Endangered Species

of Mississippi

Mississippi Department of Wildlife, Fisheries, and Parks
&
Mississippi Museum of Natural Science

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PREFACE

INTRODUCTION

Mississippi has 85 species and subspecies of plants and animals which are officially recognized as endangered. This number does not include whales, which although officially listed as endangered, rarely occur in Mississippi waters.

Extinction is a natural process, but it normally occurs at a low rate. Extinctions have increased due to human actions. It has been estimated that man is responsible for the extinction of thousands of species worldwide per year. Unfortunately, this number appears to be increasing. In Mississippi, extinct fauna include the Carolina parakeet and passenger pigeon. Endangered species which no longer occur in Mississippi include the red wolf, Florida panther, stirrupshell mussel, and several others.

Species become endangered for a variety of reasons. In some cases, crucial habitats are destroyed or drastically modified, making it impossible for a species to find food or a place to live. In other cases, species have been overused by man for food, commercial purposes, or sport. Species may also decline from the effects of disease, pollution, or predation. The accounts that make up this booklet provide information on the appearance of each species, where it occurs, its habitat, aspects of its life history and ecology, the basis of listing it as endangered, recommendations on management necessary to ensure it remains part of Mississippi's diversity, and selected references which can provide additional information. The descriptive information and illustration in each account provide a general idea of what each species looks like. In many cases, however, closely related species that are similar in general appearance also occur in Mississippi. Some of Mississippi's endangered species have been designated as such by the State of Mississippi, some by the Federal Government, and others by both. The former are referred to as "state-listed species," the latter two categories as "federally-listed species." The State of Mississippi does not have an endangered species designation for plants.

STATE PROTECTION OF ENDANGERED SPECIES

Mississippi's endangered species law, entitled "Nongame and Endangered Species Conservation Act 1974," declares that "Species or subspecies of wildlife indigenous to the state should be accorded protection in order to maintain and to the extent possible enhance their numbers." An endangered species or subspecies of wildlife is one whose survival and continued welfare in the state is in jeopardy or is likely to become so in the near future. The law prohibits taking, possessing, transporting, exporting, offering to sell, or offering to ship endangered species. Penalties for violating provisions of the Nongame and Endangered Species Act include fines between $2,000 and $5,000 and/or imprisonment for up to one year. Mississippi's official list of endangered species is reviewed every two years by the Department of Wildlife, Fisheries, and Parks

(MDWFP), and may be amended by additions or deletions as deemed appropriate. MDWFP is responsible for management of endangered species and enforcement of the Nongame and Endangered Species Conservation Act.

FEDERAL PROTECTION OF ENDANGERED SPECIES

The United States government protects endangered species under authority of the "Endangered Species Conservation Act of 1973," as amended. This act groups species into two main categories, endangered and threatened. Endangered species are defined as those that are in danger of becoming extinct throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the near future in all or a significant portion of their range. A third classification is used for some species, "threatened by similarity of appearance." In Mississippi, the American alligator and shovelenose sturgeon are protected under this classification. Species in this category, although not listed as either threatened or endangered, are treated as if they were. This classification is used when the species so closely resembles a threatened or endangered species that enforcement personnel may have a difficult time distinguishing them. This difficulty could act as an additional threat to the listed species especially if the unlisted species or its parts are in commercial demand. Threatened by similarity of appearance is used when such treatment of an unlisted species will aid in the enforcement of the Endangered Species Act.

The U.S. Government agencies responsible for implementing the Endangered Species Act are The Department of Interior and The Department of Commerce. The U.S. Fish and Wildlife Service, part of the Department of the Interior, has been given the responsibility of listing and protecting terrestrial and inland aquatic animals and plants, along with some marine animals (e.g., polar bear, sea otter, walrus, manatee, and dugong). The National Marine Fisheries Service, part of the Department of Commerce, is responsible for listing and protecting all other marine organisms. Responsibility for protecting sea turtles belongs to Fish and Wildlife Service when the turtles are on land and to the National Marine Fisheries when the turtles are at sea. Penalties for violating the U.S. Endangered Species Act include fines up to $100,000.00 and/or imprisonment for up to one year.

The protection by the U.S. Government afforded to federally listed species differs substantially from that provided by most state governments, including Mississippi's. Not only is the species protected from hunting or illegal possession, its habitat is partly protected as well. The Endangered Species Act requires that the actions of the federal agencies and the use of federal funds do not jeopardize the continued existence of listed species or their habitats.

THE FEDERAL LISTING PROCESS

Listing a species or changing the status of an already-listed species usually begins as an action of the Fish and Wildlife Service, National Marine Fisheries Service, or when an organization or person files a petition requesting such action. Both foreign species and species that occur in areas under the jurisdiction of the U.S. Government can be listed. Full species and subspecies of both plants and animals, as well as distinct populations of animals, are eligible for federal listing; notices to that effect are published in the Federal Registrar and announced in local newspapers in areas affected by the listing. State and local governments that may be affected are also informed. A final decision on whether to formally list the species is required within one year.

During the listing process, the federal agency may identify and propose critical habitat. Critical habitat is a specific area (or areas) within the known range of the species which has biological or physical features essential for the survival of that species. Critical habitat designation is not required in order for a species to be listed, and may in fact be detrimental to it, as such information may focus the attention of unscrupulous hunters or collectors on the areas where the species occurs.

The federal government provides opportunities to state and local governments, scientific organizations, and concerned individuals or groups to support or oppose the proposal to list a species. If valid scientific evidence is provided which counters the suggested need for listing, the proposal is usually withdrawn.

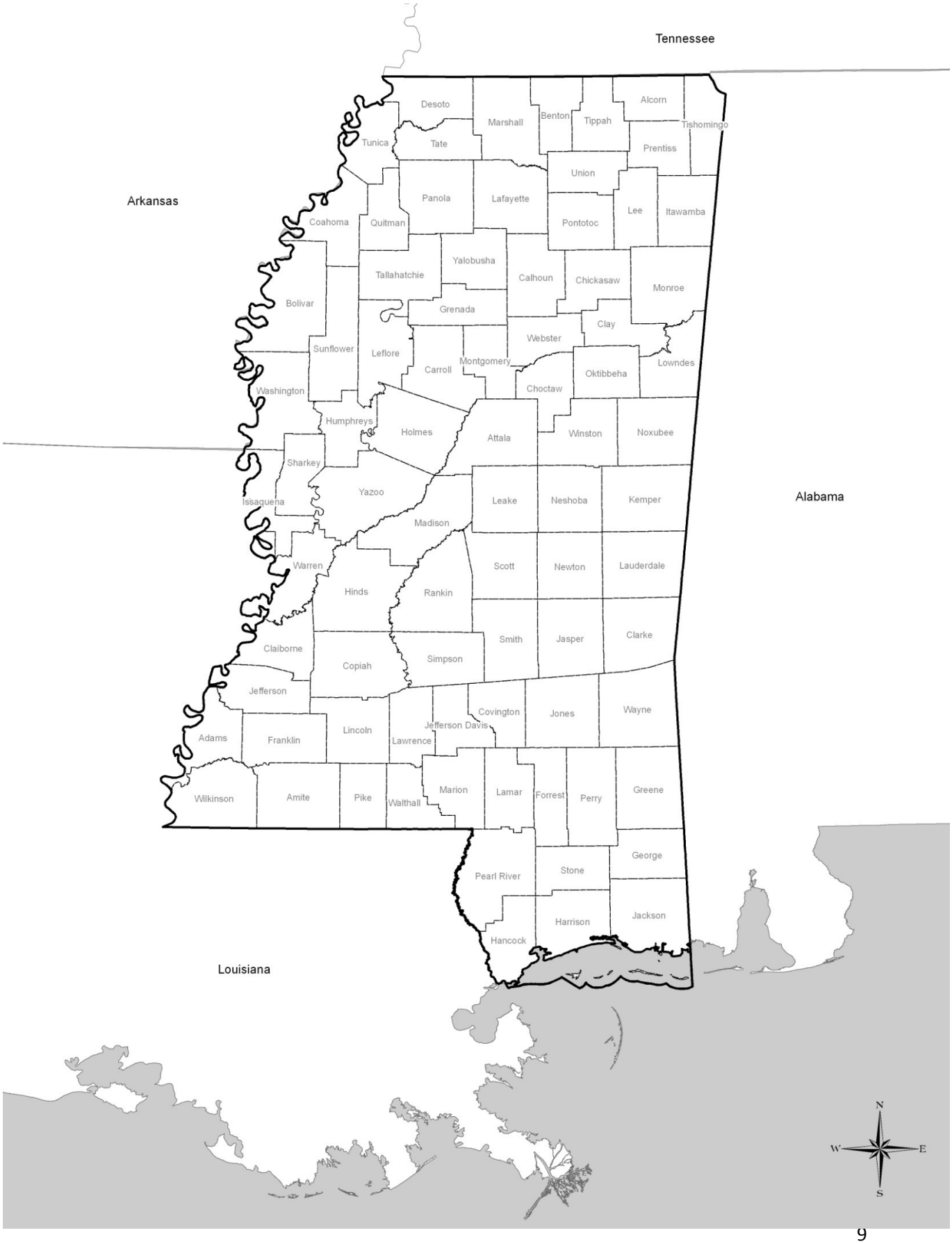
Once a species is listed, a recovery plan is prepared for it. The recovery plan is a document which details how the species will be managed. The goal of a recovery plan is to increase the population size of a species to the point that the species will no longer need federal protection. Recovery plans are issued only for species that occur in areas under the jurisdiction of the U.S. Government. Unfortunately, the time lag between listing and preparation of a recovery plan is often long, and many listed threatened and endangered species lack formal recovery plans. Species that have been listed are reviewed every five years to determine whether they should have their status changed or should be removed from the federal list.

THE VALUE OF ENDANGERED SPECIES

Endangered species are part of the biological diversity of this planet. From an ethical standpoint, the right of endangered species, or any other species for that matter, to exist is regarded by many as no different from the right of mankind to exist. It has also been argued that species should be preserved because of their beauty or because they are intrinsically interesting. Species, including endangered species, are part of ecosystem which provide a wide variety of indirect benefits to humanity, such as maintenance of quality of the atmosphere, generation of soils, disposal of waste, recycling of nutrients, pollination of plants, and pest and disease control. If enough species are driven to extinction, the ecosystems of which they are members

may collapse, and therefore negatively impact mankind. In agriculture, the productivity of most of the major crop species is maintained and expanded by the constant influx of genetic material from the wild relatives of modern crop plants. A high percentage of medicines, pharmaceutical products, and organic industrial chemicals owe their origin to compounds from wild organisms. It has been reasonably argued that, by driving other species to extinction, man is in reality contributing to his own.

Next page: The State of Mississippi and its counties.


Tennessee
Arkansas
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Louisiana
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Benton
Tippah
Alcorn
Tishomingo
Tunica
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Union
Panola
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Attala
Winston
Noxubee
Sharkey
Yazoo
Issaquena
Leake
Neshoba
Kemper
Madison
Warren
Scott
Newton
Lauderdale
Hinds
Rankin
Smith
Jasper
Clarke
Claiborne
Copiah
Simpson
Jefferson
Covington
Jones
Wayne
Adams
Franklin
Lincoln
Jefferson Davis
Lawrence
Wilkinson
Amite
Pike
Walthall
Marion
Lamar
Forrest
Perry
Greene
Pearl River
Stone
George
Harrison
Jackson
Hancock
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W
E
S

Official State of Mississippi List of Endangered Species

MUSSELS:
Alabama Moccasinshell (*Medionidus acutissimus*)
Black Clubshell (*Pleurobema curtum*)
Cumberlandian Combshell (*Epioblasma brevidens*)
Delicate Spike (*Elliptio arctata*)
Fat Pocketbook (*Potamilus capax*)
Inflated Heelsplitter (*Potamilus inflatus*)
Kidney Shell (*Ptychobranchus fasciolaris*)
Monkeyface (*Quadrula metanevra*)
Mucket (*Actinonaias ligamentina*)
Orange-nacre Mucket (*Hamiota perovalis*)
Ovate Clubshell (*Pleurobema perovatum*)
Purple Wartyback (*Cyclonaias tuberculata*)
Pyramid Pigtoe (*Pleurobema rubrum*)
Rabbitsfoot (*Quadrula cylindrica cylindrica*)
Sheepnose (*Plethobasus cyphyus*)
Slabside Pearlymussel (*Lexingtonia dolabelloides*)
Snuffbox (*Epioblasma triquetra*)
Southern Clubshell (*Pleurobema decisum*)
Southern Combshell (*Epioblasma penita*)
Southern Pink Pigtoe (*Pleurobema taitianum*)
Southern Round Pigtoe (*Pleurobema marshalli*)
Spike (*Elliptio dilatata*)
Stirrupshell (*Quadrula stapes*)

CRAYFISHES:
Camp Shelby Burrowing Crayfish (*Fallicambarus gordoni*)

INSECTS:
American Burying Beetle (*Nicrophorus americanus*)
Mitchell's Satyr Butterfly (*Neonympha mitchellii mitchellii*)

FISHES:
Alabama Sturgeon (*Scaphirhynchus suttkusi*)
Bayou Darter (*Etheostoma rubrum*)
Bigeye Shiner (*Notropis boops*)
Crystal Darter (*Crystallaria asprella*)
Frecklebelly Madtom (*Noturus munitus*)
Greenside Darter (*Etheostoma blennioides*)
Gulf Sturgeon (*Acipenser oxyrhinchus desotoi*)
Ironcolor Shiner (*Notropis chalybaeus*)
Pallid Sturgeon (*Scaphirhynchus albus*)
Pearl Darter (*Percina aurora*)
Piebald Madtom (*Noturus gladiator)*

Official State of Mississippi List of Endangered Species, Continued

FISHES (continued):
Shovelnose Sturgeon (*Scaphirhynchus albus*)
Slender Madtom (*Noturus exilis*)
Slenderhead Darter (*Percina phoxocephala*)
Southern Redbelly Dace (*Phoxinus erythrogaster*) (Western Mississippi disjunct populations only)
Suckermouth Minnow (*Phenacobius mirabilis*)

AMPHIBIANS:
Dusky Gopher Frog (*Rana sevosa*)
Cave Salamander (*Eurycea lucifuga*)
Green Salamander (*Aneides aeneus*)
Hellbender (*Cryptobranchus alleganiensis)*
One-toed Amphiuma (*Amphiuma pholeter*)
Spring Salamander (*Gyrinophilus porphyriticus*)

REPTILES:
Black Pine Snake (*Pituophis melanoleucus lodingi*)
Eastern Indigo Snake (*Drymarchon corais couperi*)
Rainbow Snake (*Farancia erytrogramma*)
Southern Hognose Snake (*Heterodon simus*)
Alabama Redbelly Turtle (*Pseudemys alabamensis*)
Atlantic Ridley (*Lepidochelys kempi*)
Black-knobbed Sawback (*Graptemys nigrinoda*)
Gopher Tortoise (*Gopherus polyphemus*)
Green Turtle (*Chelonia mydas*)
Hawksbill Turtle (*Eretmochelys imbricata*)
Leatherback Turtle (*Dermochelys coriacea*)
Loggerhead Turtle (*Caretta caretta*)
Ringed Sawback *(Graptemys oculifera*)
Yellow-blotched Sawback (*Graptemys flavimaculata*)

BIRDS:
American Swallow-tailed Kite (*Elanoides foricatus*)
Bachman's Warbler (*Vermivora bachmanii*)
Bewick's Wren (*Thryomanes bewickii*)
Brown Pelican (*Pelecanus occidentalis*)
Ivory-billed Woodpecker (*Campephilus principalis*)
Least Tern (*Sterna antillarum*) (Interior population nesting along the Mississippi River only)
Mississippi Sandhill Crane (*Grus canadensis pulla*)
Peregrine Falcon (*Falco peregrinus*)
Piping Plover (*Charadrius melodus*)
Red-cockaded Woodpecker (*Picoides borealis*)
Snowy Plover (*Charadrius alexandrinus*)
Wood Stork (*Mycteria americana*)

Official State of Mississippi List of Endangered Species, Continued

MAMMALS:
Black Bear (*Ursus americanus*)
Florida Panther (*Puma concolor coryi*)
Gray Bat (*Myotis grisescens*)
Indiana Bat (*Myotis sodalis*)
West Indian Manatee (*Trichechus manatus*)
Whales, Order Cetacea, excluding Family Delphinidae

PEARLY FRESHWATER MUSSELS

SPECIES		River Drainage	SPECIES LISTING			
Common Name	**Scientific Name**		**Global Rarity Rank**	**Federal Protection Status**	**State Protection Status**	**State Rarity Rank**
Alabama moccanasinshell	*Medionidus acutissimus* (Lea)	TB	G2	LT	LE	S1
black clubshell	*Pleurobema curtum* (Lea)	TB	G1	LE	LE	SH
Cumberlandian combshell	*Epioblasma brevidens* (Lea)	TN	G1	LE	LE	S1
delicate spike	*Elliptio arctata* (Conrad)	PE, PA, TB	G3Q	Non-listed	LE	S1
fat pocketbook	*Potamilus capax* (Green)	MS	G1	LE	LE	S1
flat pigtoe	*Pleurobema marshalli* Frierson	TB	GH	LE	LE	SX
heavy pigtoe	*Pleurobema taitianum* (Lea)	TB	G1	LE	LE	SX
inflated heelsplitter	*Potamilus inflatus* (Lea)	PE, TB	G1G2	LT	LE	SH
kidney shell	*Ptychobranchus fasciolaris* (Rafinesque)	TN	G4G5	Non-listed	LE	S1
monkeyface	*Quadrula metanevra* (Rafinesque)	TB	G4	Non-listed	LE	SX
mucket	*Actinonaias ligamentina* (Lamarck)	MS	G5	Non-listed	LE	S1
orangenacre mucket	*Hamiota perovalis* (Conrad)	TB	G2	LT	LE	S1
ovate clubshell	*Pleurobema perovatum* (Conrad)	TB	G1	LE	LE	S1
purple wartyback	*Cyclonaias tuberculata* (Rafinesque)	TN	G5	Non-listed	LE	S1
pyramid pigtoe	*Pleurobema rubrum* (Lea)	MS	G2	Non-listed	LE	S1
rabbitsfoot	*Quadrula cylindrica* (Say)	MS, TN	G3T3	LT	LE	S1
sheepnose	*Plethobasus cyphyus* (Rafinesque)	MS	G3	LE	LE	S1
slabside pearlymussel	*Pleuronaia dolabelloides* (Lea)	TN	G2	LE	LE	S1
snuffbox	*Epioblasma triquetra* (Rafinesque)	TN	G3	LE	LE	S1
southern clubshell	*Pleurobema decisum* (Lea)	TB	G2	LE	LE	S1S2
southern combshell	*Epioblasma penita* (Conrad)	TB	G1	LE	LE	S1
spike	*Elliptio dilatata* (Rafinesque)	MS	G5	Non-listed	LE	S1
stirrupshell	*Quadrula stapes* (Lea)	TB	GH	LE	LE	SX

Drainage acronyms: MS – Mississippi River (including Big Black River, Lower MS River North and South, and the Yazoo River); PA – Pascagoula River (including coastal rivers); PE – Pearl River; TB – Tombigbee River; TN – Tennessee River

DESCRIPTION

Pearly freshwater mussels have two shells connected on their dorsal (upper) margins by a stout ligament which serves as a hinge. Below the ligament, on the inside of the shells, there are usually teeth. Some species of mussels have reduced teeth, or even no teeth. The teeth serve to prevent the shells from being torn apart. When the shells are closed, the teeth of one shell fit into corresponding depressions in the other. The outer surface of the shells may be smooth, wrinkled, or knobby, and is covered with an epidermis called the periostracum. Coloration varies from light yellow to black, and may include stripes, spots, or other markings. The beaks (umbos) are the prominent humps found on each shell at the anterior end. The smooth, shiny material lining the inside of the shell is called the nacre. Muscle scars may also be evident on the inside of the shells. The body of a mussel fits within the shells, and contains the organs of digestion, excretion, respiration, circulation, and reproduction. Surrounding the body is a specialized organ called the mantle. The mantle functions to secrete the calcium carbonate shell. It also produces the epidermis that covers the outer surface of the shell. The posterior edge of the mantle forms siphons that circulate water into and out of the mussel. A large, fleshy organ called the foot can be extended from between the shells and the mantle (on the ventral side of the animal) and can be wedged into the substrate, to move the animal horizontally or vertically. The gills are a striking and important feature of the internal anatomy of a mussel. All pearly freshwater mussels have four gills that function to remove food from the water and for respiration. Eggs and larvae are also held in the gills within a chamber called the marsupium. When anchored in the bottom of a stream and feeding, mussels are typically oriented "head" downward. That is, the anterior end of the animal (the end with the umbo) is buried in the substrate, and the posterior end protrudes just above the sediment, permitting the siphons clear access to the water.

RANGE

Tennessee River Species:

The **Cumberlandian combshell** (*Epioblasma brevidens*) is a small species which is quadrangular in outline. It reaches a maximum length of about 80 mm (3 in.), but most adults average 50 mm (1.87 in.) in length. Its periostracum is yellowish brown to brown, sometimes with narrow green rays, and its nacre is white. The posterior ridge is broadly curved in males and includes an elevated marsupial swelling in females. The Cumberlandian combshell occurs in the Cumberland and Tennessee River drainages, and in Mississippi is known only from Bear and Cedar creeks, Tishomingo County. It may no longer occur in Cedar Creek.

The **kidneyshell** (*Ptychobranchus fasciolaris*) has an elongate, elliptical, compressed shell which can attain a length of up to 150 mm (6 in.). It has a prominent dorsal ridge. The periostracum is yellow to yellowish-green to dark chestnut and may have rays. The nacre is white. The kidneyshell is another species known in

Mississippi only from Bear Creek in Tishomingo County. Outside of the state, it occurs in the Ohio, Cumberland, and Tennessee river systems.

The **purple wartyback** (*Cyclonaias tuberculata*) attains a length of 130 mm (5 in.) and is subquadrate to circular in outline. Its yellowish-brown to dark brown periostracum is covered with rounded or elongated tubercles. The nacre ranges from light to deep purple. The purple wartyback can be found in the upper Mississippi River drainages, from Pennsylvania west to Wisconsin, south to Iowa, Missouri, and Arkansas. In Mississippi, live specimens are known from Bear Creek and relict shells have been found in Cedar Creek, both in Tishomingo County.

The **slabside pearlymussel** (*Pleuronaia dolabelloides*) is subtriangular in outline and has a wide, flat disc from the umbo to the ventral margin. It is a relatively small species (85 mm, 3.33 in.) with a narrowly rounded posterior ridge. The periostracum is greenish-yellow to brown, sometimes with a few broken green rays which may be reduced to a series of small blotches or dots. The nacre is white. The slabside pearlymussel is another species limited to the Tennessee River drainage in Mississippi, as it is known only from Bear Creek in Tishomingo County. Outside Mississippi, it occurs from southwestern Virginia south to northern Alabama and central Tennessee.

The **snuffbox** (*Epioblasma triquetra*) is a small, straw-colored species with an oval or subtriangular shell and a conspicuous posterior ridge. Young specimens are marked with greenish chevrons in the umbo area; these may fuse into green stripes in older animals. The shell of the female is greatly inflated posteriorly, and is typically toothed and radially sculptured. The nacre is white. The shell is thick and no longer than 64 mm (2.5 in.). The snuffbox has been collected only once in Mississippi, in Bear Creek at Tishomingo State Park in 1967.

Tombigbee River Species

The **black clubshell** (*Pleurobema curtum*) varies from green in young shells to a dark greenish-brown in older shells. It is subtriangular in outline, inflated in front, and has a bluish-white, iridescent, thin nacre. The shell surface is smooth and may grow to 50 mm (2 in.) in length. The black clubshell occurs only in a segment of the East Fork Tombigbee River in Mississippi.

The **ovate clubshell** (*Pleurobema perovatum*) is yellow to dark brown and may occasionally have broad green rays that cover most of the beak and posterior ridge. Its shell is oval to elliptical and has inflated, nearly terminal beaks. The posterior ridge is well-developed, broadly rounded, and often concave. The nacre is white. This species may grow to 50 mm (2 in.) in length. The ovate clubshell occurs in the

Buttahatchee River and Yellow Creek (Lowndes County) in Mississippi, the Sipsey River in Alabama, a few tributaries of the Black Warrior River in Alabama, and in one tributary of the Tallapoosa River in Alabama.

The **southern clubshell** (*Pleurobema decisum*) is yellow to yellowish brown with green rays or spots on the beak in young specimens. It is roughly rectangular in outline with the beaks nearly terminal at the anterior margin, and has a white nacre. The southern clubshell may grow up to 70 mm (2.75 in.) in length. The southern clubshell still occurs in a few localities on the Buttahatchee River and Yellow Creek in Mississippi and Alabama, the East Fork of the Tombigbee River in Mississippi, the Sipsey and Cahaba Rivers in Alabama, and in a few tributaries of the Alabama and Tallapoosa Rivers in Alabama.

The **flat pigtoe** (*Pleurobema marshalli*) can attain up to 60 mm (2.4 in.) in length, 50 mm (2 in.) in height and 30 mm (1.2 in.) in width. The shell has a shallow umbonal cavity, a rounded subovate or obliquely elliptical outline, nearly terminal beaks, and very low knobs on the posterior surface. It is yellow-brown to dark brown in color. This species once occurred in the Tombigbee River in Mississippi and Alabama, but may now be extinct.

The **heavy pigtoe** (*Pleurobema taitianum*) is brown to brownish-black, smooth, obliquely triangular, and inflated. It has narrowly pointed breaks directed anteriorly, pink-tinted nacre, and shallow beak cavities. It may attain 50 mm (2 in.) in length. The heavy pigtoe was last seen in Mississippi at one locality in the Buttahatchee River in 1987. The Heavy Pigtoe is nown known from a single location in the Alabama River.

The **monkeyface** (*Quadrula metanevra*) is squared to rhomboid in shape and attains a shell length of 110 mm (4.3 in.). It has a prominent posterior ridge which has several large, high, and elongated knobs. Most of the rest of surface is covered with small tubercules. The periostracum ranges from yellow to yellowish-green to brown. Many individuals have dark green rays or chevron shaped markings which appear to be most distinct on the umbos. The nacre is white. The monkeyface occurs in drainages of the central part of the Mississippi River basin. In Mississippi, it was known only from the old Tombigbee River channel before the river was destroyed by the Tennessee-Tombigbee Waterway and from the lower part of the Buttahatchee River.

The **orangenacre mucket** (*Hamiota perovalis*) is yellow to dark reddish-brown and may have green rays. The shell is oval, moderately thick, and is inflated (the mussel is relatively wide laterally). The nacre is orange, rose-colored, pink, or sometimes white. The orangenacre mucket attains a length from 50 to 90 mm (2-3.5 in.). The orangenacre mucket still occurs in the Buttahatchee River, Yellow Creek (Lowndes County),

and a small segment of the East Fork Tombigbee River in Mississippi and in the Sipsey and Little Cahaba rivers in Alabama.

The **Alabama moccasinshell** (*Medionidus acutissimus*) is a tiny species that rarely grows larger than 30 mm (1.2 in.) in length. It is yellow to brownish-yellow and has broken green rays over the entire surface of the shell. Its shell is narrowly elliptical and has a well-developed posterior ridge. The posterior slope is corrugated. The nacre is translucent along the margins and salmon-colored in the beak cavities. The Alabama moccasinshell is known from three rivers in Mississisippi: the Buttahatchee River, Luxapallila Creek, and a tributary of Luxapallila Creek. In Alabama it occurs in the Sipsey River, one tributary of the Sipsey Fork of the Black Warrior River, and the Conasauga River.

The **southern combshell** (*Epioblasma penita*) is yellowish, greenish-yellow, or tawny in color, sometimes with darker dots, and up to 55 mm (2.1 in.) in length. It is rhomboid in outline with a radially sculptured posterior and has white or straw-colored nacre. The southern combshell now is only known to occur in parts of the Buttahatchee River in Mississippi and Alabama.

The **stirrupshell** (*Quadrula stapes*) is yellowish-green to brown in color and has pustules on the shell surface. It is quadrate in outline and has a sharp posterior ridge, squared-off posterior, and a silvery-white nacre that is thinner and iridescent posteriorly. It may grow to 55 mm (2.2 in.) in length. The stirrupshell once occurred in the Tombigbee River in Mississippi and Alabama, and the Black Warrior and Alabama Rivers in Alabama. It is now presumed to be extinct.

Other Mississippi Species:

The **delicate spike** (*Elliptio arctata*) is a small, slender elongated species. The shell is thin and is not inflated. It reaches a length of approximately 75 mm (3 in.). The periostracum color is greenish-yellow to tawny-brown or black (older and larger specimens), and may be weakly rayed. The outer surface of the shell is fairly smooth. Nacre color varies from purple to white. In Mississippi, the delicate spike has been found in the Pearl, Pascagoula, and Tombigbee river drainages. It is known from a very small number of specimens collected from seven sites.

The **fat pocketbook** (*Potamilus capax*) is a greatly inflated, thin-shelled species which is obovate when viewed laterally. The periostracum is a smooth, shiny, yellowish-olive color, and the nacre may be bluish-white, pinkish, or salmon. Externally, this species is easily confused with the pocketbook, *Lampsilis ovata*.

Shell length may be up to 127 mm (4.8 in.). The fat pocketbook has been collected from Jefferson, Adams, Issaquena, Sharkey, Bolivar, and Warren counties.

The **inflated heelsplitter** (*Potamilus inflatus*) has a thin, greenish-brown to brown shell with a prominent wing extending well above the hinge on the posterior part of the shell. Young individuals may have a few green rays on the shell. The nacre is pink to purple, and the beak cavities are very shallow. The shell may be up to 140 mm (5.5 in.) in length. The inflated heelsplitter has been collected at two localities on the Pearl River in Mississippi, and in the West Pearl in Louisiana. It still occurs in the Amite River in Louisiana and parts of the Tombigbee River drainage in Mississippi and Alabama.

The **mucket** (*Actinonaias ligamentina*) is a large species which can attain a shell length of up to 140 mm (5.5 in.). It is oval, oblong, or elliptical, and has a low, rounded posterior ridge. The periostracum can range from yellowish brown to greenish to dull olive yellow to dark brown. Some specimens have broad, dark green rays. The nacre is white. The mucket occurs from western New York to Minnesota, south to Oklahoma, and northern Louisiana. In Mississippi, it is known from only a few localities in the Big Sunflower River.

The **pyramid pigtoe** (*Pleurobema rubrum*) is a thick-shelled, triangularly shaped species. The periostracum is yellowish-brown to dark reddish-brown, and young specimens may have greenish rays. Except for the growth lines, the shell surface is smooth. The beaks and beak cavities are very pronounced. The nacre is usually rose-colored or white. It reaches a length of 102 mm (4 in.). The pyramid pigtoe has been collected at several sites in the Big Black and Big Sunflower rivers.

The **rabbitsfoot** (*Quadrula cylindrica*) has an elongate, inflated, and very rugose shell. The dorsal and ventral lines are parallel, yielding a cylindrical shape. It reaches a shell length of 102 mm (4 in.). The periostracum is straw-colored to tawny, and may have greenish stripes. Nacre color is white, or rarely, purplish. The flesh is distinctive in being black. The rabbitsfoot has been collected at several localities in the Big Black and Big Sunflower rivers and in Bear Creek in Tishomingo County.

The **sheepnose** (*Plethobasus cyphyus*) is elongated and ovate in shape and reaches 110-120 mm (4.3-4.7 in.) in length. Its periostracum is light yellow to dull yellowish brown. Each valve has large, tubercular swellings on the center, which run from the umbo to the ventral margin. The nacre is white. The sheepnose occurs in the Ohio, Cumberland, Tennessee and upper Mississippi river systems from Minnesota southward. In Mississippi, it is known only from a few localities in the Big Sunflower River.

The **spike** (*Elliptio dilatata*) has a compressed and oblong shell which tapers gradually at the posterior end. It attains a length of 120 mm (4.75 in.). The posterior ridge is strongly developed. The periostracum is greenish-brown in young individuals and brown in adults. Some individuals may have faint rays. The nacre is white to salmon to deep purple. The spike occurs throughout the entire Mississippi River drainage from the St. Lawrence River south to northern Louisiana and west to the Red River in Oklahoma. Live specimens of this species have been found in the Wolf River in Benton County and in the Big Sunflower River in Sunflower County.

HABITAT

Most of these species inhabit moderate to large rivers with moderate to swift currents. Their preferred habitats are riffle or shoal areas with stable bottoms composed of sandy gravel or gravel and cobble, although the inflated heelsplitter and fat pocketbook may prefer soft, stable substrates in slow or moderate current.

LIFE HISTORY & ECOLOGY

Sperm are released into the water column and, by normal siphoning activity, reach the eggs held in the gills of the female. The fertilized eggs are retained in the gills until they develop into larvae called glochidia. Before the glochidia can develop into juvenile mussels, they must undergo a parasitic stage on the gills or fins of a fish. A glochidium of a particular species of mussel can usually parasitize only certain species of fish. The parasitic glochidia remain attached to the host fish up to several weeks. After metamorphosis is complete, the larval mussels drop from the host to the bottom of the stream or lake. They must be dropped onto appropriate substrate within habitat suitable for their adult life or they will not survive. Larval mussels may be predated by aquatic insects, crustaceans, and fish. Host fish species for many of the endangered freshwater mussels are unknown. Adult mussels may be eaten by muskrats, raccoons, otters, fish, and turtles. They are hosts to parasitic aquatic mites and leeches.

BASIS FOR CLASSIFICATION

Much of the historic habitat of endangered species in the Tombigbee River drainage has been destroyed by dams or channelization. Channelization and dredging of streambeds has negatively affected species in other drainages as well. The Bear Creek watershed has been adversely affected by channelization in Mississippi and by impoundment construction upstream in Alabama. The Big Black River has experienced massive destabilization of river bottom sediments in recent decades. This is considered to be a consequence of dredging and channel modification of the Mississippi River, which induced flow-rate changes and subsequent alteration of channel structure in the Big Black River. This has resulted in widespread washout and suffocation of mussel beds. The Big Sunflower River, which has been affected by modification of the

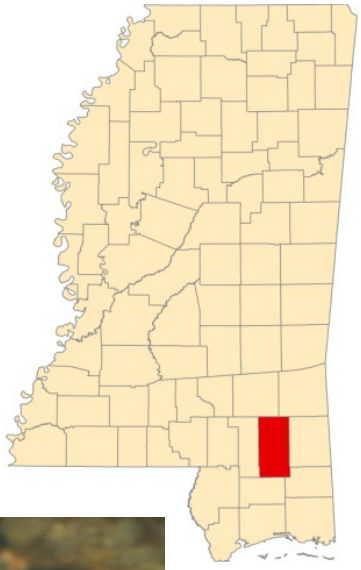
Mississippi River, has also been channelized in certain reaches. Most of its watershed has been converted to agriculture, resulting in enormous inputs of silt, fertilizer, pesticides, and herbicides into the river and its tributaries. In addition, lowering of the water table throughout much of the Delta due to both excessive pumping and a lack of recharge of groundwater has resulted in much lower flow volume within the Big Sunflower River. Most other streams within Mississippi have been severely altered by pollution and siltation, and many streams have suffered from erosion resulting from gravel mining within or adjacent to stream channels.

RECOMMENDATIONS

The life history and ecology of all species of endangered mussels are poorly known, and study of these mussels should be encouraged. Stream or watershed projects which may cause siltation, impoundment, headcutting, or otherwise negatively affect remaining habitat should be discouraged. Remaining habitat and mussel populations should be periodically monitored for quality and corrective steps taken if further degradation is noted. Implementation of stream restoration should be considered where possible.

CAMP SHELBY BURROWING CRAYFISH

Fallicambarus gordoni Fitzpatrick



LISTING

Global Rarity Rank – *Rarity ranging between imperiled & vulnerable throughout the range (G2G3)*
Federal Protection Status – *Non-listed*
State Protection Status - ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

This is a small crayfish, approximately 41mm (1.6 in.) in total length. The cephalothorax is dark grey dorsally and yellowish-grey laterally; the abdomen is a drab yellow. The claws (chela) are grey with a slight lavender wash. The eyes are tiny. This species is similar to several other members of the genus *Fallicambarus* found elsewhere in Mississippi. Crayfish identification is the domain of a few specialists, as classification is typically based upon the shape of the copulatory structures (pleopods) in mature males. Pleopods are the anterior most abdominal appendages.

RANGE

This crayfish occurs only on the Camp Shelby National Guard Training Facility on the DeSoto National Forest. It lives in pitcher plant bogs in the Cypress Creek, Dickey Creek, Sweetwater Creek, and Coleman Creek drainages.

HABITAT
Camp Shelby burrowing crayfish live only in pitcher plant flats.

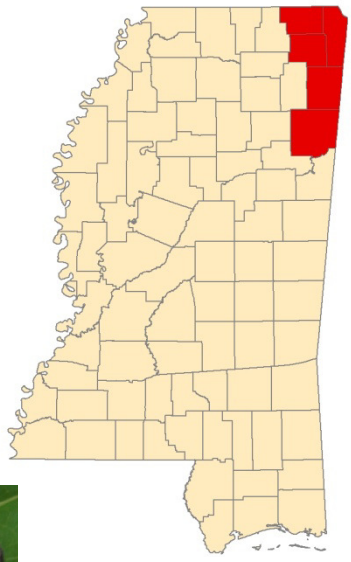
LIFE HISTORY & ECOLOGY
This is a primary burrower, as are most members of its genus. This means that its activities are largely confined to its burrow system, although it may emerge on the surface for feeding or mating at night during mild, wet weather. The burrow system is complex, but relatively shallow, with vertical and horizontal tunnels and side passages.

BASIS FOR CLASSIFICATION
Potential threats to the existence of this species include a limited range and modification of its pitcher plant habitat by construction of military training platoon lanes, by all-terrain vehicle trails, by destructive logging practices, and by overgrowth of brush because of ineffective burning.

RECOMMENDATIONS
The Mississippi National Guard, U.S. Forest Service, and MDWFP have developed and implemented a Candidate Conservation Plan for this species. Threats to habitat due to military construction can be averted with careful planning, since this species is not widely distributed at Camp Shelby. All-terrain vehicles have been excluded from areas where this species occurs. Logging operations in the vicinity of pitcher plant bogs are planned and conducted to avoid vehicle wheel ruts and skidder trail troughs which can alter the subtle topographical features and drainage patterns which permit development of the pitcher plant community. Growing season prescribed burns have been used to maintain pitcher plant flat communities and to maintain appropriate habitat for listed species occurring, or historically occurring, on adjacent well-drained sites.

MITCHELL'S SATYR BUTTERFLY

Neonympha mitchelli mitchelli French



LISTING

Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status - ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of MMNS

DESCRIPTION

The Mitchell's satyr butterfly is a medium-sized, rich brown butterfly that has a wing span of 4.4 cm (1.7 in.). The undersides of both pairs of its wings are marked with a row of four to five, yellow-ringed black circular eyespots containing silvery centers. A pair of orange bands encircles the eyespots in addition to an outer orange band and a darker brown mid-wing band.

RANGE

This butterfly is considered to be one of the most endangered butterflies in North America and is currently only known to occur in Mississippi, Alabama, Michigan, Indiana and Virginia. In Mississippi, this species has only been found at a few locations in the northeastern counties of Alcorn, Prentiss, Tishomingo, Monroe, and Itawamba.

HABITAT

Seepage slopes composed of lowland shrub-sedge marshes and forested swamps in northeastern Mississippi appear to provide ideal habitat for the Mitchell's satyr. These wetland habitats are often associated with flooding from beaver activity and contain several sedge species such as *Carex lurida* and *C. crinita*. Biologists believe these plants likely serve as larval host plants for Mitchell's satyrs. Mitchell's satyrs are most often encountered along the interface between forest edges and sedge meadows. Biologists have observed that adult butterflies appear to be very sedentary and seek out shaded areas under shrubs or sedges in which to rest during hot, sunny days.

LIFE HISTORY & ECOLOGY

The life history and ecology of the Mitchell's satyr is not fully understood due to its extreme rarity. In Mississippi and Alabama, this species has been found to produce two separate broods (bivoltine) with the first adult flight period occurring from late May to late June and the second occurring from early August to early September.

BASIS FOR CLASSIFICATION

This species was first identified in Mississippi in 2003, in Tishomingo and Prentiss Counties. It is now known from Itawamba and possibly Alcorn counties, as well. Historically, the loss of fire in the natural landscape, drainage and alteration of wetlands through man-made disturbances, and the near eradication of beavers in the early 1900s likely have attributed to the extreme rarity of this species.

RECOMMENDATIONS

Additional survey work for this species is needed. More research is needed to identify the specific larval host food plants on which Mitchell's satyr depend for survival. More research on the ecosystem dynamics associated with this species is needed.

GULF STURGEON

Acipenser oxyrhynchus desotoi Mitchill

LISTING

Global Rarity Rank – ***Species*** *ranked rare & uncommon with the* ***subspecies*** *ranked as very rare & imperiled (G3T2)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The Gulf sturgeon is a large fish, attaining an average length of 1.8 to 2.5 m (6-8 ft). A large female caught in the Pearl River north of Jackson in 1942 was 2.4 m (7.75 ft) long and weighed 154 kg (340 lb). This species has an elongated head and a pointed, slightly upturned snout. The body is covered with several rows of bony, scale-like plates and the upper section of the caudal fin is markedly longer than the lower section. The mouth is sucker-like, toothless, and has thick lips. There are four elongated fleshy projections (barbels) hanging down between the tip the snout and the mouth. The head and back are yellowish-brown and the belly is white.

RANGE

The Gulf sturgeon occurs along the Gulf Coast from the Suwannee River in Florida west to the Mississippi River. In Mississippi, it has been collected in the Pearl River upstream to Madison County and in the Bogue Chitto River upstream to Pike County. In the Pascagoula River watershed, it occurs in the Chickasawhay

River upstream to at least the town of Waynesboro, the Leaf River system upstream to the town of Hattiesburg on the Bouie River, and in the Escatawpa River system.

HABITAT

The Gulf sturgeon is anadromous, meaning that adults spawn in freshwater and migrate into marine waters in the fall to forage and overwinter. Juvenile Gulf sturgeon remain in the river for the first 2-3 years of life. Adults return to their natal stream to spawn. Riverine habitats where the healthiest populations of Gulf sturgeon are found include long, spring-fed, free-flowing rivers, typically with steep banks, a hard bottom, and an average water temperature of 60-72° F. Gulf sturgeon initiate movement up the rivers between February and April and migrate downstream to the Gulf of Mexico between September and November.

LIFE HISTORY & ECOLOGY

A female sturgeon may produce between 800,000 and 2,500,000 eggs per spawning season. Eggs are laid in running water over rubble, gravel, clay, or shell at a water temperature of between 55° and 65° F. The eggs hatch in approximately one week. Young sturgeon appear to remain in fresh water for up to four years, after which they migrate to the sea. They reach sexual maturity in 7-12 years at weights of 45-60 kg (100-150 lb). Gulf sturgeon may grow as large as 3 m (10 ft) and may live up to 70 years. Spawning may occur every year, although there is some evidence that gulf sturgeon require a long resting period between spawnings. Mature sturgeon move into freshwater from the ocean in early spring to spawn and migrate back to saltwater in the autumn or early winter. Younger, immature sturgeon may participate in these yearly migrations, but apparently do not move as far upriver as adults. Similar to salmon, Gulf sturgeon appear to return as adults to spawn in the same river in which they hatched. The diet of the Gulf sturgeon consists of aquatic insects and other aquatic invertebrates when they inhabit freshwater and mollusks, shrimps, other invertebrates, and small fish while in marine environments.

BASIS FOR CLASSIFICATION

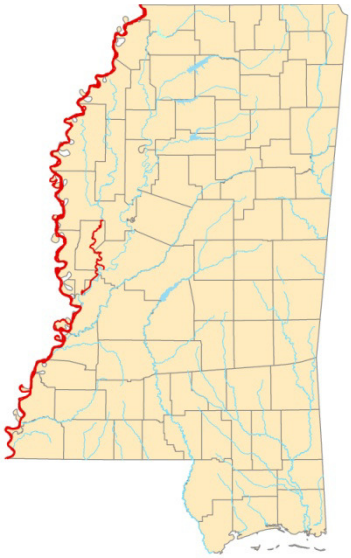
The decline of the Gulf sturgeon throughout its range appears to have resulted from overfishing and the loss or alteration of spawning habitat. Commercial fishing depleted Gulf sturgeon stocks shortly after the turn of the century. In the Pascagoula River, for example, 11,000 kg (24,000 lb) of sturgeon were taken in 1902. Since that time, this species has been infrequently observed in that river system. Incidental take by shrimp boats or other commercial fishing operations in the Gulf of Mexico may also contribute to the continued low population size of this species. River modifications resulting from dam construction, dredging, and/or channelization may prevent sturgeon from gaining access to spawning grounds or may destroy the substrates on which eggs are deposited. Finally, widespread industrial and domestic pollution has reduced both feeding and spawning habitat for sturgeon.

RECOMMENDATIONS

Existing gulf sturgeon populations in the Pascagoula and Pearl river systems should be inventoried to determine the current status of this species in Mississippi. Life history studies to determine spawning periods and locations, feeding grounds, and population structure should be conducted. Any proposed channel modifications in the Pearl or Pascagoula watersheds should be scrutinized for possible impact on the survival of the gulf sturgeon.

PALLID STURGEON

Scaphirhynchus albus (Forbes and Richardson)



LISTING

Global Rarity Rank –*Critically Imperiled (G1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

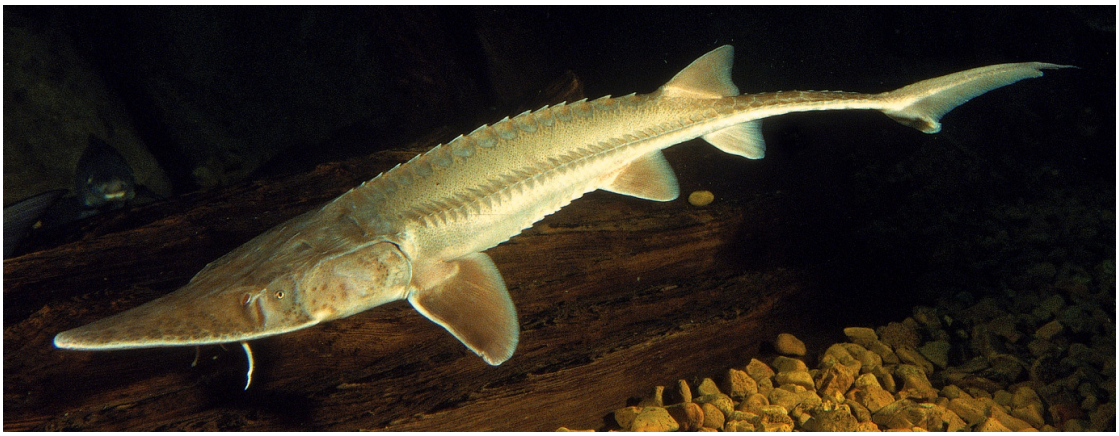


Photo courtesy of Jerry L. Litton©

DESCRIPTION

This freshwater sturgeon is grayish-white and has a broad, shovel-shaped snout and a slender caudal peduncle (area just in front of the tail fin). It differs from the similar shovelnose sturgeon in its lighter hue, in its barbel arrangement (the bases of the lateralmost two barbels beneath the snout are usually just posterior to the bases of the medial barbel pair; the opposite arrangement is characteristic of the shovelnose), and in the absence of scale-like scutes on the belly between the rows of ventrolateral plates. Additionally, the pallid has more rays in its dorsal fin (37 or more) and anal fin (24 or more) than does the shovelnose, and attains a larger maximum weight, 39 kg (85 lb), and length, 168 cm (66 in.). Adult pallids typically weigh 6.8-11.3 kg (15-25 lb).

RANGE

The pallid sturgeon is nearly restricted to the main channels of the Lower Yellowstone River, the Missouri River, and the Mississippi River below Saint Louis, Missouri. It is known to occur in the Mississippi River in the State of Mississippi; there is a single historical collection record from the Yazoo River.

HABITAT

The pallid sturgeon prefers turbid, large rivers with strong current over sandy or rocky bottom.

LIFE HISTORY & ECOLOGY

This is one of the most poorly known and infrequently encountered North American fish. It spawns in May and June and feeds on aquatic insects and small fish.

BASIS FOR CLASSIFICATION

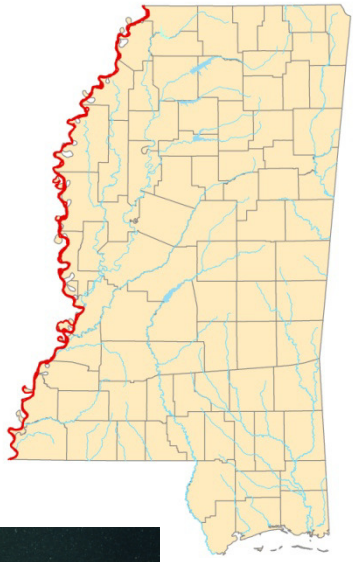
Numbers of pallid sturgeon appear to be low throughout its 3,500 mile river range. Fifty-one percent of its range has been channelized, an additional 28% has been impounded, and the remaining 21% is affected by related changes in flow regimes. These alterations have blocked movements of the fish, modified or destroyed spawning habitat, rendered food sources less accessible, and changed important environmental factors (water temperature, for example). The commercial sturgeon fishery (principally directed at the shovelnose) and snag hook fishing for paddlefish have probably negatively impacted some pallid sturgeon populations as well. Water pollution and possible hybridization with shovelnose sturgeon are additional potential threats.

RECOMMENDATIONS

A pallid sturgeon recovery team has been established by the U.S. Fish and Wildlife Service. Researchers are currently striving to develop improved methods for distinguishing between pallid and shovelnose sturgeon as well as for identifying hybrids of the two. This will facilitate law enforcement and permit better assessment of the hybridization problem. Commercial harvest of sturgeon species is now prohibited in rivers known to be occupied by pallid sturgeon, and legal harvest is no longer a threat. Recent investigations in the Lower Mississippi River have documented reproduction and recruitment of pallid sturgeon and the species does not appear to be as rare in this portion of its range as previously believed. While river channel alteration was an important factor that influenced protection of the species under the ESA, the Mississippi Valley Division of the U.S. Army Corps of Engineers has developed a Conservation Plan for the Lower Mississippi River, which includes Best Management Practices for minimizing impacts to pallid sturgeon and restoring river habitat functions.

Shovelnose Sturgeon

Scaphirhynchus platorynchus (Rafinesque)



LISTING

Global Rarity Rank – *Apparently Secure (G4)*

Federal Protection Status – ***Threatened, Similarity of appearance (T/SA)***

State Protection Status – *Non-listed*

State Rarity Rank – *Apparently Secure (S4)*

Photo courtesy of NEBRASKAland Magazine/Nebraska Game and Parks Commission ©

DESCRIPTION

This is a smaller sturgeon generally similar in appearance to the pallid sturgeon. The shovelnose sturgeon is darker in coloration than the pallid sturgeon and is also differentiated by the presence of dermal scutes or plates on the ventral side. It differs from the similar (and less-common) pallid sturgeon in its darker hue, in its barbel arrangement (the bases of the lateralmost two barbels beneath the snout are usually just anterior to the bases of the medial barbel pair; the opposite arrangement is characteristic of the pallid), and in the presence of scale-like scutes on the belly between the rows of ventrolateral plates. Additionally, the pallid has more rays in its dorsal fin (37 or more) and anal fin (24 or more) than the shovelnose.

RANGE

The shovelnose sturgeon is found in the Mississippi River and its larger tributaries including the Arkansas, White, Missouri and Ohio Rivers. In Mississippi, it is known to occur in the Mississippi River proper.

HABITAT

The shovelnose sturgeon occurs in the main channel of large, turbid rivers. It associates primarily with bottom substrates, preferring flowing water over sand mixed with gravel and mud.

LIFE HISTORY & ECOLOGY

The most common diet items of the shovelnose sturgeon include benthic insects such as caddisflies, mayflies, and midges. The fish uses its protrusile, ventrally located mouth to create suction and "vacuum" these prey items from the river bottom. Shovelnose sturgeon spawn in the spring, but specifics regarding spawning habitat, fecundity, and spawning periodicity are not well known.

BASIS FOR CLASSIFICATION

This species is similar to the less common pallid sturgeon and has received federal threatened status because of this similarity. Law enforcement and commercial data indicated that up to 2% of shovelnose harvested for caviar were actually pallid sturgeon, and it was deemed that the risk for incidental catch of pallid sturgeon by commercial fisherman seeking to harvest shovelnose sturgeon was great enough to warrant regulation.

RECOMMENDATIONS

Life history studies are needed in order to better understand the reproductive biology and habitat requirements of the shovelnose sturgeon. Morphological and genetic studies are on-going to aid biologists and fisherman in distinguishing this fish from the very similar pallid sturgeon. The Mississippi Valley Division of the U.S. Army Corps of Engineers has developed and implemented a Conservation Plan for the Lower Mississippi River, which includes Best Management Practices for minimizing impacts to sturgeon and restoring river habitat functions.

BIGEYE SHINER

Notropis boops (Gilbert)

LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The bigeye shiner is a medium-sized minnow with distinctly large eyes and a short, rounded snout. The back and upper sides of the body are greenish to olive-yellow. Scales in this region are strongly outlined with dark pigment and the midline of the back has a thin, but distinct, stripe. The sides of the body are marked with a distinct, dark lateral band that encircles the snout and continues posteriorly to the caudal fin base. The lateral band is bordered above by a pale, faintly pigmented zone. The lateral line is punctulate, with the anterior lateral line pores distinctly bordered above and below by dark dots. The body below the lateral band is generally white. Adults are typically smaller than 66 mm (2.6 in.) while the maximum reported length is 91 mm (3.6 in.) total length.

RANGE

This fish occurs mostly in upland streams of the Mississippi River Basin from Illinois, Indiana, and Ohio south to the Tennessee River drainage of northern Mississippi and Alabama. It is found in western Mississippi River tributaries in Missouri, Arkansas, Oklahoma, Kansas, Texas, and Louisiana. In Mississippi, the bigeye shiner is found only in the Tennessee drainage in Tishomingo and Alcorn counties.

HABITAT

The bigeye shiner generally occurs in pools of cool, clear flowing creeks and streams with clean sand or gravel substrata.

LIFE HISTORY & ECOLOGY

The bigeye shiner feeds primarily on terrestrial and aquatic insects, organic detritus, and algae. Spawning occurs from April through August, with activity peaking in early July. Most fish live only to their second year, with very few surviving to their third year.

BASIS FOR CLASSIFICATION

The bigeye shiner still occurs in Mississippi although recent survey efforts suggest a low population size. It is intolerant of siltation and continuous high turbidity. Throughout its range, declines in populations of bigeye shiner have been associated with increased stream turbidity resulting from poor land management practices.

RECOMMENDATIONS

A survey of the current status of this species in Mississippi is needed, as are studies of its natural history. Restrictions on water quality degradation and deleterious habitat alterations should be implemented for those streams known to harbor bigeye shiners.

IRONCOLOR SHINER

Notropis chalybaeus (Cope)

LISTING

Global Rarity Rank – *Apparently Secure (G4)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The ironcolor shiner is a small shiner with a deep, compressed body which is generally arched, being deepest at the origin of the dorsal fin. The body is straw-olive to dark olive with the dorsal scales lightly pigmented along their margins. A conspicuous black lateral band extends from the tip of the snout to the base of the tail and terminates as a small irregularly shaped caudal spot. The lips and chin are lightly pigmented by the lateral band as it encircles the snout and the inside of the mouth is distinctly sprinkled with black pigment. Breeding males develop an orange to rosy hue over the entire body. The maximum size is 65 mm (2.5 in.) total length.

RANGE

This fish species is widespread and occurs in the Atlantic Slope and Gulf Coastal Plain drainages from New York to eastern Louisiana, the Mississippi Embayment from northern Louisiana to southern Illinois

(exclusive of Tennessee), and the upper Mississippi basin in Michigan and Iowa. Within Mississippi, the ironcolor shiner historically occurred along the coastal area of the state in the Biloxi, Jourdan, Wolf (Coastal Rivers drainage), Escatawpa (Pascagoula drainage), and Pearl River (Pearl drainage) systems.

HABITAT

The ironcolor shiner is found primarily in lowland streams where stream reaches are characterized by abundant aquatic vegetation, open swamp habitat, and/or areas draining densely canopied woodlands. Individuals often aggregate at the upstream ends of pools in water 60-90 cm (23.6-35.4 in.) deep with a moderate to sluggish current and sand, mud, silt, or detrital substrata.

LIFE HISTORY & ECOLOGY

This fish is a sight feeder, with its diet including small crustaceans, aquatic insects, terrestrial insects, and filamentous algae. The spawning season extends from mid-April to late September, with peak activity in the Mississippi likely occurring in late June. Eggs are adhesive and stick to sand and detritus along the bottom.

BASIS FOR CLASSIFICATION

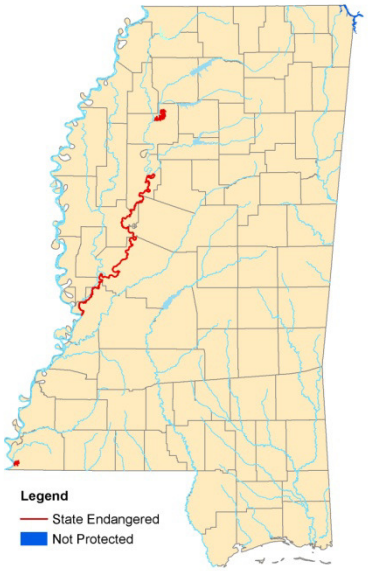
A survey conducted in 1995-1996 of historic localities of this species in Mississippi failed to yield any specimens, although individuals were documented from a backwater area of the Escatawpa River in 1996 during a separate investigation. Prior to that occurrence, the species was last observed in the Wolf River in 1984. The ironcolor shiner is intolerant of habitat degradation and the absence of this fish from several historic sites may be related to channel and floodplain alteration, loss of stream side vegetation, and/or drainage improvement.

RECOMMENDATIONS

Ongoing surveys for the ironcolor shiner that began in 2013 documented occurrences at two locations on the main channel of the Escatawpa River. The status of this fish should be re-evaluated upon the completion of this survey. The only known extant population of ironcolor shiner in Mississippi should be protected from habitat degradation in the Escatawpa River watershed. The establishment of a riparian buffer zone would aid in protecting instream habitat and water quality. The coastal counties of Mississippi are experiencing rapid development and a large influx of new residents. As such, deterioration of water quality within coastal drainages is very likely if new development within these watersheds is not encouraged to follow best management practices to minimize impacts on the aquatic systems.

SOUTHERN REDBELLY DACE

Phoxinus erythrogaster (Rafinesque)



LISTING

Global Rarity Rank –*Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of W. Pflieger AFS ©

DESCRIPTION

The southern redbelly dace is a small minnow averaging 55-65 mm (2.1-2.6 in.) in length. It has two black stripes along its sides which are separated by a larger light green to yellow or silvery white stripe. The back is greenish-brown with scattered dark spots. The belly is white. In breeding males, the undersurface of the head and body is vivid red, the base of the dorsal fin may be red or yellow, and the pelvic and anal fins are yellow.

RANGE

This fish occurs from Minnesota and western Pennsylvania south to Arkansas, Mississippi, and Alabama. In Mississippi, the southern redbelly dace occurs in the Tennessee River drainage of Tishomingo County, small tributaries of the Yazoo River drainage in Yazoo and Warren counties, the Tallahatchie River drainage in Tallahatchie County, and small tributaries of the Lower Mississippi River South drainage in Wilkinson and Warren counties.

HABITAT

The southern redbelly dace occupies small creek and spring run pools which have permanent cool water with clean gravel or sometimes clay bottoms.

LIFE HISTORY & ECOLOGY

This fish is usually found near the bottom of small streams, often in association with exposed roots or other vegetation, where it forages over rocks and other objects. It appears to feed primarily on algae and other plant materials. Spawning occurs in the spring, when females lay their eggs in the nests of other minnow species on clean gravel sections of riffles. This fish matures when it reaches approximately 54 mm (2 in.) in length and probably does not live more than two years.

BASIS FOR CLASSIFICATION

The populations of the southern redbelly dace occurring in western Mississippi are considered endangered while those in Tishomingo County are not. The latter are part of a much larger population occurring throughout the Tennessee River basin in Alabama, Tennessee, and Kentucky. Those in western Mississippi are disjunct (separated by a large area) from the main population and thus are of great scientific interest. Siltation from industrial activities, urban development, and improper agricultural or forestry practices appears to be the principal threat to this species in its disjunct range.

RECOMMENDATIONS

A survey of this fish in the loess bluff region along the Mississippi and Yazoo rivers is needed. Areas with viable populations should be preserved through conservation easements.

SUCKERMOUTH MINNOW

Phenacobius mirabilis (Girard)

LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Possibly extirpated; known occurrences only from historic records (SH)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The suckermouth minnow is a long, cylindrical minnow with small eyes and bluntly rounded snout. The small sucker-like mouth is distinctive, with large fleshy lips and enlarged fleshy lobes distinctly noticeable at the rear corners of the mouth. The back is dusky olive-brown, becoming silvery white on the undersides. The sides are marked by a dusky lateral band that encircles the snout and terminates at the caudal fin as a conspicuous horizontal, elongate, black spot. The suckermouth reaches a total length of 122 mm (4.8 in.).

RANGE

The suckermouth minnow is primarily found in the upper and central portions of the Mississippi River basin from Ohio and West Virginia to Minnesota, South Dakota, Wyoming and Colorado, and south to northern Mississippi and Alabama. It is also found in some western Gulf of Mexico drainages of New

Mexico, Texas, and Louisiana. In Mississippi the occurrence of this species is limited to the Tuscumbia River in Alcorn County and from Bear Creek in Tishomingo County.

HABITAT

The suckermouth minnow may be found in small creeks and large rivers with sand or gravel substratum. Although more abundant in riffles and shallow raceways, it is not restricted to fast current. It is moderately tolerant of turbidity and siltation provided there is sufficient current to keep gravel riffles somewhat free of silt.

LIFE HISTORY & ECOLOGY

The suckermouth minnow feeds upon aquatic insects and organic detritus by using its sensitive snout and lips to root for prey in the substratum. Spawning occurs from April through August with females containing up to 1,640 mature eggs. Individuals likely reach maturity at age two. The life span is four to five years.

BASIS FOR CLASSIFICATION

Survey efforts since 1985 have failed to document the presence of this species in Mississippi. This is surprising in light of the wide habitat tolerance exhibited elsewhere by the species and its apparent eastward range extension from Illinois into Indiana and Ohio in response to increased stream siltation.

RECOMMENDATIONS

A status survey is needed to determine whether this species still occurs in Mississippi, as are studies of its natural history. Restrictions on water quality degradation and habitat alterations should be implemented for those streams known to harbor suckermouth minnows.

FRECKLEBELLY MADTOM

Noturus munitus Suttkus and Taylor

LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The frecklebelly madtom is a diminutive member of the catfish family reaching an adult length of 40-90 mm (1.5-3.5 in.). It has four dark brown, saddle-shaped blotches over a mottled, light brown ground color and the abdomen is speckled with widely spaced brown spots. The adipose fin is continuous with the caudal fin and has a dark brown blotch that extends to its upper margin. The frecklebelly madtom is similar in appearance to the piebald madtom, *Noturus gladiator*, but the two can be distinguished by examining pigmentation on the caudal peduncle and caudal fin. The piebald madtom exhibits a prominent horizontal band of pigment that connects the end of the caudal peduncle to the first vertical band of pigment on the caudal fin. This horizontal band of pigment is absent or very thin and faint in the frecklebelly madtom.

RANGE

This species was formerly widely distributed in the Pearl and Mobile river drainages of Mississippi, Alabama, Louisiana, Tennessee, and Georgia. In Mississippi, it occurs in major tributaries of the highly altered Tombigbee River. Surveys indicate the species no longer occurs in the main channel. The frecklebelly madtom is relatively common throughout lower portions of the Pearl River drainage in Mississippi.

HABITAT

The frecklebelly madtom prefers stable gravel or rubble riffles and rapids in both the main river channels and in their larger tributaries.

LIFE HISTORY & ECOLOGY

Reproduction is thought to occur in June and July, with adult females laying 50 to 75 eggs per season. This fish feeds primarily on aquatic insects.

BASIS FOR CLASSIFICATION

The frecklebelly madtom is intolerant of siltation and sedimentation, and apparently cannot withstand disturbance of its gravel bar habitat by gravel mining. Its low mobility and low reproductive potential make it extremely sensitive to any form of habitat alteration, resulting in its absence from large parts of its former range. The construction of the Tennessee-Tombigbee Waterway has eliminated much of its former habitat in the Tombigbee River system.

RECOMMENDATIONS

Life history studies should be initiated in the Pearl River watershed where this species is still relatively common. Any watershed alteration projects planned for the Pearl River should be planned to minimize impacts to this species.

PIEBALD MADTOM

Notorus gladiator (Thomas and Burr)

LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The piebald madtom is described from sandy Coastal Plain streams of Mississippi and Tennessee. These populations were formerly considered conspecific with populations of the northern madtom, *Noturus stigmosus*, which occur in the Great Lakes and Ohio River basins. Both fishes exhibit a pattern of contrasting pigmentation, but the piebald madtom is distinguished by a greater degree of pigment contrast, a distinct color pattern, larger body size (132 mm or 5.2 in.), and more extensive armature on the anterior and posterior portions of the pectoral spine. The specific epithet, *gladiator*, reflects the robustness of the pectoral spines. The common name, piebald madtom, reflects the alternating dark and light pigmentation found from the anterior to the posterior ends of the body. The degree of contrast between light and dark pigments is such that the piebald madtom was considered by its describers as the most boldly marked of the madtom catfishes. The piebald madtom exhibits a prominent horizontal band of pigment that connects the end of the caudal peduncle to the first vertical band of pigment on the caudal fin. This horizontal band of pigment is absent or very thin and faint in the similar-looking frecklebelly madtom.

RANGE

The range of the piebald madtom includes eastern tributaries of the Mississippi River in western Tennessee and Mississippi. Vouchered records of piebald madtom in Mississippi exist from the Lower Mississippi North, Big Black, and Yazoo River drainages.

HABITAT

The piebald madtom inhabits rivers 4-15 m wide and occur in areas of slow current over shifting sand and mud substrates. Individuals are most frequently associated with leaf litter deposited below riffles and can be collected beneath undercut banks if that habitat is available.

LIFE HISTORY & ECOLOGY

Studies on the feeding and reproductive biology of the piebald madtom have not been conducted.

BASIS FOR CLASSIFICATION

The piebald madtom is rare throughout its range, apparently persisting at very low densities. Low population sizes leave the species vulnerable to catastrophic extirpation and limit the amount of information biologists can gather regarding the ecology of the species. Populations also exhibit a disjunct distribution, a characteristic that limits gene flow and can reduce fitness.

RECOMMENDATIONS

Surveys conducted during 2011-2012 indicate that the piebald madtom continues to exhibit an extremely patchy distribution and low abundance. It should retain its S1 ranking in Mississippi. Restrictions on water quality degradation and deleterious habitat alterations should be implemented for those streams known to harbor piebald madtoms. Methods for better detecting the species in habitats where it occurs need to be developed in order to gather the biological information further conservation measures will require.

SLENDER MADTOM

Noturus exilis (Nelson)

LISTING

Global Rarity Rank –*Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Shute AFS©

DESCRIPTION

A member of the catfish family, the slender madtom is a relatively small species with a flattened head and long, slender body. The body is relatively uniform in color ranging from yellowish-brown to gray along the back and sides, fading to a pale yellow along the abdomen. There are no dark saddles or blotches. The margins of the dorsal, caudal, and anal fins are outlined with a black band. The adipose fin is continuous with the caudal fin except for a shallow indentation. Adults range in size from 76-127 mm (3-5 in.) total length with a maximum size of 152 mm (6 in.) total length.

RANGE

This fish exhibits a disjunct distribution apparently with two population centers. Populations west of the Mississippi River are generally confined to Ozark highland streams of Oklahoma, Arkansas, and Missouri north to southern Wisconsin and Minnesota. Populations east of the Mississippi River occur in upland

streams of Alabama, Tennessee, and Kentucky. In Mississippi, the slender madtom is known only from Bear Creek in Tishomingo County.

HABITAT

Slender madtoms occur in small to medium-sized streams with clear water and rock or gravel bottoms. It is generally more common in riffle and pool habitats with moderate to swift currents. Adults utilize large rocks and instream debris for cover during the day with most activity taking place at night.

LIFE HISTORY & ECOLOGY

Major food items include small aquatic insects and crustaceans. Most feeding activity occurs at night, particularly at dusk and dawn. Reproduction occurs from June to July with females producing 20-150 mature eggs. Males excavate nest cavities under large, flat rocks and defend the nest until the young fish have absorbed the yolk sacs and are capable swimmers. Individuals likely reach maturity at age two and live four to five years.

BASIS FOR CLASSIFICATION

A slender madtom has not been collected in the State of Mississippi since 1988 and the species could be extirpated from the state. It is intolerant of siltation and has declined in the greater northern part of its range due to agricultural runoff and alterations in river flow.

RECOMMENDATIONS

A status survey is needed to determine whether this species still occurs in Mississippi, as are studies of its natural history. Restrictions on water quality degradation and deleterious habitat alterations should be implemented for those streams known to harbor slender madtoms.

BAYOU DARTER

Etheostoma rubrum Raney and Suttkus

LISTING

Global Rarity Rank – *Critically Imperiled (G1)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The bayou darter is a small fish attaining a maximum total length of about 63 mm (2.5 in.). The back and upper sides are gray and the belly is light green to white. The breast of the male is blue while that of the female is light blue to white. There are small, bright red spots and dark, somewhat indistinct horizontal lines along the sides of the body. The dorsal, caudal, and anal fins of males are light brown at the base, have a broad red band in the middle, and have a narrow light band below the outer margin. The pectoral and pelvic fins are light red to reddish orange at the base and clear toward the outer margin. All fins of female bayou darters have rows of black spots and lack the red pigmentation.

RANGE

This fish is a State of Mississippi endemic, occurring only in Bayou Pierre and its larger tributaries (White Oak, Foster and Turkey creeks) in Copiah, Claiborne, and Hinds counties in southwestern Mississippi.

HABITAT

The bayou darter normally prefers swift, shallow water flowing over coarse gravel, but during the winter it occupies areas with large cover objects like logs and boulders which are used as refuges during floods. Occasionally, large individuals are found in areas of swift current in aquatic vegetation along steep banks. The bayou darter seems to prefer larger streams and is not found in small tributaries.

LIFE HISTORY & ECOLOGY

Bayou darters reach densities of three fish per square meter in good habitat. Spawning occurs from late April to mid-June at water temperatures between 21° and 30° C (70° to 86° F). At least 80 eggs are produced by each female during each spawning season. Females are thought to spawn at least twice per breeding season. Most bayou darters mature at one year of age and do not live more than four years. Bayou darters feed primarily on aquatic insect larvae and water mites.

BASIS FOR CLASSIFICATION

The bayou darter is relatively vulnerable to disturbances because it occurs in only a portion of a relatively small watershed. Erosion issues within the Bayou Pierre watershed are currently the main threats to this species. Although river reaches currently experiencing erosion in the form of headcutting present suitable habitat in the form of cleanly swept gravel, previously suitable habitats downstream of these areas are rendered uninhabitable as course substrates are covered over by silt generated at the active headcut.

RECOMMENDATIONS

Landowner cooperation has been obtained in maintaining the integrity of bank areas along Foster Creek, one of the tributaries of Bayou Pierre inhabited by the bayou darter. Restrictions on gravel mining in or near Bayou Pierre should be implemented and enforced. Stream banks within this watershed which have been cleared should have their natural vegetation restored to reduce erosion.

CRYSTAL DARTER

Crystallaria asprella (Jordan)

LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The crystal darter is an elongate, slender species exhibiting a noticeably narrow caudal peduncle. Maximum total length is about 150 mm (6 in.). The head is relatively large and flat compared to other darters. It has four brown saddles on the back which extend downward and forward to the midline on each side. The area between the saddles is patterned with dark brown mottling. The sides have a row of oblong dark brown blotches. The belly is silvery white and a dark brown stripe extends from eye to eye around the snout.

RANGE

The crystal darter once occurred from Wisconsin east to Ohio and south to Oklahoma, Louisiana, and Florida. Its current range is considerably reduced as it is absent from all of Ohio and Indiana. In Mississippi, the crystal darter occurs in the Bayou Pierre, Homochitto, Pearl, and Tombigbee watersheds. The species formerly occurred in the Pascagoula River watershed of Mississippi as well, but has not been collected there since the 1930's.

HABITAT

The crystal darter inhabits clean sand and gravel raceways of larger creeks and rivers. It is usually found in water deeper than 60 cm (ca. 2 ft) with moderate to strong current. In the altered main channel of the Tennessee-Tombigbee Waterway, crystal darters are known to occur over remnant gravel patches that are often near tributary confluences.

LIFE HISTORY & ECOLOGY

The crystal darter buries itself in sand with only its eyes protruding and darts out in pursuit of prey drifting in the current. Its diet consists primarily of aquatic insect larvae under natural conditions, but it has been known to switch to planktonic prey in human-altered habitats. It moves to deeper water during the day and into shallower water at night. The crystal darter breeds during late winter and early spring.

BASIS FOR CLASSIFICATION

The crystal darter has apparently disappeared from much of its former range because of pollution and habitat alteration. In Mississippi, it still occurs in Bayou Pierre and in the Pearl River system, but does not appear to be abundant. Its status in the Homochitto River is undetermined and its existence there is based on one collection record. Persistent populations of the crystal darter occur in major tributaries of the Tombigbee River. It remains unclear if individuals occurring in the heavily altered main channel represent a breeding population or are simply immigrants from tributaries.

RECOMMENDATIONS

A survey of the current status of this species in Mississippi outside of the Tombigbee River watershed is needed to update the status of this fish, as are studies relating to its reproductive biology and genetic variability. Restrictions on water quality degradation and deleterious habitat alterations should be implemented for those streams known to harbor crystal darters.

GREENSIDE DARTER

Etheostoma blennioides Rafinesque

LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The greenside darter is a robust darter with a blunt snout, broadly connected gill membranes, and long, expansive pectoral fins. The fusion of the skin over the upper lip with the skin of the snout makes this species unique among all darters. The body color is tan to greenish-brown with six to eight dark saddles along the dorsum and orange-red spots scattered along the upper portion of the sides. The sides are marked with five to eight lateral blotches that are "W" or "U" shaped. Breeding males are intense green to blue-green and the lateral blotches often elongate to become dark vertical bars. The greenside darter is one of the largest species in the genus *Etheostoma* with a maximum total length of 166 mm (6.5 in.).

RANGE

This fish has a disjunct distribution with population centers broadly separated by the Mississippi River. East of the Mississippi River, greenside darters are widespread from New York and Maryland, south from Ontario to Alabama, Tennessee, Georgia, and northern Mississippi. Populations west of the Mississippi

River occur in upland streams of Arkansas, Kansas, Oklahoma, and Missouri. In Mississippi, the greenside darter only occurs in Bear and Cedar creeks in Tishomingo County.

HABITAT

Greenside darters typically occur in upland creeks and small rivers. Reaches are characterized by clear water flowing over gravel and rubble riffles with moderate to fast current or shallow, silt-free pools with steady current and a bedrock substratum. Some studies report a strong association with stream reaches containing aquatic vegetation or green algae.

LIFE HISTORY & ECOLOGY

Greenside darters feed on the immature stages of aquatic insects such as midges, black flies, caddisflies, mayflies, stoneflies, beetles, and dragonflies. One study from Tennessee reports that adults also consume snails. Spawning occurs from February to April in southern populations. Individuals typically spawn in very swift, rubble-bottomed riffles among areas with vegetation, boulders, or sand. Females may produce 500-2,000 mature eggs per season and may spawn several times during a single season. The lifespan for greenside darters is four to five years.

BASIS FOR CLASSIFICATION

In Mississippi, this species is known only from a few individuals taken from Bear and Cedar creeks in Tishomingo County. This scarcity is of particular concern, given that this species is often abundant where it is found in Alabama, Arkansas, and Tennessee. The greenside darter seems to be intolerant of turbidity and sedimentation and could be at risk of extirpation from Mississippi.

RECOMMENDATIONS

Survey efforts in 1999 and 2000 have documented the continued occurrence of greenside darter in both Bear and Cedar creeks of Mississippi. However, additional survey work is needed to update its status in Mississippi and to identify ecological and habitat associations of Mississippi populations. Restrictions on water quality degradation and deleterious habitat alterations should be implemented for those streams known to harbor greenside darters.

PEARL DARTER

Percina aurora (Suttkus and Thompson)

LISTING

Global Rarity Rank –*Critically Imperiled (G1)*
Federal Protection Status – ***Listed Candidate Species (C)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The body of the pearl darter is olive to light brown in color with the sides marked with a series of dark oval to oblong blotches and a single black caudal spot located at the base of the caudal fin. The upper sides are speckled with dark "X" shaped markings. The common name, pearl darter, is in reference to the pearly, pastel blue coloration prominently located on the sides and lower portions of the head. The maximum total length is 75 mm (2.95 in.) with males reaching a larger adult size than females.

RANGE

The pearl darter is known only from Louisiana and Mississippi, where it originally occurred in the Chickasawhay, Leaf, and Pascagoula River systems of the Pascagoula drainage and in the Pearl and Strong River systems of the Pearl drainage. The pearl darter was last taken from the Pearl drainage during the early 1970's and it is assumed that the species is extirpated there.

HABITAT

In the Pascagoula River, the pearl darter occurs in the slow flowing waters along the downstream edge of sandbar point bars in runs 90-150 cm (35-59 in.) deep over a substratum of sand with scattered patches of detritus. It has also been known to occur in pools or deep runs over a bedrock substrate.

LIFE HISTORY & ECOLOGY

Little is known about the biology of the pearl darter. Spawning likely occurs from late February or March to May.

BASIS FOR CLASSIFICATION

Extirpation of this fish in the Pearl drainage is attributed to the deterioration of instream habitat. It is difficult to more precisely describe the cause because multiple, concurrent impairments can be identified (e.g., impoundment, channel alteration, increased siltation). However, the Pascagoula drainage remains the sole refuge for this species, rendering its continued exsistence especially vulnerable to disturbance.

RECOMMENDATIONS

Recent surveys indicate that pearl darters continue to thrive in the Pascagoula drainage and are still absent in the Pearl drainage. Specifically, these surveys confirm presence in the mainstem Pascagoula River, as well as two tributaries, the Leaf and Chickasawhay Rivers. Red Creek of the Pascagoula drainage was surveyed as well, but no occurrences were documented, corroborating the results of previous attempts to document the species there. Efforts should be made to avoid altering channel morphology, hydrology, and connectivity within the Pascagoula drainage in order to avoid impacts that may result in this fish being unable to carry out its life history. Field studies should be conducted to identify spawning areas, evidence of recruitment, and seasonal habitat use.

SLENDERHEAD DARTER

Percina phoxocephala (Nelson)

LISTING

Global Rarity Rank –*Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Jerry L. Litton©

DESCRIPTION

The slenderhead darter has an elongated head and relatively long, pointed snout. The snout and cheek are marked with well developed pre- and postorbital bars. The suborbital bar is generally absent or reduced to a small teardrop-shaped bar below the eye. The back and upper sides are straw yellow to light olive in color with numerous irregular shaped dark saddles that coalesce along their lower margins to produce a faint, wavy line. The sides have 10-16 round to rectangular blotches often connected by a faint, lateral stripe. There is a dark, round black spot at the caudal fin base. Bright colors are generally absent, except for the first dorsal fin which has a distinctive orange submarginal band. The lower portions of the head and body are white to yellow and generally lack dark pigment except for breeding males which develop darker fins and body coloration. Maximum size is 92 mm (3.6 in.) total length.

RANGE

This fish occurs in the upper and middle portions of the Mississippi River basin from Minnesota south to Arkansas, Oklahoma, northwestern Alabama and northeastern Mississippi. In Mississippi, the slenderhead

darter is found in Bear, Yellow and Cedar creeks in Tishomingo County. It is also known from Arkabutla Reservoir on the Coldwater River, though its presence there may be the result of introduction by humans.

HABITAT

Slenderhead darters inhabit moderate to large sized streams with moderate to swift current. They typically occur in raceways with gravel, sand, and rubble substrates. In Alabama, slenderhead darters are reported in pools with mixed sand, silt, and detritus substrates. Young or small fish are noted to inhabit gravel riffles and all individuals may move to deeper waters to overwinter. In Wisconsin, slenderhead darters occur more frequently in streams with turbid waters than clear waters.

LIFE HISTORY & ECOLOGY

Feeding occurs primarily during the day, with food items including mayfly, midge, blackfly, and caddisfly larvae. Spawning occurs from April to June in swift flowing runs or riffles 15-60 cm deep over gravel and rubble substrata. Males generally move to the spawning area before females. Maximum life span is three to four years.

BASIS FOR CLASSIFICATION

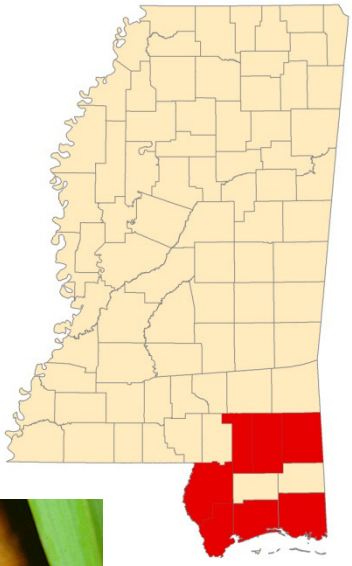
This species has rarely been collected in Mississippi waters and could be extirpated from the state. However, populations still occur in the Alabama portion of Bear and Cedar creeks and therefore represent the potential for downstream movement and colonization of Mississippi's waterways in Tishomingo County, provided instream habitat remains suitable. Populations have declined in Illinois and Ohio due to siltation of gravel riffles.

RECOMMENDATIONS

A survey of the current status of this species in Mississippi is needed, as are studies to identify ecological and habitat associations of Mississippi populations. Restrictions on water quality degradation and improved land management practices should be implemented to reduce deleterious habitat alterations for those streams known to harbor slenderhead darters.

DUSKY GOPHER FROG

Rana sevosa Goin & Netting



LISTING

Global Rarity Rank – *Critically Imperiled (G1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status - ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

This is a medium-sized, large-headed frog. Snout to vent (i.e., not counting the legs) length of adults ranges from 56-113 mm (2.2-4.3 in.). The tympanum (the thin oval membrane separating the inner and outer ear) is smaller than the eye, the ridges down the sides of the back are conspicuous, and there is a prominent hump at the hips (sacral hump). The back is often warty, although this feature may vary on individual frogs, depending upon moisture and temperature. The back is marked with large brown spots on a dark gray to almost black background color. In Mississippi, these frogs can easily be confused with the crawfish frog *(Rana areolata circulosa)* but can generally be distinguished from the latter by the absence of light borders

around the dark dorsal spots and by a darkly mottled or speckled venter. The two species are not found together, since the crawfish frog is not found in southeastern Mississippi. The species is sometimes referred to as the dark gopher frog and has been placed by some amphibian taxonomic authorities in the genus *Lithobates*.

RANGE

The dusky gopher frog's historic range extends along the coastal plains region from the three easternmost counties of the Florida Parishes region of Louisiana east to the Mobile River in Alabama. Recent research indicates the gopher frog in Mississippi is genetically distinct from its nearest remaining relatives in Alabama. In Mississippi, the dusky gopher frog has been recorded in Forrest, Greene, Hancock, Harrison, Jackson, Pearl River, and Perry counties.

HABITAT

Dusky gopher frogs require two distinct habitats: temporary pools for breeding and upland foraging sites with some sort of subterranean refuge (tortoise burrows, small mammal burrows, or stump holes). Breeding pools periodically dry up which minimizes the likelihood that fish or large predacious insects will be present, thus increasing survival prospects of tadpoles. Ponds may not fill each year or may not remain full long enough to permit tadpoles to transform, so survival is likely to vary considerably from season to season. Adults live in droughty, sandy uplands but can do so only with access to cool, moist, subterranean refuges. Florida populations of gopher frogs are known only from sites which support gopher tortoises, and if tortoise colonies are farther than 1.6 km (1 mi.) from potential breeding pools, they rarely support the gopher frog. In Mississippi, gopher frogs were historically found within tortoise burrows in the coastal counties. However, gopher tortoises are scarce in the areas which currently support dusky gopher frogs.

In Mississippi, approximately 1,996 ha (4,933 acres) are designated as critical habitat for the dusky gopher frog in Forrest, Harrison, Jackson, and Perry counties.

LIFE HISTORY & ECOLOGY

Dusky gopher frogs typically breed from December through March, but very wet weather (often after hurricanes) occurring outside this timeframe may stimulate the frogs to migrate to their breeding pools. Egg masses are roughly spherical and attach to stems of aquatic vegetation or woody debris just beneath the water surface, in the deeper zones of the pool. Some other ranid species (e.g., leopard frogs, pickerel frogs) also deposit globular egg masses, but these species typically produce highly clustered, irregularly shaped (i.e., less spherical) egg masses that are often deposited in very shallow water. Young gopher frogs transform and exit the ponds 81-179 days after hatching. Adults live in or near subterranean refuges in

upland, open longleaf pine forests the remainder of the year, feeding on arthropods and small vertebrates, including other frogs.

BASIS FOR CLASSIFICATION

Populations of this frog are in decline throughout their range. No dusky gopher frogs have been seen in Louisiana in over 45 years. Once described as abundant in Harrison County, Mississippi, intensive surveys since 1989 have revealed only one breeding population in that county (in DeSoto National Forest), one small population in Jackson County near Vancleave, and one isolated male calling at another site in Jackson County. The Jackson County sites were first discovered in 2004. No gopher frogs have been heard or seen at one of these sites since the original observation. The dusky gopher frog population near Vancleave is very small, likely less than 50 adults. Since 1988, little natural production of metamorphs has occurred at the Harrison County site, primarily because the pond dries up before metamorphosis of tadpoles into terrestrial frogs can be completed. During those years, many of the young frogs found at the site descended from tadpoles reared in cattle-watering tanks from eggs collected from the pond. In some years, there was no reproduction at all, as there was insufficient rainfall to fill the basin to a level which would trigger breeding.

Exact reasons for the rangewide declines are unknown, but there are a number of factors of probable importance. Some historical breeding sites have been drained and/or filled or degraded. Sunfish, natural predators of tadpoles, have been introduced at some sites. Growing season fires have been suppressed. These fires are essential to the maintenance of community structure in temporary pools (which often dry during the growing season) and in the surrounding upland habitat. Extensive areas within the historic range of this species with potentially suitable temporary pond basins have been converted into agricultural production or industrial forestry; land uses generally incompatible with persistence of gopher tortoises or gopher frogs.

The remaining gopher frog populations in Mississippi face a number of threats. Increased development and major roadways can destroy or fragment remaining habitat and constrain application of prescribed burning programs. Historically this species occurred in metapopulations associated with several local temporary pools of varying hydroperiods and individuals breeding in one pond (or dispersing juveniles) could use wetter basins in dry years or could recolonize drier sites following extended droughts. This is no longer possible in most areas because of habitat fragmentation. In addition, invasive species such as cogon grass and tallow trees can exclude native species, resulting in habitat characteristics unsuitable for this species. Droughts have resulted in years with unsuccessful reproduction at the Harrison county site, but the use of cattle-watering tanks to head-start metamorphic frogs and the addition of water to the breeding pond from

wells and tanker trucks has allowed the population to persist. Outbreak of a *Perkinsus*-like mycoplasma, which infects tadpoles, has caused at least one major die-off at the Harrison County site and remains present in the populations.

RECOMMENDATIONS

Since the Harrison County pond supports the largest remaining population of the dusky gopher frog, management of the pond and adjacent upland habitat with regular prescribed fire, including growing season fire to reduce woody vegetation encroachment, is recommended.

Additional survey work should be undertaken on private lands which have not been surveyed. Pools which have been enlarged and created by the U.S. Forest Service should be inoculated with cattle tank head-started tadpoles or metamorphs at the earliest opportunity. Each of these sites should be managed for gopher frogs and gopher tortoises (where present) with appropriate prescribed fire. Ideally, stands at all sites should be stocked with longleaf pine, preferably naturally regenerated, and averaging no more than 60% canopy closure. Broad scale application of herbicide should be avoided where possible in occupied gopher frog habitat and in areas for which translocations are planned.

CAVE SALAMANDER

Eurycea lucifuga (Rafinesque)

LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

Adult cave salamanders grow to a total length of 12-18 cm (4.75-7.1 in.), are slender, and have relatively long tails. They are yellow to orange to orange-red with scattered black spots on the tail and body. The lower surface is yellowish and usually unmarked.

RANGE

The cave salamander is limited to limestone areas from western Virginia and southeastern West Virginia south to central Alabama and northeastern Mississippi, north to southern Ohio, Indiana, and Illinois, and west to Missouri and northern Arkansas. In Mississippi, this species is known from only a few localities in Tishomingo County.

HABITAT

The cave salamander occurs around the mouth and twilight zones of caves, in crevices, and beneath rocks and litter in limestone areas. They have also been found in bottomland areas adjacent to such habitats.

LIFE HISTORY & ECOLOGY

Cave salamanders lay clutches of 50-90 eggs from autumn to early spring. The eggs are usually attached to the undersides of rocks in cave pools or in nearby seepage areas and are attended by the female until they hatch. The aquatic larvae transform into the adult stage in about two years. This species feeds primarily on small invertebrates.

BASIS FOR CLASSIFICATION

The cave salamander is listed as an endangered species in Mississippi because of the limited habitat available for it within the state and the small number of known populations. It is threatened by habitat destruction (primarily development), limestone mining, and incidental disturbance and removal by private collectors.

RECOMMENDATIONS

Periodic surveys by qualified individuals should be undertaken to assay population status. Areas with limestone outcrops and/or caves that have populations of cave salamanders should be preserved.

GREEN SALAMANDER

Aneides aenus (Cope & Packard)

LISTING

Global Rarity Rank – *Rarity ranging between vulnerable & secure throughout the range (G3G4)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The green salamander is black with large light green to greenish-yellow mottled blotches. The belly is gray to light yellow and may be unmarked or flecked with yellow. The green salamander has four toes on the front foot and five on the rear foot. The toes (except for the greatly reduced innermost toe on each foot) end in flattened disks. The tail is rounded and is slightly longer than the body. Adult size (including the tail) is slightly over 10 cm (4 in.).

RANGE

The green salamander is found from southwestern Pennsylvania and western Maryland south through eastern Tennessee, northwestern Georgia, and northern Alabama to extreme northeastern Mississippi. Isolated populations occur in southwestern North Carolina, western South Carolina, and southern Ohio. In Mississippi, populations are known only from a small area in Tishomingo County.

HABITAT

The green salamander is primarily an inhabitant of sandstone cliffs, although it is occasionally found under logs or beneath the bark of dead trees, usually in the vicinity of such cliffs. In some cases it occurs in crevices or indentations on boulders that have become detached and are some distance from the rock faces. The green salamander prefers moist areas but does not normally inhabit sites that are continually saturated with water. Occupied cliffs usually have an abundance of crevices and overhangs. Most inhabited rock faces have a hardwood or mixed-pine hardwood overstory and are shaded from direct sunlight.

LIFE HISTORY & ECOLOGY

Courtship in Mississippi populations of the green salamander has been reported in late May and June. Clutch size ranges from 10-20 eggs, which are suspended from the ceiling of a crevice and are attended by the female. Hatching dates in Mississippi are from mid-August to mid-October. There is no aquatic larval stage in this species and hatchlings resemble miniature adults. Mississippi populations use crevices for reproduction, as shelters from predators or adverse environmental conditions, and as overwintering areas. Crevices in direct sunlight are apparently never used. Brumation (period of inactivity during cold periods) occurs from late November to March, although green salamanders may be active in warm periods during this time. In Mississippi, the green salamander prefers horizontal crevices during dry weather and vertical crevices during periods of high humidity and during cold weather. Mississippi populations are most active when the temperature is 70° F or above and the relative humidity is high. On cool or dry nights they are not active on the rock faces, but instead remain at the entrances to their home crevices. Daytime activity has been noted in November during a light rain. Dietary items include insects and other invertebrates. In Mississippi, a high proportion of the diet is apparently composed of ants. Predators include several species of snakes and probably other, larger species of salamanders.

BASIS FOR CLASSIFICATION

The green salamander is listed as an endangered species in Mississippi because of the limited habitat available within the state and the small number of known populations. Sandstone rock face habitat suitable for this species in Mississippi is apparently present only within a small part of Tishomingo County. Declines have been noted in green salamander populations in other parts of its range, although reasons for these are unknown. Like other small amphibians with highly restricted ranges in northeastern Mississippi, it is

vulnerable to removal and incidental disturbance by private collectors. This species is classified as a Category 2 candidate species by the U.S. Fish and Wildlife Service.

RECOMMENDATIONS

Habitat should be preserved when possible. Periodic surveys by qualified individuals should be undertaken to assay population status and all suitable habitats in Tishomingo and surrounding counties should be searched for evidence of the green salamander.

HELLBENDER

Cryptobranchus alleganiensis (Daudin)

LISTING

Global Rarity Rank – *Rarity ranging between vulnerable & secure throughout the range (G3G4)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Terry L. Vandeventer & Robert A. Young©

DESCRIPTION

This is the largest salamander in North America, reaching a length of 20-75 cm (12–29 in.). They are completely aquatic but have no gills as adults. Larvae have external gills until about 18 months of age. There is an opening (the spiracle) on each side of the neck. The head and body are flattened and the skin along the lower sides of the body is loose and folded. This facilitates respiration through the skin, though adults do have lungs. Their small eyes are located at the top of the head; even though they have poor vision they can detect changes in light. The tail is laterally compressed and has a dorsal keel. Limbs are stout and well developed, and there are five toes on the rear feet. Background dorsal coloration is a drab brownish to gray, but irregular darker spots or blotches may also be present.

RANGE

Hellbenders occur or historically occurred in the Susquehanna River drainage of New York, Pennsylvania, and Maryland; the upper tributaries of the Savannah River in South Carolina and Georgia; the Tennessee

River drainage in Tennessee, Georgia, Alabama, Mississippi, North Carolina, and Kentucky; and the Ohio River drainage in New York, Maryland, Pennsylvania, West Virginia, Virginia, Ohio, Indiana, Kentucky, and Illinois. In Mississippi, this species is at the periphery of its range and is found only in Bear Creek in Tishomingo County.

HABITAT

Hellbenders live in clear, moderate to fast-flowing streams with abundant cover, which can include large, flat rocks, bedrock shelves, crevices, and logs.

LIFE HISTORY & ECOLOGY

Hellbenders are completely aquatic, hiding beneath rocks or logs in streams during the day and emerging to forage at night. The principal component of their diet is crayfish, but they will also take other invertebrates and small vertebrates. Breeding occurs from August to October. Eggs are laid in long strings in depressions beneath rocks. More than one female may deposit her eggs in such a depression. Eggs are fertilized externally and the male will guard this site until the eggs hatch (2-3 months).

BASIS FOR CLASSIFICATION

Hellbenders merit a high priority for protection because of their small range and general rarity. They are critically imperiled to vulnerable throughout their range. They are classified as rare in Georgia and as endangered in Illinois, Indiana, Maryland, and Ohio. The principal threat is degradation or destruction of habitat from a variety of sources including impoundments, channelization, mining, silt and nutrient run-off, other water pollution, and den site disturbance from recreational users of rivers. Additionally, they are vulnerable to over-collection for commercial and/or scientific purposes and to incidental capture by fishermen.

RECOMMENDATIONS

Improvements to water quality are important within the Bear Creek drainage for hellbenders and other listed species. Nutrient-rich run-off and other pollutants need to be identified and eliminated. Best management practices are recommended to ensure that silt from construction, agricultural activities, and timber harvest does not enter the stream. Impoundments and channelizing within streams in Mississippi and upstream in Alabama should be avoided. A survey is needed to investigate the frequency of incidental capture of this species by recreational fishermen to determine if regulations to minimize or mitigate such disturbance are needed.

ONE-TOED AMPHIUMA

Amphiuma pholeter Neill

LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of R.D. Bartlett©

DESCRIPTION

A slender, aquatic salamander with four tiny legs that each end in a single toe. The legs may not be readily noticed upon casual inspection. The total length of this dark, reddish brown salamander ranges from 89.3-314.2 mm (3.5-12.4 in.).

RANGE

This species has a patchy distribution within the east Gulf coastal plain in the southeastern United States. It is known from the panhandle of Florida, extreme southwestern Georgia, extreme southwestern Alabama, and from one collection in Mississippi on the Mississippi Sandhill Crane National Wildlife Refuge.

HABITAT

Preferred habitat of the one-toed amphiuma is deep, organic, liquid muck in floodplain terrace streams and in alluvial swamps of low gradient streams.

LIFE HISTORY & ECOLOGY

Little is known of the life history of this species. It eats sphaerid clams, earthworms, insects, and insect larvae.

BASIS FOR CLASSIFICATION

The species merits a high priority for protection because of its small range and general rarity. The coastal counties in Mississippi are undergoing rapid development. Many small wetlands which could potentially support this species have been filled and destroyed, particularly south of Interstate 10.

RECOMMENDATIONS

Additional survey work for this species is needed. Preservation of existing wetlands should be paramount. Mitigation for wetland filling in the coastal counties is typically off-site and distant, which does not contribute to the conservation of this species.

SPRING SALAMANDER

Gyrinophilus porphyriticus (Green)

LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The spring salamander is a relatively large species attaining an adult length of 11.5-22.5 cm (4.5-8.75 in.). It has a small, light-colored ridge, known as the canthus rostralis, extending from the nostril to the eye. Spring salamanders may be reddish-brown, orange, or salmon colored and have variable, small dark markings on the back. The undersurface may or may not be flecked with dark pigment.

RANGE

The spring salamander occurs from southern Canada and southern Maine south to northern Georgia and west to extreme northeastern Mississippi. In Mississippi, it is known to occur at only a few localities in Tishomingo County.

HABITAT

This species occurs in springs, seepage areas, small streams, and in and around wet caves.

LIFE HISTORY & ECOLOGY

The spring salamander lays from 20-100 eggs during the summer, usually attaching them to the undersurface of partially submerged rocks in springs or seepage areas. The eggs are attended by the female until they hatch, usually in late fall. The aquatic larvae transform into the adult form in two to three years.

BASIS FOR CLASSIFICATION

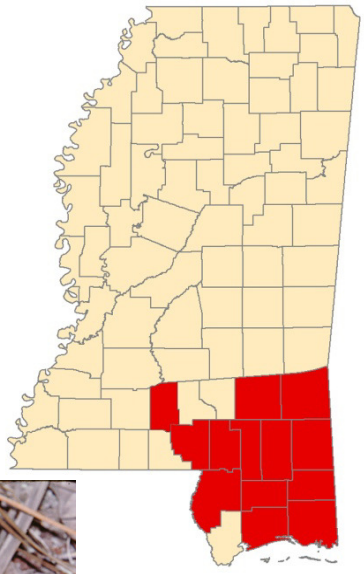
This species is listed as endangered in Mississippi because of the limited habitat available for it within the state and because of the small number of known populations. It is threatened by habitat destruction from development and from conversion of hardwood habitats to dense monocultures of pine. Also, like other small amphibians with highly restricted ranges in northeastern Mississippi, it is vulnerable to removal and incidental disturbance by collectors.

RECOMMENDATIONS

A status survey to determine the size and distribution of the spring salamander population in Mississippi is needed. Habitat determined to be essential to this species should be preserved.

BLACK PINE SNAKE

Pituophis melanoleucus lodingi (Blanchard)



SPECIES LISTING

Global Rarity Rank – *Rare & uncommon (G4T3)*
Federal Protection Status – ***Candidate Species (C)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The black pine snake is a large, relatively stout species attaining a maximum adult size of approximately 2 m (76 in.). Adults are dark brown to black, sometimes with a vague pattern of blotches toward the tail, occasionally exhibiting a few white scales. The venter is dark brown to black, but there may be a few white spots on the belly or throat. Young individuals tend to have more light scales than do adults. The rostral scale is relatively large and curves slightly backward, ending in a point between the nostrils. The scales on the sides and back are keeled.

RANGE

The subspecies has been recorded from 14 counties in southern Mississippi, 6 counties in southwestern Alabama, Escambia County in Florida, and Washington Parish in Louisiana. However, the form found east of the Alabama River (in Baldwin, Escambia, and Covington Counties in Alabama and Escambia County in

Florida), though traditionally called a black pine snake, is distinctly different in appearance and habits from the form found west of this drainage. The eastern form, usually referred to as an "intergrade", is apparently a relic of historical hybridization between the black pine snake and the Florida pine snake (*Pituophis melanoleucus mugitus*). Significant ecological barriers now widely separate the Florida pine snake and the intermediate form from the "true" black pine snake. It is recommended that the intermediate form be managed as a unique entity for this reason.

HABITAT

Black pine snakes, like gopher tortoises and other upland inhabitants of the Longleaf Pine Region, prefer mature longleaf pine forest with sandy soil, an open canopy, moderately fire-suppressed midstory, and thick, grassy understory. Like many other animals adapted to the longleaf pine habitat, they avoid closed canopy pine plantations, pastures, and urban areas. Because the black pine snake (called "gopher snake" by locals) and the federally threatened gopher tortoise (*Gopherus polyphemus*) have similar habitat requirements and are often found in the same general area, some herpetologists have hypothesized that black pine snakes spend a great deal of time in tortoise burrows. However, during a recent three-year telemetry study co-sponsored by the Mississippi Natural Heritage Program, tracked black pine snakes were never found in active tortoise burrows. Snakes in that study were usually found in rotting pine stumps and were underground two-thirds of the time. Black pine snakes have been observed in abandoned tortoise burrows.

LIFE HISTORY & ECOLOGY

Little is known of the reproductive habits of the black pine snake, although mating has been observed in September. One individual was known to have oviposited within the burrow of a juvenile gopher tortoise. In captivity they lay 7-24 eggs. The incubation period is approximately 65 days. Gravid females have been captured in July and August. Scat analysis, field observations, and small mammal trapping studies within pine snake home ranges indicate that the hispid cotton rat (*Sigmodon hispidus*) and the cotton mouse (*Peromyscus gossypinus*) are the most important prey species. However, black pine snakes will readily eat birds in captivity and most likely do so opportunistically in the wild. They may also ingest carrion. One black pine snake was observed to climb 5 m (15 ft) into a young oak tree, but there are no other reports of black pine snakes climbing trees. Tracked black pine snakes had an average home range size of 47.5 ha (125 acres). There was little overlap in black pine snake home ranges, perhaps an indication of territoriality.

BASIS FOR CLASSIFICATION

The Mississippi population of the black pine snake appears to have declined since 1930, when they were relatively common in the cutover "stump forests" in the southeastern part of the state. The subspecies is

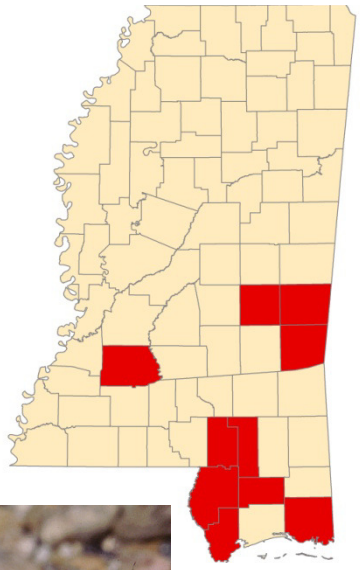
now extremely rare over most of the historic range and has apparently been extirpated from Louisiana and Lauderdale County, Mississippi, but is still relatively common within DeSoto National Forest. A recent study commissioned by the U.S. Fish and Wildlife Service found that 31% of historical black pine snake population segments have been extirpated and that another 26% are in serious jeopardy. The main reason for the decline is habitat destruction/fragmentation due to changes in forest management practices and urbanization. In the past, periodic fires created excellent black pine snake habitat in pine forests by killing competing shrubs and hardwoods and by maintaining openings with adequate sunlight for plants important to mammals and birds that were in turn eaten by the black pine snake. In recent years, fire has been excluded from some of formerly suitable habitats in Mississippi, resulting in a dense understory of hardwoods and shrubs that prevents sunlight from reaching the forest floor, shading out food plants of these prey species. In addition, the majority of controlled burning done in the dormant season or early growing season is not hot enough to effectively control woody underbrush. Shading also results when sandy ridges are clear-cut and planted to form dense pine plantations. Because of their large home range size, black pine snakes are particularly susceptible to road mortality in a landscape increasingly fragmented with roads and off road vehicle trails. Given their size and rarity, they are susceptible to collection for the pet trade and, like many other snakes, they are often killed simply for being snakes; both actions towards this species are illegal in Mississippi. The U.S. Fish and Wildlife Service considers the black pine snake a "Candidate Species" for federal listing.

RECOMMENDATIONS

Black pine snakes are difficult to detect, even when present in relative abundance. Reports of road-kills and other sightings should be actively solicited from the public to better determine the status of this species. More public education and advisement of the penalties is needed to prevent intentional killing of black pine snakes. Management of comparatively large land parcels is probably the best hope for the long-term presence of black pine snakes, gopher tortoises, gopher frogs, and Red-cockaded Woodpeckers in Mississippi. While recent telemetry studies have provided some information about black pine snake ecology, there is still little known of black pine snake daily activity patterns or reproductive ecology. More telemetry studies are needed to fill in these gaps. Research is also needed to more accurately differentiate the black pine snake from the intermediate form found east of the Alabama River.

RAINBOW SNAKE

Farancia erytrogramma (Palisoot de Beauvois)



SPECIES LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Imperiled (S2)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The rainbow snake is a relatively large species attaining a maximum length of approximately 1.5 m (5 ft). Its upper surface is shiny blue or blue-black with three narrow, red stripes running the length of the body. The belly is red with two rows of black spots running lengthwise down the body and a row of smaller spots between them. The background color of the belly is yellow. The scales are large and smooth (no ridge-like structure running lengthwise through the center of the scale), and there is a spine-like scale at the tip of the tail.

RANGE

The rainbow snake is found from southern Maryland south to central Florida and west to the Mississippi River. In Mississippi, it has been recorded from Forrest, Jackson, Hancock, Lamar, Pearl River, and Copiah counties. There are published records of this species from Oktibbeha and Lowndes counties but the validity of these records has been questioned.

HABITAT

The rainbow snake is found in rivers, streams, springs, ponds, and lakes associated with soils which are sandy enough to allow it to burrow.

LIFE HISTORY & ECOLOGY

This species breeds in early summer. Clutch sizes range from 20-52 and the eggs are deposited in cavities in sandy soils. The rainbow snake is most active at night, but has occasionally been seen foraging during the day. Eels appear to be the preferred prey, although other fish, tadpoles, and salamanders are also occasionally eaten. This species is presumed to burrow in sandy soils or mats of aquatic vegetation when not actively foraging.

BASIS FOR CLASSIFICATION

The rainbow snake is seldom encountered anywhere in its range, implying that it is a relatively rare species. However, because it apparently spends much time burrowed into vegetation or sandy soil, this species may be much more common than it appears. In either case, the habitat required by the rainbow snake is suffering widespread alteration through channelization, siltation, and water pollution.

RECOMMENDATIONS

Surveys are needed to determine the status and distribution of the rainbow snake in Mississippi. Water quality and stream channel integrity in areas that are found to contain populations of this species should be maintained to ensure the survival of the rainbow snake. Dams large enough to block eel migrations will also restrict the distribution of rainbow snakes, unless mitigated with fish ladders.

ALABAMA RED-BELLIED TURTLE

Pseudemys alabamensis (Baur)

SPECIES LISTING

Global Rarity Rank –*Critically Imperiled (G1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status - ***Listed Endangered (LE)***
State Rarity Rank –*Critically Imperiled (S1)*

Photo courtesy of Pete Floyd©

DESCRIPTION

This is a large basking turtle with yellow stripes on the limbs, neck, and head, belonging to a group of turtle species commonly called cooters. The carapace length reaches up to 364 mm (14.3 in.) in females and up to 312 mm (12.2 in.) in males. Despite its common name, the color of the plastron is typically reddish only in hatchlings, subadults, and some adult males. Other plastron colors may be cream, yellow, orange, or coral. The plastrons of hatchlings and older juveniles usually have dark markings along the seams between the scutes and there may be dark, often asymmetrical blotches, elsewhere. The dark plastral pattern typically fades with age and may completely disappear, but a hint of the scute seam markings often persists. The carapace exhibits a network of orange-red or yellowish stripes on a green, olive, brown, or black background. In larger juveniles and adult females, the most prominent aspect of the carapace striping

pattern is the presence of a single, relatively broad transverse bar in each of the costal scutes. Adult males frequently become melanistic, obliterating this character, but they often have numerous blackish or reddish spots on the plastron. This species, as with other species in the red-bellied turtle complex, has a pair of tooth-like cusps located on either side of a notch in the middle of the upper jaw and an arrow-shaped stripe pattern on top of the snout. The point of the arrow is directed anteriorly, with its tip just posterior to the nostrils. Red-bellied turtles in Mississippi differ somewhat from Alabama populations in having fewer or less conspicuous head stripes, a narrower head, less conspicuous cusps (particularly on hatchlings), darker background color on the carapace and skin, and a relatively longer, narrower shell.

RANGE

The Alabama red-bellied turtle was first reported in Mississippi in 1932. From then until 1990, only a few turtles identified as red-bellied turtles were collected in Mississippi. When the Alabama red-bellied turtle was listed as federally endangered in 1987, its range description only included Alabama. Since 1990, researchers have established that red-bellied turtles occur in portions of most coastal Mississippi drainages east of St. Louis Bay, including the headwaters of Bayou Cumbest, the lower Pascagoula River and its tributaries (Bluff Creek, Escatawpa River), and lower portions of three coastal rivers entering Back Bay of Biloxi (Old Fort Bayou, the Tchoutacabouffa River, and the Biloxi River). Live adults and a dead hatchling have also been found on the beach at Horn Island and dead hatchlings have been found on the beaches of South Rigolets Island and Round Island. It is probable that these sightings represent waifs and are not indicative of a permanent presence of the species in these areas.

HABITAT

This species is found in fresh and brackish water with submerged and emergent vegetation. This includes channels with little current bordered by extensive open marshes (fresh, brackish, and salt marshes) comprised principally of black needle rush *(Juncus roemerianus*) and habitats farther upstream such as lakes, ditches, ponds, cypress swamps, and oxbows with ample aquatic vegetation. Most identified nesting areas are at sites disturbed by man (marinas, campgrounds, road embankments, and home-sites) with close proximity to streams, bayous, or canals. Recent research has documented numerous small juveniles in vegetated shallows flanked by more or less natural forests and it is suspected that female red-bellied turtles nest within natural canopy breaks. Females often use streams and canals to move from foraging areas in more open marshes or water bodies to upland nesting sites. Nests are made in loamy sand and in heavier, silty substrate. Some nests are placed in open, grassy areas but many are found in shaded areas beneath trees, sometimes immediately adjacent to the trunk. In Mississippi, some nests have been documented in active alligator nests.

LIFE HISTORY & ECOLOGY

Red-bellied turtles are primarily herbivorous as adults, feeding on submerged aquatic vegetation. Tape grass *(Vallisneria americana)* beds are often extensive where red-bellied turtles are captured in brackish marshes and may compose a significant component of the diet. Other plant species are eaten in more riverine habitats upstream and in non-riverine habitats occasionally connected with or completely separated from the rivers. Since some adults are incidentally captured by anglers using shrimp for bait, they may scavenge available animal matter. Nesting has been documented from May through July and may occur at any time, although most nesting is documented between late afternoon and midnight. Clutch sizes of six nests ranged from 11-14 eggs. Several females are known to have deposited two clutches within a nesting season and it is likely some nest three times within a season. Hatchlings from some nests emerge during the year of oviposition, but hatchlings at other nests may emerge the following year. The significance of natural predation on red-bellied turtles is unknown; however, predation of eggs and hatchlings by fish crows and raccoons at nesting sites can be high. A majority of large adults bear scars on their shells from alligator teeth.

BASIS FOR CLASSIFICATION

The Alabama red-bellied turtle was listed as endangered by the U. S. Fish and Wildlife Service in 1987. Reasons for listing include losses attributed to human activities on nesting sites, incidental capture by commercial fishing gear, capture for the pet trade, and nest predation by species such as wild hogs and fish crows. In Alabama, many females nest along causeways crossing Mobile Bay, and there has historically been significant traffic-caused mortality to these animals and to hatchlings emerging from nests.

The species is often locally abundant within its narrow distribution in Mississippi and seems to be limited more by the availability of clear, shallow water supporting submerged aquatic plants than by any other factor. Anything diminishing this habitat would negatively affect this species. However, a number of other potential problems have been identified. Incidental and intentional take on recreational fishing lines results in injury or death to an undetermined number of these animals. Hook injuries have been documented on captured turtles near fishing piers. Many turtles bear propeller scars and a number of mortalities due to such strikes have been documented. Incidental entrapment and/or mortality from crabpots is low since these traps are too small to capture adults and are usually employed in higher saline areas not usually occupied by this species. Occasional shooting of basking animals may occur, but the significance of this is undetermined.

Alteration and destruction of habitats have probably reduced the area available to this species. The shallow-water beds of aquatic vegetation which provide habitat for this species have declined in some of the rivers and associated bays from channel dredging, propeller scarring, pollution (particularly in the lower Escatawpa River), and perhaps from a decrease in water clarity due to excessive nutrient input and/or sediment-rich run-off from coastal developments. Bulkheading and ripraping blocks access to nesting habitat. Desnagging projects remove basking platforms from foraging habitat. Predation of nests and hatchlings by non-native fire ants causes significant losses to this species in Alabama and likely in Mississippi as well. Raccoons and fish crows also frequently predate nests.

RECOMMENDATIONS

Any actions that reduce the vegetation beds upon which this species depends should be minimized. This includes channel dredging, nutrient and/or sediment rich run-off, various pollutants, and propeller scouring. Propeller strikes injure and kill these turtles; lower boat speeds would reduce losses. Riprap and bulkheading prevent passage of red-bellied turtles to nesting areas; providing access points through riparian zones otherwise blocked by these features would be beneficial. Additional survey work for this species should be undertaken in fresh water habitat on Petit Bois Island, in Big Lake and Bernard Bayou at the western end of Back Bay, and in the more numerous private lakes and swamps along each of the drainages supporting this species.

BLACK-KNOBBED SAWBACK

Graptemys nigrinoda (Cagle)

SPECIES LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The black-knobbed sawback is a medium-sized aquatic turtle. Adult females average 102-109 mm (4-7.5 in.) in carapace length. Adult males are smaller, averaging 76-102 mm (3-4 in.). There are prominent, black, knob-like projections on the center ridge of the carapace. These knobs are usually more prominent on juveniles and adult males and are often reduced to small points in old females. The carapace varies from greenish-olive to brown and has narrow yellow or white circles on the costal scutes. The marginal scutes have narrow semi-circular yellow or white markings. The plastron is yellow with dark lines along the scute seams or with a dark, branching pattern. The skin is black with yellow stripes on the head, neck, tail, and legs. There is a pair of crescent-shaped yellow bars behind the eyes.

RANGE

This turtle occurs in the Alabama, Tombigbee, and Black Warrior River systems of Alabama and Mississippi. In Mississippi, the black-knobbed sawback occurs in the Tombigbee River system in Lowndes, Clay, Noxubee, Monroe, and Itawamba counties.

HABITAT

The black-knobbed sawback prefers large streams and rivers with relatively fast current, numerous basking logs, and abundant sandbar areas for nesting. These streams must be wide enough to allow sunlight to reach the water level for several hours per day.

LIFE HISTORY & ECOLOGY

Female turtles nest at night from May to late July. Optimal nesting sites are in open, sunny situations with clean sand. Most nest sites are well above the water line, but within 50 m (137 ft) of the water's edge. Nest cavities, dug with the hind limbs, are flask shaped and average about 15.2 cm (6 in.) in depth. Average clutch size is five to six eggs, and two to three clutches are laid by females nesting within a particular year (not all adult females nest each year). Predators destroy many of the nests before the eggs hatch. In those nests that do survive, hatching takes place about 62 days after the eggs are laid, usually in mid-August. Approximately two days are required for the hatchling turtles to burrow to the surface of the nest cavity. Emergence from the nest usually occurs at night. Female black-knobbed sawbacks grow at a faster rate but mature at a later age than males. Females usually mature at 8-9 years of age while most males mature at 4-5 years. The diet is composed of various types of aquatic invertebrates, but the turtles also feed on plants in some parts of the range.

BASIS FOR CLASSIFICATION

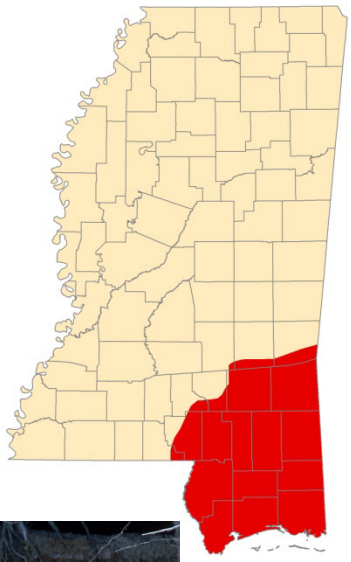
The black-knobbed sawback requires both sandbars and basking logs. Construction of the Tennessee-Tombigbee Waterway eliminated these habitat features from much of the range of this species in Mississippi. Recent surveys seem to indicate that *G. nigrinoda* has adapted to the canal section of the waterway and may be doing better in these modified habitats than first expected. However, the canal has opened the way for *G. ouachitensis* from the Tennessee River watershed to invade the range of *G. nigrinoda* in the Tombigbee-Alabama watershed, as well as for the converse. This may result in competitive interactions and/or possibly hybridization between these two species. Although a striking animal much desired in the pet trade, rampant collecting for commercial markets has not been reported from Mississippi.

RECOMMENDATIONS

Surveys of the black-knobbed sawback, particularly in the Tennessee-Tombigbee Waterway and its associated reservoirs, should be conducted to determine population size and whether or not successful reproduction is occurring. Additionally, surveys should be conducted to determine whether *G. nigrinoda* and *G. ouachitensis* are moving from their native ranges into that of the other species and whether hybridization is occurring if the two species are indeed in contact.

GOPHER TORTOISE

Gopherus polyphemus (Daudin)



SPECIES LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Imperiled (S2)*

Photo courtesy of Stephen Kirkpatrick©

DESCRIPTION

The gopher tortoise is a large, terrestrial turtle which attains an average carapace length of 23.5-37.8 cm (9.25-14.9 in.). The domed carapace of adults is uniformly colored, ranging from yellowish-brown to dark gray. The plastron is yellowish. Juveniles have a considerable amount of yellow on the carapace. The front limbs are flattened for digging and have large, thick scales and prominent toenails. The rear feet are relatively small and stump-like, resembling an elephant's foot in shape.

RANGE

The gopher tortoise is known from extreme southern South Carolina, south over most of Florida, and west to extreme southeastern Louisiana. In Mississippi, tortoises are found in all of the counties south of an imaginary line arching through Walthall, Marion, Jeff Davis, Covington, Smith, Jasper, and Clark counties. Most colonies occur east of the Pearl River, but a few small colonies have recently been discovered in Marion and Walthall counties on the west side of the Pearl River.

HABITAT

Gopher tortoises generally inhabit well-drained to excessively well-drained upland soils. Tortoises require soils that are sandy enough to permit construction of burrows and open canopies that allow sufficient herbaceous plant growth and sunny areas in which to nest. In Mississippi, these areas often support a mixture of longleaf pine and scrub oaks.

LIFE HISTORY & ECOLOGY

Tortoises usually live in loose aggregations of several to dozens of individuals. They show strong fidelity to their home range. Tortoises are sedentary and rarely move from one locality to another, which may reduce their chances of finding suitable mates. Tortoises dig unbranched burrows which average 4.1 m (13.5 ft) in length. Burrows can be much longer in deeper sand; one Mississippi burrow was 9.9 m (32.4 ft) long. Burrows may be as deep as 3 m (10 ft). A tortoise digs its burrow using its flattened front limbs and may construct two or more burrows which are used regularly. It may also use burrows constructed by other tortoises. Occasionally two or more tortoises may use a single burrow temporarily, but a burrow will typically only house one tortoise; usually fewer than half the burrows at a given site will actually be occupied by a tortoise. The burrow is approximately as wide as the tortoise is long, which enables the tortoise to turn around anywhere inside the burrow. The burrow provides shelter from extremes of heat and cold, as temperatures at the bottom of the burrow remain fairly constant throughout the year.

The gopher tortoise eats a wide variety of plants, with various species of grasses and herbs comprising the bulk of the diet. Fruit is eaten when available.

Gopher tortoises begin mating in April, and most nesting activity takes place in mid-May through mid-June. In open, sunny habitat, most nests are dug in the mound of excavated dirt (the burrow apron) at the mouth of the burrow. The average clutch size is five, and clutch size ranges from 1-12 eggs. A female tortoise will lay, on average, two clutches of eggs every three years. The eggs hatch in approximately 102 days. However, almost 90% of the clutches are destroyed by predators prior to hatching. It has been estimated that due to the high predation rate on nests, infrequent nesting, and the small number of eggs produced per nesting attempt, a female gopher tortoise only succeeds in producing hatchlings once every 10 years.

Hatchlings have soft shells and are very vulnerable to predation. Most do not survive the first year. A long period of growth is required before the tortoise reaches maturity. Research in Georgia has indicated male tortoises mature at 16-18 years of age and females mature slightly later, when they are 19-21 years old. Gopher tortoises are thought to live for 40-60 years or longer.

BASIS FOR CLASSIFICATION

The gopher tortoise is declining in Mississippi and throughout its range. In 1987 the U.S Fish and Wildlife Service designated tortoises within the western portion of the range of the species as threatened. This includes all tortoises west of Alabama's Mobile River and includes tortoises in Mississippi and Louisiana.

In the past, periodic growing season fires created excellent gopher tortoise habitat in pine forests by killing shrubs and hardwoods, thus maintaining openings with adequate sunlight for the food plants required by tortoises. In recent decades, fire has been excluded from formerly suitable habitat in Mississippi, resulting in a dense understory of hardwoods and shrubs that reduce sunlight reaching the forest floor. Most of the controlled burning now performed occurs during the dormant season for plant growth or early in the growing season, and does not adequately suppress growth of woody understory plants. Shading also results when sandy ridges are clear-cut and planted to form dense pine plantations. In both situations, the habitat becomes unsuitable for tortoises, which are forced to move. They will then take up residence in deep sands within utility corridors (powerlines and pipelines) and even along highways, the right-of-ways of which have historically been maintained by periodic mowing. Many of these areas are currently being maintained with applications of herbicide, which may destroy the herbaceous plants tortoises favor, rendering such habitats less usable or even unusable. In addition, tortoises moving away from open forest to edges, and most particularly to highway right-of-ways, are susceptible to increased predation and to being run over by automobiles.

Other threats to tortoise habitat are urban and suburban development, highway construction, and sand mining. Habitat disturbances associated with development often result in an increase in the abundance of various predators, both native and non-native. Native predators such as raccoons and crows can be present in unnatural abundance due to various human “subsidies” (roadkills, dumps, dumpsters, bird feeders, etc.) and may become a problem for other wildlife. Two introduced species, the fire ant and cogon grass, also pose significant threats to gopher tortoises. Fire ants are major predators of young tortoises, at least for the first few years of their lives, beginning with the moment that the hard eggshells are cracked open (pipped) during the hatching process. Cogon grass, originally from southeastern Asia, is inedible to tortoises and

rapidly forms thick mats which exclude vegetation that tortoises do eat. It quickly invades disturbed areas such as road-sides, clearcuts, and all-terrain vehicle trails. It can also invade good habitat in relatively undisturbed areas, either through airborne seeds or by seeds or rhizomes transported by vehicle tires. Two other species posing serious threats to tortoise eggs and adults, respectively, are armadillos and coyotes; these arrived in Mississippi relatively recently on their own and via human agency. In the past, tortoise populations were threatened by capture for both the pet trade and for food. These illegal activities are no longer regarded as significant sources of tortoise mortality, but there still may be local pockets of such depredation, which can quickly extirpate a population.

An upper respiratory tract disease (URTD) has been observed in desert tortoises in the western U.S. and in gopher tortoises in Florida, Georgia, and Mississippi. The disease is highly contagious and is transmitted by close contact between tortoises. Large die-offs of tortoises in the west and in Florida are thought to be linked to this disease. It has been suggested that the disease may have been introduced to wild desert tortoise populations by the release of sick captive tortoises. Some tortoise die-offs in Florida have occurred in areas known to be used as sites for relocated tortoises. A few tortoises in Mississippi have tested positive for exposure to the disease, but to date no mortality is known to have been caused by URTD in this state.

Recent research on the tortoise population at Camp Shelby indicates there is a much lower hatching rate (even within protected nests or within clutches carefully transferred to laboratory incubators) than in eastern tortoise populations. The reason for this is unknown, but could include any one or a combination of the following factors: inbreeding depression, reproductive senescence in an elderly tortoise population, inadequate mating frequency, insufficient number of different mates, disease, and dietary factors associated with a plant community affected by inadequate or inappropriate burning.

Gopher tortoise burrows, the tortoises themselves, and/or their droppings are essential to the survival of a wide variety of vertebrates and invertebrates, including some that are found nowhere else, and are of facultative importance to others. The latter include the state endangered black pine snake and the federally and state endangered indigo snake. The pine snake may occaisionally use abandoned tortoise burrows for refuge and may also use juvenile tortoise burrows for nesting. Indigo snakes may use active or abandoned tortoise burrows as both summer refuges and as overwintering sites. The extinction of the gopher tortoise could result in the decline or extinction of many species that depend upon its burrows for survival.

RECOMMENDATIONS

In habitats occupied by tortoises, trees should be widely spaced, regular controlled burning should be conducted, and burning should be conducted in the growing season whenever possible. Burning intervals should be shortest on savannah habitats, longer on sandhill habitats, and longest on sandhills supporting Florida Rosemary. Sandhill communities are particularly important for tortoises; in general, tortoise colonies there have a significantly higher proportion of juvenile tortoises, perhaps because fire ants are comparatively less abundant on sites with deep sand. Where possible, sandhills should be conserved for tortoises and other rare animals and plants. Maintenance of longleaf pine is particularly important on these sites because they typically have a less dense grass and forb layer, and without this layer propagation of fire is more dependent upon needle cast from pines.

If tracts planned for development support gopher tortoises, the U.S. Fish and Wildlife Service and the Mississippi Department of Wildlife, Fisheries, and Parks should be contacted regarding the best procedure for accommodating both the tortoise and the development. On-site accommodation of tortoises is typically preferred, as animals often try to return to their point of origin after relocation to an area seemingly better for them and/or more convenient for a landowner. Sometimes it is possible to set aside a portion of the tract to be developed that is sufficiently large enough to support the tortoises present and can be permanently managed. However, when prospective land use is incompatible with a tortoise presence, animals may be relocated, with permission from the U.S. Fish and Wildlife Service and the Mississippi Department of Wildlife, Fisheries, and Parks, to an off-site location. Tortoises must always be tested for possible exposure to URTD prior to being considered for off-site relocation. Off-site relocations must be to a place with appropriate soil types and plant communities, come with some assurance of appropriate long-term management, have the approval of landowners, may not be on state or federal land, and must be undertaken in a way which will maximize the likelihood that relocated tortoises will remain on the site. The latter will generally require that an experienced contractor be hired to properly and safely capture (burrow excavation may be required), transfer, and re-establish the animals on another site.

Range fragmentation due to road building is a threat to the survival and recovery of several listed species adapted to longleaf pine uplands. Wherever possible, every effort should be made to minimize construction of new roads across habitat occupied by listed species and to minimize the impact of road projects that are undertaken. It is particularly important to avoid further fragmentation of U.S. Forest Service lands. Proper management of these comparatively large parcels is probably the best hope for the long-term presence of gopher tortoises, black pine snakes, gopher frogs, and Red-cockaded Woodpeckers in Mississippi.

Application of herbicides in areas occupied by gopher tortoises should be carefully targeted to control invasive species and an excessive density of woody understory/midstory plants. Herbicides should not be applied to herbaceous species generally eaten by tortoises. Control of fire ants, mammals, and crows that feed on gopher tortoise eggs may be necessary in some areas. Control of native predators may be done through removal of anthropogenic subsidies (e.g., garbage dumps) in areas where these are identified as contributing to local problems. Regulations prohibiting capture and possession of tortoises should be rigorously enforced. Research into the cause(s) of lowered hatching success of Mississippi tortoises is needed and when understood, appropriate palliative measures should be implemented.

RINGED SAWBACK

Graptemys oculifera (Baur)

SPECIES LISTING

Global Rarity Rank –*Imperiled (G2)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –Imperiled (S2)

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION

The ringed sawback is a medium-sized turtle with a dark, olive-green carapace which has conspicuous, black, spine-like projections on the dorsal keel. At maturity, the carapace length of males is 7-10 cm (3-4 in.), while females grow considerably larger (12-22 cm or 5-8 in.). Each costal scute has a relatively wide, black-bordered yellow or orange circle. Marginal scutes have bars or semicircular markings. The plastron is usually cream-colored and may feature black along the seams between the scutes. Sometimes the plastron may be almost entirely black. There is a large bar or spot behind each eye and yellow stripes down the neck. The dorsal keel is strongly evident in adult males and juveniles but small to obscure in adult females.

RANGE

This turtle occurs only in the Pearl River and its tributary, the Bogue Chitto River. In the Pearl River, the ringed sawback can be found from Hancock County upstream to Neshoba County in Mississippi. In the Bogue Chitto River, it occurs as far north as Pike County, Mississippi. The largest populations of this turtle occur in the upper Pearl River above Ross Barnett Reservoir.

HABITAT

The ringed sawback prefers a riverine environment with moderate current, sandbars for nesting, and an abundance of logs, snags, and downed treetops on which it can bask. Because of this need for basking, the river must be wide enough to allow sunlight to reach the water's surface for several hours per day.

LIFE HISTORY & ECOLOGY

Ringed sawbacks occur at densities of 85-341 turtles per kilometer (0.62 miles) of river. Males mature at 3.5 years of age, but females reach maturity much later, around 10-16 years of age. The nesting season occurs from mid-May until early July, with peak nesting in mid-June. Nests, which are flask shaped cavities dug by the female, are usually constructed on sandbars or sand banks during the morning hours. Clutch size ranges from 1-10 eggs with an average of 3-4 eggs per clutch. Most females lay only one clutch per season, but some are able to produce two clutches. Very large females may produce up to three clutches in a season. It usually takes about 65 days for the eggs to hatch, and young turtles may remain in the nest chamber for another 10-12 days. About 86% of all ringed sawback nests are destroyed by predators, which include primarily fish crows, raccoons, and armadillos. Invertebrate predators, primarily ants and fly larvae, may also kill recently hatched turtles.

BASIS FOR CLASSIFICATION

The ringed sawback is listed as endangered in Mississippi because of its limited distribution in the Pearl River watershed, low reproductive frequency, small clutch size, and because very few nests successfully produce hatchlings. The decline of this species in the Pearl and Bogue Chitto Rivers has been attributed to habitat modification and water quality degradation. Habitat modifications have included reservoir construction, which results in unsuitable habitat for the species, and channelization and de-snagging, which remove basking sites and destroy nesting beaches. Human recreation on nesting beaches may interfere with the use of beaches by female ringed map turtles, especially north of the Ross Barnett Reservoir. Siltation and water pollution may adversely affect both the ringed sawback and its invertebrate food source. This turtle is listed as a threatened species by the U.S. Fish and Wildlife Service.

RECOMMENDATIONS

Ringed sawback populations in the Pearl River that have been studied in the past should be re-sampled periodically to determine whether they are increasing, decreasing, or remaining stable. Additional research is needed to determine the survival and habitat use of hatchling turtles and to investigate what appears to be an unusuallly low clutch frequency in the species. Stream alteration projects that result in the removal of snags or sandbars should be discouraged within the range of this species. Water quality and its effects on invertebrate species that serve as food of the ringed sawback should be closely monitored in the Pearl River and its tributaries.

Yellow-blotched Sawback

Graptemys flavimaculata Cagle

SPECIES LISTING

Global Rarity Rank –*Imperiled (G2)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank –*Imperiled (S2)*

Photo courtesy of Terry L. Vandeventer@

DESCRIPTION

The yellow-blotched sawback is a medium- sized turtle with males reaching 7-10 cm (3-4 in.) carapace length as adults and females growing to 10-18 cm (4-7 in.). The carapace is olive to brown with large yellow to orange blotches on the costal scutes and vertebral scutes. Marginal scutes have variously shaped yellow bars. The plastron is usually cream-colored, sometimes with black along the seams between the scutes. There is a large variable bar or spot behind each eye and two broad yellow stripes extending from behind each eye down the neck. The dorsal keel of the carapace has conspicuous black, spine-like projections which are best developed in adult males and juveniles.

RANGE

A Mississippi endemic, the yellow-blotched sawback occurs in the Pascagoula, Chickasawhay, Leaf, Bouie, and Escatawpa rivers and in Tallahala, Black, Bluff, Bogue Homa, Bucatunna, Gaines, Okatoma, and Thompson's creeks. This turtle occurs in the Pascagoula River from Jackson County upriver to the confluence of the Leaf and Chickasawhay rivers in George County. It is sporadically distributed up the Leaf River to Covington County and as far upstream as Clarke County in the Chickasawhay River. The largest and most viable population appears to occur in the lower Pascagoula River from the town of Wade downstream to the beginning of the brackish marshes at the mouth of the Pascagoula River.

HABITAT

The yellow-blotched sawback requires streams with strong, consistent current and large sandbars for nesting. It spends much of the day basking, so it needs streams which are wide enough to receive several hours of direct sunlight per day and which have abundant snags and logs on which to bask. This habitat type is most often found in the rivers and larger creeks within its range, but may also be found in bends of medium-sized (15 -30 m wide) creeks.

LIFE HISTORY & ECOLOGY

Female yellow-blotched sawbacks are found in deeper and faster waters at a greater distance from shore in areas with fewer emergent snags than are males. Average home range area and length for male yellow-blotched sawbacks is 1.12 ha (2.77 acres) and 1.8 km (1.11 miles), respectively, and 5.42 ha (13.39 acres) and 1.5 km (0.93 miles) for females. Females may move seasonally from their home ranges to suitable nesting areas. The yellow-blotched sawback nests from mid-May through early August. Most nests are built on sandbars, but a significant number are located on non-sandbar areas along river banks. Clutch sizes range from 3-9 eggs with an average of 4-5 eggs per clutch. Most females lay one clutch per season, although a few individuals produce two clutches and some may produce as many as three. However, some females may not reproduce every year. Most nests in the lower Pascagoula River are destroyed either by predators or by flood waters during the nesting season. Fish crows and fire ants are the major predators of yellow-blotched sawback nests along the lower Pascagoula River.

BASIS FOR CLASSIFICATION

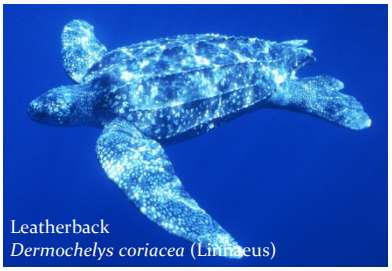
This turtle is listed as endangered in Mississippi because of its limited distribution in the Pascagoula River watershed, low reproductive frequency, a relatively low clutch size, and because a very small proportion of nests successfully produce offspring. Human recreation on nesting beaches may interfere with the use of these beaches by female yellow-blotched sawbacks. As a result, many females are now nesting along the riverbanks in locations that are not conducive to the successful production of hatchlings. Many of the sandbars in the lower Pascagoula are being colonized by non-native vegetation such as cogon grass,

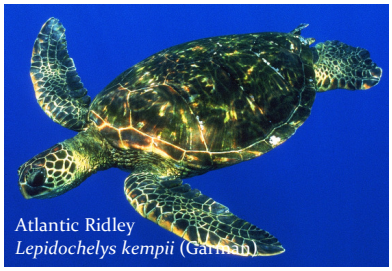
which reduces their usefulness as nesting sites. The yellow-blotched sawback is listed as threatened by the U.S. Fish and Wildlife Service.

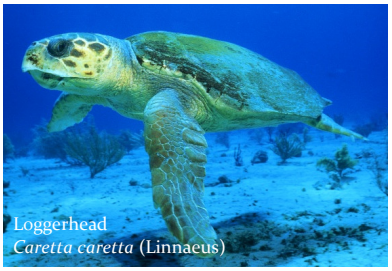
RECOMMENDATIONS

The yellow-blotched sawback population of the lower Pascagoula River should be re-sampled periodically to determine whether that population is increasing, decreasing, or is stable. Educational programs should be established to inform the public about this and other threatened turtles, specifically focusing on the effects of random shooting of basking turtles and the disturbance of nesting beaches. Exotic vegetation on sandbars along the lower Pascagoula River should be controlled to enhance nesting areas, coupled with efforts to reduce the impact of recreational users on nesting turtles. Additional research is needed to understand the effects of incidental take on yellow-blotched sawback populations, the survival and success of nests in nonsandbar areas, and the survival and habitat use of hatchling turtles.

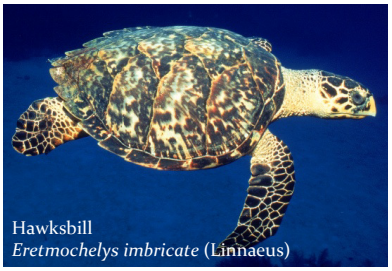
SEA TURTLES


Leatherback
Dermochelys coriacea (Linnaeus)


Atlantic Ridley
Lepidochelys kempii (Garman)


Loggerhead
Caretta caretta (Linnaeus)


Green Turtle
Chelonia mydas (Linnaeus)


Hawksbill
Eretmochelys imbricate (Linnaeus)

Photos courtesy of Doug Perrine/Innerspac ©

	SPECIES LISTING			
SPECIES	**Global Rarity Rank**	**Federal Protection Status**	**State Protection Status**	**State Rarity Rank**
Leatherback	G2	LE	LE	SNA
Loggerhead	G3	LT	LE	S1B, S1N
Green turtle	G3	LT	LE	SNA
Hawksbill	G3	LE	LE	SNA
Atlantic ridley	G1	LE	LE	S1N

DESCRIPTION

Mississippi lists five species of marine turtles as endangered. The leatherback (*Dermochelys coriacea)* is the largest turtle in the world, with a carapace length of up to 2.5 m (8 ft) and a weight of 273-727 kg (650-1300

lb). This species has a shell covered with a layer of black, rubbery skin rather than the hard scutes (scales) characteristic of most turtles. The loggerhead (*Caretta caretta*) averages between 77-159 kg (170-350 lb) in weight with a carapace length of 79-144 cm (31-45 in.). It has a relatively large head, a reddish brown carapace, and a yellow plastron. The slightly larger green turtle (*Chelonia mydas*) has a carapace length of 91-122 cm (36-48 in.) and weighs 113-204 kg (250-450 lb). It has a relatively small head, a carapace that is brownish with light and dark spots and streaks, and a white plastron. The hawksbill (*Eretmochelys imbricata)* has a carapace length of 76-89 cm (30-35 in.) and weighs between 43- 75 kg (95-165 lb). It has a greenish brown, mottled, shield-shaped carapace and a yellow plastron. The smallest of these five species is the Atlantic ridley (*Lepidochelys kempi)*. Also known as Kemp's ridley, it averages 60-75 cm (23- 29 in.) in carapace length and 36-45 kg (80-100 lb) in weight. Its carapace is nearly circular and ranges in color from olive green to black to gray brown. The plastron is white. All five of these species have the front limbs modified as flippers.

RANGE

The loggerhead, green, leatherback, and hawksbill are found world-wide in warm temperate and tropical oceans. The leatherback also forages in cool temperate waters. The Atlantic ridley is found in the Gulf of Mexico and the Atlantic seaboard of eastern North America, sometimes ranging as far north as southern Canada during the summer. In Mississippi, the leatherback is observed sporadically. A group of at least six was observed feeding on jellyfish near Petit Bois Island in 2000. Observations of green turtles and hawksbills in state coastal water are very rare. The loggerhead nests regularly in small numbers on Mississippi's offshore barrier islands and sporadically in low numbers on mainland beaches. They are regularly seen around offshore oil rigs and are occasionally hooked on fishing lines by individuals fishing near these platforms. The rarest species of sea turtle globally, the Atlantic ridley is the sea turtle most frequently encountered in Mississippi's coastal waters. Ridleys do not nest in Mississippi, but juveniles are regularly seen in the Mississippi Sound and around the barrier islands.

HABITAT

All five of these species spend most of their life cycle in marine environments, coming ashore only to lay eggs. The leatherback is most highly adapted to life on the open sea, while the other four species are most often encountered in relatively shallow coastal water in bays, lagoons, or estuaries. Nesting beaches are typically on shorelines with ready access to offshore currents important for transport of hatchlings to juvenile habitat. Although habitat of young juveniles varies somewhat by species and geographic zone, in general offshore algae beds (Sargasso Sea) and convergence zones seem critical.

LIFE HISTORY & ECOLOGY

Long distance migrations between adult feeding grounds and breeding grounds are exhibited by each of these species, although not necessarily by all populations of a particular species. Female turtles will return year after year to specific nesting beaches. In general, sea turtles mate in shallow water off the nesting beaches. Females come to shore one or more times per nesting season and deposit eggs in cavities that they have excavated in the sand with their rear feet. Most females lay eggs once every two to five years. Many clutches are destroyed by predators and the surviving young turtles face a great number of predators before they reach maturity. Some of these turtle species do not mature until they are 15-20 years old, perhaps much older in areas with cooler water.

The leatherback occasionally nests on Florida beaches between April and November. Females may lay several clutches of 50-170 eggs per season. Leatherbacks are carnivorous, eating primarily jellyfish.Loggerheads nest at night from May to September along Atlantic and Gulf Coast beaches. Females deposit approximately 115 eggs per nesting attempt, and a female may nest from 1 to 7 times at roughly 12 day intervals within one season. Loggerheads eat a wide variety of marine invertebrates. A comparatively small but increasing number of green turtles nest along the southeastern coast of Florida. Females nest at night one to eight times per year, depositing about 100 eggs per nesting attempt. This species feeds primarily on algae and sea grasses, but occasionally takes marine invertebrates as well. Hawksbills occasionally nest on Florida beaches, usually laying 50-200 eggs. They feed mainly on marine invertebrates and recent evidence suggests that a major component of the diet is marine sponges. Atlantic ridleys nest from April to July, mainly along a stretch of beach in Mexico. Unlike most sea turtles, Atlantic ridley females come ashore during the day to nest, depositing about 100 eggs. Atlantic ridleys may nest two to three times per season. This species eats primarily marine invertebrates.

BASIS FOR CLASSIFICATION

The leatherback, Atlantic ridley, and hawksbill are listed as endangered, and the green and loggerhead turtles are listed as threatened, by the U.S. Fish and Wildlife Service. The eggs of all of these species have historically been over-collected for food by humans throughout their ranges. The green, Atlantic ridley, and hawksbill have historically been in great demand for their meat, which is eaten or was formerly eaten by the local human population in the areas where they nest and which is or was exported to gourmet food markets around the world. The green and ridley are used for leather products and the hawksbill is exploited for its strikingly marked shell, which is used to make "tortoise shell" jewelry. In addition to direct exploitation of sea turtles and their eggs, these species have declined because many nesting beaches have been developed. Human activity and artificial lighting on developed beaches may deter nesting females, and artificial lighting attracts emerging hatchlings away from the sea. The most significant impact of beach development

is that it usually leads to erosion of nesting beaches, denying turtles nesting habitat safe from high tides and storms. Although eroded beaches are frequently replaced with sand obtained elsewhere, the physical characteristics of such beaches may differ significantly from the natural beach and may not be as satisfactory as a nesting or incubation medium. Prior to the mandatory use of turtle excluder devices (TEDs) in their nets, shrimp trawlers were major sources of incidental mortality of adult and large juvenile sea turtles. Today an estimated 500 to 5,000 loggerheads and 50 to 500 Atlantic ridleys are killed annually due to entrapment within or entanglement by other fishing gear, including purse seines, float lines attached to lobster and crab pots, unattended pompano and shark gill nets, drift nets, various long line fisheries, pound nets, recreational hook and line fishing, and discarded monofilament line. Many juvenile ridleys are hooked incidentally by recreational fishermen on mainland piers. Many sea turtles die from intestinal blockage following ingestion of inedible objects such as plastic bags, balloons, and even tar balls, with an undetermined number becoming ill or die because of the toxic components of some ingested petroleum based debris. In some states sea turtles have been incidentally captured and killed within dredging apparatus and by explosives used during demolition of inoperative oil or gas drilling platforms. Increasing numbers of sea turtles are injured or killed by collisions with boat hulls and boat propellers.

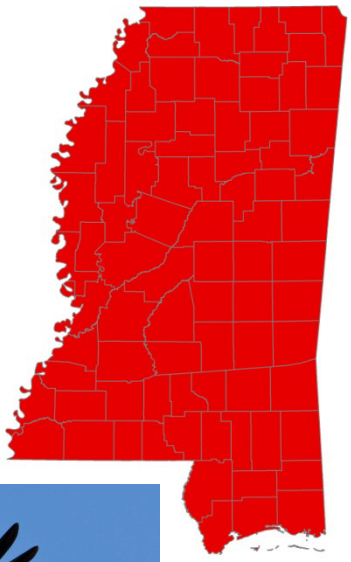
RECOMMENDATIONS

Surveys are needed to better determine the habitats occupied by these species (particularly juvenile Atlantic ridleys) in Mississippi waters, and in which times of the year they may be found. Surveys of sea turtles nesting on the islands within the Gulf Island National Seashore should be continued to monitor trends. Nesting on the mainland is likely still too sporadic to warrant regular formal surveys, but nesting activity should always be reported to the Mississippi Department of Marine Resources and the Mississippi Department of Wildlife, Fisheries, and Parks. Nest sites should also be protected from beach maintenance equipment. Commercial shrimp trawlers and others are required to use TEDs within trawl nets under certain conditions. While TEDs allow many inadvertently captured turtles to escape nets, many turtles are still captured within shrimp nets and more research on improved TED designs is needed. Several hundred dead sea turtles (the great majority of them Atlantic ridleys) washed ashore in Alabama, Mississippi, and Louisiana in 2010, 2011, and 2012. This number is greatly in excess of the the numbers washing ashore in previous years according to data collected by the Sea Turtle Stranding Network. The majority of turtles on which post-mortems were completed had symptoms consistent with drowning and the National Marine Fisheries Service concluded that most had died within shrimp nets. This could be because TED gear didn't work as well as it should, because the gear was intentionally bypassed by illegal modification of gear, or perhaps because TEDs weren't installed at all. It should not be assumed that a turtle found dead on the beach is necessarily drowned in a net fished in Mississippi waters. In fact, during the period when many of

these turtles have washed ashore, Mississippi waters were closed to shrimping. If sea turtles are incidentally captured within nets they should be freed if vigorous and able to swim. However, if a captured turtle is comatose (heartbeat and/or breathing may be temporarily stopped or virtually undetectable) or inactive, it should be kept in a shaded place on deck to allow for the possibility of recovery and authorities should be promptly notified. As per National Oceanic Atmosphere Administration regulations, such turtles should be oriented with the rear of the shell higher than the forequarters to facilitate drainage of liquid from the lungs. Additionally they may be turned upside down briefly to depress the plastron (by foot if the turtle is large) to expel water from the lungs. Recovery to the point of swimming and breathing competence may require hours or days. A turtle recovering on board should ideally be returned to the water within 24 hours of its capture; appropriate authorities should be contacted if recovery will be longer than 24 hours. Enforcement of regulations prohibiting trash or discarding fishing gear from vessels is needed. Given the scale and frequency of channel maintenance dredging in Mississippi, research is needed to determine the incidence/likelihood of incidental capture within a dredging apparatus. The Mississippi Department of Marine Resources or the National Marine Fisheries Service should be contacted promptly if turtles are accidentally captured on hook and line. If hooks cannot be easily and safely removed, veterinary assistance should be sought after contacting these agencies.

WOOD STORK

Mycteria americana Linnaeus



LISTING

Global Rarity Rank – *Apparently Secure (G4)*
Federal Protection Status – ***Proposed threatened (PT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2N)*

Photo courtesy of Bill Stripling©

DESCRIPTION

The Wood Stork is a large wading bird 102-112 cm (40-44 in.) in length with a wingspread of 1.5 m (5.5 ft). Its body is white with black flight feathers and a black tail. The head is naked and blackish-gray in adults and the bill, which is thick and down-curved, is brownish-gray. Juveniles have a feathered, grayish head and a yellow bill. The Wood Stork flies with its neck extended.

RANGE

This species formerly bred from South Carolina south to Florida, west to Texas, and south to southern South America. In the United States, it now breeds only in South Carolina, Florida, and Georgia, but

disperses throughout the Southeast, East, and Midwest after breeding activities have been concluded. In Mississippi, Wood Storks have been observed most frequently along the western edge of the state in those counties bordering the Mississippi River and with increasing frequency in some counties along the eastern edge of the state, although they may occur almost anywhere there are sloughs or swamps to provide feeding habitat.

HABITAT

The Wood Stork occurs primarily in freshwater wetlands, including ponds, bayheads, flooded pastures, oxbow lakes, and ditches. Nesting usually occurs in baldcypress trees in swamps, although breeding has also been observed in mangroves.

LIFE HISTORY & ECOLOGY

Wood Storks apparently nest during periods of receding water, which usually happens during the winter and spring within its breeding range. Reduced water levels tend to concentrate fish into smaller, more easily fishable areas.

Wood Storks are colonial nesters and formerly occurred in colonies of up to 10,000 pairs. Today, most colonies are much smaller. Nests may be built in the lower branches a few feet above the water level up to the tops of the tallest trees in the colony area. The nest is a platform of sticks 0.6-1 m (2-3 ft) in diameter with a sparse lining of grasses or leaves. Usually three or four eggs are laid, which hatch in 28-32 days. The young remain in the nest for 50-55 days, after which they begin making short flights. Wood Storks mature in two to four years.

Wood Storks feed in fresh, brackish, or saltwater habitats both by day and at night. Fish comprise the bulk of the diet, but crayfish, mussels, small turtles, snakes, frogs, small mammals, insects, plants, and seeds are also eaten.

BASIS FOR CLASSIFICATION

The Wood Stork is listed as an endangered species by the U.S. Fish and Wildlife Service in only Florida, Georgia, Alabama, and South Carolina because at the time of listing, that was the range of the U.S. breeding population. Birds from Mexican and Guatemalan breeding populations can be found in the U.S. as well, but these birds are not considered to be endangered. It was assumed birds found in Mississippi came from the non-listed population, but monitoring of satellite-tracked individuals has shown many of the birds that show up in eastern Mississippi come from the federally-listed population. As a result, the Fish and Wildlife

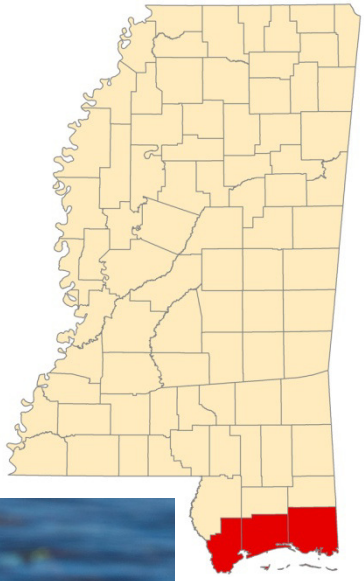
Service has recommended including Mississippi within the listed range. The Wood Stork population in the United States has declined at least 75% in the last 50 years. In 1930, more than 150,000 birds were present in Florida alone. In 2000, the breeding population of Wood Storks in Florida, Georgia, and South Carolina was about 6,000 pairs. The Wood Stork population has declined throughout its range because of habitat alteration. The construction of canals, levees, and other such structures has interfered with normal water cycles upon which successful Wood Stork breeding depends. In a normal cycle, high water levels increase fish populations. This is followed by a drying period which concentrates the fish in shallow water where they become easy prey for the storks. Falling water levels and concentrations of fish are necessary both to stimulate breeding activity in Wood Storks and to keep the adults feeding the young. Human disturbance at breeding colony sites has also contributed to the decline of this species.

RECOMMENDATIONS

Nesting Wood Storks have not been confirmed in Mississippi, although a report of possible nesting was made along the Mississippi River north of Vicksburg. Given this observation, surveys should be conducted across the state to attempt to locate and document nesting of this species. Studies should also be undertaken to determine how important Mississippi habitats are to the overall status of this species in the southeastern United States.

BROWN PELICAN

Pelecanus occidentalis Linnaeus



LISTING

Global Rarity Rank – *Apparently Secure (G4)*
Federal Protection Status – *Recovered/Delisted*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1N)*

Photo courtesy of Bill Stripling©

DESCRIPTION

The Brown Pelican is a large, relatively stocky bird 114-137 cm (45-54 in.) in length with a wingspread of 2.5 m (7.5 ft). Its body is grayish-brown and its belly is dark-brown to black. The nonbreeding adult has a white head and neck which sometimes has a yellowish tint. In breeding plumage, the rear of the neck is dark chestnut and there is a yellow patch on the front part of the neck at its base. Juvenile Brown Pelicans are entirely gray-brown with whitish underparts. Brown Pelicans have long, heavy bills with huge throat pouches. The head is drawn back during flight.

RANGE

This species occurs from North Carolina south to Venezuela on the Atlantic coast and from British Columbia to Chile on the Pacific coast. Brown Pelicans do not nest in Mississippi but are seen fairly regularly along the Gulf Coast and near the barrier islands.

HABITAT

Brown Pelicans nest most commonly on offshore islands, but have also nested on islands in estuaries. This species feeds in small inlets, in tidal rivers, and along open beaches. They may also congregate near wharves and pilings where they scavenge food from tourists and fishermen. Brown Pelicans may be seen as much as 20 to 40 miles offshore and may roost on coastal sandbars and mudflats.

LIFE HISTORY & ECOLOGY

Brown Pelicans are colonial birds, building nests in groups of 25-250 in low shrubs, trees, or on the ground. Nesting dates in the Southeast are from February to June, depending upon latitude. Two or three eggs are normally laid in each clutch and hatching occurs in about 30 days. The young leave the nest when they are 71 to 88 days old. Brown Pelicans begin breeding at four to seven years of age and may live for 20 years.

Brown Pelicans eat fish, with menhaden appearing to be the most commonly eaten species. Pigfish, pinfish, thread herring, crevalle, silversides, and mullet are also common prey items. Brown Pelicans catch fish by plunge-diving, in which they dive from heights of up to 20 m (65 ft), partially or fully submerge, and capture their prey in their pouches. They may feed both day and night.

BASIS FOR CLASSIFICATION

The Brown Pelican was listed as an endangered species by the U.S. Fish and Wildlife Service in Mississippi, Louisiana, Texas, California, Mexico, Central America, and South America. It had disappeared as a breeding species from Louisiana and had severely declined along the Texas coast by the early 1960s. Populations in other areas were also declining. This was caused by pesticides which acted through direct poisoning of the birds and through interference with its reproductive system. Pelicans acquired these chemicals by eating contaminated fish. These compounds generally inhibit calcium deposition during egg shell formation, resulting in thin-shelled eggs that are easily broken during normal nesting activities. Both endrin and DDT have been implicated in the decline of this species.

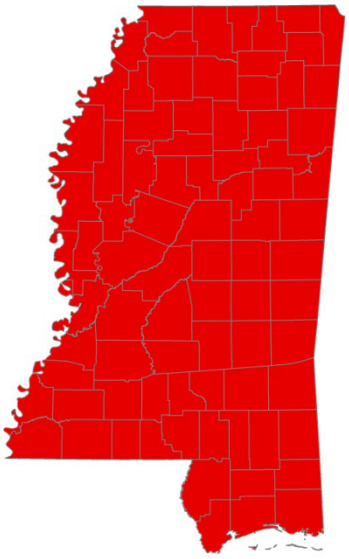
Since restrictions were placed on the use of many pesticides, the Brown Pelican has slowly recovered and has recently been delisted by the U.S. Fish and Wildlife Service because of stable or increasing breeding populations.

RECOMMENDATIONS

Monitoring of Brown Pelican populations via the annual "Christmas Bird Count" suggests that the number of Brown Pelicans in Mississippi has risen and stabalized. Given the recent delisting by the U.S. Fish and Wildlife Service, apparently stable numbers using Mississippi waters, and the fact that these birds do not nest in Mississippi, it is recommended this species be considered for delisting in the State.

SWALLOW-TAILED KITE

Elanoides forficatus (Linnaeus)



LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2B)*

Photo courtesy of Nick Winstead/MMNS©

DESCRIPTION

Swallow-tailed Kites are a mid-sized raptor (50-64 cm in length) with long pointed wings and a deeply forked tail. Sexes are similar with a striking white/black color pattern. The upper body, wing, and tail surfaces are black, as are the undersides of the tail and flight feathers. The head, underside, and under-wing coverts are white. Feet and bill are smaller than many raptors and are black to bluish-gray. Birds less than one year old can be distinguished from adults by a combination of shorter tail and a lack of wing molt.

RANGE

The historical range of this species within the U.S. included most of Florida, much of the southeastern coastal plain, and up the Mississippi River Valley and its major tributaries into Minnesota. The current U.S. range is now restricted to much of Florida and a handful of coastal plain river systems within Louisiana, Mississippi, Alabama, Georgia, and South Carolina. A small number of locations in Texas, Arkansas, and North Carolina have very few individuals.

HABITAT

The species is found primarily in and near forested wetlands and the edges of pine forests adjacent to floodplain forests. Sites with tall trees interspersed with open areas or gaps in the canopy are necessary for nesting sites and capturing prey.

LIFE HISTORY & ECOLOGY

The U.S. population is migratory. Birds start arriving in Mississippi around March. During July and August, they gather into relatively large concentrations called pre-migration roosts along rivers in south Mississippi and then depart for their wintering grounds in South America. Their diet consists mainly of insects and small vertebrates that are gleaned from the surface of vegetation while the birds are in flight. Food is consumed while in flight. Nests are placed in relatively close proximity to other nesting pairs. Nests are usually placed in the top of a tall tree adjacent to some kind of opening or gap in the canopy. Nests are made of small sticks, lichens, and Spanish moss. Incubation lasts about 28 days, and chicks fledge after about 35 days.

BASIS FOR CLASSIFICATION

The most important cause for decline has been the loss and degradation of habitat through timber production or the conversion of forests to agriculture or urban development. Birds are especially vulnerable to disturbance at pre-migration roost sites. Though habitat has improved in many areas in recent years the species has been slow to reoccupy its former range, possibly due to its relatively gregarious nature.

RECOMMENDATIONS

Additional surveys should be made to locate nesting and pre-migration roosting sites in Mississippi. These areas should be protected. If on private lands, efforts should be made to work with landowners to avoid disturbance or to manage timber in a way to avoid destroying nest sites.

MISSISSIPPI SANDHILL CRANE

Grus canadensis pulla Aldrich

LISTING

Global Rarity Rank – ***Species*** *is widespread & secure however the* ***subspecies*** *is extremely rare & critically imperiled (G5T1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Tim & Donna Bailey©

Photo courtesy of Olivia Graves©

DESCRIPTION

The Mississippi Sandhill Crane is a large, relatively slender, gray to brownish-gray bird with a long neck and legs. It is about 120 cm (4 ft) tall with a wingspread of 160 cm (5.5 ft). This species has a red forehead and, when at rest, its back feathers droop over the tail in a "bustle." It flies with both its neck and legs outstretched. The voice of the Mississippi Sandhill Crane has been described as a loud, rattling “kar-r-r-o-o-o.”

RANGE

Sandhill Cranes nest from Siberia and Alaska south to the northwestern United States, Intermountain and Great Lakes states, and winter in the southern U.S. and Mexico. Small resident populations exist in the southeastern United States and Cuba. The Mississippi Sandhill Crane is a non-migratory subspecies that was once a year-round inhabitant of the Gulf Coastal Plain of Louisiana, Mississippi, and Alabama. At present, it is found only in a small area west of the Pascagoula River in Jackson County, Mississippi.

HABITAT

The Mississippi Sandhill Crane inhabits coastal prairies and pine savannas as well as associated bayheads and swamps. These areas are seasonally wet, open to semi-open herbaceous communities dominated mainly by grasses and sedges with scattered, often poorly formed shrubs and trees.

Approximately 10,117 ha (25,000 acres) in Jackson County have been designated as critical habitat for the Mississippi sandhill crane.

LIFE HISTORY & ECOLOGY

This subspecies uses the prairies and wet pine savannas for nesting and feeding during the summer breeding season. Nests are constructed on the ground in savannas, ponded areas, or swamp openings. The nests are made from vegetation and usually are in shallow, standing water. The average clutch size is two eggs, but rarely does more than one chick survive to flight stage. Fledging occurs when chicks are approximately 80 days old.

The diet of the Mississippi Sandhill Crane includes adult and larval insects, earthworms, crayfish, frogs, rodents, seeds, roots, tubers, nuts, fruits, and leafy materials. During the summer, most feeding occurs on the nesting grounds. In fall and winter, they congregate in groups to feed in cornfields, pastures, and other uplands near their summer range and roost in larger ponds and marshy areas.

BASIS FOR CLASSIFICATION

As of 2012, there were only 100-110 cranes in the wild. About 40 individuals are maintained in captivity as part of a captive breeding program at the Audubon Nature Institute's Species Survival Center in Louisiana and White Oak Conservation Center in Florida. The principal threats to this species include fire suppression, habitat destruction, predation, urban growth and development, and shooting. Thousands of acres of prairie and savanna are now unsuitable for the cranes because fire suppression, dense pine plantations, and drainage canals have resulted in unacceptable nesting and feeding habitats. Predation by

coyotes, red foxes, and raccoons is the major cause of mortality and an important factor limiting recovery. The number of coyotes and other predators in Sandhill Crane habitat has increased with human development of crane habitat. These predators destroy eggs and kill young cranes and occasionally adults. Because of the small size of the existing wild population, mortality directly resulting from human activities, including the shooting of cranes, is a serious problem.

RECOVERY ACTIONS

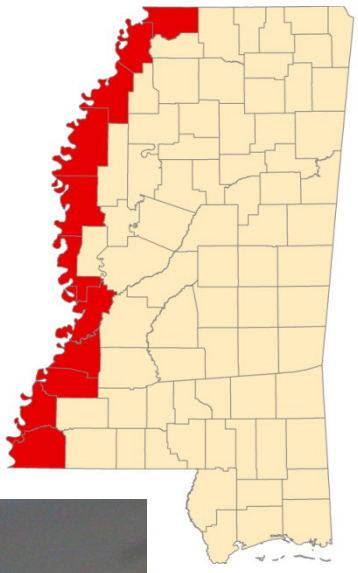
The Mississippi Sandhill Crane National Wildlife Refuge was established in 1975 to provide protection and management for the cranes and to preserve the unique savanna plant communities which they require. The refuge consists of three separate land units containing approximately 19,300 acres. Sandhill Crane habitat on the refuge is being restored to savanna and prairie, with interspersed small shallow ponds for roosting. This process includes land clearing, timber thinning, and prescribed burning to maintain a grass-dominated ecosystem, and creating small ponds and water control structures to enhance roosting and nesting habitat. The U.S. Fish and Wildlife Service has a captive breeding/restocking program designed to enhance natural production of the Mississippi Sandhill Crane. Beginning in 1965, extra eggs from wild cranes were sent to the Patuxent Wildlife Research Center to be hatched and reared to establish a captive population. In the mid-1990s, the captive flock was moved to the Audubon Nature Institute's Species Survival Center in Louisiana and the White Oak Conservation Center in Florida. Juveniles reared from these captive flocks have been released annually on the refuge since 1981. As a result, the crane population has increased from a low of 35 birds to over 100 and from 5-6 nesting pairs to nearly 25. Of the birds living in the wild, over 95% are captive-reared or descendants of captive-reared birds. Although hatching success has improved, natural recruitment has been dismal with only about 2 fledglings a year, primarily due to predation on eggs and chicks.

RECOMMENDATIONS

Increased funding to reduce woody vegetation using prescribed fire and mechanical treatment is needed along with other restoration activities to reestablish more pine savanna habitat within the range of the Mississippi Sandhill Crane. Studies are needed to determine why successful natural reproduction is so low, and appropriate measures should then be taken to increase recruitment from the wild population.

INTERIOR LEAST TERN

Sternula antillarum athalassos Burleigh and Lowery



LISTING

Global Rarity Rank – ***Species*** *is uncommon but not rare, however the* ***subspecies*** *is very rare (G4T2Q)*
Federal Protection Status –***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2B)*

Photo courtesy of Tim & Donna Bailey©

DESCRIPTION

The Least Tern is one of the smallest terns, measuring 20-22 cm (7.8-8.6 in.) in length with a wingspread of 50 cm (20 in.). Breeding adults have gray backs and wings and are white underneath. The top of the head and back of the neck are black. The forehead is white, the bill is orange-yellow with a black tip, and the legs are orange. There is a black wedge on the top outer feathers of the wing that is noticeable when the birds are in flight. Juveniles are pinkish-buff with brown U-shaped markings on the back and have a dark shoulder bar. The top of the head and back of the neck are dusky, and there is a black bar behind each eye. Birds approximately one year old have dark bills, legs, and shoulder bars, but are gray above like adults. The tops of their heads are dusky but the back of the neck is black and connected to the dark bar behind the

eye. The tail is deeply forked (noticeable when the birds are in flight) in all age groups. The sounds made by the Least Tern include high-pitched kip notes and a lower “chir-ee-eep” or “killich.”

RANGE

Least Terns occur primarily along the coast from Massachusetts south to the northern coast of South America, southern California and western Mexico, and along various river systems in the interior of the United States. Within Mississippi, the coastal population breeds in the three coastal counties on mainland beaches and on the barrier islands. The interior populations nest on sandbars in the Mississippi River and along the Missouri, Ohio, and Rio Grande river systems. The interior population is considered to be endangered; the coastal population is not.

HABITAT

The Interior Least Tern's nesting habitat is dry, non-vegetated sand bars. Most bars chosen for nesting in Mississippi are not connected to the shore and can be considered islands.

LIFE HISTORY & ECOLOGY

The Interior Least Tern is a colonial species which nests on flat, non-vegetated to sparsely vegetated sandbars near shallow-water feeding areas. The nest is a small depression in sand or gravel, usually located close to debris such as logs or brush. Time of nesting is dependent upon when water levels are low enough to expose sandbars in the Mississippi River, but usually occurs between late May and June. Normally two eggs are laid, but as many as five eggs have been observed in a single nest. The eggs hatch in about three weeks and the chicks are able to fly about three weeks later. The young are partially dependent upon the parents for some time after they learn to fly. Least Terns apparently begin breeding when they are two or three years old and may live for 20 years.

Least Terns hunt for food by slowly flying 10-15 m (30-50 ft) above the water with the bill pointed downward. When prey is seen, the terns dive downward and plunge into the water to capture it. The diet is composed primarily of small fish, but crustaceans and insects are occasionally eaten as well.

BASIS FOR CLASSIFICATION

Only the interior population of the Least Tern is listed as endangered by the U.S. Fish and Wildlife Service. Declines are attributed to the elimination of sandbar nesting habitat by the construction of reservoirs and channelization of rivers. Least Terns have also been prevented from using formerly suitable habitat by the artificial, regulated flows of rivers modified by the construction of dams. The release of water from dams

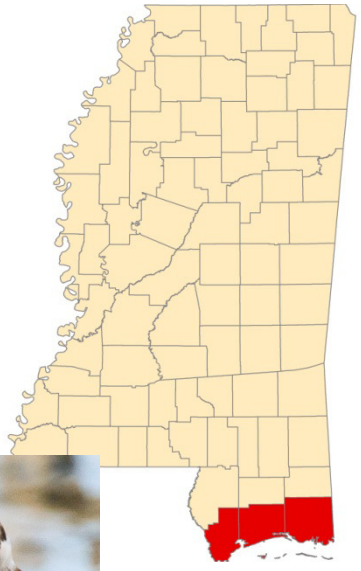
may flood sandbars downstream, destroying both eggs and chicks. Recreational use of sandbars during the breeding season has also affected nesting success of the Least Tern.

RECOMMENDATIONS

The Mississippi Valley Division of the U.S. Army Corps of Engineers has conducted annual counts of Interior Least Terns and mapped nesting areas on the Mississippi River since 1985. They have also developed and implemented a Conservation Plan for the Lower Mississippi River, which includes Best Management Practices for minimizing impacts to Interior Least Tern and restoring river habitat functions. These include the protection of colony sites to minimize disturbance by humans, and avoiding construction activities or sand and gravel mining on or adjacent to sandbars used for nesting.

PIPING PLOVER

Charadrius melodus Ord



LISTING

Global Rarity Rank –*Vulnerable (G3)*

Federal Protection Status – ***Formally listed as endangered in part of its range and as threatened in other parts (LE, LT)***

State Protection Status – ***Listed Endangered (LE)***

State Rarity Rank – *Imperiled (S2N)*

Photo courtesy of Bill Stripling©

DESCRIPTION

The Piping Plover is a small shorebird with an overall body length of 17 cm (6.7 in.). Adults have a pale, gray-colored upper body and white undersides. The legs are orange. Breeding adults have a black forehead and breast band and black-tipped orange bill. Juveniles and nonbreeding adults have neither the forehead nor breast bands, and their bills are entirely dark. The voice of the Piping Plover has been described as a clear, whistled "peep-lo."

RANGE

The Piping Plover breeds from central Canada south to Nebraska and Iowa, east along the Great Lakes and Newfoundland, and south along the Atlantic Coast to North Carolina. It winters on the Atlantic and Gulf coasts, in the West Indies, and in Mexico. The Piping Plover does not nest in Mississippi but is seen fairly commonly during the winter on coastal beaches and barrier islands.

HABITAT

Piping Plovers preferred habitats include tidally-exposed sand and mud flats with no or very sparse vegetation for foraging on invertebrates at or just below the soil surface. Other important habitats include adjacent sandy beaches and washover areas with little to no vegetation for roosting.

LIFE HISTORY & ECOLOGY

Piping Plovers arrive on their breeding grounds from mid-April to mid-May. They may nest singly or in loose colonies of 30 or more pairs. Piping Plovers may also nest in colonies of Least Terns, Arctic Terns, Common Terns, or American Avocets. Nests, which are shallow depressions usually lined with small pebbles or shell fragments, are constructed on sparsely vegetated sand or gravel shorelines of the ocean and large lakes or on sandbars of large rivers. Usually four eggs are laid during mid to late May. The eggs hatch in mid-June and the young are able to leave the nest and feed themselves within a few hours. The chicks are usually able to fly in 30 to 35 days. Adults usually leave the breeding grounds by early August, and juveniles leave a few weeks later. Juveniles mature and begin breeding in one year. Piping Plovers may live to be five years old or older.

BASIS FOR CLASSIFICATION

The Piping Plover is listed as an endangered species by the U.S. Fish and Wildlife Service in the Great Lakes area and as threatened in the remainder of its range, which includes Mississippi. Piping Plovers were extensively hunted in the mid-1800s, which considerably reduced their numbers. After hunting for them was prohibited in 1913, their populations started to increase but never attained earlier levels. Today Piping Plovers are threatened by human disturbance during their breeding season when eggs and young are destroyed by both trampling and recreational vehicles. The presence of humans on the breeding grounds can also interrupt incubation, increasing the chances for predation on the eggs or chicks. Habitat alteration and development has resulted in fewer acceptable nesting beaches for Piping Plovers. Water development projects along major western rivers has led to increased flooding of the nesting sandbars during the breeding season, as well as to permanent inundation of former nesting habitat. Alteration of normal river flows by these projects has resulted in increased woody plant growth on riverine islands and sandbars, which makes such areas less desirable to Piping Plovers for nesting habitat. Winter habitat of the Piping Plover is threatened primarily by urban and industrial development especially projects that dredge or fill in tidally exposed flats that comprise essential foraging habitat. Disturbance from recreation on shorelines is a problem on the non-breeding grounds as well.

RECOMMENDATIONS

Important winter habitat should be protected from development and appropriate mitigation should be implemented when destruction is unavoidable, especially when important tidal flats are dredged or filled. The usefulness of creating tidally-exposed flats for foraging opportunities should be explored, and an investigation into factors contributing to greater use of some tidal flats should be made.

SNOWY PLOVER

Charadrius nivosus (Cassin)

LISTING

Global Rarity Rank – ***Species*** *is apparently secure, however the* ***subspecies*** *is vulnerable (G4T3Q)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of Nick Winstead/MMNS©

DESCRIPTION

Snowy Plovers are small shorebirds 13-17 cm (5-7 in.) in length and are gray-whitish above and white below. Adults have a black patch on the forehead, an incomplete black breast band, and a dark ear patch. Juveniles lack the forehead patch, the breast band, and the ear patches. The bill is thin and dark and the legs are dark gray. The call of the Snowy Plover has been described as "chu-we" and as soft, whistled "ku-wheet."

RANGE

This species breeds locally along the Pacific Coast from Washington south to Baja California, along the Gulf Coast from western Florida to Mexico, in the Bahamas, on Cuba, in the Dominican Republic, on Puerto Rico, in the Lesser Antilles and islands off the northern coast of Venezuela, and in arid parts of California, Nevada, Oregon, Colorado, New Mexico, Utah, Arizona, Kansas, Oklahoma, and Texas. In Mississippi, the Snowy Plover nests on the barrier islands and occasionally on mainland beaches in Harrison County. Snowy

Plovers winter from California and the Gulf Coast south. It is assumed that birds breeding in Mississippi are year-round residents, though the non-breeding population is supplemented with birds from Florida.

HABITAT

Snowy Plovers inhabit expanses of flat, dry sand along seacoast beaches or alkaline interior lakes out west. This species forages at the edge of the water or on the sand flats of tidal creeks.

LIFE HISTORY & ECOLOGY

The Snowy Plover usually lays 2 or 3 eggs on the sand within a small depression lined with broken shells and other bits of debris. Eggs are normally laid from early April to as late as July in some parts of the range. Hatching occurs in about 24 days and the young are able to fly 22 to 31 days after hatching. The young leave the nest a few hours after hatching and can find food for themselves without the aid of the parents. Feeding usually occurs on the wet sand at the surf line or along the shores of inland ponds and lakes. Crustaceans, marine worms, mollusks, and aquatic insects comprise the bulk of the diet.

BASIS FOR CLASSIFICATION

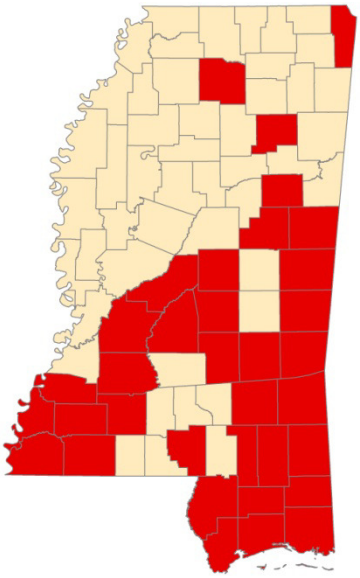
Even though the Snowy Plover occurs over a large area, it is a relatively uncommon species and appears to be declining. The western subspecies is listed as threatened by the U.S. Fish and Wildlife Service, but does not occur in Mississippi. Populations along the Gulf Coast are not listed by the U.S. Fish and Wildlife Service; however, they are by the State of Mississippi. The sandy beach habitat Snowy Plovers require is increasingly used for recreation and urban development. These activities reduce the available foraging and nesting habitat.

RECOMMENDATIONS

The Snowy Plover has attempted to nest on mainland beaches in Harrison County but has been disrupted by beach maintenance activities. These should be modified if possible in order to allow this species to nest.

RED-COCKADED WOODPECKER

Picoides borealis (Vieillot)



LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Middleton/Littschwager©

DESCRIPTION

The Red-cockaded Woodpecker is a relatively small woodpecker, about 20 cm (8 in.) in length. The top of the head and back of the neck are black. There are large, white cheek patches on the sides of the head. A narrow, black streak extends from behind each eye to the top of the head. The throat and belly are white. The back and wings are a barred black and white and the flanks have black streaks and bars. The tail is black with white on the outer feathers. Adult males have a few red feathers (the red cockade) behind and above the eye. These are not usually visible unless the bird is in hand. The Red-cockaded Woodpecker makes a raspy “sripp” or “tiick" note and a longer, wavering “shirt."

RANGE

The Red-cockaded Woodpecker once occurred from Maryland and Kentucky west to Missouri and south to eastern Texas and southern Florida. In Mississippi, this species has been recorded primarily from the southern two-thirds of the state. It has not been found in the Delta and only sporadically occurs in the northern counties.

HABITAT

The Red-cockaded Woodpecker is a species of southern pine forests. The preferred nesting habitat is open, park-like, mature pine woodlands with few or no hardwood trees present. Preferred feeding habitats are pine stands with trees 23 cm (9 in.) and greater in diameter. These may or may not include a significant hardwood component.

LIFE HISTORY & ECOLOGY

The Red-cockaded Woodpecker excavates nesting and roosting cavities in living pine trees, and is the only species known to do so exclusively. Cavities have been found in most species of southern pines, but longleaf pine (*Pinus palustris*) appears to be the preferred species. Older, mature trees are selected for cavity excavation. The reported cavity tree ages range from 63-176 years for longleaf pine, 70-101 years for loblolly pine, 75-149

or shortleaf pine, 62-130 years for pond pine, and 70-76 years for slash pine. Occasionally, cavities have been found in trees as young as 30 to 40 years old. A high percentage of trees with cavities have been found to be infected with red heart fungus, which decays and softens the normally hard heartwood. It is thought that woodpeckers actively select infected pines because excavation of the heartwood in such trees is easier.

Cavity excavation may take several months. Most cavities are between 6-15 m (20-50 ft) above the ground and are usually located on the trunk below the lowest, first live limb. The completed cavity is 15-25 cm (6-10 in.) deep and 7.5-12.5 cm (3-5 in.) wide. Prior to the completion of the cavity, bark is flaked away from the trunk for several feet above and below the entrance, presumably to make it more difficult for snakes to reach the cavity. Several small holes called resin wells are chipped through the bark near the cavity. The resin from these wells eventually covers the trunk with pitch which may also discourage predators, especially snakes, from approaching the cavity. The resin wells are pecked regularly to maintain resin flow. Bark is chipped away from around the entrance hole, exposing the sapwood. This area, called the plate,

prevents the cavity entrance from growing shut. As long as a cavity is being used for roosting or nesting, the bark is chipped around it, the plate is continually enlarged, and the resin wells are worked to provide a flow of resin.

Red-cockaded Woodpeckers are non-migratory and maintain territories throughout the year around their nesting and roost trees. They live in family groups that may consist of only an adult male and female, a mated pair of adults with their current year's offspring, or a mated pair of adults with their current year's offspring and a few helpers, which are usually male offspring from one or both of the breeding adults from previous years. Helpers assist the mated pair in rearing the young. Most groups have only one helper, but as many as four have been observed. Although a group may consist of two to six adult birds, there is only one breeding pair.

This species may use the same cavity trees for years or even decades. The area with cavity trees used by a group is referred to as a cluster. Clusters may have from one to 30 cavity trees, including trees with completed cavities, trees with cavities under construction, and trees with abandoned cavities. In most clusters, cavity trees are within 500 m (1500 ft) of one another.

Red-cockaded Woodpeckers lay two to five eggs in late April through early May or later. The eggs hatch in about 10 days and the young are able to fly in 24 to 29 days. In general, groups with helpers are able to successfully rear more offspring than those composed of only a mated pair. Juvenile birds remain on their parents' territory through the remainder of the summer and early fall. Juvenile females leave the territory between late fall and the next spring. Usually some of the juvenile males remain on the territory and become helpers during the following nesting season.

Red-cockaded Woodpeckers prefer to look for food in stands of living pine trees, although they occasionally forage on hardwoods within a mixed pine-hardwood forest. They also prefer larger over smaller pine trees. Most foraging is concentrated on the trunks and limbs of the trees where bark is scaled off to uncover the invertebrate prey. Spiders, centipedes, insects, and insect larvae appear to be the primary food items, although occasionally fruits of blueberry, sweetbay, wild cherry, and wax myrtle are eaten. Foraging by members of a group may cover between two to four hundred acres or more depending upon the season and quality of the habitat.

BASIS FOR CLASSIFICATION

The Red-cockaded Woodpecker was formerly a widely distributed and relatively abundant species over the southeastern United States. Its decline began with the widespread cutting of the virgin pine forests in the late 1800s and continues today. Populations have become fragmented and isolated as suitable habitat

continues to disappear. There were estimated to be only 4,800 to 10,000 Red-cockaded Woodpeckers left in 1978. There have been many documented losses of known clusters since that time, and little evidence of the colonization of new areas.

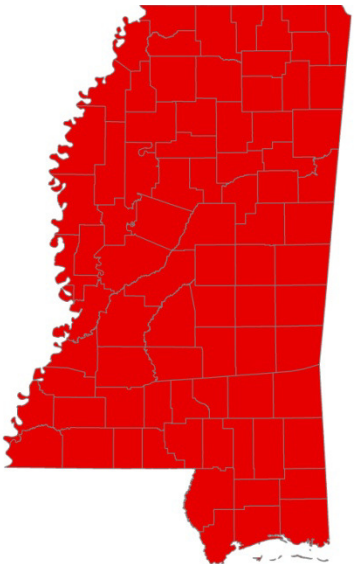
The Red-cockaded Woodpecker has become an endangered species because of its dependence upon mature pine forests with an open understory. This type of habitat was maintained in the past by recurring wildfires, but is uncommon today. Modern forestry practices on both private and public lands emphasize the establishment of even-aged, dense plantings of pines and the harvesting these trees when they are young to middle-aged. Also, fire has been excluded from many pine woodlands or is restricted to the dormant season, when it is less effective at brush control. Without the large, mature pine trees, the woodpecker has no suitable trees in which to excavate nesting cavities, and the absence of periodic fires encourages the encroachment and growth of hardwood trees. Clusters in areas with a substantial number of hardwoods are soon abandoned by the Red-cockaded Woodpecker. It is thought that these hardwoods lead to increased numbers of other cavity-using species, such as the Red-bellied Woodpecker, the Pileated Woodpecker, and the southern flying squirrel, which often compete for and ultimately evict Red-cockaded Woodpeckers from their cavities.

RECOMMENDATIONS

Survival of the Red-cockaded Woodpecker in Mississippi will depend on wise management of publically owned lands. Large private tracts supporting the mature, fire-maintained forests required by the Red-cockaded Woodpecker are increasingly uncommon, but these can also play a role in the species' recovery through programs such as Safe Harbor, which has been well-received in neighboring states. Accurate censuses should be conducted periodically for all populations of Red-cockaded Woodpeckers, because the current status of this species is poorly known. Legally mandated management procedures for Red-cockaded Woodpeckers on publicly owned forests should be immediately implemented and enforced. Mature pine trees should be maintained along major highway corridors to provide habitat for displaced woodpeckers and to link isolated stands of suitable habitat. Publicly owned forest lands should be managed to produce old-growth timber and stands should be maintained with prescribed fire. Further research is also needed on foraging habitat requirements and the characteristics of trees selected by Red-cockaded Woodpeckers for cavity construction.

PEREGRINE FALCON

Falco peregrinus Tunstall



LISTING

Global Rarity Rank – *Apparently Secure (G4)*
Federal Protection Status – *Recovered/Delisted*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critcially Imperiled (S1N)*

Photo courtesy of Tim & Donna Bailey©

DESCRIPTION

The Peregrine Falcon is a crow-sized bird 41-51 cm (16-20 in.) in length with a wingspread of approximately 91-112 cm (36-44 in.). Adults have a black crown with a black wedge extending downward below the eye along the side of the head. The nape (back of the neck) is also black. The back and wings are pale to slate gray. The undersides of the wings and tail and the breast are light gray to white with numerous black spots and bars. Immature birds are dark brown above with a pale brown forehead and heavily streaked underparts. The wings are long and pointed.

RANGE

The Peregrine Falcon formerly bred from Alaska and Greenland south to Georgia and Baja California, in southern South America, in Eurasia, Africa, and Australia. It is now gone from much of the eastern United States and Europe. There are no breeding records of the Peregrine Falcon from Mississippi. However, it may have once nested along the Tennessee River in Tishomingo County prior to impoundment of Pickwick Reservoir, as there was an active nest on the Tennessee River in Alabama during the 1950s. Today the Peregrine Falcon migrates through inland Mississippi and along the Gulf Coast, and may occasionally winter on the coast.

HABITAT

Peregrine Falcons formerly occurred in a wide variety of habitats including Arctic tundra, relatively densely forested areas, and coastal cliffs. Eastern populations were concentrated in mountainous areas and along major river valleys.

LIFE HISTORY & ECOLOGY

Nest sites are most often located on cliffs in the eastern United States. Nests have also been noted in trees in a few states, and Peregrine Falcons have nested on bridges and high window ledges in some metropolitan areas. Peregrine Falcons usually reach maturity when they are three years old. Two to four eggs are laid in late March or April and hatch in about 33 days. Most incubation and brooding is done by the female. The diet is composed primarily of birds, including common species such as Blue Jays, Meadowlarks, and Northern Flickers. Shorebirds and waterfowl are occasionally taken on the wintering grounds. Prey is captured by diving at it from great heights and striking it in mid-air.

BASIS FOR CLASSIFICATION

The Peregrine Falcon population in much of North America and Europe began a rapid decline in the late 1940s and 1950s. Chemical pesticides (chlorinated hydrocarbons, specifically DDT) caused eggshell thinning which reduced the breeding success of this species. Thin shells made it almost impossible for adult birds to hatch eggs, as even normal brooding activities resulted in crushed shells. Pesticides are used to kill insects, which are then eaten by birds that are preyed upon by peregrines. Large doses of the compounds are thus transferred up the food chain to the falcons. The use of DDT and related pesticides has been severely restricted in the United States. However, Peregrine Falcons can still be exposed to these compounds because they and many of their prey species are migratory, and winter in Mexico and Central America where DDT is still commonly used.

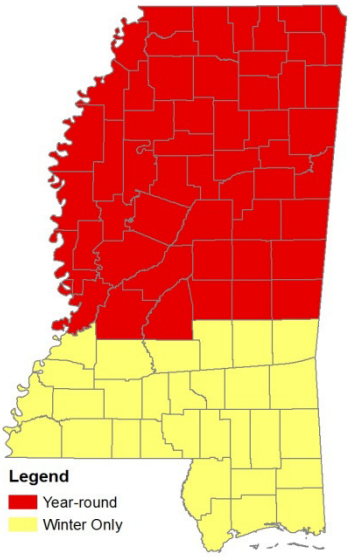
The Peregrine Falcon was formerly listed as an endangered species by the U.S. Fish and Wildlife Service over most of the United States. Through the banning of DDT, implementation of a captive breeding program which reintroduced the species to parts of its range from which it had been extripated, and other protective measures, the species has recovered enough to be removed from the federal list. It is still listed by the State of Mississippi.

RECOMMENDATIONS

Better survey data are needed to determine the status of this species in Mississippi. Coastal areas especially should be regularly surveyed to determine the extent of Peregrine Falcon usage. Efforts should be made to ensure that disturbance of falcons on barrier islands is minimized.

BEWICK'S WREN

Thryomanes bewickii (Audubon)



LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1B, S2N)*

Photo courtesy of Bill Stripling©

DESCRIPTION

Bewick's Wren is a small bird 12.5-14 cm (5-5.5 in.) in length. The upper parts of the head, body, and wings are reddish brown and the lower surface is uniformly grayish-white. There is a white stripe above the eye and a dark brown line both in front of and behind the eye. The wings and tail have dark brown bars and the outer parts of the tail feathers are white. The song of Bewick's Wren has been variously described as a thin,

loud “chick, click, for me-e, for you” or “cheep cheep chewe-e-e-e”. It also makes a call note described as a harsh, grating “*weed-it*, *weed-it*.”

RANGE

Bewick's Wrens breed from southern British Columbia, southwestern Wyoming, southern Ontario, and southwestern Pennsylvania south to the northern parts of the Gulf States and into Mexico. It is a year-round resident in the western parts of its range but migratory in much of the eastern United States, wintering from the lower Ohio River valley south to the Gulf Coast and central Florida. Bewick's Wrens are found throughout the state year-around, but are found only in central and northern Mississsippi during the breeding season.

HABITAT

Bewick's Wren occurs in and around brush piles, in open woodlands, and in scrubby areas in the eastern United States. It is often found in the vicinity of buildings, especially out-buildings in a state of disrepair.

LIFE HISTORY & ECOLOGY

This species builds bulky nests of sticks lined with leaves, grasses, and feathers. The nests are built in natural cavities such as tree stumps, brush piles, or woodpecker holes, and in artificial ones such as tin cans and baskets, empty barrels, or crevices in stone or brick walls. Breeding occurs between late March and July and two or even three broods may be raised per year. Usually five to seven eggs are laid, but clutch size may range from 4-11. The eggs hatch in about 14 days, and the young are able to fly in about two weeks. The young are apparently cared for by the parents for an additional two weeks after they leave the nest. The diet of Bewick's Wren is composed primarily of insects and other invertebrates.

BASIS FOR CLASSIFICATION

This species has declined considerably in the eastern part of its range, including Mississippi, since the mid-1900s. The reasons for this decline are unknown, but may include pesticide poisoning, land use changes, or competition with the House Wren (*Troglodytes aedon*). The House Wren nests in the same locations and occupies the same habitats as Bewick's Wrens and the two species are apparently intolerant of one another. Destruction or alteration of wintering habitat in the east has also been suggested as a possible factor contributing to the decline of this species.

RECOMMENDATIONS

A status survey of Bewick's Wrens in Mississippi is needed, especially in the northern counties where they nest. Research is needed to determine why this species has been decreasing in the eastern United States.

GRAY BAT

Myotis grisescens (Howell)

LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1N)*

Photo courtesy of Adam Mann/Environmental Solutions & Innovations©

DESCRIPTION

The gray bat is the largest of its genus in the eastern United States. This species has a wingspread of 25.5-30 cm (10.8- 11.8 in.). It weighs 7-16 grams. The fur along the back is uniformly dark gray from the base to the tips, distinguishing it from other eastern bats. The wing membranes are attached to the foot at the ankle.

RANGE

The gray bat occurs from Arkansas and Missouri east to southern Illinois and Indiana and south to the limestone belt in northwestern Florida. Largest populations are found in Alabama, northern Arkansas,

Kentucky, Missouri, and Tennessee. This species is known only from Tishomingo County in Mississippi and may represent foraging individuals.

HABITAT

The gray bat roosts in caves during the summer and winter. Caves used during hibernation are usually deep, vertical pits that act as cold-air traps. There are only nine known caves that are believed to house 95% of the hibernating population. Summer caves used by females usually have dome-shaped ceilings which act as warm-air traps. Most gray bats forage over rivers or reservoirs in the vicinity of their summer caves.

LIFE HISTORY & ECOLOGY

Gray bats migrate between summer caves and hibernation caves. Mating takes place upon arrival at the winter caves; this usually occurs between early September and October. Adult females begin hibernating soon after mating while adult males and juveniles remain active a few weeks longer, usually going into hibernation by mid-November. Gray bats emerge from winter caves in late March to mid-May. Females leave the caves first, followed by juveniles and later still by adult males. After migration to the summer range, adult females roost in different caves than those occupied by adult males and juveniles. Groups of adult females are known as maternity colonies and these congregations are large. Females give birth to a single pup in late-May or early June. Depending upon growth rate, pups may begin flying 20-35 days after birth. Gray bats appear to feed primarily upon aquatic insects, particularly emerging mayflies. This species may live for up to 35 years.

BASIS FOR CLASSIFICATION

The gray bat has declined substantially over the last 30 years, and as a result, is listed as endangered by the U.S. Fish and Wildlife Service. The gray bat is very selective in its requirements for hibernating caves. It has been estimated that fewer than 5% of caves and caverns provide suitable habitat for gray bats. Because of their specific habitat requirements, hibernating gray bats are extremely vulnerable to human disturbance. If bats are provoked at this time, they metabolize stored fats which would have sustained them through the rest of the winter. Thousands of gray bats have starved in their winter caves because of repeated disturbances, primarily by humans, during hibernation. Gray bat maternity roosts have also suffered from human disturbance. Visitors to the maternity caves have caused thousands of flightless young to become dislodged from the cave roof and fall to their deaths. In addition to unintended disturbances by cave explorers, this species has suffered from human disturbance, such as collecting or killing bats in the cave or at the cave entrance, commercialization of the hibernation caves and maternity caves, destruction of caves by reservoir construction, and from pesticide pollution. The cutting of forests in the vicinity of maternal

colonies and along rivers and reservoirs also has impacted this species by reducing available foraging habitat and by making the bats, especially juveniles, more vulnerable to predation. With cave gating programs and signs warning of disturbance to bat colonies, populations of gray bats were rebounding. However, white nose syndrome, a disease caused by a fungus found in caves, could have devastating effects on bat populations.

RECOMMENDATIONS

This species does not appear to breed or hibernate in Mississippi, so there is little that can be done to protect them in this state. However, the frequency with which they migrate through Mississippi needs to be determined. Any caves in the state that turn out to be important temporary roosts should be protected.

INDIANA BAT

Myotis sodalis (Miller and Allen)

LISTING

Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Possibly extirpated; known occurrences only from historic records (SH)*

Photo courtesy of Adam Mann/Environmental Solutions & Innovations©

DESCRIPTION

The Indiana bat is a medium-sized North American bat. It has a wingspread of 24-26 cm (9.5-10.5 in.). It typically weighs between 5 and 9 g. The Indiana bat is a dull, dark chestnut-gray above and paler below.

Individual hairs have dark bases and lighter tips. The wing membrane is attached at the base of the toes and the calcar (heel of the foot) is strongly keeled.

RANGE

The Indiana bat has been reported from Oklahoma north to Iowa, east to the New England states, and south to Florida. The main breeding and hibernating area appears to be in the Midwest. Recent surveys indicated there may be scattered maternity roosts in the northern counties in MS. This species is not known to hibernate in MS.

HABITAT

Indiana bats hibernate in limestone caves during the winter, but roost under bridges in the summer. Maternity colonies have been found in hollow trees and under bark during the summer. Foraging occurs above the trees along rivers and streams. Creeks are apparently not used if riparian trees have been removed.

LIFE HISTORY & ECOLOGY

Indiana bats are migratory, arriving at their hibernation caves in late August to early September. As with gray bats, females mate soon after their arrival at the winter caves and begin hibernation shortly thereafter. Males and juveniles remain active until about mid-October to November. Female Indiana bats generally leave their winter caves for their summer rangesin mid to late April. Some males will migrate to the summer range, but others remain in the vicinity of the winter hibernation caves. There is little information on the activities of female Indiana bats while they are rearing young. The data available indicate that small maternity colonies are formed under the loose bark of living or dead trees. A single individual is born in late June or early July and is able to fly in three to four weeks. Indiana bats feed upon insects, especially moths and flies.

BASIS FOR CLASSIFICATION

The Indiana bat has declined substantially over the last 30 years, and as a result, is listed as endangered by the U.S. Fish and Wildlife Service. This species is selective in its requirements for hibernating caves, with 85-90% of the known population of Indiana bats hibernating in only seven caves. Because of this specificity, hibernating Indiana bats are extremely vulnerable to human disturbance. If bats are provoked at this time, they metabolize stored fats which would have sustained them through the rest of the winter. Thousands of Indiana bats have starved to death in their winter caves because of repeated disturbances, primarily by humans, during hibernation. In addition to unintentional disturbances by cave explorers, this species has

suffered from human disturbance, such as collecting or killing bats in the cave or at the cave entrance, commercialization of hibernating caves by reservoir construction, and from pesticide pollution. The cutting of forests in the vicinity of maternal colonies along rivers and reservoirs also has impacted this species by reducing available foraging habitat and by making the bats, especially juveniles, more vulnerable to predation. With cave gating programs and signs warning of disturbance to bat colonies, populations of Indiana bats were rebounding. However, white nose syndrome, a disease caused by a fungus found in caves, could have devastating effects on bat populations.

RECOMMENDATIONS

Recent surveys tracked a female Indiana bat to a wetland in northern Mississippi, the first known occurrence in over 40 years. The Indiana bat does not hibernate in Mississippi. However, the frequency with which they migrate through Mississippi needs to be determined. If any of the few caves in the northern part of the state turn out to be important temporary roosts, those caves should be protected.

WEST INDIAN MANATEE

Trichechus manatus (Linnaeus)

LISTING

Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1N)*

Photo courtesy of Doug Perrine/Innerspace Visions©

DESCRIPTION

The West Indian manatee is an aquatic mammal which averages between 3 and 4 m (10 to 13 ft) in length and between 360 and 900 kg (800 to 1,980 lb) in weight, although one female weighing 1620 kg (3,500 lb) has been reported. The skin is thick and slate-gray to brown in color. The front limbs are modified into flippers and there are no hind limbs. The paddle-shaped tail is flattened horizontally. Manatees are nearly hairless, with only a few colorless hairs scattered over the body and stiff bristles on the upper lip. There are no external ears. Juveniles (calves) are blackish-gray.

RANGE

This species occurs in rivers, estuaries, and coastal areas of Florida, southeastern Georgia, and the shores of the Gulf of Mexico, Caribbean Sea, and Atlantic Ocean from Mexico to northern Brazil. In Mississippi, one or more individuals have been observed at a number of sites inshore along the Mississippi coast, and manatees were observed along the Gulf Coast as far west as Louisiana in 2011.

HABITAT

Manatees live in both fresh and saltwater throughout their range. These habitats include rivers, bays, estuaries, and similar areas at least 1 m (3.3 ft) in depth. Occasionally manatees have been observed well away from shore in the Gulf of Mexico. Manatees migrate long distances (850 km) to congregate in wintering areas.

LIFE HISTORY & ECOLOGY

Manatees apparently breed throughout the year, with birth of usually one (rarely two) young occurring 385 to 400 days after mating. It is thought that females choose secluded backwaters in which to give birth and that most births occur in the spring and early summer. The calves may be over 1 m (3.3 ft) in length at birth and weigh 11 to 27 kg (24.3 to 59.5 lb). Birth and nursing take place entirely within the water. Calves remain with their mothers for at least one to two years. Females apparently have calves once every two to five years. Manatees may mature when they are four to seven years of age, although one investigator estimated that females mature in 7 to 8 years and males at 9 to 10 years. It is not known how long manatees live in the wild, but one individual has been maintained in captivity for over 65 years.

BASIS FOR CLASSIFICATION

The West Indian manatee has been decreasing in abundance since the arrival of the first Europeans. Current estimates are that only about 1,400 remain in the United States. As a result, this species is listed as endangered by the U.S. Fish and Wildlife Service. The initial decline of manatee populations resulted from overhunting for food, oil, and hides. At present, the illegal killing of manatees has almost been eliminated, but many individuals are injured or killed from collisions with power boats and barges or are trapped, crushed, or drowned in automatic flood control structures and power plant intake pipes. Occasionally manatees are entrapped and drowned in shrimp nets or hoop nets. Manatees are also susceptible to cold temperatures and to habitat destruction.

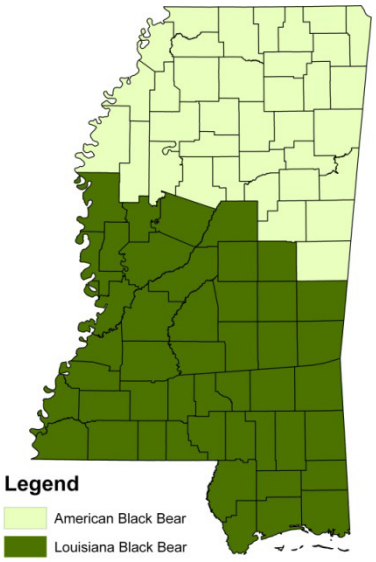
RECOMMENDATIONS

The manatee is a rare but regular visitor to the Mississippi coast, with one to several individuals spotted in Mississippi waters during most years. Any manatee found in Mississippi waters would probably not survive

winter weather, as this species is prone to respiratory diseases during cold periods. Any manatees discovered in Mississippi during winter should be reported to the U. S. Fish and Wildlife Service.

BLACK BEAR

Ursus americanus (Pallas)



LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Partial Status (PS)*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Critically Imperiled (S1)*

Photo courtesy of Brad Young/MDWFP©

DESCRIPTION

The black bear is a large, stocky, short-tailed mammal which, in the eastern United States, is dark brownish-black. Adults usually stand from 90-105 cm (3-3.5 ft) at the shoulder, are 137-188 cm (4.5-6.25 ft) long, and weigh 90-182 kg (198-400 lb).

RANGE

The black bear formerly occurred over most of Canada, the United States, and the mountains of northern Mexico. In the eastern United States, it now occurs in northern Minnesota, Wisconsin, and Michigan; in New England, New York, and Pennsylvania south through the Appalachians to northern Georgia; in most of

Florida; and along the Gulf Coast to central Louisiana, north to the Ozark Mountains of Missouri and Arkansas. According to historical accounts, black bears once lived throughout Mississippi. Today, black bears are primarily found in counties along the Mississippi, lower Pearl, and Pascagoula watersheds. However, as populations continue to grow, confirmed sightings of black bears have become more and more common in other regions of the state.

Mississippi is home to two subspecies of black bears. The Louisiana black bear (*Ursus americanus luteolus*) occurs in the southern two-thirds of the state as well as all of Louisiana and eastern Texas. Declining populations and loss of habitat led the U.S. Fish and Wildlife Service to list the subspecies as threatened under the Endangered Species Act in 1992. The American black bear (*Ursus americanus americanus*) is found in the northern counties of the state and was listed as state endangered in 1984.

LIFE HISTORY & ECOLOGY

Black bears will mate in June or July, and a litter of one to five cubs are born in February of the following year. In optimal conditions, females will have cubs every other year. The cubs emerge from the den with their mother in April or early May and will stay with their mother through the summer and fall and then den with her in the following winter. Female black bears reach sexual maturity at three to five years of age.

Habitat type, sex, age, season, environmental conditions, food availability, and population density all play a role in determining the size and shape of a bear's range. It has been shown that adult males have home ranges three to eight times that of a female bear. Studies conducted in central Louisiana showed that males used areas from 11,000 to 40,000 acres while females covered ranges of 2,500 to 18,000 acres.

Black bears eat a wide variety of foods, but their diet has been shown to consist primarily of plant materials, including grasses, fruits, seeds, and mast. Insects and carrion have also been found to be an important source of protein. Most foraging takes place during the evening and early morning hours. Although black bears occasionally are active during the day, they often spend the day resting on soft ground or leaf litter.

Black bears are not true hibernators but rather enter a period known as carnivorean lethargy or torpor. The primary purpose of this extended sleep is to survive food shortages and extreme weather during winter months. Research has shown that black bears in Mississippi do den for extended periods of time during winter months. The duration of the denning period is dependent on several factors including pregnancy, age, sex, and food availability. Studies conducted on bears in Mississippi showed that females entered dens 45 days earlier than males with a median entrance date for females of December 3 and January 17 for males. Average length of the denning period was 83 days longer for females than for males. Den sites can be ground nests, logging slash piles, or tree cavities with openings as high as 90 feet or more.

Bears benefit from management practices that promote a diverse habitat, such as shelterwood cuts and small clearcuts. A diverse, productive habitat contains blackberries, hardwoods, and other food plants; shrubs and fallen logs that provide escape cover; and brushpiles and large trees that can serve as den sites. Bears require living areas where they can avoid human contact. Bears can coexist with humans if provided habitat where all their needs are met.

BASIS FOR CLASSIFICATION

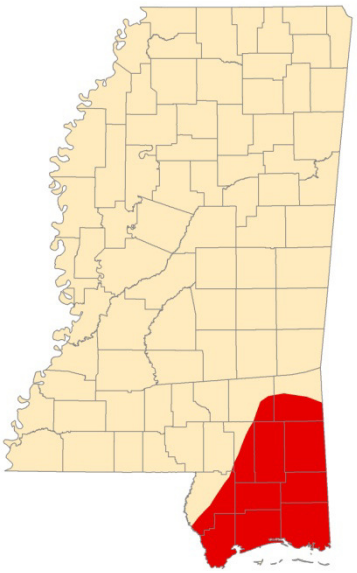
The black bear was almost eliminated from Mississippi and has been on the state's endangered species list since 1984. It is currently estimated that less than 150 still remain in the state. The primary reasons for the decline in population numbers were habitat destruction and over-hunting. Today, illegal kills and collisions with automobiles are the primary causes of death in Mississippi.

RECOMMENDATIONS

Efforts should be made to preserve bear habitat, especially bottomland hardwoods along some of the major river systems. Forest management activities in these habitats should include leaving some large, old-growth timber, which may be important denning sites for females.

LOUISIANA QUILLWORT

Isoëtes louisanensis Thieret



LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – *Non-listed*
State Rarity Rank – *Imperiled (S2)*

Photo courtesy of MMNS

DESCRIPTION

The Louisiana quillwort, a perennial emergent aquatic or wetland herb, is a primitive relative of true ferns and is related to club mosses (*Lycopodiaceae*) and spike mosses (*Selaginellaceae*). It reproduces via spores instead of seeds. The grass-like plants are comprised of a whorl of linear, arching, leaf-like sporophylls, each of which encloses four parallel air chambers (a unique feature of all quillworts). Each sporophyll contains a basal pouch where highly ornamented spores of two sizes develop. The sporophylls, as shown in the photograph, are attached to a shallowly buried, two-lobed rootstock. As one of about two dozen species of quillworts occurring in the southeastern United States, the Louisiana quillwort is intermediate in size between the extremely rare granite outcrop quillworts of Georgia that are scarcely more than 2-3 cm (0.79-1.18 in.) tall and the robust quillwort species of south Alabama that are upwards of 50 cm (19.69 in.) tall.

RANGE

The type locality for Louisiana quillwort is in Washington Parish, Louisiana, where the plants were first discovered in 1972. A few additional colonies were found in neighboring St. Tammany Parish over the next two decades, but not until 1996 were Louisiana quillwort plants verified in Mississippi. Small colonies of quillwort plants have been observed in the Chickasawhay Ranger District of DeSoto National Forest and adjacent private lands (Jones, Wayne, Greene counties); however, most of the Mississippi colonies are found in the DeSoto Ranger District of the DeSoto National Forest (Forrest, Perry, Stone, Harrison, and Jackson counties) with a small cluster of sites in north-central Hancock County. One colony is known from Pearl River County.

HABITAT

Louisiana quillworts grow in mineral soil, usually light gray in color, in bottomlands that are periodically washed free of leaves and debris. Overstory trees are typically laurel oak, red maple, tuliptree, and swamp tupelo. Pine trees are only occasionally observed, but they may have been more common, as large old pine stumps are frequently observed around quillwort populations. The shrub layer is sparse, with titi being the usual dominant plant. Streams along which quillworts grow may have flow year round; however most quillwort sites dry out enough that the plants wither in June-July and do not resprout until early November when the weather is cooler and rains return.

LIFE HISTORY & ECOLOGY

Healthy, mature quillwort plants are comprised of as many as 60 leaf-like sporophylls. New sporophylls form at the center of the whorl as the outer ones mature and wither or are lost by abrasion from floodwater scouring. In some colonies, leaves are also browsed by marsh rabbits and deer. The outer leaves form subterranean megaspores and the inner leaves form microspores. Egg cells are produced by the female gametophyte developing within the megaspore and a sperm cell is produced by the male gametophyte which develops within the microspore. Water is necessary for fertilization. After fertilization, the new plant (known as a sporeling) develops and becomes buoyant, facilitating dispersal by flowing water. If the young plant reaches bare, moist soil, roots develop and a new colony is formed.

BASIS FOR CLASSIFICATION

The Louisiana quillwort was listed as an endangered species by the U.S. Fish and Wildlife Service in 1992 before populations were discovered in Mississippi. Although the majority of known Mississippi colonies are found on public land, various land uses, including certain silvicultural activities, military training, and some

recreational activities (all terrain vehicles, for example), as well as natural alterations arising from impoundment of streams, may contribute to adverse impacts on quillwort habitat.

RECOMMENDATIONS

Monitoring of Louisiana quillwort colonies at Camp Shelby has been ongoing since November 1999. U.S. Forest Service biologists are monitoring colonies elsewhere in DeSoto National Forest. Genetic research at University of Wisconsin-Milwaukee has shown subtle differences within quillwort colonies across the Louisiana-Mississippi range. Private landowners should be made aware of quillwort habitat and encouraged to voluntarily protect colonies because bottomland hardwood forests provide benefits not only for quillworts but also for fish and game. Activities which negatively affect hydrology, water quality, and/or substrate stability with respect to the needs of this species could threaten population persistence in its habitat.

AMERICAN CHAFFSEED

Schwalbea americana Linnaeus

LISTING

Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – *Non-listed*
State Rarity Rank – *Possibly extirpated; known occurrences only from historic records (SH)*

Photo courtesy of MMNS

DESCRIPTION

American chaffseed, a perennial herb in the broomrape family, occurs in a monotypic genus. Plants are densely hairy throughout and grow to a height of 30-60 cm (1-2 ft). The leaves are alternate, lance-shaped to elliptic, stalkless, 2-5 cm (1-2 in.) long, and smooth on the edges; the upper leaves are reduced to narrow bracts. Large (15 mm [0.6 in.] long and 7 mm [0.3 in.] wide), purplish, tubular flowers occur singly

on short stalks in the axils of these upper reduced leaves and form a many-flowered, spike-like raceme. The fruit is a long, narrow capsule (up to 10 mm [0.4 in.] long), enclosed in a loose-fitting, sac-like structure composed of persistent sepals that provides the basis for the common name, chaffseed.

RANGE

This plant is primarily a coastal plain species of the Atlantic and Gulf Coasts, with historic locations documented from 17 states. Today, known populations occur in Alabama, Florida, Georgia, Louisiana, New Jersey, North Carolina, and South Carolina. Two historic populations are documented from Mississippi: one from Jackson County and another in the vicinity of Saratoga in Simpson County (this locality may also include Jefferson Davis and Covington counties). There is still a chance that the species will be rediscovered in Mississippi.

HABITAT

Characteristically the species occurs in sandy (sandy peat, sandy loam), acidic, seasonally-moist soils. It is found in habitat described as open, moist, pine flatwoods, fire-maintained savannas, areas between peaty wetland and wet, sandy soils, and other open grass-sedge systems. On Fort Bragg Military Reservation in North Carolina, American chaffseed has been observed in mesic pine savanna habitat, which is dominated by longleaf pine and wiregrass.

LIFE HISTORY & ECOLOGY

Flowering occurs from April to June in the South, and from June to mid-July in the North. Fruits mature from early summer in the South to October in the North. American chaffseed is a hemiparasite (i.e., is parasitic but also photosynthetic). It is considered to be one of the rarest root parasitic flowering plants in the Southeast. The species appears to be shade intolerant and is dependent on factors such as fire and fluctuating water tables to thrive in open to partly open conditions.

BASIS FOR CLASSIFICATION

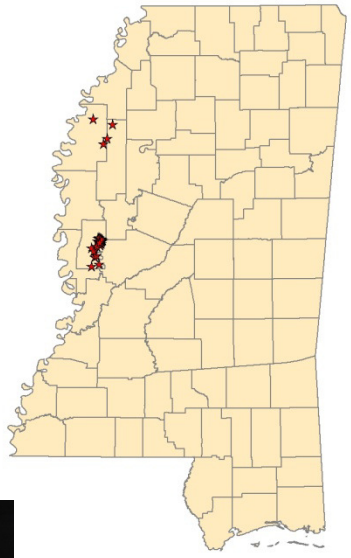
American chaffseed is listed as an endangered species by the U.S. Fish and Wildlife Service. Three-fourths of the known populations have been extirpated due to conversion of the habitat to residential and commercial purposes, incompatible agriculture and forestry practices, and succession of the vegetative community towards a dominance of shrubby species due to fire suppression. Current populations continue to be threatened by such activities.

RECOMMENDATIONS

Surveys should be made in the appropriate habitats to locate additional populations. Protection and appropriate management should be sought for the Jackson County population. Surveys should be initiated to locate appropriate habitat in the vicinity of Saratoga.

PONDBERRY OR SOUTHERN SPICEBUSH

Lindera melissifolia (Walt.) Blume



LISTING

Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – *Non-listed*
State Rarity Rank –*Imperiled (S2)*

Photo courtesy of Middleton/Liittschwage©

DESCRIPTION

This deciduous, thicket-forming shrub in the laurel family grows to 2 m (6 ft) tall and spreads underground by root-like structures. The young stems are hairy. Pale yellow flowers appear in the spring before the leaves. The bright red, 12 mm (0.5 in.) long, oval-shaped fruits mature in the fall. Pondberry is distinguished from the two other North American members of this genus (*L. benzoin* and *L. subcoriacea*) by its drooping, thin oval to elliptic leaves that have a strong sassafras odor when crushed. The leaves are also rounded at the base.

RANGE

Pondberry occurs in several states in the southeast, including Alabama, Arkansas, Georgia, Missouri, Mississippi, North Carolina, and South Carolina. The historical range of this species also included Louisiana and Florida. In Mississippi, populations are known to occur in the Yazoo Delta Region in Bolivar, Sharkey, Sunflower, and Tallahatchie counties.

HABITAT

Pondberry is associated with wetland habitats such as bottomland hardwoods in the interior areas and the margins of sinks, ponds, and other depressions in the more coastal sites. The plants generally grow in shaded areas. Associated plants in the habitat include sweetgum, overcup oak, willow oak, Nuttall's oak, green ash, American elm, sugarberry, deciduous holly, swamp privet, dwarf palmetto, box-elder, red maple, and switchcane.

LIFE HISTORY & ECOLOGY

Individuals of this species are either male or female. Populations are typically dominated by male plants. Reproduction seems to be primarily asexual by means of root-like stolons. This means that the plant produces stems that spread across the ground and eventually take root and become an individual plant separate from the parent. The plants grow in clumps of clones which flower in the second to fourth year of growth. This species has a low rate of sexual reproduction in the wild populations. Natural dispersal is limited, as available habitat is restricted because of the fragmented landscape of the Delta Physiographic Province. Hermit thrushes may be vectors for seed dispersal in Mississippi's populations. Stem dieback is not very well understood in this species; the fungus *Phomopsis* was present in the dieback stems of populations in South Carolina. *Ceracospora, Diaporthe,* and *Colletotrichum* fungi were found in the dieback of stems in the Arkansas populations. Numerous pathogens were also associated with the dieback twigs of the Arkansas populations. An emerging threat to this species is the laurel wilt, in which the fungus *Raffaelea* sp. is introduced into members of the laurel family by the redbay ambrosia beetle, *Xyleborus glabratus*.

BASIS FOR CLASSIFICATION

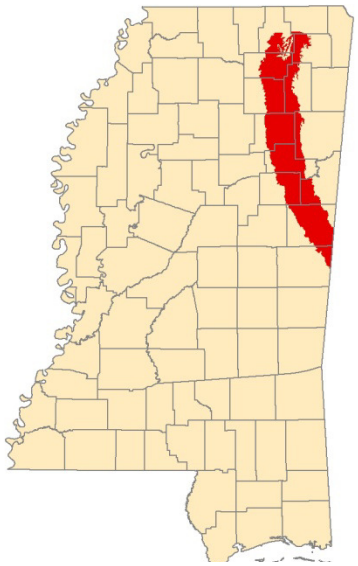
Pondberry is significantly threatened by drainage and subsequent conversion of its habitat to other uses. Even ditching without the later conversion of land use can alter the water regime in a manner that reduces the plant's vigor or eliminates it from the site. Cattle grazing and timber harvesting have also impacted the plants at some sites. Additional factors increasing this population's vulnerability to extirpation are the extreme, male-biased sex ratio and limited seedling establishment.

RECOMMENDATIONS

Protection should be obtained for all populations. Surveys to locate additional populations are ongoing and should continue. Delta National Forest, which contains Mississippi's largest population, has developed a program for population monitoring and management.

PRICE'S POTATO BEAN

Apios priceana B.L. Robins



LISTING

Global Rarity Rank –*Imperiled (G2)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – *Non-listed*
State Rarity Rank – *Critically Imperiled (S1)*

DESCRIPTION

This member of the pea family is a twining perennial vine, arising from a large, thickened potato-like tuber, and climbing to 5 m (15 ft) in height. Leaves are alternate, made of several leaflets joined to a central rib with typically 5-7 leaflets (up to 9 leaflets on shade leaves) that are oval-shaped, sharpening to a lanceolate point. The lowest pair of leaflets is the largest; the length of the leaves is 18 to 30 cm. Long flower clusters (5-15 cm [2-6 in.]) are borne in the leaf axils. Individual flowers are about 2 cm (0.75 in.) in length and are greenish-white tinged with purplish-pink tips. The flower has a prominent beak-like tip. The fruit is a cylindrical legume 13-20 cm (5-8 in.) in length. Price's potato bean is distinguished from groundnut (*Apios americana*) by typically having a larger leaf with seven leaflets rather than the five leaflets of the latter species; the flowers having the beak-like tip; longer fruit; and a single large tuber rather than smaller and numerous tubers.

RANGE

Price's potato bean is known to exist in Alabama, Mississippi, Tennessee, and Kentucky. A historic record exists for Illinois. In Mississippi, populations have been found in Oktibbeha, Lee, and Kemper counties. Historically, this species has been found in Clay County, and new populations may still be found there, as well as in Chickasaw, Pontotoc and Benton counties.

HABITAT

Populations occur in open woods and along woodland edges in limestone areas, often where bluffs grade into creek or river bottoms. Several populations extend onto roadside or powerline rights-of-way. The soils are described as well-drained loams on old alluvium or over limestone. Plant associates in Mississippi's

populations include chinkapin oak, white ash, basswood, sugar maple, slippery elm, redbud, spicebush, and switchcane.

LIFE HISTORY & ECOLOGY

Little information exists on the life history of Price's potato bean in Mississippi. This species is thought to be a native of forest openings and thrives best in areas with partial canopy. Price's potato bean flowers from late June through July and produces fruit in August. Seed production is reported to be low. Long-tailed skipper butterflies, honey bees, and bumble bees may be possible pollinators of the flowers. Studies of the populations on the Redstone Arsenal in Alabama indicate that the species may have a low sexual reproduction rate, particularly in drought years. These studies also indicate that the flowers are probably cross-pollinated and that the plant does not produce a seed bank.

BASIS FOR CLASSIFICATION

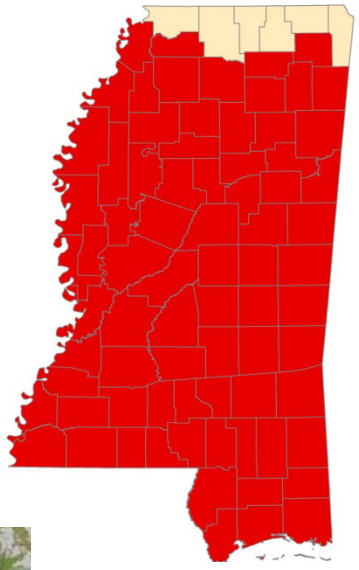
Price's potato bean is listed as a threatened species by the U.S. Fish and Wildlife Service. This species has disappeared from several of the reported sites and many of the existing populations have declined. Price's potato bean is threatened by cattle grazing and trampling, clear-cutting, road and line right-of-way activities (e.g., construction, herbicides), and excessive shading and competition associated with plant succession. Several of Mississippi's populations have been damaged or destroyed by construction or agricultural disturbances.

RECOMMENDATIONS

Protection is needed for all known sites of the Price's potato bean. Studies are needed to gain information on this species' life history and ecology, as well as to determine appropriate habitat management measures. Surveys to locate additional populations are ongoing and should continue.

AMERICAN ALLIGATOR

Alligator mississippiensis (Daudin)



SPECIES LISTING

Global Rarity Rank – *Secure (G5)*

Federal Protection Status – ***Threatened, Species of Similar Appearance (T/SA)***

State Protection Status – *Game species with limited season and take*

State Rarity Rank –*Apparently Secure (S4)*

Photo courtesy of MMNS

DESCRIPTION

The alligator is a large aquatic reptile which may grow to more than 4 m (13 ft) in length and more than 363 kg (800 lb) in weight. The adult is heavily scaled and is dark gray or black. Juveniles are patterned with black and yellow. The tail is laterally compressed and topped with high, pointed scales.

RANGE

The alligator historically occurred along the Coastal Plain from North Carolina south through most of Florida, west to central Texas, and north to southeastern Oklahoma and southwestern Arkansas. The historical distribution of alligators in Mississippi is not precisely known, but is assumed to have included the southern two-thirds of the state. It was introduced into several counties north of this area in the early

1970s. At present, the alligator is known to occur in at least 77 Mississippi counties, with the largest population along the Gulf Coast.

HABITAT

Alligators inhabit coastal salt marshes, sluggish rivers and streams, lakes, oxbows, and ponds. Large lakes with marshy borders and fresh and brackish marshes appear to be the best habitat for alligators.

LIFE HISTORY & ECOLOGY

The reproductive season for alligators begins in March or April (depending upon local weather conditions) and involves bellowing by both sexes. Mating takes place in the water, usually at night. Females build mound-shaped nests composed of mud and organic debris in May or June. The nest is typically about two meters (6.5 ft) in diameter, one meter (3.2 ft) high, and is located fairly close to water. The female deposits between 30 and 70 eggs in a cavity in the center of the nest mound. The cavity is covered with debris after the eggs are laid. Most females remain in the vicinity of the nest mound and will defend it against intruders. The eggs hatch in August or September. Hatchlings are about 23 cm (9 in.) long and make high-pitched yelping noises, which may induce the female to help open the nest. The young may remain together for the rest of the summer and may remain in the vicinity of the nest site for several months thereafter. The young grow approximately 30 cm (11.8 in.) per year under optimal conditions.

Adult alligators often dig dens along the edges of rivers and lakes, or in marshes. These dens are tunnels with underwater entrances and serve as shelters against adverse weather conditions and as retreats.

Alligators eat a wide variety of prey items and the diet is determined in part by the size of the alligator. Small alligators eat crayfish, small frogs, insects, and mollusks. Larger individuals feed on wading birds, snakes, turtles, fish, and small mammals. Very large adults may kill and eat deer, hogs, or cattle.

BASIS FOR CLASSIFICATION

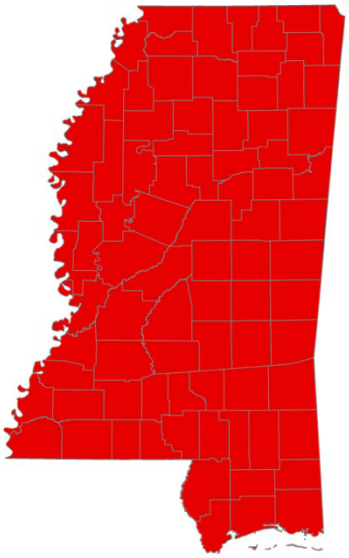
The alligator was almost hunted to extinction for its hide beginning in the mid to late 1800s and continuing until the 1960s. Millions of acres of alligator habitat were also destroyed by development. Alligators had declined so much that the species was listed as endangered by the U.S. Fish and Wildlife Service in 1967. Federal and state protection have enabled alligator populations to stabilize or increase throughout its range to the extent that the species was reclassified as threatened due to similarity of appearance (to the crocodile) in 1987. This is a formal recognition by the U.S. Fish and Wildlife Service that the alligator is biologically secure throughout its range.

RECOMMENDATIONS

Presently the alligator is considered to be a game species in Mississippi and has been hunted since 2005 on public waters and private lands via managed hunting permits. The Department of Wildlife, Fisheries, and Parks has issued detailed regulations on the management and captive breeding of this reptile.

BALD EAGLE

Haliaeetus leucocephalus (Linnaeus)



LISTING

Global Rarity Rank – *Secure (G5)*
Federal Protection Status – *Non-listed*
State Protection Status – *Recovered/Delisted (LE)*
State Rarity Rank – *Imperiled (S2B, S2N)*

Photo courtesy of Bill Stripling©

DESCRIPTION

The Bald Eagle is a large, hawk-like bird 79-94 cm (31-37 in.) in length with a wingspread of 178-229 cm (70-90 in.). Adults are dark brown with a white head, neck, and tail. The bill and feet are yellow. Immature birds are variously marked, not attaining adult plumage until they are about five years old. Juveniles in their first year are uniformly brown while older juveniles have increasing amounts of white giving them a

blotchy, mottled appearance. The Bald Eagle's call is a series of high-pitched chitterings.

RANGE

The Bald Eagle breeds from Alaska and northern and western Canada south to the northern and central United States, Florida, the Gulf Coast, and Arizona. During the non-nesting season Bald Eagles occur along large lakes and rivers throughout the United States. During the 2009 nesting season at least 77 pairs of Bald Eagles were believed to nest in Mississippi. Pairs nest throughout the state.

HABITAT

The Bald Eagle generally occurs in the vicinity of lakes, rivers, marshes, and along sea coasts. Nesting usually occurs in areas with mature trees near large bodies of water.

LIFE HISTORY & ECOLOGY

Bald Eagles generally begin nesting activities in early to mid-September in the southeastern United States. Most nests are placed in the upper 10 m (30 ft) of a large live pine or baldcypress. A nest is usually placed so that there are branches shielding it from above and a clear view of open water from the top of the nest. The nest is cone-shaped and may be 1.8 m (6 ft) in diameter and 1.8-2.4 m (6-8 ft) from top to bottom. It is often lined with Spanish moss or grasses. The same nest is often used by the same pair of eagles year after year.

The peak of egg-laying in the Southeast appears to occur in December, although this may vary from October to March depending upon latitude. Usually one or two, or occasionally three, eggs are laid. Hatching occurs in about 35 days and young birds are able to leave the nest in 10-12 weeks. The parents usually care for the young birds an additional four to six weeks after they have left the nest. Research on Florida and South Carolina Bald Eagles has indicated that these birds move northward for long distances after the nesting season. Several birds from these states have been recorded 1000 miles or more north of where they hatched.

The diet is primarily comprised of fish. However, this species also feeds on reptiles, waterfowl, small mammals, and carrion.

BASIS FOR CLASSIFICATION

Bald Eagle populations declined considerably from early 1950 through the 1970s. This decline prompted the listing of this species as endangered by the U.S. Fish and Wildlife Service. However, Bald Eagle nesting activity has recently increased range-wide, including in the Southeast, prompting the U.S. Fish and Wildlife

Service in 1994 to reclassify the Bald Eagle as threatened; the species was later removed from the list in 2007. Surveys of nesting Bald Eagles in the lower 48 states in early 1960 showed only 417 active eagle nests; surveys in 2006 showed 9,789 active nests. Environmental contaminants were responsible for dramatic declines of this species during 1950-1960. One of the major chemicals involved was DDT and related compounds that inhibited calcium deposition. This resulted in thin, fragile egg shells which were often broken by the adults during normal nesting activities. Recently, lead poisoning from shotgun pellets, which are ingested when eagles feed on dead or wounded waterfowl, has been implicated as a significant cause of mortality. Shooting has been a major factor in the decline of Bald Eagle populations. From 1961-1981, 25% of documented Bald Eagle deaths were from gunshot wounds. Habitat destruction has also impacted Bald Eagle populations. Suburban development, water control projects, and habitat alteration in the vicinity of nest sites have all contributed to the decline of the Bald Eagle.

RECOMMENDATIONS

Areas with nests should be monitored and protected from development or human disturbance. The use of steel shot for hunting ducks should be continued throughout the state.

AMERICAN BURYING BEETLE

Nicrophorus americanus (Olivier)

LISTING

Global Rarity Rank – *Rarity ranging between imperiled & vulnerable throughout the range (G2G3)*

Federal Protection Status – ***Listed Endangered (LE)***

State Protection Status – ***Listed Endangered (LE)***

State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of Middleton/Liittschwage©

DESCRIPTION

Ranging from 25-45 mm (1-1.8 in.) in length, these are the largest beetles in their genus. They also can be readily distinguished from other members of the genus by the large, orange-red spot on the upper back (pronotal disc). The front of the head (frons), antennal clubs, and wing covers also sport orange-red markings, contrasting sharply with the black background color. Males have an orange-red rectangle below the head; females have a small triangle in the same spot.

RANGE

Once widely distributed across North America, this beetle was reported from 32 states, the District of Columbia, and three Canadian provinces. It is now known to be present in six states: Rhode Island, Oklahoma, Arkansas, South Dakota, Nebraska, and Kansas. In Mississippi, there are records from Chickasaw, Madison, Marshall, Oktibbeha, Lafayette, and Tishomingo counties, with the most recent collection in 1950.

HABITAT

Little is known of the American burying beetle's habitat requirements, but the soil cannot be too wet, sandy, or rocky, as this would prevent proper interment of carrion and/or compromise preservation of the buried carcass until consumed by the beetle larvae.

LIFE HISTORY & ECOLOGY

This beetle depends upon vertebrate carrion in the 50-200 gm (1.0-7.1 oz) range, with larger-sized items preferred, as brood size is correlated with carrion mass. It requires high concentrations of carrion in this size class and competitors for this food source must be scarce. Bird rookeries seem to be favorable candidates for burying beetle colonies, as they have high concentrations of suitable food items and are often on islands without mammalian predators. In Rhode Island, Block Island supports one of the few remaining natural populations of beetles and has a very large concentration of woodcocks. Formally abundant prairie chicken populations may also have provided the necessary concentrations of carrion in earlier times.

High numbers of beetles of both sexes arrive at a carcass soon after dark and fight among themselves for possession of the carcass until a dominant pair (one male and one female) remain. Working together, the pair excavates a chamber in the soil for the carcass and an adjacent tunnel for the eggs. Excavation is accomplished by removal of dirt from beneath the body. Fur or feathers are removed from the carcass, it is cleaned of fly larvae and other organisms, then coated with secretions to slow decomposition. Following this, the beetles mate and eggs are laid.

BASIS FOR CLASSIFICATION

The American burying beetle was listed as endangered in 1989. For unknown reasons, it has undergone a catastrophic decline. The decline is probably related to a scarcity of natural communities in which concentrations of vertebrate carrion in the appropriate size classes are available, coupled with a surge in increased numbers of scavenging mammals. Unfavorable soil conditions may exclude many possible sites from colonization.

RECOMMENDATIONS

More research is needed to elucidate specific reasons for the decline. If the problems identified can be mitigated locally, reintroduction of beetles can be attempted. A survey for additional existing populations is needed and should be focused upon areas with favorable concentrations of appropriately sized carrion on appropriate substrate.

ALABAMA STURGEON

*Scaphirhynchus suttkusi W*illiams and Clemmer

LISTING

Global Rarity Rank –*Critically Imperiled (G1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of Glenn Clemmer/Inland Fishes of Mississippi/Stephen T. Ross©

DESCRIPTION

The Alabama sturgeon attains an adult size of approximately 72 cm (2.4 ft) and has a flattened, shovel-shaped snout. The upper lobe of the caudal (tail) fin is larger than the lower lobe and the body is covered by several rows of bony plates. The mouth is set far back on the underside of the snout and has large, fleshy lips. Four elongated, fleshy projections (barbels) hang down from the lower surface of the snout. The Alabama sturgeon potentially co-occurs with the gulf sturgeon, from which it can be distinguished by having an elongated and armored caudal peduncle and a lack of spiracles.

RANGE

The Alabama sturgeon is found in the Mobile Bay drainage of Mississippi and Alabama. In Mississippi, it is known only from the main channel of the Tombigbee River.

HABITAT

The Alabama sturgeon occurs in oxbows or the main channel of large rivers. They typically were collected over sand and gravel, or less often, mud.

LIFE HISTORY & ECOLOGY

The biology of this species is poorly understood. It inhabits the main channel of large coastal plain rivers in swift to moderate current. Stomach contents of several individuals examined contained aquatic insect larvae, oligochaetes, and fragments of mollusk shells. Females with ripe eggs have been captured in March, April, and May. Spawning sites have not been identified.

BASIS FOR CLASSIFICATION

The Alabama sturgeon has declined because of alterations to its big river habitats by dredging, channelization and the construction of dams. This has not only directly destroyed and fragmented essential riverine habitats but has also led to increased siltation that degrades both feeding and spawning areas. The Alabama sturgeon is likely extirpated from Mississippi.

RECOMMENDATIONS

Efforts have been underway in Alabama for more than a decade to collect Alabama sturgeon and initiate a conservation hatchery program. To date, they have been unsuccessful.

EASTERN INDIGO SNAKE

Drymarchon corais couperi (Holbrook)

SPECIES LISTING

Global Rarity Rank – *Vulnerable (G3)*
Federal Protection Status – ***Listed Threatened (LT)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*


Photos courtesy of Aaron Francois©

DESCRIPTION

The longest native snake in North America, the indigo snake may grow to a maximum length of approximately 2.6m (8.5 ft), although adults usually average about 2m (6.5 ft) in length. The indigo snake is heavy-bodied and almost uniformly a glossy blue-black in color except for the throat, chin, and sides of the head, which may be cream, orange, or red. The latter is more prominent in snakes from the eastern part of the range. The scales are not keeled and appear to be large in size relative to the size of the snake.

HABITAT

The indigo snake is found associated with dry sand ridges and pine uplands, at least in the northern parts of its range outside of Florida. These areas are dominated by a mixture of pines (primarily longleaf) and oaks. Recent studies have indicated that indigo snakes move from the upland sites during the summer and utilize bottomlands along streams as well as agriculture areas.

LIFE HISTORY & ECOLOGY

This species breeds from October to February. There are typically nine eggs laid in the late spring and early summer which hatch three to four months later. The indigo snake is active during the day and eats a wide variety of animals, including snakes, turtles, frogs, lizards, birds, and small mammals. It appears to especially relish other snakes, including venomous species. The indigo snake is often associated with gopher tortoises (*Gopherus polyphemus*), whose burrows it uses for both refuges and winter denning sites. A Georgia study indicated 94% of the monitored snakes used gopher tortoise burrows as overwintering locations.

BASIS FOR CLASSIFICATION

The eastern indigo snake is classified as a threatened species throughout its range by the U.S. Fish and Wildlife Service. This species has declined throughout the southeastern United States because of habitat destruction by urban and suburban development and habitat alteration caused by agriculture and forestry practices. In the past, periodic growing season fires created excellent upland habitat for the gopher tortoise, the presence of which is important to the indigo snake in Mississippi. In recent years, fires have been excluded from formally suitable habitat and burning is primarily performed in the dormant season; this sort of burning does not effectively control proliferation of hardwoods and brush. In parts of its range, this species has been adversely affected by the "gassing" of gopher tortoise burrows. This practice, which involves introducing gasoline into the gopher tortoise burrows to drive out wintering snakes, is illegal in Mississippi. Indigo snakes, like the black pine snake, are susceptible to road mortality, intentional killing, and illegal collecting for the pet trade. The last specimen actually collected in Mississippi was taken in 1939, and there have been no verified observations of natural populations in Mississippi since the 1950s, so it may be extirpated.

RECOMMENDATIONS

Surveys are needed to determine the status of the native indigo snake population in Mississippi. The two areas where indigo snakes were restocked in the early 1980's should be monitored to determine whether this species has become reestablished, but there have been no verified observations of indigo snakes other than shortly after the release dates. Areas that have indigo snake populations, whether introduced or native, should be managed to support gopher tortoises. Range fragmentation due to road building is a threat to the survival and recovery of indigo snakes and other listed species adapted to longleaf pine uplands. Efforts should be made to minimize effects of road construction across habitat occupied by listed species. Management of comparatively large parcels of land is probably the best hope for the long-term presence of indigo snakes, black pine snakes, gopher tortoises, gopher frogs, and Red-cockaded Woodpeckers in Mississippi.

Southern Hognose Snake
Heterodon simus (Linnaeus)

SPECIES LISTING
Global Rarity Rank – *Imperiled (G2)*
Federal Protection Status – *Non-listed*
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of Terry L. Vandeventer©

DESCRIPTION
The southern hognose snake is a relatively short, stout species averaging 36-51 cm (14-20 in.) in length. The ground color is light brown, yellowish, or gray, sometimes with a reddish tinge. There is a row of dark blotches down the back that alternate with a row of smaller dark blotches on each side. The belly is mottled and the underside of the tail is about the same color as the belly. The rostral scale is pointed and sharply upturned. Scales are keeled. The closely related eastern hognose snake (*Heterodon platyrhinos*), which is found throughout Mississippi, has a rostral scale that is not upturned as sharply as in the southern hognose and a belly that is usually much darker than the underside of its tail.

RANGE

This species occurs from southeastern North Carolina south to central Florida and west to Mississippi. Within Mississippi, the southern hognose snake has been recorded from Forrest, Stone, Hancock, Harrison, and Pearl River counties.

HABITAT

Like the gopher tortoise and the black pine snake, the southern hognose snake inhabits open or sparsely wooded dry areas with deep sandy or sandy-loam soils. Periodic growing season fire is necessary to maintain open habitat.

LIFE HISTORY & ECOLOGY

Very little is known about the life history of this species. It is suspected that it spends much of its time burrowing in the loose soils it seems to prefer, and that its diet is composed mostly of toads and perhaps frogs.

BASIS FOR CLASSIFICATION

Throughout much of its range, the southern hognose snake is seldom encountered. In recent decades a rangewide decline in this species has occurred. No specimens have been collected in Mississippi since 1976, despite intensive and extensive field surveys for snakes and other species in habitats suitable for the southern hognose snake on large areas of federal and state land in southern Mississippi. The species may be extirpated from Alabama and Mississippi and it is declining rapidly in Georgia, North Carolina, and portions of South Carolina. The reasons for this decline are unclear, but it has been suggested that predation by imported fire ants on eggs and/or young may be a contributing factor. Exclusion of fire, replacement of natural longleaf stands with dense stocking of other pine species, urbanization, and road construction have caused extensive destruction, degradation, and fragmentation of habitat formally occupied by this species and may have contributed to its decline.

RECOMMENDATIONS

Biologists and wildlife technicians working in potential habitat for this species should be alerted to the importance of documenting its presence and should be taught how to distinguish it from the eastern hognose snake. Research should be undertaken to determine the cause or causes of its decline. If the southern hognose snake is demonstrated to be extirpated in Mississippi, and if the factors leading to its decline are reversible, perhaps one day the snake can be reintroduced. Construction of new roads across habitat occupied by this and other listed species should be avoided where possible. It is particularly important to avoid further fragmentation of the U.S Forest Service lands. Management of these

comparatively large parcels is probably the best hope for the long-term presence of southern hognose snakes, gopher tortoises, black pine snakes, gopher frogs and Red-cockaded Woodpeckers in Mississippi. If research demonstrates that depredation by fire ants is a significant factor in the decline of this snake, carefully conducted control of fire ants may be necessary in some areas.

BACHMAN'S WARBLER
Vermivora bachmanii (Audubon)

LISTING
Global Rarity Rank – *Possibly Extinct (GH)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Courtesy of Sam Beibers©

DESCRIPTION
Bachman's Warbler is a small bird 11-11.5 cm (4.25-4.5 in.) in length. The adult male has a bright yellow forehead, chin, and eye ring. The front part of the top of the head and the throat are black. The rear part of the top of the head, the sides of the head, and the back of the neck are gray. The belly and bend of the wing are bright yellow. The rest of the upper part of the body is olive-green and the feathers underneath the tail have white markings. The adult female lacks the black markings and has less yellow in the plumage. The top and sides of the head and back of the neck are gray. Females also have indistinct dark streaks on the

breast and yellow or white eye rings. Immature birds appear to be duller versions of the adults. The song of the Bachman's Warbler is an eight-note buzzy trill on the same pitch that has been described as “bzz-bzz-bzz-bzz-bzz-bzz-bzz-bzz.”

RANGE

Bachman's Warbler has been recorded as a breeding bird in Alabama, Arkansas, Kentucky, Missouri, and South Carolina. It has been reported from Florida, Georgia, Louisiana, Mississippi, Indiana, Oklahoma, and Virginia, but there is some doubt as to the validity of the records from some of the northern and western parts of that range. Bachman's Warbler apparently wintered in Cuba. This species has only been collected a few times in Mississippi. All records from this state were of presumably migrating birds along the Gulf Coast. Bachman's Warbler was last seen in Mississippi on Ship Island in 1949.

HABITAT

Bachman's Warbler apparently nested in timbered swamps or wetlands that had dense understory thickets. There is disagreement over whether optimal breeding areas were in mature swamp forests or in those that had been disturbed by either natural or man-made forces and had dense understories. It has been suggested that Bachman's Warbler might have been restricted to areas with extensive canebrakes for breeding.

LIFE HISTORY & ECOLOGY

Bachman's Warblers apparently left their wintering grounds in late February, arriving on the breeding range a few weeks later. Nests were placed in low vegetation, usually 1 m (3.3 ft) or less above ground, and supported by the stems of blackberry, cane, or other species of plants. The nests were constructed of dead leaves, grasses, mosses, and plant stems and were lined with black fibers of a lichen. Three to five eggs were laid in April or May, and hatching occurred in about eleven days. Young birds are thought to have fledged in about ten days. Birds left the nesting grounds relatively early and may have arrived back in the winter range by August or September. There is little information available on the diet of this species, but it was probably composed primarily of insects.

BASIS FOR CLASSIFICATION

Bachman's Warbler has always been a rare species and may now be extinct. There have been numerous undocumented reports in the United States, but the last documented sighting was probably in the early 1960s. The most recent reliable sightings from the wintering grounds in Cuba are from the early 1980s.

The reasons for the decline of Bachman's Warbler are unknown. The conversion of old growth swamp forests to agriculture eliminated habitat for this species. Others have suggested that it declined because of alteration and destruction of both its wintering and breeding habitat.

RECOMMENDATIONS

Searches should be conducted for Bachman's Warblers in swamp forests during the breeding season. If individuals or a small breeding population are discovered, steps should be taken to preserve the area in which they occur.

IVORY-BILLED WOODPECKER
Campephilus principalis (Linnaeus)

LISTING

Global Rarity Rank – *Critically imperiled (G1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of Middleton/Liittschwage©

DESCRIPTION

The Ivory-billed Woodpecker, which is 48.5 to 53.5 cm (19-21 in.) long, is the largest woodpecker in the United States. Both sexes have a prominent crest on the head, which is red in males and black in females. The rest of the head and throat is black and the bill is ivory white. A white stripe begins on each cheek and continues down the neck onto the back. The two stripes meet in the middle of the back, forming a large white saddle which is prominent when the bird is perched. There is a broad, white patch on the rear of each wing which narrows toward the tip. There is another white patch on the lower surface of the front of each wing. The other large woodpecker in Mississippi, the Pileated Woodpecker (*Dryocopus pileatus*), has a white chin, no white saddle visible on the back when perched, and a large, white patch on the front lower surface of the wings, not on both the front and rear parts of the lower surface of the wing as in the Ivory-billed Woodpecker. Immature Ivory-billed Woodpeckers are a duller black with less white than the adults and lack the red crest. The voice of the Ivory-billed Woodpecker has been described as a nasal "kent" or "pait", usually given in a series such as "kent, kent-kent, kent." When an Ivory-billed Woodpecker drums

(territorial signal made by pounding with the bill on limbs or stubs), it usually strikes the stub or limb only twice, the second immediately following the first and sounding like an echo of it. Other woodpeckers drum by striking stubs or limbs several times in rapid succession, producing a rolling sound.

RANGE

The Ivory-billed Woodpecker formerly occurred in the Coastal Plain from southeastern North Carolina south to southern Florida, west to eastern Texas, and north and west in the major river valleys to central Alabama, southern Illinois, southeastern Missouri, and southeastern Oklahoma. It also occurred in Cuba. There have been no indisputable sightings of this species since the 1940s, though a sighting in 2004 in Arkansas and subsequent searches suggested the species might still persist. It is probably extinct in North America and Cuba. There are records of Ivory-billed Woodpeckers in Mississippi from Monroe, Clay, Jackson, Harrison, Hancock, Bolivar, Yazoo, Warren, Coahoma, and Sharkey counties. Some of these are sight records and others represent collected specimens. Most are from the late 1800s. M. G. Vaiden reported the last possibly acceptable sighting of this species from Mississippi nine miles south of Rosedale, where he claimed six pairs were present until the beginning of World War II.

HABITAT

The Ivory-billed Woodpecker is (or was) an inhabitant of old growth forests in swamps and bottomlands along large rivers throughout most of its range. These sorts of habitats in Mississippi were dominated by forests of sweetgum, Nuttall oak, and green ash, and with lesser numbers of various species of oaks and elms, hackberry, water hickory, and pecan. In Florida, it also occurred in large cypress swamps not associated with rivers.

LIFE HISTORY & ECOLOGY

Ivory-billed Woodpeckers excavated cavities for nests in the dead parts of both living and dead hardwood trees, usually 12-18 m (40-60 ft) above the ground. The cavity was about 48 cm (19 in.) deep and had an entrance hole about 11.5 cm wide by 13.4 cm long (4.5 by 5.25 in.). Nesting occurred from January to May when one to four eggs were laid. The eggs hatched in about 20 days, and the young remained in the nest about five weeks. The young were cared for by the parents for two to three months after they learned to fly.

Ivory-billed Woodpeckers apparently ranged over a relatively wide area while looking for food. They were estimated to occur at a density of one pair per six square miles of habitat, a much lower density than is characteristic of most other species of woodpecker. Ivory-billed Woodpeckers fed primarily upon the larvae

of wood-boring beetles, but also ate fruits and acorns. The beetles were captured by scaling the bark from recently dead trees. Most feeding occurred on old, large sweetgums, Nuttall oaks, and hackberry.

BASIS FOR CLASSIFICATION

The Ivory-billed Woodpecker is listed as an endangered species by the U.S. Fish and Wildlife Service, but may actually be extinct. It apparently declined because the cutting of old-growth timber destroyed its food supply. The original bottomland forests within the range of the Ivory-billed Woodpecker contained many old trees that were gradually and constantly weakening and dying, resulting in an abundance of standing dead trunks with dead limbs and branches. The abundance of dead wood in these forests meant that the populations of wood-boring beetle larvae upon which Ivory-billed Woodpeckers fed were also locally abundant. These particular beetle larvae are most common in wood that has been dead about two years. Wood that has been dead longer than two or three years is no longer suitable for them. The major food source for the Ivory-billed Woodpecker was therefore present for only a short period of time on any particular tree, and was widely scattered throughout the old growth forests. Logging these forests removed most of the large, old trees upon which the Ivory-billed Woodpecker depended for food. The woodlands that replaced the original forests were composed of healthy, young trees. Little newly dead wood was available for the beetle larvae, and thus little food was available for the Ivory-billed Woodpecker.

RECOMMENDATIONS

Surveys were funded by the U.S. Fish and Wildlife Service to determine whether the Ivory-billed Woodpecker still exists in the United States. These surveys did not yield evidence of the bird's continued existence in Mississippi. If Ivory-billed Woodpeckers are ever found in Mississippi, steps should be taken immediately to preserve their habitat and to conduct intensive surveys to determine the number of individuals in the area. Adequate acreages of old-growth, bottomland hardwoods should be established to facilitate re-establishment of this species if it still exists and to conserve other species which require this habitat.

FLORIDA PANTHER

Felis concolor coryi (Bangs)

LISTING

Global Rarity Rank –***Species*** *is common, widespread, and abundant, however* ***subspecies*** *is critically imperiled (G5T1)*
Federal Protection Status – ***Listed Endangered (LE)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of Larry W. Richardson/USFWS©

DESCRIPTION

The Florida panther is a large, long-tailed cat which is pale brown to rusty on the back and sides and buff-colored underneath. Until they are six months old, juveniles are buff-colored with black spots. The sides of the nose, backs of the ears, and tip of the tail are dark brown to black. An adult may range from 1.8 to 2.1 m (6 to 7 ft) from the tip of the nose to the end of the tail and weigh 27-72 kg (60-158 lb). The Florida panther is one of 27 subspecies of *Felis concolor*, and can be distinguished from the other subspecies by several skull characteristics and by the right-angle crook at the tip of the tail, a whorl of hair (cowlick) in the middle of the back, and irregular white flecking on the head, back of the neck, and shoulders. There are no scientifically verified records of black-colored (melanistic) individuals of *Felis concolor*, although stories of "black panthers" are common in folklore. A panther track consists of four toe marks in a semi-circle in front of an imprint of a three-lobed heel pad. Claw marks are not normally apparent.

RANGE

Panthers once occurred from British Columbia, south throughout the United States and Central America to Argentina. The Florida panther formerly occurred from eastern Texas and the lower Mississippi River Valley east to Florida and north to parts of South Carolina and Tennessee. This range included Arkansas, Louisiana, Mississippi, Alabama, Georgia, and Florida. At present it is known only in parts of southern Florida, although there are many unconfirmed reports from other parts of its former range. The Florida panther probably once ranged over most of Mississippi. Unconfirmed reports of panthers in this state in the past few years have been concentrated along the Mississippi River and along the lower Pearl River. There have been confirmed sightings of panthers in Louisiana in recent years, but those were of panthers from the southwestern subspecies, now expanding its range eastward.

HABITAT

The Florida panther, based on data from the only population remaining in existence in Florida, primarily inhabits mixed swamp forests and hardwood hammocks. It less frequently occurs in upland pine forests and pine savannas. The other subspecies of *Puma concolor* live in a variety of habitats with adequate food and cover.

LIFE HISTORY & ECOLOGY

Studies of Florida panthers have indicated that the home ranges of males vary from 181-583 km^2 (44,726-144,062 acres) and those of females from 103-286 km^2 (25,452-70,672 acres). These animals moved only at night during the summer, but were active both day and night during the winter months. Individual Florida panthers have been recorded moving as much as 30 km (18.6 miles) overnight, but at other times have remained in the same general area for as much as a week. The home ranges of panthers overlapped considerably, but they rarely were found together except during the mating season.

The scant information available on reproduction in the Florida Panther indicates that the breeding season occurs from October through March. The young are born 90 to 95 days after breeding, usually during the period from February to June. There is little information on litter size in the Florida panther, but other subspecies of panther usually average from two to four per litter. Kittens nurse for two to three months and may remain with the mother for as much as a year. The kittens may remain together for a few months even after leaving their mother. Male Florida panthers are thought to mature at three years of age while females may mature at two years of age.

Deer are the most important prey item for panthers throughout North America. Panthers have also been reported to feed on fish, wild turkey, foxes, raccoons, rats, mice, squirrels, bobcats, reptiles, and armadillos. The few data available on the diet of the Florida panther indicate that they eat rabbits, wild hogs, deer, raccoons, cotton rats, armadillos, and birds.

After killing larger prey, panthers drag the carcass to a secluded place before feeding. After feeding, the panther covers the prey remnants with grass, leaf litter, or other debris. The panther often returns later to continue feeding on the carcass.

BASIS FOR CLASSIFICATION

The Florida panther began declining shortly after the first European settlers arrived and has disappeared from most of its former range. Only 20-30 panthers were estimated to occur in southern Florida in 1985; recent data from the Florida Fish and Wildlife Conservation Commision in 2011 indicated a population size of approximately 160 individuals. It has been listed as endangered by the U.S. Fish and Wildlife Service since 1967.

The Florida panther has been eliminated over most of its range by hunting and trapping. Early settlers killed them because of fear of these large cats and because panthers were potential threats to livestock. As a result, the Florida panther was gone from much of its range prior to 1900. The small population in Florida now suffers from habitat destruction and alteration, mortality from collisions with automobiles, problems with diseases and parasites, inbreeding, and the generally poor condition of the deer and hog populations.

RECOMMENDATIONS

Because there is no substantiated evidence that Florida panthers still occur in Mississippi, nothing can be done for this species except to investigate seemingly reliable reports of its presence.

RED WOLF

Canis rufus (Audubon and Bachman)

LISTING

Global Rarity Rank – *Critically imperiled (G1Q)*
Federal Protection Status – ***Listed Endangered, (LE, XN)***
State Protection Status – ***Listed Endangered (LE)***
State Rarity Rank – *Presumed extirpated in Mississippi (SX)*

Photo courtesy of B. McPhee/USFWS ©

DESCRIPTION

The red wolf is a large, slender canid (member of the dog family), intermediate in size between coyotes and gray wolves. Red wolves are not always red; coloration is highly variable and animals might be cinnamon, gray, or black. Adults range in total length from 4.4-5.4 cm (about 5 ft) and weigh from 16-41 kg (36-90 lb); females are slightly smaller than males. Legs of the red wolf might appear longer relative to body size than those of gray wolves, coyotes, and dogs.

RANGE

Red wolves were the only wolves that evolved entirely in North America. Possibly, red wolves once ranged in suitable habitats throughout the southern United States, from Missouri, Indiana, and Virginia south to Texas and Florida. Three subspecies might have existed, one of which (*Canis rufus gregoryi*) occurred from eastern Texas to eastern Mississippi. *Canis rufus* is extinct in the wild, although some red wolf-coyote

hybrids might persist in remote marshes on the Texas-Louisiana coast. A small, closely-monitored red wolf family was temporarily introduced on Horn Island (Gulf Islands National Seashore) in 1989, as part of a five-year endangered species project. There are currently no wolves on Horn Island.

LIFE HISTORY & ECOLOGY

Few studies of the red wolf were performed when it was still abundant, so little of its natural history is known. Red wolves mate in the winter, and pups are born about 60-63 days later, in April and May. Up to 12 pups can be born in a litter, but average litter size is seven in the wild and five in captivity. Dens are built in hollow logs, culverts, and other hidden areas. Mated pairs usually travel together and both mates take care of the pups. The calls of red wolves and coyotes are very similar. Evidently red wolves were most common in moist areas with dense plant growth such as swamps, marshes, pine forests, and bottomland hardwood forests. Unlike gray wolves, red wolves were not major predators of deer and other large game but mostly ate rabbits, other small animals, and carrion. Ranchers in the South disagreed over whether red wolves were serious predators of livestock.

BASIS FOR CLASSIFICATION

Red wolves declined for several reasons. Habitat destruction, trapping, and poisoning were major causes of mortality. Red wolves were also susceptible to various diseases, including hookworms, heartworms, and distemper. Historically, coyotes did not live in eastern North America. Since about 1930, coyotes have spread into the eastern United States (possibly due to the combination of the eliminated red and gray wolves, and the clearing of vegetation), and they have taken up residence in many areas once inhabited by red wolves. The appearance of red wolf-coyote hybrids, particularly in Texas, seems to have occurred as humans were eradicating red wolves. In 1967 the U.S. Fish and Wildlife Service listed red wolves as a federally endangered species. As wild populations in Louisiana and Texas continued to dwindle, biologists captured the last few animals that appeared to be “pure” red wolves (that is, not wolf-coyote hybrids) in order to start a captive breeding program. In 1980, the U.S. Fish and Wildlife Service considered the red wolf extinct in the wild.

PROSPECTS

Through a successful captive breeding and re-introduction program, breeding populations of red wolves have been reestablished in North Carolina. Hopefully, future reintroduction efforts into remaining suitable habitat will establish new populations and help guard against extinction of this animal. Continued presence of the now nearly ubiquitous coyote is a series challenge to the reintroduction of red wolves into most of their original range as interbreeding between these two species is likely to occur.

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Mississippi Natural Heritage Program
Species Status & Rank Explanations
2014

GLOBAL RARITY RANK – The global or world-wide rank of a species which is a non-legal rank indicating the rarity and vulnerability of a species.

G1 – Critically Imperiled	Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 – Imperiled	Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 – Vulnerable	Rare and uncommon in its range or found locally in a restricted range, generally from 21-100 occurrences. At moderate risk of extinction.
G4 – Apparently Secure	Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.
G5 – Secure	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GU – Unranked	Cannot be ranked using available information.
GH – Possibly Extinct	Missing; known only from historical occurrences but still some hope of rediscovery.
GX – Presumed Extinct	Believed to be extinct throughout its range with virtually no likelihood that it will be rediscovered.

TAXON (T) RANK – The T-ranks (T1 - T5) are defined the same way as the Global ranks (G1 - G5), but the T-rank refers only to the rarity of the subspecific taxon. T1 through T5: See Global Rank definitions above.

FEDERAL PROTECTION STATUS – The federal listing of plants and animals under the U.S. Endangered Species Act.

LE – Listed Endangered	Taxon is threatened by extinction throughout all or a significant portion of its range.
LT – Listed Threatened	Taxon is likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
E/SA – Listed Endangered by Similarity of Appearance	Taxon is treated as an endangered species because it may not be distinguishable from the listed species.
T/SA – Listed Threatened by Similarity of Appearance	Taxon is treated as a threatened species because it may not be distinguishable from the listed species.
PE – Proposed Endangered	Taxon proposed for listing as endangered.
PT – Proposed Threatened	Taxon proposed for listing as threatened.
C – Candidate Species	Taxon for which the USFWS has sufficient information to support proposals to list the species as threatened or endangered and for which the service anticipates a listing proposal.
LE, LT –	The species is formally listed as endangered in part of its range and as threatened in the other part; or, one or more subspecies or varieties is listed as endangered and the others are listed as threatened.
LT, PDL –	Populations of the species are formally listed as threatened and proposed for delisting.
LT, T(S/A) –	One or more subspecies or populations of the species are formally listed as threatened and the others are treated as threatened because of similarity of appearance to the listed threatened subspecies or populations.
PS – Partial status	The species is listed in parts of its range and not in others; or, one or more subspecies or varieties is

	listed, while the others are not listed.
XN –	Nonessential experimental population.
Non-listed –	Taxon does not have any federal protection under the ESA but may have other federal protections or be state protected.

STATE PROTECTION STATUS – The legal listing of animals in Mississippi. Plants do not have any threatened or endangered status in the state.

LE – Listed Endangered	Taxon is threatened by extinction throughout all or a significant portion of its range.
Non-listed	Taxon does not have any state endangered status but may be federally protected.

STATE RARITY RANK – The State Rarity Rank of a species in Mississippi. This is a non-legal rank indicating the rarity and vulnerability of a species at the state level.

S1 – Critically Imperiled	Critically imperiled in Mississippi because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.
S2 – Imperiled	Imperiled in Mississippi because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3 – Vulnerable	Rare or uncommon in Mississippi (21 to 100 occurrences).
S4 – Apparently Secure	Apparently secure in Mississippi, with many occurrences.
S5 – Secure	Demonstrably common, widespread, and secure in Mississippi.

S#B, S#N –	Where S# is one of the alphanumeric codes above (S1, S2, etc.) and refers to the rarity within Mississippi of the breeding (B) and/or non-breeding populations (N) of migratory species (e.g., S1B, S3N).
SU – Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SH – Possibly Extirpated	Missing; known only from historical occurrences in Mississippi but still with some hope of rediscovery.
SX – Presumed Extirpated	Apparently extirpated from the state.
SNA – Not applicable	A conservation status rank is not applicable because the species is not a suitable target for conservation activities.