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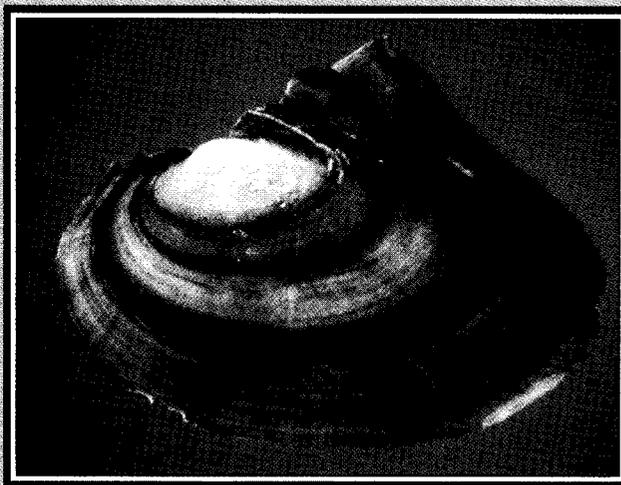
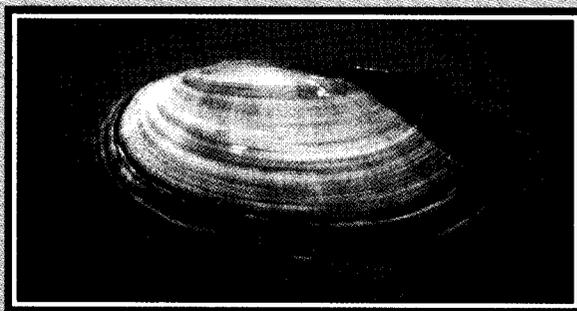
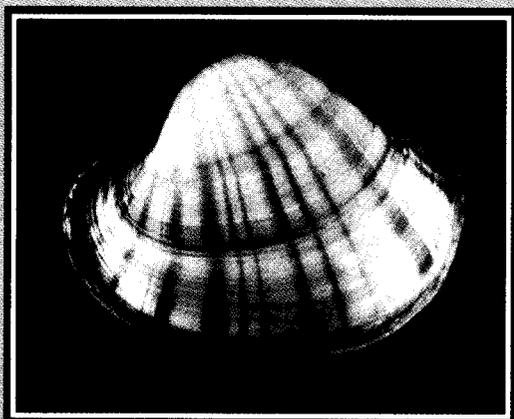
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# Current Distributional Information on Freshwater Mussels (family Unionidae) in Mississippi National Forests

Wendell R. Haag and Melvin L. Warren, Jr.



## SUMMARY

Little is known about the distribution of freshwater mussels in Mississippi national forests. Review of the scant available information revealed that the national forests harbor a diverse mussel fauna of possibly 46 or more species (including confirmed, probable, and potential occurrences). Occurrence of 33 species is confirmed. Because of the geographic, physiographic, and drainage basin diversity of Mississippi national forests, there is considerable variation in mussel communities among the national forests. Three distinct faunal groups are represented in Mississippi national forests, each with a characteristic assemblage of species. One species of potential occurrence is a federally endangered species, 1 species of confirmed occurrence is a candidate for listing, and 11 species of confirmed or probable occurrence are considered of special concern by the American Fisheries Society (Williams and others 1993). None of the national forests have been surveyed adequately, and specific population data are almost completely lacking. This review of existing information represents the first of a three-phase program needed to comprehensively evaluate the mussel resources of Mississippi national forests. Phase two involves an exhaustive, qualitative field survey of Mississippi national forests to document precise distribution of species and location of important communities. Phase three consists of a quantitative study of important communities in order to assess reproductive characteristics and viability and to establish baseline density estimates for monitoring of future population trends.

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## INTRODUCTION

There are 6 national forests (NF's) in Mississippi (fig. 1), with proclamation boundaries covering a total of 936,165 ha in 33 counties, of which 461,787 ha are publicly owned and under USDA Forest Service management. The remaining land within the proclamation boundaries is privately owned. These forests are widely distributed across the State and lie in several physiographic regions. Consequently, Mississippi NF's encompass streams within most major river drainages in the State and provide a diversity of habitats for aquatic organisms.

In many Mississippi streams, freshwater mussels are a conspicuous element of the fauna. However, mussel populations have declined precipitously in the past 100 years due to a variety of human-induced changes to streams, such as channelization, impoundment, and water pollution. Currently, 72 percent of the freshwater mussel fauna of North America is considered threatened, endangered, or of special concern (Williams and others 1993). In many regions, streams on NF's may be less impacted by poor land-use practices and water pollution than nearby lands and serve as refugia for rare or endangered organisms. Therefore, Mississippi NF's potentially represent important habitat for freshwater mussels.

There is little published information available on the distributions of freshwater mussels in Mississippi, and virtually nothing is known of mussel distributions on NF lands in the State. National Forest personnel need accurate current information on mussel distributions and status in order to effectively manage this component of the aquatic resource. Our goal in this report is to present available information on mussel distributions, including the presence of threatened or endangered species, on NF lands in Mississippi and to prioritize information gaps that need urgent attention.

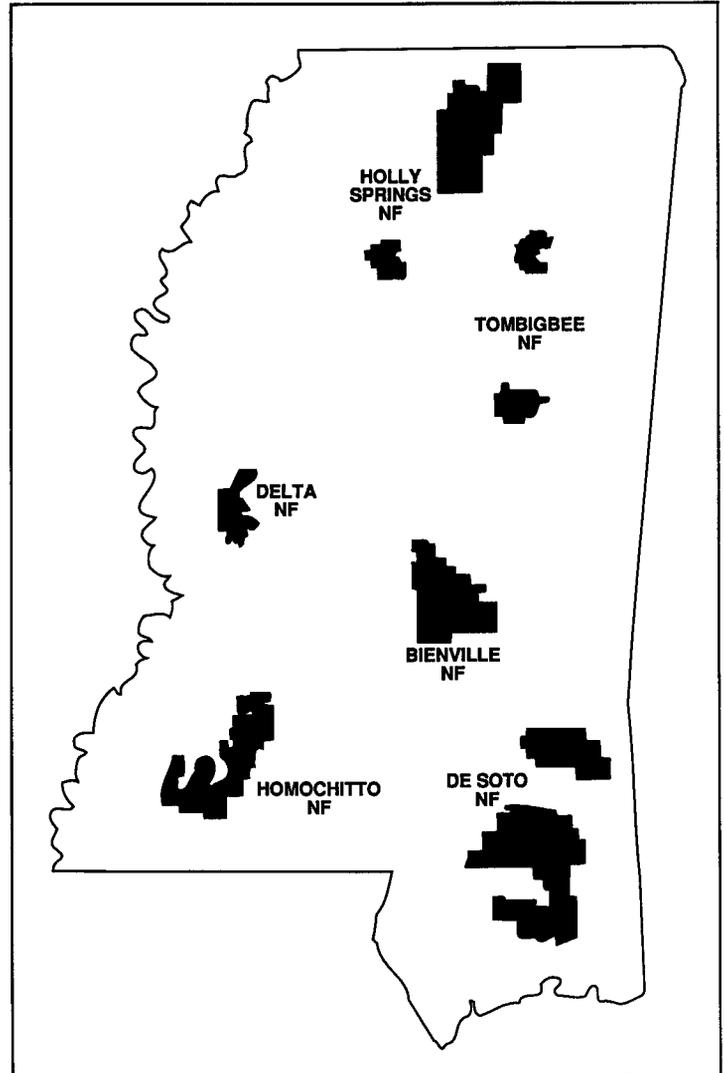


Figure 1. — Locations of the six national forests in Mississippi are designated by shaded areas.

## METHODS

Information on mussel distributions was obtained from three sources: (1) published mussel surveys; (2)

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mussel collection records of the Mississippi Museum of Natural Science (MMNS), Mississippi Department of Wildlife, Fisheries, and Parks, Jackson, MS, and the Ohio State University Museum of Biological Diversity (OSU), Columbus, OH; and (3) field collection records of the Forest Hydrology Laboratory (FHL), Southern Forest Experiment Station, USDA Forest Service, Oxford, MS. Occurrence of mussel species on NF lands is classified in one of three categories: (1) confirmed sites—confirmed record of a species within the proclamation boundary of a NF; (2) probable occurrence—a species for which there are confirmed records near the forest and in streams of the same drainage as those in the NF; or (3) potential occurrence—a species that is known to occur in the same drainages and in similar habitats as those present in the NF but for which there are no known records near the NF.

Conservation status of each species was obtained from Williams and others (1993) and the U.S. Department of the Interior (USDI) Fish and Wildlife Service (USDI FWS 1994a, b). Mussel nomenclature follows Williams and others (1993). Streams were classified following Ross and Brenneman (1991). Physiographic regions are from Stephenson and Monroe (1940).

## RESULTS AND DISCUSSION

At least 46 species of mussels may occur in Mississippi NF's (table 1). Occurrence was confirmed for 33 species, and 13 other species are considered of probable or potential occurrence. The Delta National Forest had the greatest number of species, with at least 27 total and 22 confirmed species. The Homochitto National Forest had the fewest number of species with at least 11 total and 8 confirmed species. Tombigbee and Bienville National Forests had the fewest confirmed species (3 and 1, respectively), although the total number of species, including probable or potential occurrences was higher (at least 14 and 18 species, respectively). DeSoto and Holly Springs National Forests were intermediate in diversity, with each having at least 20 total and 12 confirmed species.

Mississippi NF's contain streams belonging to 7 of the 10 major drainages in Mississippi identified by Ross and Brenneman (1991) (table 2). The three drainages not represented on NF lands are the Big Black River, Lake Pontchartrain, and the Tennessee River. This drainage diversity is responsible for the relatively high mussel species diversity found in Mississippi NF's. There are three distinct mussel faunal groups represented in NF streams: (1) Mississippian, (2) Pontchartrain/Pearl/Pascagoula, and (3) Mobile Bay. Species found in Mississippi NF's characteristic of the Mississippian fauna include *Actinonaias ligamentina*, *Fusconaia flava*, *Lampsilis cardium*, *L. siliquoidea*,

*Obovaria subrotunda*, *Pleurobema pyramidatum*, *Potamilus ohioensis*, *Quadrula nodulata*, *Q. pustulosa*, and *Q. quadrula*. Species of the Mississippian fauna are found in Delta, Holly Springs, and Homochitto National Forests. Species unique to the Pontchartrain/Pearl/Pascagoula fauna are *Pleurobema beadleianum* and *Q. refulgens*; these species are found in the DeSoto National Forest and potentially in the Bienville National Forest. Species characteristic of the Mobile Bay fauna include *P. decisum* and *Q. asperata*; these species are potentially found in the Tombigbee National Forest. Several species are found only in the Gulf of Mexico basin and are absent from the Mississippian basin. These include *Elliptio arctata*, *F. cerina*, *L. ornata*, *L. straminea straminea*, *L. s. claibornensis*, *O. unicolor*, *Strophitus subvexus*, and *Villosa vibex*. Species of this group are found in the DeSoto National Forest and potentially in Bienville and Tombigbee National Forests. The remaining species show no particular drainage affinities and are distributed widely in appropriate habitats. *Unio merus tetralasmus* and *U. declivos* are collectively referred to as *Unio merus* spp. because of confusion about reidentification and the validity of these taxa.

Precise information on distributions of mussel species is scarce for Mississippi NF's. Even NF's with the most available information were represented by only four or five collection sites. Other NF's had one or zero collection sites. Most stream reaches in Mississippi NF's have not been surveyed for mussels; therefore, the faunal lists presented here should be considered preliminary and incomplete. The only population data available for Mississippi NF's are for a single site in the Big Sunflower River in the Delta National Forest (Miller and others 1992).

## INDIVIDUAL FOREST ACCOUNTS

### Bienville National Forest

The Bienville National Forest proclamation boundaries encompass 155,043 ha in the Jackson Prairies and Longleaf Pine Hills physiographic regions in south-central Mississippi. The Bienville is located in two major drainages, the Pearl and Pascagoula Rivers. The northern portion of the Bienville is drained by small tributaries of Tuscolameta Creek of the Pearl River drainage. The southwestern portion of the Bienville is drained by headwaters of the Strong River system, also a Pearl River tributary. The southeastern portion of the Bienville is drained by headwaters of the Leaf River system within the Pascagoula River drainage. Aquatic habitat within the Bienville consists mostly of small streams with scattered small wetlands and reservoirs.

Table 1. — *Mussels of confirmed, probable, or potential occurrence in Mississippi national forests*

	National forest*					
	B	DL	DS	HS	HO	T
<i>Actinonaias ligamentina</i>		X				
<i>Amblema plicata</i>		X		X	X	
<i>Anodonta suborbiculata</i>		X		X		
<i>Anodontoides radiatus</i> †				X		
<i>Arcidens confragosus</i>		X		X		
<i>Elliptio arcata</i> †	X		X			
<i>E. crassidens</i>		X	X		X	
<i>Fusconaia cerina</i>	X		X			X
<i>F. ebena</i>		X	X		X	
<i>F. flava</i>		X			X	
<i>Glebula rotundata</i>		X	X			
<i>Lampsilis cardium</i> †				X		
<i>L. ornata</i> †	X		X			
<i>L. siliquoidea</i>		X		X	X	
<i>L. straminea straminea</i> †						X
<i>L. s. claibornensis</i>	X		X			X
<i>L. teres</i>	X	X	X	X		X
<i>Lasmigona complanata</i>			X			
<i>Leptodea fragilis</i>	X	X		X		
<i>Ligumia subrostrata</i>	X			X		X
<i>Megalonaias nervosa</i>		X				
<i>Obliquaria reflexa</i>		X		X		
<i>Obovaria subrotunda</i> †					X	
<i>O. unicolor</i> †	X		X			
<i>Plectomerus dombeyanus</i>		X	X	X		
<i>Pleurobema beadleianum</i> †	X		X			
<i>P. decisum</i> ‡						X
<i>P. pyramidatum</i> §		X				
<i>Potamilus ohioensis</i>		X				
<i>P. purpuratus</i>	X	X		X		
<i>Pyganodon grandis</i>	X	X	X	X	X	X
<i>Quadrula apiculata</i>			X			
<i>Q. asperata</i> †						X
<i>Q. nodulata</i>		X				
<i>Q. pustulosa</i>		X		X		
<i>Q. quadrula</i>		X		X		
<i>Q. refulgens</i> †			X			
<i>Strophitus subvexus</i> †	X					X
<i>Toxolasma parvus</i>	X		X	X		X
<i>T. texasensis</i>		X		X	X	
<i>Tritogonia verrucosa</i>	X	X	X	X		X
<i>Truncilla donaciformis</i>		X				
<i>T. truncata</i>		X				
<i>Uniomerus</i> spp.	X	X		X	X	X
<i>Utterbackia imbecillis</i>	X	X	X	X	X	X
<i>Villosa lienosa</i>	X		X	X	X	X
<i>V. vibex</i>	X		X			

\*National forests: B = Bienville; DL = Delta; DS = DeSoto; HS = Holly Springs; HO = Homochitto; T = Tombigbee.

†Considered of special concern by American Fisheries Society.

‡Listed as endangered by the U.S. Department of the Interior Fish and Wildlife Service (USDI FWS).

§Candidate for listing by USDI FWS.

There is only one mussel collection record available from within the proclamation boundaries of the Bienville:

Roadside ditch along Interstate 20, 0.4 km west of Forest community, Scott County, MS. 17 April 1972. (MMNS).

Records from nearby areas are also scarce, being limited to sites on the Leaf and Strong River mainstems, downstream of the Bienville boundary (MMNS).

Bienville has a possible mussel fauna of at least 18 species (table 3). Only one species is confirmed from within the proclamation boundaries. Twelve species

Table 2. —Hierarchical classification of stream systems found in Mississippi national forests (stream classifications from Ross and Brenneman 1991)

National forest	Basin	Drainage	System
Bienville	Gulf of Mexico	Pearl	Tuscolameta Creek Strong River
		Pascagoula	Leaf River
Delta	Mississippi River	Yazoo	Sunflower River
DeSoto	Gulf of Mexico	Pascagoula	Red Creek Black Creek Leaf River Chickasawhay River
		Coastal Rivers	Biloxi River Tchoutacabouffa River
Holly Springs	Mississippi River	Yazoo	Tallahatchie River Yalobusha River Coldwater River
		Lower Mississippi North	Hatchie River Wolf River
Homochitto	Mississippi River	Lower Mississippi South	Homochitto River Bayou Pierre Buffalo River
Tombigbee	Gulf of Mexico	Tombigbee	Noxubee River Tibbee Creek
		Pearl	Yockanookany River

are considered of probable occurrence based on their presence in other small streams in the upper Pearl and Pascagoula River drainages. Five species are considered of potential occurrence based on their presence in larger streams in the Pearl and Pascagoula drainages downstream of the Bienville boundary.

### Delta National Forest

Delta National Forest proclamation boundaries encompass 47,885 ha in the Yazoo Delta physiographic region in west-central Mississippi. The Delta is drained entirely by the Sunflower River system of the Yazoo drainage. Aquatic habitat consists of large rivers, including the mainstems of the Big Sunflower River and Little Sunflower River (a side channel of the Big Sunflower) and numerous lowland streams and bayous.

There is only one mussel collection record available within the proclamation boundaries of the Delta:

Big Sunflower River, River Mile 35.2, Sharkey County, MS (Miller and others 1992).

There are no other collection records available for areas near the Delta, but there are several records for streams and wetlands within the Delta region of the Yazoo drainage (FHL).

The Delta has a possible mussel fauna of at least 27 species (table 4). Twenty-two species of mussels are

known to occur in the Big Sunflower River at the previously mentioned site. Five species are considered of potential occurrence based on their presence elsewhere in the Delta physiographic region in habitats similar to those found within the Delta. One species known to occur in the Delta, *Pleurobema pyramidatum*, is considered a candidate for listing under the Endangered Species Act (Category 2, listed as *P. rubrum*, USDI FWS 1994a), and is considered threatened by the American Fisheries Society (Williams and others 1993). The record of *Actinonaias ligamentina* from the Big Sunflower River is the only known occurrence of this species in Mississippi (Miller and others 1992).

### DeSoto National Forest

The DeSoto National Forest proclamation boundaries encompass 323,133 ha in the Longleaf Pine Hills and Coastal Pine physiographic regions in southeastern Mississippi. The northern part of the DeSoto is drained by tributaries of the Leaf and Chickasawhay River systems, both major tributaries of the Pascagoula River drainage. The central part of the DeSoto is drained by the Black and Red Creek systems, which are direct tributaries of the Pascagoula River. The southern part of the DeSoto is drained by small streams that flow directly into the Gulf of Mexico (Coastal Rivers drainage) including the Biloxi and

Table 3. — *Mussels of confirmed, probable, or potential occurrence in the Bienville National Forest*

Species	Occurrence*		
	CF	PR	PO
<i>Elliptio arctata</i> †		X	
<i>Fusconaia cerina</i>		X	
<i>Lampsilis ornata</i> †		X	
<i>L. straminea claibornensis</i>		X	
<i>L. teres</i>		X	
<i>Leptodea fragilis</i>			X
<i>Ligumia subrostrata</i>		X	
<i>Obovaria unicolor</i> †			X
<i>Pleurobema beadleanum</i> †			X
<i>Potamilus purpuratus</i>			X
<i>Pyganodon grandis</i>		X	
<i>Strophitus subvexus</i> †		X	
<i>Toxolasma parvus</i>		X	
<i>Tritogonia verrucosa</i>			X
<i>Unio merus</i> sp.	X		
<i>Utterbackia imbecillis</i>		X	
<i>Villosa lienosa</i>		X	
<i>V. vibex</i>		X	

\*CF = confirmed; PR = probable; PO = potential.

†Considered of special concern by the American Fisheries Society.

Tchoutacabouffa River systems. Aquatic habitat consists of small and medium-sized lowland streams, a short reach of the Leaf River mainstem, wetlands, and small reservoirs.

Mussel records within the proclamation boundaries of the DeSoto are available for five sites:

1. Leaf River from New Augusta to the mouth of Tallahala Creek, Township 3 North, Range 11 West, Sections 23 and 24, Perry County, MS. 19 August 1980, 26 June 1985. (MMNS).
2. Black Creek between Brooklyn and Cypress Creek landings, Perry County, MS. 14 June 1980, 29 June 1980. (MMNS).
3. Red Creek at Interstate 59 crossing, 19 km northeast of Poplarville, Township 1 South, Range 14 West, Section 5, Pearl River County, MS. 27 May 1967. (MMNS).
4. Ashe Lake, 19 km north of Wiggins, 26 km east of Lumberton, Township 1 North, Range 12 West, Section 23, Forest County, MS. 1 July 1968. (MMNS).
5. Big Biloxi River at Interstate 49 crossing, 8 km south of Saucier, 16 km north of Jct Interstate 10 and Interstate 49 in Gulfport, Township 5 South, Range 11 West, Section 31, Harrison County, MS. 21 October 1964. (MMNS).

Records near the DeSoto but outside the proclamation boundary include sites on lower Red, lower Black, Tallahala, and Bogue Homa Creeks; the Leaf River; and the Little Biloxi River (MMNS and OSU).

The DeSoto has a possible mussel fauna of at least 20 species (table 5). Twelve species of mussels are re-

Table 4. — *Mussels of confirmed or potential occurrence in the Delta National Forest*

Species	Occurrence*	
	CF	PO
<i>Actinonaias ligmentina</i>	X	
<i>Amblema plicata</i>	X	
<i>Anodonta suborbiculata</i>		X
<i>Arcidens confragosus</i>	X	
<i>Elliptio crassidens</i>	X	
<i>Fusconaia ebena</i>		X
<i>F. flava</i>	X	
<i>Glebulia rotundata</i>	X	
<i>Lampsilis siliquoidea</i>		X
<i>L. teres</i>	X	
<i>Leptodea fragilis</i>	X	
<i>Megalonaias nervosa</i>	X	
<i>Obliquaria reflexa</i>	X	
<i>Plectomerus dombeyanus</i>	X	
<i>Pleurobema pyramidatum</i> †	X	
<i>Potamilus ohioensis</i>	X	
<i>P. purpuratus</i>	X	
<i>Pyganodon grandis</i>	X	
<i>Quadrula nodulata</i>	X	
<i>Q. pustulosa</i>	X	
<i>Q. quadrula</i>	X	
<i>Toxolasma texasensis</i>	X	
<i>Tritogonia verrucosa</i>		X
<i>Truncilla donaciformis</i>	X	
<i>T. truncata</i>	X	
<i>Unio merus</i> sp.	X	
<i>Utterbackia imbecillis</i>		X

\*CF = confirmed; PO = potential.

†Candidate for listing by the U.S. Department of Interior Fish and Wildlife Service.

corded from the five sites listed, and eight other species are considered of probable occurrence in the DeSoto based on their presence just outside the proclamation boundary. No species known to occur in the DeSoto are listed currently as federally threatened or endangered. *Pleurobema beadleanum* and *Quadrula refulgens* are considered species of special concern by the American Fisheries Society (Williams and others 1993). These species, both of which are endemic to southern Mississippi and Louisiana, occur in Black Creek and the Leaf River and are likely to occur in other streams within the DeSoto. Two species of probable occurrence in the DeSoto, *Elliptio arctata* and *Obovaria unicolor*, are considered species of special concern (Williams and others 1993). These species occur in Red and Black Creeks and the Leaf River near the DeSoto boundary and likely occur within the DeSoto as well.

### Holly Springs National Forest

The Holly Springs National Forest proclamation boundaries encompass 210,581 ha in the North Central Hills physiographic region in northern Mississippi. Most of the Holly Springs is drained by tributaries of the Tallahatchie River system although northern parts

of the Holly Springs are drained by the Coldwater, Wolf, and Hatchie River systems, and a small area of the southern portion of the Holly Springs is drained by the Yalobusha River system. The largest tributaries of the Tallahatchie River system within the Holly Springs are the Little Tallahatchie River, Cypress and Big Spring Creeks, and the Tippah River (including Chewalla and Oaklimiter Creeks). Aquatic habitat consists primarily of three types: large river and reservoir habitat of the Little Tallahatchie River mainstem, small upland streams, and small lakes and reservoirs.

Mussel survey records within the proclamation boundaries of the Holly Springs are available for four localities:

1. Cypress Lake, 6 km south-southeast of Puskus Lake, 18 km east of Oxford, Township 8 South, Range 1 West, Section 17, Lafayette County, MS. 15 October 1993. (FHL).
2. Puskus Lake, 3 km southeast of Cambridge, 18 km northeast of Oxford, Township 7 South, Range 1 West, Section 30, Lafayette County, MS. 28 July 1993. (FHL).
3. Chewalla Creek downstream of Chewalla Lake dam, 5 km southwest of Lake Center, 12 km southeast of Holly Springs. Township 4 South, Range 1 West, Section 19. Marshall County, MS. 14 July 1993. (FHL).

Table 5. — *Mussels of confirmed or probable occurrence in the DeSoto National Forest*

Species	Occurrence*					PR
	CF					
	1	2	3	4	5	
<i>Elliptio arctata</i> †						X
<i>E. crassidens</i>	X					
<i>Fusconaia cerina</i>						X
<i>F. ebena</i>						X
<i>Glebula rotundata</i>						X
<i>Lampsilis ornata</i> †	X	X				
<i>L. straminea claibornensis</i>	X	X				
<i>L. teres</i>	X					
<i>Lasmigona complanata</i>	X					
<i>Obovaria unicolor</i> †						X
<i>Plectomerus dombeyanus</i>	X					
<i>Pleurobema beadleanum</i> †	X	X				
<i>Pyganodon grandis</i>						X
<i>Quadrula apiculata</i>						X
<i>Q. refulgens</i> †	X					
<i>Toxolasma parvus</i>	X					
<i>Tritogonia verrucosa</i>						X
<i>Utterbackia imbecillis</i>			X	X		
<i>Villosa lienosa</i>	X	X	X			
<i>V. vibex</i>		X			X	

\*CF = confirmed; PR = probable.

†Considered of special concern by the American Fisheries Society.

4. Cypress Creek at Hwy 30 crossing, 15 km north-northwest of Lafayette Springs, 23 km east-northeast of Oxford, Township 7 South, Range 1 West, Section 27, Lafayette County, MS. 25 May 1993, 23 August 1993, 5 April 1994. (FHL).

Records from areas near the Holly Springs but outside the proclamation boundary include sites on the mainstem Little Tallahatchie River downstream of the Holly Springs (FHL, MMNS) and small tributaries of the Tallahatchie (FHL) and Yalobusha (MMNS) systems. There are no collection records for any tributaries of the Wolf, Hatchie, or Coldwater Rivers within or near the Holly Springs boundary.

The Holly Springs has a possible mussel fauna of at least 21 species (table 6). Twelve species of mussels are known from the four sites listed, and nine other species are considered of probable occurrence in the Holly Springs based on: (1) their presence in the Little Tallahatchie River just downstream of the Holly Springs boundary or (2) their presence in small tributaries outside the Holly Springs but within the Tallahatchie River system. No species known to occur in the Holly Springs are listed currently as federally threatened or endangered. *Lampsilis cardium*, known to occur in Chewalla Creek, is considered a species of

special concern by the American Fisheries Society (Williams and others 1993). One species of probable occurrence in the Holly Springs, *Anodontooides radiatus*, is considered a species of special concern (Williams and others 1993). This species occurs in a small Tallahatchie tributary near the Holly Springs boundary, and the presence of similar habitat within the Holly Springs suggests that it likely occurs there as well.

### Homochitto National Forest

Homochitto National Forest proclamation boundaries encompass 151,266 ha in the Loess Hills and Longleaf Pine Hills physiographic regions in southwestern Mississippi. Most of the Homochitto is drained by the Homochitto River system, although small areas in the northern and southern portion of the Homochitto are drained by the Bayou Pierre and Buffalo River systems, respectively.

Mussel records within the proclamation boundaries of the Homochitto are available for five sites:

1. Homochitto River at Forest Service Road 109 crossing, 10 km southeast of Union Church, 18 km northeast of Bude, Township 7 North,

Table 6. — *Mussels of confirmed or probable occurrence in the Holly Springs National Forest*

	Occurrence*				PR
	CF				
	Site				
	1	2	3	4	
<i>Amblema plicata</i>					X
<i>Anodonta suborbiculata</i>					X
<i>Anodontooides radiatus</i> †					X
<i>Arcidens confragosus</i>					X
<i>Lampsilis cardium</i> †			X		
<i>L. siliquoidea</i>		X	X	X	
<i>L. teres</i>			X		
<i>Leptodea fragilis</i>			X		
<i>Ligumia subrostrata</i>		X			
<i>Obliquaria reflexa</i>					X
<i>Plectomerus dombeyanus</i>					X
<i>Potamilus purpuratus</i>			X		
<i>Pyganodon grandis</i>		X	X		
<i>Quadrula pustulosa</i>			X		
<i>Q. quadrula</i>					X
<i>Toxolasma parvus</i>					X
<i>T. texasensis</i>		X		X	
<i>Tritogonia verrucosa</i>					X
<i>Unio sp.</i>	X	X			
<i>Utterbackia imbecillis</i>	X	X			
<i>Villosa lienosa</i>		X		X	

\*CF=confirmed; PR=probable.

†Considered of special concern by the American Fisheries Society.

Range 5 East, Section 8, Franklin County, MS. 7 May 1982. (Hartfield and Ebert 1986, MMNS).

2. Homochitto River at State Route 550 crossing, 7 km east of Union Church, Township 8 North, Range 5 East, Section 16, Lincoln County, MS. 5 April 1972, 12 May 1982. (Hartfield and Ebert 1986, MMNS).
3. Homochitto River at Forest Service Road 128 crossing, 5 km southeast of Pleasant Hill, 10 km northeast of Union Church, Township 9 North, Range 5 East, Section 34, Copiah County, MS. 1982. (Hartfield and Ebert 1986, MMNS).
4. Clear Springs Creek below Clear Springs Lake dam, 11 km southwest of Meadville, 12 km southeast of Roxie. Township 5 North, Range 2 East, Section 2, Franklin County, MS. 19–20 May 1982. (Hartfield and Ebert 1986, MMNS, OSU).
5. Clear Springs Lake, 11 km southwest of Meadville, 12 km southeast of Roxie, Township 5 North, Range 2 East, Section 2, Franklin County, MS.<sup>1</sup>

One other collection record is available from McCalls Creek, a Homochitto River tributary, approximately 3 km upstream from the Homochitto boundary (MMNS).

The Homochitto has a possible mussel fauna of at least 11 species (table 7). Eight species of mussels are known to occur in the Homochitto, and an additional three species are considered of probable occurrence based on their presence in McCalls Creek, a tributary of the Homochitto River that flows through the Homochitto. One species of probable occurrence, *Obovaria subrotunda*, is considered a species of special concern by the American Fisheries Society (Williams and others 1993).

### Tombigbee National Forest

Tombigbee National Forest proclamation boundaries encompass 48,258 ha in the Flatwoods, Pontotoc Hills, and Black Prairies physiographic regions in central and northeastern Mississippi. Most of the Tombigbee is drained by tributaries of the Tombigbee River system, although a small area in the southwestern portion of the Tombigbee is drained by headwater tributaries of the Yockanookany River (Pearl River drainage). Most Tombigbee tributaries within the Tombigbee are part of the Noxubee River or Tibbee Creek systems. Aquatic habitat in the Tombigbee consists of small streams and small reservoirs.

Mussel survey records within the proclamation boundaries of the Tombigbee are available for one site:

Davis Lake, 18 km west-northwest of Okolona, 18 km north-northeast of Houston, Township 11 South, Range 3 East, Sections 12–14, Chickasaw County, MS.<sup>2</sup>

Records for areas near the Tombigbee but outside the proclamation boundaries include one site each on Chugatonchee and Houlka Creeks in the Tibbee Creek system (MMNS). These streams drain portions of the Tombigbee, and the available sites are both less than 3 km downstream of the Tombigbee boundary. There are also records available for Chewawah Creek (Tibbee Creek system) in Chickasaw County (MMNS). In addition, there are numerous records available for other sections of the Tibbee Creek and Noxubee River systems (MMNS, OSU).

The Tombigbee has a possible mussel fauna of at least 15 species (table 8). Three species are confirmed from the Tombigbee and nine species are considered of probable occurrence based on their occurrence in nearby small streams of the Tibbee Creek and Noxubee River systems. Three species are considered of potential occurrence based on their presence in larger streams downstream from the Tombigbee. Three species of probable occurrence in the Tombigbee, *Lampisilis straminea straminea*, *L. ornata*, and *Strophitus subvexus*, are considered species of special concern by the American Fisheries Society (Williams and others 1993). *Pleurobema decisum*, a federally endangered species (USDI FWS 1994b), is known to occur in small streams elsewhere in the Tombigbee drainage (van der Schalie 1981, Williams and others 1992) and is considered of potential occurrence in the Tombigbee.

### CONCLUSIONS AND RECOMMENDATIONS

Current knowledge of distributions of mussel species and locations of important mussel communities in Mississippi NF's is inadequate to support informed management decisions. Very little mussel survey data exist, but the available information revealed that Mississippi NF's harbor a diverse freshwater mussel fauna of at least 33 species but possibly including 46 or more species. Considerable variation in mussel community composition exists among NF's because of the diversity of physiography and river drainages in which the NF's lie and the resulting diversity of aquatic habitats. Three distinct faunal groups are present in the NF's. These are characterized by species endemic to the: (1) Mississippi River basin; (2) Lake Pont-

<sup>1</sup> Hartfield, Paul. 1995. USDI FWS, Jackson, Mississippi, personal communication with the authors.

<sup>2</sup> McDougal, L.A. 1995. Forest Service, Blacksburg, Virginia, personal communication with the authors.

Table 7.—Mussels of confirmed or probable occurrence in the Homochitto National Forest

Species	Occurrence*					PR
	CF					
	Site					
	1	2	3	4	5	
<i>Amblema plicata</i>						X
<i>Elliptio crassidens</i>				X		
<i>Fusconaia ebena</i>						X
<i>F. flava</i>				X		
<i>Lampsilis siliquioda</i>		X		X		
<i>Obovaria subrotunda</i> †						X
<i>Pyganodon grandis</i>					X	
<i>Toxolasma texasensis</i>		X	X	X		
<i>Unio merus</i> sp.				X		
<i>Utterbackia imbecillis</i>				X		
<i>Villosa lienosa</i>	X	X	X	X		

\*CF = confirmed; PR = probable.

†Considered of special concern by the American Fisheries Society.

chartrain, Pearl River, and Pascagoula River drainages; and (3) Mobile Bay drainages. Another group of species was widely distributed and showed no drainage affinities. Because of the paucity of survey data on NF lands, the distribution of many species within Mississippi NF's was necessarily inferred from surveys near the NF's.

A systematic, three-phase approach is needed to efficiently and accurately assess mussel resources in Mississippi NF streams. This study represents the first phase in which a review of existing information is compiled. The second phase involves an exhaustive, qualitative field survey to document current distributions of species and the location of important communities. The third phase consists of establishing selected sites within the drainage(s) for intensive quantitative descriptions of ecological characteristics and monitoring of population trends. National forests should be prioritized for inventory according to potential diversity and conservation status of species occurring or potentially occurring in each NF. Using this rationale, we recommend that the DeSoto National Forest be inventoried first due to its high number of potential species (20) and species with special conservation status (5). The Delta National Forest should be surveyed next due to its high number of potential species (27). The remaining NF's should be surveyed in the following order: Bienville, Tombigbee, Holly Springs, and Homochitto.

Currently, there are no mussels present on the Forest Service Southern Region (R-8) Sensitive Species list for NF's in Mississippi. However, 11 species of confirmed or probable occurrence in Mississippi NF's are considered species of special concern by the American

Table 8.—Mussels of confirmed, probable, or potential occurrence in the Tombigbee National Forest

Species	Occurrence*		
	CF	PR	PO
<i>Fusconaia cerina</i>		X	
<i>Lampsilis ornata</i> †		X	
<i>L. straminea straminea</i> †		X	
<i>L. s. claibornensis</i>		X	
<i>L. teres</i>		X	
<i>Ligumia subrostrata</i>	X		
<i>Pleurobema decisum</i> ‡			X
<i>Pyganodon grandis</i>		X	
<i>Quadrula asperata</i> †			X
<i>Strophitus subvexus</i> †		X	
<i>Toxolasma parvum</i>	X		
<i>Tritogonia verrucosa</i>			X
<i>Unio merus</i> sp.		X	
<i>Utterbackia imbecillis</i>	X		
<i>Villosa lienosa</i>		X	

\*CF = confirmed; PR = probable; PO = potential.

†Considered of special concern by the American Fisheries Society.

‡Listed as endangered by the U.S. Department of the Interior FWS.

Fisheries Society (Williams and others 1993), 1 species of confirmed occurrence is a candidate for listing under the Endangered Species Act, and 1 species of potential occurrence is listed as endangered by USDI FWS. In total, there are potentially at least 13 species with special conservation status in Mississippi NF's, suggesting that more distributional and population data are urgently needed to assess the sensitive status of these and other mussel species in NF streams.

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A review of freshwater mussel distribution data showed that Mississippi national forests harbor a diverse fauna of potentially 46 or more species. Occurrence of 33 species is confirmed. Three distinct faunal groups are represented, each with a characteristic assemblage of species. A three-phase program for evaluation of the resource is outlined.

**Keywords:** Field survey, sensitive species.

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