyze human, wildlife and environmental risk. The Forest Service generally applies only low risk herbicides chosen to minimize risk to human and wildlife health, and often uses selective treatments over broadcast treatments, and technology that minimizes spray drift. Risk assessments estimate potential off-site movement by spray drift, percolating ground water, and surface water runoff, which must be minimal to un-measurable for approved pesticides and rates of active ingredient per acre. Approved herbicides have low toxicities and short persistence, and low risk of exposure. Protective measures include applying herbicides according to labeling information and using formulations registered by Environmental Protection Agency (EPA) and approved by the Forest Service.

A number of other management activities are proposed to meet specific management needs beyond ecological restoration. These generally affect small areas and include management of roads, recreation, special use, grazing, and soil and water improvement activities. In general, road management for the National Forests in Mississippi entails the maintenance or improvement of existing corridors (reconstruction) rather than establishing new roadways (construction). The primary focus will be on maintaining and rehabilitating the existing road system. Maintenance priorities will include bridge safety, adequate signs, suitable stream crossings, and any resurfacing or reconstruction needed to provide an overall road system that is useable and safe. Road maintenance includes brushing, surfacing, culvert and bridge replacement, and grading to assure safe public access within the Forest.

No major development of recreation facilities is proposed. Management for recreation activities on the forest will address maintenance needs on hiker and bike trails, hunter and fishing access points, and developed sites such as campgrounds and parking lots. Actions would include brushing, removal of hazard trees, and limited removal of trees during trail construction. A new backcountry designation on the Tombigbee National Forest and acquisition next to Black Creek Wilderness provides approximately 4600 acres of more remote outdoor experiences. Mountain bike trails would be allowed as a way for people to tour the undeveloped area but outdoor skills are emphasized. Management options that could be explored are primitive hunting and other use experiences. Special area designations may require additional trail segments for public access

and site protection which may in some locations provide distinctive destinations for forest visitors, improving visitor experience and discovery of unique natural and cultural heritage. The total amount of trails will remain approximately the same or have a slight increase. Developed recreation sites would stay approximately the same number and size. Emphasis on aquatic habitats will improve anglers catch and maintenance or enhancement of habitats for some game species may increase hunting opportunities.

Special use authorizations are issued for multiple purposes to individuals, corporations, and other government agencies. The predominant uses are for public roads, communication facilities, oil and gas leasing, military training activities, and utility rights-of-way. Proposed actions include maintaining the existing permits and authorizing new permits. The maintenance activities would predominantly be road maintenance and maintenance of utility line corridors including hazard tree removal and maintenance of grass/forb and shrub communities within the right-of-way. New authorizations that would involve clearing of trees are not expected to be substantial.

The National Forests in Mississippi proposes to continue to implement soil and water improvement projects. These projects generally include closing and seeding abandoned roads, illegal roads and trails, rehabilitating old mine sites, and stream bank restoration. The projects could involve some clearing of trees to facilitate treatment operations.

Species Considered and Evaluated

The USDI Fish and Wildlife Service is responsible for listing proposed, threatened and endangered species. The Forest Service cooperates with that agency's efforts in conserving these species through protection and habitat management. The Forest Service conducts activities and programs to assist in the identification, conservation, and protection of proposed, threatened, and endangered species and their habitats. Site specific evaluations are conducted for any proposed activity that may take place within habitat for these species or near known populations. The National Forests in Mississippi threatened and endangered species program priorities include:

- Implement Forest Service actions as recommended in recovery plans for federally listed species. In the absence of an approved recovery plan, implement and, if necessary develop interim Forest Service guidelines. Update interim guidelines as needed when new science becomes available.
- Work with USDI Fish and Wildlife Service and other conservation partners to develop recovery plans for federally listed species and candidate conservation agreements for species proposed for listing.
- Coordinate with partners to implement measures to resolve conflicts with proposed, threatened, and endangered species and their habitats.
- Monitor trends in population and/or habitat of federally listed species.

The list of Threatened and Endangered species in Mississippi is maintained by the USDI Fish and Wildlife Service and can be found at:
http://ecos.fws.gov/tess_public/StateListing.do?state=MS&status=listed

Developing the Forest list of threatened and endangered species was completed cooperatively with the USDI Fish and Wildlife Service. Some categories of occurrence raised questions about which species should and should not be retained on the list. The following direction provided the Forest the means to determine which species would remain on the list:

- If an occurrence is thought to be an "accidental", i.e., an occurrence of a species well outside its normal range, then consideration of the species in the forest plan revision process may not be warranted as determined by the Responsible Official. However, only if there is general consensus about the accidental nature of the occurrence.
- In some situations, a threatened and endangered species occurred on the forest historically but there are no current occurrences. In this case, for a species which has been absent from a forest for a long period of time, and there is no expectation that it would be reestablished, consideration of the species in the forest plan revision process may not be warranted.

Both of these circumstances occurred with threatened and endangered species on the Forest. Forty-four threatened and endangered plant and animal species with ranges occurring throughout the state were included and evaluated. Thirty-four species were removed from our list because they did not occur or have potential to occur on National Forest System land based upon suitable habitat, range, or expert taxonomic consensus (FSH 1909.12, Chap. 40, Sec. 43.22d). If these species are found to occur on the National Forests in Mississippi, they will be re-evaluated and carried through the evaluation process. Ten threatened and endangered species remained and were further evaluated including critical habitat for one species.

Table 2 Federally listed threatened and endangered species included in the Forest Plan Revision process.

Taxa	Species	District Most Likely to Occur	Status
Amphibian	Dusky Gopher Frog and Critical Habitat (*Rana sevosa*)	De Soto	Endangered
Bird	Mississippi Sandhill Crane (*Grus canadensis pulla*)	De Soto	Endangered
Bird	Red-cockaded Woodpecker (*Picoides borealis*)	Bienville Chickasawhay De Soto Homochitto	Endangered
Fish	Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	Bienville Chickasawhay De Soto	Threatened
Fish	Pallid Sturgeon (*Scaphirhynchus albus*)	Delta	Endangered

Taxa	Species	District Most Likely to Occur	Status
Mammal	Indiana Bat (Myotis sodalis)	Holly Springs	Endangered
Mammal	Louisiana Black Bear (*Ursus americanus luteolus*)	Chickasawhay, Delta, De Soto, Homochitto	Threatened
Reptile	Gopher Tortoise (*Gopherus polyphemus*)	Chickasawhay De Soto	Threatened
Vascular Plant	Louisiana Quillwort (*Isoetes louisianensis*)	Chickasawhay De Soto	Endangered
Vascular Plant	Pondberry (*Lindera melissifolia*)	Delta	Endangered

Dusky Gopher Frog

Affected Environment

The dusky gopher frog is listed as federally endangered and is distributed across three localities. The largest and best known population, of approximately 100 adult frogs, breed at a pond (Glen's Pond) located in Harrison County, Mississippi on the De Soto Ranger District of De Soto National Forest. Dusky gopher frogs were found in 2004 at two other pond sites one of which is owned by the state of Mississippi and the other on private land with the nearest recently found pond at least 20 miles from Glen's Pond. In 2013, dusky gopher frogs bred at Pony Ranch Pond which is also located on De Soto Ranger District. These frogs are part of the Glen's Pond population, but this new site indicates the beginnings of the establishment of a metapopulation which was the intent of the management that has been on-going by the Forest Service on De Soto Ranger District.

Glen's Pond is an ephemeral pond, typically dry during the summer. The frogs come to the pond to breed in the fall and winter in years when there has been adequate rainfall. The adults subsequently leave the pond after breeding. Metamorphosed juveniles leave the pond in the summer. A water well and pump is in place to supplement water levels in the pond due to inadequate rainfall in recent years.

Gopher frog habitat includes both upland foraging sites with a subterranean refuge and isolated temporary wetland breeding sites embedded within the forested landscape. This species is associated with longleaf pine habitat and utilizes burrows of the gopher tortoise and small mammals as a refuge from heat and predators. Frequent fires are necessary to maintain the open canopy and groundcover vegetation in the aquatic and terrestrial habitats (USDI Fish and Wildlife Service 2001).

Threats

The greatest threat to the dusky gopher frog is its small population numbers that makes it extremely vulnerable to extinction from natural and man-made processes. In 2003, an undescribed disease was discovered in gopher frog tadpoles at Glen's Pond. Initial work on the disease by researchers at the National Wildlife Health Research Center indicated it is similar to *Perkinsus*, a genus of Mesomycetozoan that occurs in marine invertebrates. During work conducted to study the *Perkinsus*-like disease, an additional disease, a chytrid fungus, was found in two other species of amphibians at Glen's Pond. This disease has been implicated in amphibian declines worldwide. The effect of these two diseases on the survival of gopher frogs is unknown. In close proximity to Glen's Pond is a 4,000 acre residential development project on private land. Urban and commercial development of the surrounding area, including several highway projects, has the potential to further degrade this habitat and possibly increase mortality. Drought has also resulted in complete reproductive failure in some years.

Responses to Threats

National Forests in Mississippi along with several cooperators have been involved in research, monitoring, habitat management, acquiring land and captive propagation programs. These cooperators include the USDI Fish and Wildlife Service, Mississippi Museum of Natural Science, University of New Orleans, Southeastern Louisiana University, United States Department of Interior Geological Survey National Wildlife Health Center, University of Southern Mississippi Gulf Coast Research Lab, USDA Natural Resource Conservation Service, Harrison County Soil and Water Conservation District, The Nature Conservancy, Western Carolina University, Dr. Joe Pechmann, Dr. Steven Richter, Mississippi Department of Transportation, Mississippi Army National Guard, Memphis Zoo and Detroit Zoo.

Glen's Pond has been monitored for the presence of gopher frog egg masses since 1988. A drift fence completely encircling Glen's Pond was established in December of 1995. Both egg mass surveys and drift fence monitoring are currently being used to assess population status. Movements of adult and metamorphic gopher frogs into and out of the pond are monitored by capturing them as they enter and exit the breeding pond. Gopher frog tadpoles were collected at each breeding event since 2002 and raised in cattle tanks as a hedge against pond drying or other catastrophic events at the pond.

Prescribed burning Glen's Pond basin and the surrounding upland habitat has been a priority for the Forest Service. Frequent fires are necessary to minimize the midstory and maintain groundcover vegetation in the aquatic and terrestrial habitats. National Forests in Mississippi focus is habitat restoration and management and maintaining a 1-3 year burning regime.

Critical habitat was designated for the dusky gopher frog on June 12, 2012. This included seven areas within De Soto Ranger District encompassing approximately 3,216 acres. These areas include habitat surrounding Glen's Pond and associated ponds, Carr Bridge Road Pond, the Ashe Nursery ponds, and three ponds in the Mars Hill area of Perry County. Critical habitat is a term defined in the Endangered Species Act. It refers to specific geographic areas that are essential to the conservation of a threatened or endangered species.

This designation of critical habitat will help ensure the dusky gopher frog's habitat needs are sustained and ensure actions do not adversely modify or destroy this habitat. The establishment of this critical habitat should assist the Forest in further management of this species by creating a

focus point for management needs including restoration of longleaf pine, protection of pond sites and their hydrology, invasive species management, and prescribed fire. The continuity of habitat over large areas should focus management, preclude isolation and allow for dispersal of the species across the landscape.

Direct, Indirect, and Cumulative Effects

The chosen alternative would create optimal habitat conditions for the species. Direct effects could include mortality of individuals from ground disturbing activities associated with habitat management. Ground disturbing activities that could potentially harm dusky gopher frogs include tree harvest during thinning operations and ecosystem restoration activities including longleaf conversion and creation of ephemeral ponds, fireline maintenance and/or construction, and road maintenance. Prescribed fire can also cause direct mortality to individuals. Direct effects to individuals can be minimized through protection of escape cover such as stumps and stump holes and associated gopher tortoise burrows and following guidelines created for associated species groups. Timing prescribed fire to when individuals are less likely to be moving during a breeding period will also minimize effects to the species. A burn matrix within gopher frog habitat has been developed to minimize effects of prescribed fire (see Final Environmental Impact Statement, National Forests in Mississippi, Land and Resource Management Plan, 2013).

Generally, the indirect effects of forest management activities will be beneficial to the dusky gopher frog. Detrimental habitat isolation and fragmentation effects will be reduced as suitable areas are enlarged and joined within the Cooperative Management Unit (CMU), as described in the revised Land and Resource Management Plan. Population expansion will be fostered by restoration of historically occurring pine species, thinning of mid-successional and mature pine, prescribed fire to remove encroaching woody vegetation and restore herbaceous groundcover, chemical and mechanical treatment of encroaching midstory where fire is not a viable management tool. Capture, tagging, and monitoring of individuals and egg masses will facilitate monitoring of the population and translocation of frogs as necessary will optimize reproduction and population expansion.

Cumulative effects to dusky gopher frog populations over the long-term in all alternatives are expected to be population growth, and ultimately, recovery of the species. Management of this species and its habitat will be in accordance with the Endangered Species Act, cooperation with the USDI Fish and Wildlife Service, Mississippi Department of Wildlife, Fisheries, and Parks, and the Dusky Gopher Frog Recovery Team. When a recovery plan is written, it will be incorporated into management of this species on the National Forests in Mississippi.

Determination

Although effects are projected to be beneficial in the long run, implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is **likely to adversely affect** the dusky gopher frog as frogs could be killed through the use of prescribed fire. Individuals could also be killed by heavy equipment use during habitat management and restoration operations. The number of individuals affected cannot be determined but should be insignificant as these adverse impacts would be infrequent and chance encounters. Protective measures should reduce the possibility of take. Habitat management and restoration will be

beneficial to the species in the long term. Additional site-specific analysis would be conducted on all projects with the potential to affect this species.

Dusky Gopher Frog Critical Habitat Effects

The preferred alternative would create optimal habitat conditions for the dusky gopher frog and designated critical habitat. Direct effects to constituent elements of critical habitat could include habitat alteration associated with habitat management. Ground disturbing activities include tree harvest during thinning operations and ecosystem restoration activities including longleaf conversion and creation of ephemeral ponds, fireline maintenance or construction, and road maintenance. Prescribed fire can also directly affect critical habitat through creation of grassy understory and minimizing a woody midstory thus creating a more open condition.

Generally, the indirect effects of forest management activities will be beneficial to the dusky gopher frog critical habitat. Detrimental habitat isolation and fragmentation effects will be reduced as suitable areas are enlarged and joined within critical habitat. Population expansion will be fostered by restoration of historically occurring pine species, thinning of mid-successional and mature pine, prescribed fire to remove encroaching woody vegetation and restore herbaceous groundcover, chemical and mechanical treatment of encroaching mid-story where fire is not a viable management tool.

Cumulative effects to dusky gopher frog critical habitat over the long-term are expected to be conversion of areas to suitable habitat for the species and management of this critical habitat, and ultimately, recovery of the species. Management of this habitat will be in accordance with the Endangered Species Act, cooperation with the USDI Fish and Wildlife Service, Mississippi Department of Wildlife, Fisheries and Parks and the Dusky Gopher Frog Recovery Team. When a recovery plan is written, it will be incorporated into management of critical habitat on the National Forests in Mississippi.

Determination

Implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is **not likely to adversely affect** critical habitat for the dusky gopher frog.

Mississippi Sandhill Crane

Affected Environment

The Mississippi sandhill crane, the most endangered North American crane, is listed as federally endangered has declined in range where it once occurred along most of the northern Gulf of Mexico coast. A small population of 110-120 Mississippi sandhill cranes exists in southern Jackson County, MS from the Pascagoula River west to the county line and from 4 miles north of Vancleave, MS, south to Simmons Bayou which is located on the Mississippi Sandhill Crane Refuge (USDI Fish and Wildlife Service 1991). Currently, there are no nests known to occur on the National Forests in Mississippi nor has the crane been sighted in recent years.

The Mississippi sandhill crane inhabits pine savannahs as well as associated bay heads, swamps, and marshes. These areas are seasonally wet, open to semi-open herbaceous communities dominated by grasses and sedges with poorly formed shrubs and trees. Frequent growing season

fire is required to maintain this habitat. This bird uses the wet pine savannas for nesting during the summer breeding season. The ground cover is composed of grasses, sedges, and an array of wet-acid-soil plants. Water at the nest sites may range from none to a foot deep. The nests vary from token piles of grass laid on top of grasses or sedges, to large structures constructed from local vegetation. The nests are built at ground level. The cranes feed on the breeding grounds in savannas, swamps, and open fields in the spring, summer, and fall. During the winter they often feed in the small cornfields and pastures in the northern part of their range (USDI Fish and Wildlife Service 1991).

Threats

The greatest threat to Mississippi sandhill crane its small population numbers and its current restriction to a small area of Lower Coastal Plain pine savanna in Jackson County, MS. The wet pine savanna is critical to the crane's habitat needs, but most of the original savanna habitat has been altered by human practices. Wild flocks have also been slow to increase due to abnormally high mortality of nestlings and first-year birds. There are no known imminent dangers, but projected environmental disruptions include possible tourist, commercial, and industrial developments in the marsh and waterways.

Response to Threats

The National Forests in Mississippi recognizes that the Mississippi sandhill crane's habitat needs must be met in order for species survival. National Forests in Mississippi focus is to restore and maintain wet pine savanna to increase habitat availability for this species. A Sandhill Crane cooperative management unit (CMU), as described in the revised Land and Resource Management Plan, will be created. This unit will allow for accelerated restoration of habitat needed for the expansion of this species at a landscape scale.

Direct, Indirect, and Cumulative Effects

Although breeding populations of this species do not currently occur on the Forest, it is possible that some areas of the southeastern portion of the De Soto Ranger District have been used for foraging purposes. The preferred alternative would create optimal habitat conditions for the species. Direct effects to Mississippi sandhill crane, in the form of fatalities to individual birds, are not likely to occur through management actions and activities occurring on the National Forests in Mississippi.

Generally, the indirect effects of forest management activities will be beneficial to the Mississippi sandhill crane. The cooperative management unit (CMU) will reduce detrimental habitat isolation and fragmentation as suitable areas are enlarged and joined within the cooperative management unit (CMU). Population expansion to the National Forests in Mississippi could be fostered by restoration of historical conditions, thinning of mid-successional and mature pine to desired wet pine savanna conditions, protection of hydrologic function, prescribed fire to remove encroaching woody vegetation and restore herbaceous groundcover, and chemical and mechanical treatment of encroaching midstory where fire is not a viable management tool.

Cumulative effects to Mississippi sandhill crane populations over the long-term are expected to be population expansion, and ultimately, recovery of the species. Management of this species and its habitat will be in accordance with the Endangered Species Act and the most current USDI

Fish and Wildlife Service recovery plan will be incorporated into management of this species on the National Forests in Mississippi as populations occur.

Determination

Implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is **not likely to adversely affect** the Mississippi sandhill crane, since no reproducing populations currently occur and effects of management would create potential habitat for the expansion of the species. Additional site-specific analysis would be conducted on all projects with the potential to affect this species.

Red-cockaded Woodpecker

Affected Environment

The red-cockaded woodpecker (RCW) is a medium-sized woodpecker adapted to the historic fire maintained mature pine forest ecosystems of the southeastern United States. The range of the red-cockaded woodpecker has been reduced to approximately 1 percent of its historic range. It is currently listed as endangered by the USDI Fish and Wildlife Service throughout its range. The red-cockaded woodpecker is native to the open, fire-maintained pine forests of the southeastern United States. This species required large areas of mature pine forest with open understories to meet both foraging and nesting requirements. They excavate nesting and roosting cavities in live mature pines, 60 years old or older, and forage mainly in pines greater than 30 years of age within a half mile of the colony site and contiguous to the colony.

Species recovery is dependent on land management practices that mimic historical regimes that resulted in open stands of mature pine with understories dominated by forbs and grasses. Presently, 56% of all active red-cockaded woodpecker groups (known as clusters) reside on National Forest System land (USDI Fish and Wildlife Service 2003b). Thus, the Forest Service plays a crucial role in the conservation and recovery of the red-cockaded woodpecker.

Threats

Fire suppression and past large-scale timber harvests have resulted in loss of habitat for red-cockaded woodpeckers. One of the primary threats to red-cockaded woodpeckers, described in the recovery plan (USDI Fish and Wildlife Service 2003b), is a bottleneck in the number of pines available as cavity trees. A second impact on the viability of red-cockaded woodpeckers is demographics or the factors associated with the isolation and expansion of small populations such as genetic bottlenecking. Other threats include the lack of suitable foraging habitat and the lack of midstory control.

Response to Threats

The USDI Fish and Wildlife Service has determined that recovery populations of the endangered red-cockaded woodpecker (RCW) will be accomplished only within large expanses of mature and over-mature pine forests managed for the special nesting and foraging habits of this species. Four districts within National Forests in Mississippi have been identified by the USDI Fish and Wildlife Service and the USDA Forest Service as support units for this species. Two are primary core populations, acknowledged to harbor at least 350 potential breeding groups (PBGs) at the

time of and after delisting – the Bienville National Forest and the Chickasawhay Ranger District of the De Soto National Forest. Two others are secondary core populations which will hold at least 250 PBGs at the time of and after delisting – the Homochitto National Forest and the De Soto Ranger District of the De Soto National Forest (USDI Fish and Wildlife Service 2003b).

In 1995, the Regional Red-cockaded Woodpecker FEIS provided direction to National Forests in the Southern Region with RCW population and habitat management objectives. In January 2003, the RCW Recovery Plan *Second Revision* was released. The National Forests in Mississippi has incorporated these two sources to maximize Red-cockaded woodpecker (RCW) opportunities within existing National Forests in Mississippi conditions, current management realities, and forest planning land allocation decisions. The revised Forest Plan Final Environmental Impact Statement was used to define the Habitat Management Areas while the most current USDI Fish and Wildlife Service recovery plan will be implemented to define habitat management strategy, population management guidance and goals, and monitoring guidance.

Current understanding of this species' biology is sufficient to work towards red-cockaded woodpecker (RCW) population goals. National Forests in Mississippi will continue to improve and maintain favorable habitat conditions for this endangered species. Multiple techniques are available and effective, and strategies have been tailored to individual populations and habitat conditions. It is the implementation of these strategies, carefully designed to meet the conditions of each of four very different populations and habitat, which will continue to enhance red-cockaded woodpecker (RCW) recovery on the National Forests in Mississippi.

Direct, Indirect, and Cumulative Effects

The preferred alternative will create acceptable habitat conditions for the species. Direct effects to red-cockaded woodpeckers could include mortality of individuals during capture, handling, translocation, or prescribed fire. Prescribed fire, even when employed within prescription and guidelines, could result in the loss of individuals if nest trees are burned during nesting season. The revised recovery plan (USDI Fish and Wildlife Service 2003b) increases the fire protection standard for roost trees (area raked around each roost tree) which will reduce the number of roost tree fires to discountable levels. Therefore, the potential for mortality to red-cockaded woodpeckers during nesting season due to prescribed fire is deemed insignificant and discountable, with standard protective measures given in the recovery plan. Losses of individual cavity trees to fire can be compensated by installation of artificial cavities. Avoidance of prescribed fires during the nesting season is not recommended, since nesting season coincides with timing favorable for other important ecological fire effects.

Indirect effects to red-cockaded woodpeckers occur at the landscape level and at the population level. There will be beneficial effects from the habitat management actions to red-cockaded woodpecker habitats and populations. Detrimental habitat isolation and fragmentation effects will be reduced as suitable habitat areas are enlarged and joined across the habitat management areas (HMA). Population expansion will be fostered by: restoration of historically occurring pine stands; regeneration of mature pine stands with retention of potential roost trees; thinning of mid-successional and mature pine and pine-hardwood stands; prescribed fire to remove encroaching woody vegetation and restore herbaceous groundcovers; chemical and mechanical treatment of encroaching midstory where fire is not a viable management tool; installation of artificial roosting and nesting cavities; protection of artificial and natural cavities from

competitors through the installation of excluder devices; capture, banding and monitoring of individual birds to facilitate monitoring of the population; and translocation of birds as necessary to optimize annual reproduction.

Cumulative effects to red-cockaded woodpecker populations over the long-term are expected to be population growth at rates prescribed in the recovery plan, recovery plan population objective attainment, and ultimately, recovery of the species. Management of red-cockaded woodpecker (RCW) populations will be according to the most recent recovery plan.

The preferred alternative also adopts the revised habitat management area delineations. Establishing habitat management areas in all alternatives allows for a more landscape approach to red-cockaded woodpecker recovery. Habitat management area size is dependent on population objectives and habitat quality. Habitat management areas should contain contiguous blocks of suitable habitat. This is why, for example, the entire Chickasawhay District is included, excluding only the habitat not conducive to the species and its survival. The continuity of red-cockaded woodpecker habitat over large areas should preclude isolation of clusters and allow for dispersal of red-cockaded woodpecker across the landscape. Since the delineation of tentative habitat management areas, better information concerning red-cockaded woodpecker population demographics and understanding of ecosystem management and sustainability on the National Forests in Mississippi has been acquired; which is why the tentative habitat management areas were revised. There should be no direct and indirect effects of establishing boundaries of habitat management areas. Cumulative effects of establishing habitat management areas should be positive. The landscape approach would provide for nesting and foraging habitat and should allow red-cockaded woodpecker social interaction at the landscape level which should help in successful dispersal of sub-adults. Inclusion of private in holdings within habitat management area boundaries may lead to some habitat fragmentation, but it should not lead to demographic isolation.

Protective measures required under the recovery plan for habitat management include: protection of active and inactive cavity trees within burn units; rotation ages; limitation of regeneration area size; and limitation of operable season to avoid nesting and brood-rearing periods in active clusters.

Determination

Implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is **not likely to adversely affect** the red-cockaded woodpecker, as residual potential risks to individuals after full implementation of guidelines and recovery plan protective measures are insignificant and discountable. Additional site-specific analysis would be conducted on all projects with the potential to affect this species.

Gulf Sturgeon

Affected Environment

Gulf sturgeon was once widely distributed throughout coastal rivers of the northeastern Gulf of Mexico primarily from the Mississippi River east to the Suwannee River. The Suwannee may support the only remaining population known to spawn successfully in the wild. This fish is anadramous, with adults migrating between fresh water spawning areas and salt water non-

spawning areas. It may migrate as far as 140 miles upstream in early spring for spawning, with sub-adults and adults returning to the Gulf of Mexico in late fall, remaining there through winter (Heise et al. 2004). Young generally stay in the mouth of the river in winter and spring, where they spend the first 2 years of their lives. The substrate in spawning areas in freshwater (sometimes tidal) usually is hard clay, gravel, or shell, and may occur in brackish water. Spawning probably occurs in the natal river, with offspring returning to areas where they were born.

In Mississippi, the Gulf sturgeon has been collected in the Pearl River and in the Pascagoula watersheds. The closest recorded occurrence location to the Chickasawhay Ranger District of De Soto National Forest in suitable waterway corridors for adults is the confluence of the Leaf River and Chickasawhay River well below the forest boundary. While there is a possibility that juveniles may move up into smaller tributaries, no confirmed collections have occurred on the district. The largest perennial creek on national forest lands that flows directly into the Chickasawhay River on the east side of the district is Big Creek. It is approximately 6 miles from the forest boundary to the river. Areas that contain Gulf sturgeon critical habitat on the De Soto Ranger District of De Soto National Forest includes: the Leaf River from Mississippi Highway 588 to its confluence with the Chickasawhay River, the Pascagoula River from the confluence with the Leaf and Chickasawhay Rivers to Pascagoula Bay, and Big Black Creek from the confluence Black and Red Creeks to the confluence with the Pascagoula River (USDI Fish and Wildlife Service 2003a). There are several creeks on the De Soto Ranger District that drain into these areas.

Threats

Gulf sturgeon numbers declined due to overfishing throughout most of the 20th century. Dams or sills that are barriers to upstream fish migration during low-water conditions further exacerbated their decline. Other threats and potential threats included modifications to habitat associated with dredged material disposal, desnagging and other navigation maintenance activities; incidental take by commercial fishermen; poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; aquaculture and incidental or accidental introductions; land uses that cause excessive sedimentation, loss of spawning habitat, and the Gulf sturgeon's slow growth and late maturation (USDI Fish and Wildlife and Gulf States Marine Fisheries Commission 1995).

Response to Threats

The National Forests in Mississippi recognizes that the Gulf sturgeon’s habitat needs must be met in order for species survival. National Forests in Mississippi also realizes that many issues are outside Forest Service control such as sediment loading, head cutting of streams, upstream discharges, and past channelization practices. To address these issues, the National Forests in Mississippi works with other agencies, research institutions, and interested partners to collectively try to address solutions. Emphasis is placed on incorporating plan components during project planning that would seek to address watershed and aquatic systems with emphasis placed on the stressors for which the agency has control or jurisdiction by establishing streamside buffer zones, restricting vegetation management activities in riparian zones, and employing erosion control measures.

Direct, Indirect, and Cumulative Effects

No direct effects from management are anticipated. Most hydrologic alterations on National Forests in Mississippi watersheds occur on privately owned adjacent lands and are outside of Forest Service control. The National Forests in Mississippi is not expected to contribute negative impacts to hydrologic regimes. The National Forests in Mississippi does not contribute to nor manage for non-point source pollution therefore no effects to this species are anticipated. Forest activities, such as thinning, regeneration, prescribed fire, and oil and gas leasing may contribute temporary low levels of sediment risk. Maintenance of Forest Service roads contribute varying levels of elevated sediment depending on slope, elevation, aspect, soil type, and road management regimes. Since many Forest Service roads are important for public and intra-agency access, these effects are unlikely to abate significantly. In other cases, Forest Service roads may fall under shared jurisdiction with other agencies and entities. Here again, these impacts are unlikely to abate significantly. Some forest management practices may require the application of herbicides and pesticides which may impact aquatic systems. In most watersheds, National Forests in Mississippi sediment contributions are minor when compared to neighboring land uses. Cumulatively, sedimentation and herbicide and pesticides from the National Forests in Mississippi are predicted to have no or discountable effects on Gulf sturgeon habitat due to forest-wide standards and guidelines designed to protect water quality and aquatic habitats. In all cases, best management practices and guidelines intended to minimize sediment risk levels should minimize risks to this species.

Determination

With protective measures and guidelines implemented, the preferred alternative will have no direct effects and insignificant indirect and cumulative effects on the Gulf sturgeon, it is determined that all alternatives will **not likely adversely affect** the Gulf sturgeon.

Pallid Sturgeon

Affected Environment

The endangered pallid sturgeon has a historical range of over 3,500 miles in the Missouri and Mississippi Rivers, has been described as one of the rarest fish in North America. The perceived rarity and status have placed the pallid at the center of major conflicts over water and river use in the Missouri and Mississippi Rivers. At the time the pallid sturgeon was listed as an endangered species (1990), most information on the species came from the upper Missouri River (~800 historical capture records). The pallid sturgeon looks very similar to the shovelnose sturgeon and has only been recognized as a separate species since 1905 but, is believed to have been rare historically throughout its entire range. Consequently, records kept of total harvest prior to 1905 did not separate the two species. Today, it is essentially restricted to the Lower Yellow Stone River, the Missouri River, and the lower Mississippi River. In the state of Mississippi there have only been three reported captures of pallid sturgeon. Two were captured in the Mississippi River and one in the Big Sunflower River of Sharkey County near Delta National Forest. The later was caught on 23 November 1987, 12 miles northwest of Satartia, Mississippi (USDI Fish and Wildlife Service 1993a).

Pallid sturgeon habitat preferences are not well known, but it is believed that they prefer to dwell in sandy or rocky bottoms of large, turbid, free-flowing rivers. Pallid sturgeons feed on the

bottom of the river and typically consume aquatic insects, crustaceans, mollusks, marine worms, fish and the eggs of other fish. They are generally long-lived, possibly living as long as 41 years. Males reach sexual maturity at 5 to 7 years. Females are believed to first spawn at 15 to 20 years. Very little is known about the reproductive behavior of this species. Spawning behavior is thought to occur April through mid-June, when water temperatures reach a range between 55-70 °F (USDI Fish and Wildlife Service 2007).

Threats

The pallid sturgeon was probably never a common species throughout its range. During the past several decades, populations of the pallid sturgeon have drastically declined. Over-harvesting may have been an initial cause of this. However, they are currently threatened primarily by habitat modifications from channelization, dam construction, and other navigation maintenance activities of major rivers. These changes destroy spawning areas, reduce food supply or access to food, and impede the sturgeon's ability to move within the river. Dams decrease flow rates and produce cooler water temperatures, making rivers less desirable for pallid sturgeon. Sturgeon can live and grow in reservoirs, but they cannot reproduce there. Water pollution from rural and urban development along rivers may also be a problem for pallid sturgeons. A more recent problem that will affect the future status of the pallid sturgeon is hybridization with shovelnose sturgeon, which is occurring likely because of a lack of spawning sites for both of these species (USDI Fish and Wildlife Service 2007).

Response to Threats

The National Forests in Mississippi recognizes that the pallid sturgeon's habitat needs must be met in order for species survival. National Forests in Mississippi also realizes that many issues are outside Forest Service control such as sediment loading, head cutting of streams, upstream discharges, and past channelization practices. To address these issues, the National Forests in Mississippi works with other agencies, research institutions, and interested partners to collectively try to address solutions. Emphasis is placed on incorporating plan components during project planning that would seek to address watershed and aquatic systems with emphasis placed on the stressors for which the agency has control or jurisdiction by establishing streamside buffer zones, restricting vegetation management activities in riparian zones, and employing erosion control measures.

Direct, Indirect, and Cumulative Effects

While neighboring landowners may contribute varying and unpredictable levels of risk to watershed health, National Forests in Mississippi will continue to maintain a positive contribution to aquatic sustainability. As a result, watershed health is expected to remain relatively stable, at least to the extent that National Forests in Mississippi can control based on ownership profiles. National Forests in Mississippi lands do not contribute to non-point source or stream toxin risk levels therefore no effects are anticipated.

No direct effects from management are anticipated. Most hydrologic alterations on National Forests in Mississippi watersheds occur on privately owned adjacent lands and are outside of Forest Service control. The National Forests in Mississippi is not expected to contribute negative impacts to hydrologic regimes. National Forests in Mississippi does not contribute to nor manage for non-point source pollution therefore no effects to this species from Forest

Service activities are anticipated. Forest activities, such as thinning, regeneration, prescribed fire, and oil and gas leasing may contribute temporary low levels of sediment risk. Maintenance of Forest Service roads contribute varying levels of elevated sediment depending on slope, elevation, aspect, soil type, and road management regimes. Since many Forest Service roads are important for public and intra-agency access, these effects are unlikely to abate significantly. In other cases, Forest Service roads may fall under shared jurisdiction with other agencies and entities. Here again, these impacts are unlikely to abate significantly. Some forest management practices may require the application of herbicides and pesticides which may impact aquatic systems. In most watersheds, National Forests in Mississippi sediment contributions are minor when compared to neighboring land uses. Cumulatively, sedimentation and herbicide and pesticides from the National Forests in Mississippi are predicted to have no or discountable effects on pallid sturgeon habitat due to forest-wide standards and guidelines designed to protect water quality and aquatic habitats. In all cases, best management practices and guidelines intended to minimize sediment risk levels should minimize risks to this species.

Determination

With protective measures and guidelines implemented, the preferred alternative will have no direct effects and insignificant indirect and cumulative effects on the Pallid Sturgeon, it is determined that the revised *National Forests in Mississippi Land and Resource Management Plan* is **not likely to adversely affect** the pallid sturgeon.

Indiana Bat

Affected Environment

This endangered bat is generally associated with limestone caves in the eastern United States. The only known occurrence of Indiana bats on the National Forests in Mississippi were tracked from the Rose Cave hibernacula in White County, TN to a suspected maternity roost on the Holly Springs Ranger District in April, 2013. In addition to finding a new maternity colony, to date, this is the furthest documented migration of the Indiana bat. This straight line distance from the hibernaculum to the summer grounds is 367 km (228 mi). Winter hibernacula do not occur on the Forest.

Indiana bats forage in and around the tree canopy of floodplain, riparian, and upland forests. Within floodplain forests, Indiana bats show a preference for areas where canopy closure ranges from 30% to 70% (USDI Fish and Wildlife Service 2007). Streams, associated floodplain forests, and impounded bodies of water are preferred foraging habitats for pregnant and lactating Indiana bats, which may fly up to 1.5 miles from upland roosts to feed (USDI Fish and Wildlife Service 2007). In general, Indiana bats forage within the canopy of upland forests, over clearings with early successional vegetation, along the borders of croplands, along wooded fence rows and over farm ponds in pastures. Indiana bats use larger trees with hollows or loose bark for their summer roosts and maternity colonies, but spend their winters hibernating in caves (USDI Fish and Wildlife Service 2007).

Maternity Roosting (summer) habitat

During summer months, maternity colonies roost under sloughing bark of trees (alive and dead) of many species (USDI Fish and Wildlife Service 2007). Reproductive females require multiple

alternate roost trees to fulfill their summer habitat needs (USDI Fish and Wildlife Service 2007). Adults forage on winged insects within three miles of the occupied maternity roost (USDI Fish and Wildlife Service 2007). In summer, most reproductive females occupy roost sites under the exfoliating bark of dead trees that retain large thick slabs of peeling bark.

Information and research about summer roosting sites is extremely limited south of Tennessee. Recent work has been completed in eastern Tennessee and western North Carolina on Indiana bat maternity colonies. The colonies were found to use primary and secondary roosting sites in pines and hardwoods (Lacki et al 2009). In all cases the bats were found under the exfoliating bark of either pine or hardwood trees, with most of the roosts being in snags (Lacki et al 2009). During the summer months, possible threats include the loss and degradation of forested habitat around maternal roost trees (USDI Fish and Wildlife Service 2007). It is difficult to quantify summer roosting habitat for the Indiana bat at a range-wide, regional or local level due to the variability of known roost sites and lack of knowledge about landscape level habitat characteristics of maternity roosts (USDI Fish and Wildlife Service 2007). Maternity roost sites in the south are known from Virginia, North Carolina and Tennessee (USDI Fish and Wildlife Service). In the south, retention of large pine snags and preservation of over-mature trees will provide a sustained future supply of roost trees. Forest management practices that affect occupied roost trees may have local impacts on Indiana bat populations (USDI Fish and Wildlife Service 2007). However, the bats live in highly altered landscapes, depend on an ephemeral resource, dead and dying trees and are capable of utilizing a wide geographic range and a wide variety of tree species and conditions for maternity and summer roosts.

Threats

Indiana bat populations have been declining since early 1960s. The declining numbers were observed at winter hibernacula sites such as caves and abandoned mines, where the bats gather in large numbers. The main threats to this species are availability of natural roost structures, loss of winter hibernacula, white-nose syndrome, and human disturbance (USDI Fish and Wildlife Service 2007).

Response to threats

Protection and habitat management such as pond creation/management, maintaining available roosts/snags, prescribed fire in uplands, bottomland hardwood forest management, and protection of riparian zones are key to the survival of this species. The National Forests in Mississippi will conduct surveys for new populations and improve and maintain favorable habitat conditions for this endangered species. Based on site-specific consultation, areas of use (foraging and roosting) will be designated based on site conditions, radio-tracking or other survey information, and best available information regarding maternity habitat needs.

Direct, Indirect, and Cumulative Effects

This analysis is programmatic in that it deals only with revised Forest Plan direction, as established within various Prescription Areas including; Desired Future Conditions, Goals, Objectives and associated Standards and Guidelines that provide limitations on management activities for the protection or enhancement of threatened and endangered species, their habitats, and other resource needs. All actions authorized and proposed under the revised Forest Plan are subject to second level, site-specific analysis and subsequent Endangered Species Act (ESA)

Section 7 consultation with the USDI Fish and Wildlife Service through the Biological Assessment/Biological Evaluation process.

Potential habitat (forests with trees having exfoliating bark) exists and contains tree species of the size and type known to be used by the Indiana bat. The retention of snags, shagbark hickory, and hollow trees will allow for potential Indiana bat roost sites. Decreasing canopy closure as occurs with timber management and prescribed fire activities will increase the degree of exposure of some potential maternity roost trees to solar radiation, providing improved thermal conditions for raising young during a wide range of weather conditions. Pond/waterhole construction and management will increase the number of upland water sources available for Indiana bats. Creation of early successional habitats and forests with an open understory and patchy overstory would create insect-rich foraging areas and flight corridors leading to potential roost trees. Harvesting would produce a mosaic of regeneration areas intermixed with mature and late successional forests. Likewise prescribed fire would also create a mosaic of forest habitat conditions resulting from varying fire intensities. This will indirectly benefit Indiana bats by prov4iding feeding areas since bats are known to forage within the canopy openings of upland forests, over clearings with early successional vegetation, and over ponds.

The direction contained in the revised Forest Plan provides programmatic, long-term benefits to Indiana bat populations on the National Forests in Mississippi. While the Holly Springs Ranger District is recognized as potentially providing suitable habitat, long term management actions on the District should move the habitat conditions toward the desired future condition and provide beneficial effects to the Indiana bat. The revised Forest Plan standards and guidelines provide additional protective measures and/or habitat enhancement direction.

Potential negative impacts to the Indiana bat could occur from the slight chance that individuals or small groups of roosting bats (including summer maternity colonies) could be unintentionally taken by the intentional felling of live trees harboring undetected roosts (e.g. dead limbs with loose bark, small cavities in the boles, or naturally occurring exfoliating plate bark conditions exhibited by some tree species), or by the accidental felling of occupied snags, or damaged or hollow trees during timber harvest or other activities. Although the likelihood is very low, tree-cutting activities could result in the inadvertent loss of individual Indiana bats or small groups of Indiana bats, via removal of some large-diameter trees occupied by bats during the period from approximately April 1 to September 15.

Potential negative impacts to the Indiana bat could also occur from prescribed burning activities on the National Forests in Mississippi. Prescribed burning activities have increased over the past several years and this activity will become more prevalent during the next decade. The revised Forest Plan anticipates this increase to continue with perhaps between 13,000 to 24,000 acres being burned each year. Most of these burns will occur during the winter and spring with some occurring during the late summer and early fall. Indiana bats roosting in trees could be negatively affected by either smoke or heat from the prescribed burn.

Cumulative effects are those effects of future State, local, or private actions that are reasonably certain to occur within the action area of the National Forests in Mississippi. This Final Environmental Impact Statement (FEIS) addresses only those activities that are authorized by the revised Forest Plan on lands that are under the jurisdiction of the USDA Forest Service. Thus, any future State, local or private actions that could potentially occur on the National Forests in Mississippi would require a permit from the Forest Service and will require compliance with the

consultation provisions of Section 7 of the Endangered Species Act (ESA). There are no State, local or private actions reasonably certain to occur as a result of implementation of the revised Forest Plan. Therefore, cumulative effects, as defined by the Endangered Species Act, will not occur.

Determination

The revised *National Forests in Mississippi Land and Resource Management Plan* has the potential to adversely affect the Indiana bat through the possible "take" (as defined by Endangered Species Act) of individual bats. Although levels of vegetation management are not likely to diminish summer roosting in a significant way, the possibility for an adverse effect cannot be completely eliminated with the implementation of any level of management. Foraging and roosting habitat will be improved and increased by implementation of active prescribed fire and timber harvest programs that decrease overstory cover and canopy closure plus increase the number and quality of potential roost trees such as hickory and oak. Forest-wide standards, guidelines and prescriptions specific to Indiana bats will greatly reduce the potential for adverse effects, but the possibility for "take" still exists. Therefore the determination of effect is **likely to adversely affect**.

Louisiana Black Bear

Affected Environment

It is estimated that only 50 to 100 Louisiana black bears still remain in the state. When the Louisana black bear was federally listed in 1992, the bear's range in Mississippi was defined as the area lying west of the Mississippi river levee and south of Washington County (USDI Fish and Wildlife Service 1995). Black bears, including those that are not Louisiana black bears (American black bears), are protected in Mississippi due to similarity in appearance. Louisiana black bears in Mississippi, in general, are found in three areas within the state: the Gulf Coast, the Loess Bluffs of southwest Mississippi, and the Mississippi River Delta. These three areas include the De Soto, Homochitto, and Delta National Forests respectively. Mississippi Department of Wildlife, Fisheries, and Parks compile statewide sightings data for black bears in Mississippi. The largest numbers of reported sightings of the Louisiana black bear are located along the Mississippi River basin, mainly Issaquena and Sharkey counties. Over the last 5 years, the numbers of sightings of bears on or around Delta National Forest has also increased and are believed to be due to habitat afforded by the Delta National Forest, the only bottomland hardwood national forest in the United States (Mississippi Department of Wildlife, Fisheries and Parks 2006).

Louisiana black bears exist primarily in bottomland hardwood and floodplain forest, although use of upland hardwood, mixed pine/hardwood and coastal flat woods and marshes has been documented. Normal forest management activities that support a sustained yield of timber products and wildlife are considered compatible with Louisiana black bear needs (USDI Fish and Wildlife Service 1995). Black bears are adaptable and opportunistic, and can survive in the proximity of humans if afforded areas of retreat that ensure little chance of close contact with humans. Black bears eat a wide variety of foods, but the diet includes vegetable matter, including grasses, fruits, seeds, nuts and roots. Insects, fish, carrion and small rodents are also

eaten. Blackberries, hardwoods that produce acorns and other hard mast, shrubs, fallen logs, and brush piles are part of the black bear's habitat (Black Bear Conservation Committee 2005).

Threats

Black bears once common in Mississippi, have seen their habitat significantly reduced or eliminated throughout much of the state. The main reason for this reduction of habitat was the conversion of bottomland timber areas to agricultural farmlands. Habitat fragmentation, vehicle collisions, unrestricted harvests and illegal harvest are among the reasons for their reductions (Black Bear Conservation Committee 1997).

Response to Threats

Bear management should focus on providing suitable habitat and habitat linkages, abundant natural food supplies, denning sites, escape cover, and lots of work fostering public acceptance of black bears (Weaver 2000). The National Forests in Mississippi recognizes that the Louisiana black bear's habitat needs must be met in order for species protection and recovery. The National Forests in Mississippi focus is to restore and maintain habitat and retain and protect den sites to increase habitat availability for this species. The National Forests in Mississippi is also currently cooperating with the Bear Education and Restoration Group of Mississippi (BEaR) in relation to Louisiana black bear conservation, restoration, management, and public education.

Direct, Indirect, and Cumulative Effects

Direct effects of the preferred alternative could include temporary disturbance, possible displacement of bears and/or prey species, and loss of potential den trees during forest management activities. Direct effects to individuals will be minimized through protection of the species, following the most current recovery plan, and guidelines created for the species and associated species groups.

Habitat quality could be reduced in the vicinity of development activity due to loss of important structural components (canopy levels within the Forest and down woody material) and fragmentation of habitat which could cause indirect effects. The benefits to Louisiana black bears by managing and/or restoring the habitat will far outweigh any negative effects.

Cumulatively, implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is predicted to have no or discountable negative effects on Louisiana black bear due to forest-wide standards, guidelines, and direction which were designed to protect the species and restore its habitat.

Determination

With protective measures and guidelines implemented, the preferred alternative will have insignificant negative direct, indirect, and cumulative effects on the Louisiana black bear, therefore the determination of effect is **not likely to adversely affect** the Louisiana black bear but should benefit the species in the long term.

Gopher Tortoise

Affected Environment

The gopher tortoise is a terrestrial turtle found in South Carolina, Florida, Georgia, Alabama, Mississippi, and Louisiana, but is most abundant in northern central Florida and southern Georgia. Within this range, tortoises occur on the Ocala, Osceola and Apalachicola National Forests (Florida), the Conecuh National Forest (Alabama), and the De Soto National Forest (Mississippi). The "Western Population" of the gopher tortoise, which consists of those tortoises inhabiting the area west of the Mobile and Tombigbee Rivers in Alabama to southeastern Louisiana, has been listed as federally threatened (USDI Fish and Wildlife Service 1987). This includes all gopher tortoises occurring on the De Soto National Forest.

This species is native to the open, fire-maintained, pine forests of the southeastern United States. Dry habitats ranging from pine-scrub oak to oak hammocks and coastal dunes are favored by this species. Favored soils are deep sands occurring on ridgetops and side slopes in which tortoises can easily excavate burrows. On the De Soto NF, the majority of gopher tortoises are found in longleaf pine stands of various ages and condition classes or along road edges that occur in longleaf or other pine stands. However, gopher tortoise also inhabits sites with relatively tight, clayey soils. Other trees and shrubs tend to be xerophytic scrub oaks and associated species such as wiregrass, legumes, and blackberries with broadleaf grasses. In preferred habitats the canopy is relatively open allowing for development of the diverse herbaceous ground flora on which gopher tortoises feed, and sunny areas for nesting. The gopher tortoise digs an extensive burrow with adult burrows generally about 15-20 feet in length and 6-10 feet deep, but may be up to 47 feet long and 12 feet deep.

Threats

Currently, the primary threat to the gopher tortoise is habitat loss, either through direct means, such as type conversion to pine plantations, agriculture or development; or through indirect means, such as fire suppression that changes the understory rendering the habitat unsuitable for tortoises. Direct threats to habitat could possibly cause immediate mortality in tortoises or result in displacement of tortoises into unsuitable habitats. There is also evidence that past anthropogenic activities associated with widespread conversion of longleaf pine habitat to unsuitable pine plantations may still be impacting current gopher tortoise populations. Although gopher tortoise populations were not completely extirpated from these degraded lands, slow growth and late maturation caused by tortoises forced into unsuitable habitat may contribute to long-term declines (Aresco and Guyer 1999). Other threats include genetic bottlenecking through population isolation, take or harvest, disease, and predation.

Response to Threats

The National Forests in Mississippi contributes to the conservation and recovery of gopher tortoise populations through implementation of conservation measures consistent with most recent United Stated Department of Interior Fish and Wildlife Service *Gopher Tortoise Recovery Plan*. Intensive management practices associated with the ecosystem, fire, and species diversity objectives within the revised *National Forests in Mississippi Land Management Plan* have a potential to facilitate population expansion because more areas could be maintained in suitable habitat conditions.

Habitat management techniques such as longleaf pine and woodland ecosystem restoration, stand thinning, prescribed growing season burning, and reestablishing native ground cover should increase the chance of gopher tortoise population recovery on De Soto National Forest by improving foraging quality and thermal characteristics, thus producing faster-growing tortoises that mature sooner (Aresco and Guyer 1999).

Surveying and then periodic resurveying of gopher tortoise burrows helps determine trends in gopher tortoise populations. One of the objectives of the *Gopher Tortoise Recovery Plan* (USDI Fish and Wildlife Service 1990) is to conduct surveys of gopher tortoise at 5-year intervals. In addition to these formal surveys, Forest Service employees document gopher tortoise burrows observed during a variety of field activities, including focused surveys designed to locate burrows for protection prior to implementation of ground disturbing activities. These surveys determine population numbers and provide a valuable "baseline" against which to judge recovery. This 'baseline" enables biologists to determine the effectiveness of recovery activities by comparing data from subsequent surveys carried out at 5-year intervals, as recommended in the *Gopher Tortoise Recovery Plan*.

Direct, Indirect, and Cumulative Effects

Direct effects could include mortality of individuals from ground disturbing activities associated with habitat management. Ground disturbing activities that could potentially harm gopher tortoises include tree harvest during thinning operations and ecosystem restoration activities including longleaf conversion, fireline maintenance and/or construction, and road maintenance. Prescribed fire can also cause direct mortality to individuals. Direct effects to individuals can be minimized through protection of escape cover such as gopher tortoise burrows and following guidelines created for associated species groups.

Generally, the indirect effects of forest management activities will be beneficial to the gopher tortoise. Population expansion will be fostered by restoration of historically occurring pine species, thinning of mid-successional and mature pine, prescribed fire to remove encroaching woody vegetation and restore herbaceous groundcover, and chemical and mechanical treatment of encroaching midstory where fire is not a viable management tool.

Cumulative effects to gopher tortoise populations over the long-term are expected to be population growth, and ultimately, recovery of the species. Management of this species and its habitat will be in accordance with the Endangered Species Act, cooperation with the USDI Fish and Wildlife Service, Mississippi Department of Wildlife, Fisheries, and Parks, and the Mississippi National Guard on Camp Shelby. The most current recovery plan will be incorporated into management of this species on the National Forests in Mississippi.

Determination

Implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* is **not likely to adversely affect** the gopher tortoise, as residual potential risks to individuals after implementation of standards and guidelines are insignificant and discountable. Additional site-specific analysis would be conducted on all projects with the potential to affect this species.

Louisiana Quillwort

Affected Environment

The Louisiana quillwort is a semi-aquatic, primitive, seedless plant related to ferns. Louisiana quillwort is a small, semi-evergreen to evergreen plant with spirally-arranged, hollow, linear leaves that are erect to reclining. This species does not reproduce via flowers and seeds, and instead reproduces via spores formed at the bases of the leaves. New plants can develop from spores that grow in bare soils exposed by flood scouring (USDI Fish and Wildlife Service 1996).

The Louisiana quillwort occurs predominantly on sandy soils and gravel bars on small to medium-sized streams. Plants are regularly inundated as much as 50 cm following rains, and may be inundated for long periods in wet seasons. It is found in or near shallow channels in narrow riparian woodland and bayhead forest communities in pine flat-woods and upland longleaf pine (USDI Fish and Wildlife Service 1996). This species is listed as federally endangered (USDI Fish and Wildlife Service 1996) because of its restricted geographic range and small total population size. It occurs in the East Gulf Plain physiographic province in Louisiana and Mississippi. In Mississippi, Louisiana quillwort is found on De Soto National Forest in Wayne, Stone, Perry, Jones, Jackson, Harrison, Greene, Forrest, Hancock, and Pearl River Counties.

Threats

Natural threats to Louisiana quillwort are limited and include occasional browsing by marsh rabbits and whitetail deer, as well as periodic damming of free-flowing intermittent streams by beavers. Rooting and wallowing of non-native, feral hogs pose greater threats to Louisiana quillwort than the limited damage from native wildlife. Disease and insect pests are not known to threaten the plants. More serious threats are posed by direct damage to Louisiana quillwort colonies from vehicular and recreational traffic and logging activities as well as increased sedimentation from land clearing activities on nearby uplands, soil-laden runoff from upstream unpaved roads and wetland crossings, vehicle traffic through upstream riparian areas, and various logging activities.

Response to Threats

Extensive stream surveys by USDA Forest Service personnel to locate quillwort colonies, in compliance with the most current *Louisiana Quillwort Recovery Plan* in forest maintenance and ecosystem restoration operations, and prohibition of tracked vehicle maneuvers in wetlands by the military are positive steps to protect Louisiana quillwort on National Forests in Mississippi lands.

Surveys of areas proposed for vegetation management activities are conducted when these activities will occur in areas containing intermittent streams, along muddy shores, in floodplains, scour channels and depressions, usually lined with Titi in hardwood strands and mixed pine-hardwood bottomlands. Groups and individuals of *Isoetes louisianensis* located during these surveys will be marked. Forest management activities should avoid direct impact to these individuals by keeping activities away from stream banks.

Present distribution data suggest that long-term survival of the species at the global level is more certain than when the species was listed as Endangered by the USDI Fish and Wildlife Service. On The National Forests in Mississippi, intensive survey efforts by Steve Leonard and USDA Forest Service personnel have resulted in the discovery of populations of several thousand individuals across 2 Ranger Districts found in over 50 stream locations.

Compliance with the current recovery plan and pro-active conservation of known populations will insure survival of the species. The great majority of known populations are on National Forests in Mississippi and the survival of the species is largely up to actions of the USDA Forest Service acting with the Mississippi Military Department as overseen by the USDI Fish and Wildlife Service.

Direct, Indirect, and Cumulative Effects

The preferred alternative will create acceptable habitat conditions for the species. No direct effects from management in all alternatives are anticipated. Louisiana quillwort would be protected according to measures in the most current *Louisiana Quillwort Recovery Plan* and site-specific conditions based upon input from USDI Fish and Wildlife Service.

Most hydrologic alterations on The National Forests in Mississippi watersheds occur on privately owned adjacent lands and are outside of Forest Service control. The National Forests in Mississippi is not expected to contribute negative impacts to hydrologic regimes. The National Forests in Mississippi does not contribute to nor manage for non-point source pollution therefore no effects to this species are anticipated. Forest activities, such as thinning, regeneration, prescribed fire, and oil and gas leasing may cause indirect effects contributing temporary low levels of sediment risk. Maintenance of Forest Service roads also contribute varying levels of elevated sediment depending on slope, elevation, aspect, soil type, and road management regimes. Since many Forest Service roads are important for public and intra-agency access, these effects are unlikely to abate significantly. In other cases, Forest Service roads may fall under shared jurisdiction with other agencies and entities. Here again, these impacts are unlikely to abate significantly. Some forest management practices may require the application of herbicides and pesticides which also may impact aquatic systems. In most watersheds, the National Forests in Mississippi sediment contributions are minor when compared to neighboring land uses. Cumulatively, the National Forests in Mississippi management is predicted to have no or discountable effects on Louisiana quillwort habitat due to forest-wide standards and guidelines designed to protect water quality and aquatic habitats, minimize sediment risk levels, and protect species occurrence.

Determination

With standards and guidelines implemented, implementation of the revised *National Forests in Mississippi Land and Resource Management Plan* will have no direct effects and insignificant indirect and cumulative effects on the Louisiana quillwort, therefore a **not likely to adversely affect** determination has been made for the Louisiana quillwort.

Pondberry

Affected Environment

This endangered deciduous, aromatic shrub is found in the southeastern United States. At present, there are populations in Alabama, Georgia, Mississippi, Missouri, Arkansas, North Carolina, and South Carolina (USDI Fish and Wildlife Service 2007). New colonies have been discovered since the recovery plan was written in 1993, some of which were near known populations, as on the Delta National Forest, and, thus may allow interbreeding to occur (Devall and Schiff 2001; USDI Fish and Wildlife Service 2007).

In Mississippi, pondberry is found in bottomland hardwood forests located in Sharkey, Bolivar, and Sunflower Counties with the majority of populations found on Delta National Forest. Pondberry is usually in or at the edges of low, wet depressions that are usually within or near more extensive ridge-bottom forest within the Lower Mississippi Bottomland and Floodplain Forest. The species grows in dense clumps of numerous, usually branched stems. Both male and female plants produce small yellow flowers. The fruit is a bright red berry. Leaves produce a strong, sassafras-like odor when crushed. While pondberry is often found under relatively closed hardwood tree canopies, the species can acclimate to a variety of light conditions and may grow best at low to moderate light levels (Aleric and Kirkman 2005; Lockhart et al. 2012, 2013). However, in the absence of regular flooding, high light levels may increase the growth of competing vegetation that would otherwise be held in check (Wright 1989, 1990; Lockhart et al. 2013).

Threats

Threats to the species include timber harvesting, wetland drainage, road construction and conversion of its habitat to agricultural use. A lack of seedling establishment may also be a reason for decline and/or lack of expansion. Most colonies have been found to be clonal and consist primarily of males (USDI Fish and Wildlife Service 1993b).

Response to threats

Protection and maintenance of sites is key to the survival of this species. Management activities will seek to maintain hydrology and appropriate tree canopy coverage. The National Forests in Mississippi will continue to conduct surveys for new populations and improve and maintain favorable habitat conditions for this endangered species.

Direct, Indirect, and Cumulative Effects

The preferred alternative will create optimal habitat conditions for the species. No direct effects from management are anticipated. Pondberry would be protected according to measures in the most current recovery plan and site-specific conditions based upon input from USDI Fish and Wildlife Service.

Direct effects could include mortality of individuals from ground disturbing activities associated with habitat management. Ground disturbing activities that could potentially harm pondberry include tree harvest during thinning operations and restoration during ecosystem management operations. Direct effects to individuals will be minimized through protection of individuals and

following standards and guidelines created for the species, associated species groups, and the species' recovery plan guidance.

Generally, the indirect effects of forest management activities will be beneficial to pondberry due to the increase of forest health and habitat quality through ecosystem management.

Cumulative effects to pondberry populations over the long-term is expected to be population growth, and ultimately, recovery of the species. Management of this species and its habitat will be in accordance with the Endangered Species Act and cooperation with the USDI Fish and Wildlife Service and Mississippi Department of Wildlife, Fisheries, and Parks. The most current recovery plan will be incorporated into management of this species on the National Forests in Mississippi.

Determination

With standards and guidelines implemented, the revised *National Forests in Mississippi Land and Resource Management Plan* will have insignificant direct, indirect, and cumulative effects on the pondberry and is determined to **not likely adversely affect** the pondberry.

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Biological Assessment

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