

History and status of the American black bear in Mississippi

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Abstract: Historically abundant throughout Mississippi, American black bears (*Ursus americanus*) have declined due to habitat loss and overharvest. By the early 1900s, the bear population was estimated at <12 individuals, and Mississippi closed black bear hunting in 1932. However, habitat loss continued and by 1980 suitable habitat was estimated at 20% (20,234 km²) of historic levels (101,171 km²) with the decline continuing. Although black bear abundance is currently unknown, a recent increase in occurrence reports and documented reproduction suggests the population may be increasing. There have been 21 reported nuisance complaints since 2006, of which 7 were apiary damage. Additionally, 31 bear mortalities were reported since 1972; 80% were human caused. Government and private organizations have emphasized education on bear ecology and human–bear coexistence, while habitat restoration through land retirement programs (e.g., Conservation Reserve and Wetland Reserve Programs) will improve habitat abundance and suitability for black bears. Black bears are naturally recolonizing Mississippi with current state agency management directed at supporting population reestablishment through habitat conservation and species protection.

Key words: American black bear, Mississippi, recolonization, *Ursus americanus*, wildlife conservation

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American black bears (*Ursus americanus*) are the largest native carnivore in the southeastern United States (Hall 1981, Brown 1993, Haas 1999, Pelton 2000, Masterson 2006). Historical declines in black bear distribution and abundance in this region have been attributed to the fur and market trade, sport hunting, illegal take, and land use changes (Wooding et al. 1994, Young 2006). Mississippi, formerly an important state for bear hunting regionally, is one of the few southeastern states with a non-hunted bear population; others include Louisiana, Alabama, and Florida (Schullery 1988, Pelton et al. 1998). Historically, black bears occurred throughout Mississippi and currently, at least 2 subspecies (*U. a. luteolus* and *U. a. americanus*) are present (Young 2006). In 1932, the black bear population was estimated at <12 individuals (Cook 1943). Since the 1990s, the Mississippi black bear population appears to be increasing (Young 2006), a likely consequence of

repatriation in neighboring Louisiana and Arkansas (Clark et al. 2002).

Information about black bear population status in Mississippi is limited. Also, much of this information is in state or federal technical reports, status updates from workshop proceedings, university theses and dissertations, and reliable web sites (Miller 1993; Shropshire 1996; Bowman 1999; Young 2005, 2006). Although black bear management goals have been developed, it is difficult to assess management success without understanding the species status and distribution. Our objective was to compile available data to provide a synthesis of the history, current status, and management of black bears in Mississippi.

Study area

Mississippi encompasses 123,514 km² of land, with about 65% forested (Mississippi Forestry Commission [MFC] 2008). The topography of Mississippi is generally flat, ranging from 0 to 247 m elevation. The

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climate is subtropical, with an average July temperature of 27.1°C and average January temperature of 7.6°C (US Department of Commerce 2012). The southeastern portion of the state is primarily forested, whereas the Delta region in the northwest and west central parts of the state is primarily agricultural land with forested areas along the Mississippi River. Common trees in Mississippi include cottonwood (*Populus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), oak (*Quercus* spp.), pecan (*Carya* spp.), pine (*Pinus* spp.), bald cypress (*Taxodium distichum*), and sweetgum (*Liquidambar* spp.) (Bowman 1999, MFC 2006). Common overstory species include boxelder (*Acer negundo*), pecan, elm, and cypress along the Mississippi River levees; red maple (*A. rubrum*) and mockernut hickory (*C. tomentosa*) in mid-central Mississippi; and flowering dogwood (*Cornus florida*), longleaf pine (*Pinus palustris*), and slash pine (*P. elliotii*) in southeast Mississippi (Bowman 1999). Common understory species range from poison ivy (*Rhus radicans*) along the Mississippi River levees; blackberry (*Rubus allegheniensis* and *R. argutus*) and saw briar (*Smilax bona-nox*) in mid-central Mississippi; to yaupon (*Ilex vomitoria*) and muscadine (*Vitis rotundifolia*) in southeast Mississippi (Bowman 1999). Bowman (1999) reported 6 National Forests and 4 National Wildlife Refuges in Mississippi that combined provide 5,000 km² of suitable, but potentially unoccupied, bear habitat. Bowman (1999) also reported 61,800 km² of additional private forests as suitable, but potentially unoccupied, bear habitat in Mississippi. Agricultural and urban lands are estimated at 45,325 km² and 2,397 km², respectively, (Mississippi Department of Agricultural Commission [MDAC] 2012; US Census Bureau [USCB] 2009). Statewide human population growth has been <0.5% annually (USCB 2012).

Methods

We compiled published and unpublished literature and records of black bears in Mississippi. We assembled information into categories similar to previous syntheses for bears in the southeastern United States (Eastridge 2005, McMullin and Parkhurst 2008): historical perspective, management and research, distribution, human–bear interactions, education, and conservation. We used geographic designations defined by the US Fish and Wildlife Service (USFWS 1992; Fig. 1) to characterize distribution of subspecies. We summarized black bear natural

history in Mississippi. We compiled previous and current state and federal laws governing black bear management (i.e., harvest management, habitat management, and species protection), current Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) bear management objectives, and previous black bear research in Mississippi.

We compiled location data of bears captured during research and management efforts as well as occurrence reports maintained and verified by MDWFP, USFWS, and Mississippi State University (MSU) through 2010. Reports included bear observations (e.g., sightings or tracks), road kills, and illegal harvests. Reports were verified based on descriptions reported, images submitted, or site inspections. For reports where multiple observation methods were recorded, the more conclusive evidence was used to identify bear presence (e.g., a sighting was more conclusive than tracks). We used verified reports and those from previous surveys (Shropshire 1996) to summarize frequency of black bear occurrence and distribution before and since 2002. A more unified and consistent reporting system was initiated by MDWFP in 2002; therefore, we expected an increase in verified occurrence reports. Consequently, we used MDWFP-verified occurrence reports recorded with physical locations from 2002–10 to map occurrences by county.

We summarized human–bear interactions through September 2011, including mortalities due to vehicle collisions, illegal take, and other causes (e.g., accidental mortality from capture). We also summarized reported human–bear conflicts by type of conflict (e.g., apiary damage). We described recent outreach programs conducted by state, federal, and private entities. We reviewed black bear-related legal actions, including codes and regulations, and fines or actions imparted for illegal activities. We also described current habitat and species conservation measures for black bears, including habitat restoration programs, and estimated extent of areas conserved in Mississippi as suitable but unoccupied black bear habitat.

Historical records of black bears in Mississippi

The earliest records of black bears in Mississippi were fossil remains from Lowndes and Noxubee counties that date to Rancholabrean and Holocene deposits about 12,000 years before present (Kurtén and Kaye 1982). Black bears were used by Native

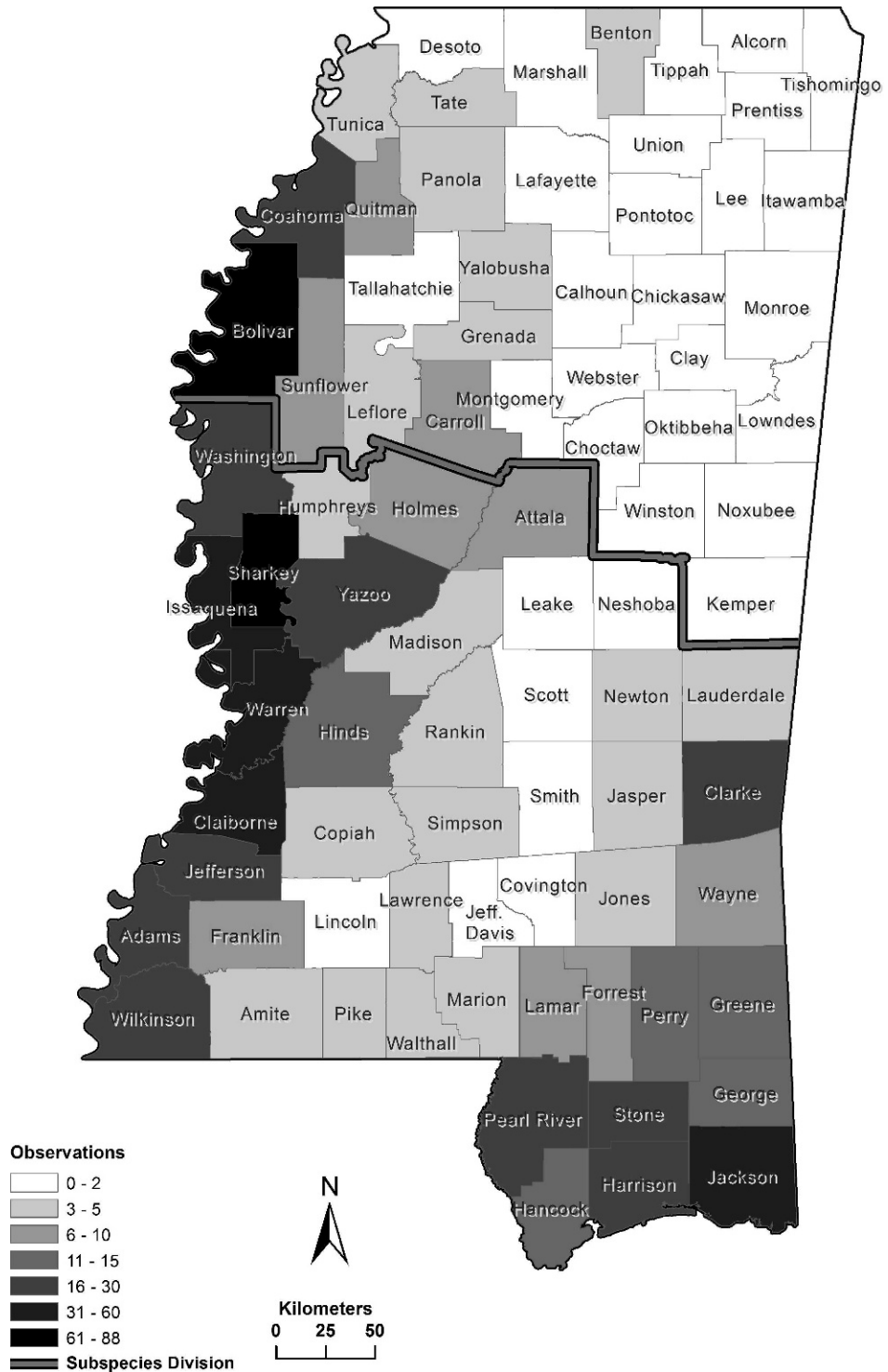


Fig. 1. Reported occurrences of American black bears in Mississippi, 2002–10. Federally-designated geographic ranges of Louisiana black bear (*U. a. luteolus*) and American black bear are south and north of subspecies division line, respectively.

Americans in Mississippi for religious ceremonies and as a source of food, clothing, and currency with European explorers in the 1500s (Swanton 1979, Young 2006).

During the late 1600s and early 1700s, when European settlements expanded in Mississippi, suitable black bear habitat existed throughout the state (Shropshire 1996). This included hard and soft mast-producing tree species, switchcane (*Arundinaria gigantea*), grasses, and bald cypress (Weaver et al. 1990). Before the 1850s, habitat in the Delta region of Mississippi was described as dense canebrakes and bottomland hardwood forests suitable for black bears (Young 2006). Black bears occurred throughout the Delta region as well as areas of dense vegetation along streams near the Gulf Coast. In northwestern Mississippi, bears consumed poke berries (*Phytolacca americana*), persimmons (*Diospyros* spp.), and other soft mast until hard mast (e.g., hickory nuts, acorns) became available in the fall (Hough 1895). In central Mississippi, bears apparently consumed hard mast species (e.g., oaks, hickory, black walnut [*Juglans nigra*], chinquapin [*Castanea* spp.], and hazelnut [*Corylus* spp.]) along wetlands and rivers, which also harbored potential den tree species such as bald cypress (Williams 1930).

In the early 1800s, bears remained common in canebrakes, which provided refuges as land and swamps were cleared and drained for agriculture (Young 2006). By the mid-1800s, bear hunting for subsistence and trade was replaced with sport hunting, particularly in the Mississippi Alluvial Valley (Delta) which contained comparatively high bear densities (Young 2006). Several prominent bear hunters in the United States (e.g., Wade Hampton III, Holt Collier, R.E. Bobo) hunted throughout the Delta. President Theodore Roosevelt's famous 1902 bear hunt, which led to the creation of the teddy bear as a children's toy, occurred in Sharkey County, Mississippi.

Black bears persisted in the Tallahatchie and Mississippi River bottoms through 1880 (Crick 1880). In 1882, good bear hunting was possible in 7 counties, primarily in western Mississippi (Hallock 1883). Bears also occurred in the swamps of Yazoo River, Big and Little Sunflower rivers, Steele's Bayou, and Deer Creek (P. 1885). As hunting and land conversion for agriculture increased during the early 1900s, remaining bears became isolated in small, fragmented pockets of habitat (Young 2006). Black bears were considered uncommon in 20 of 82 Mississippi counties and absent from all other

counties in a 1978 statewide survey by the Mississippi Game and Fish Commission (Shropshire 1996).

The first management action for conserving black bears occurred in 1932 when the newly created Mississippi Game and Fish Commission closed black bear hunting (Young 2006; Table 1). The statewide black bear population was believed to be <12 individuals (Cook 1943). In 1934, 6 individuals (3 pairs) were released in Mississippi (Cook 1943, Young 2006); the source population, release locations, and sex of these individuals are unknown. Black bears were included on the Mississippi list of rare and endangered vertebrates in 1975 (Rare and Endangered Species Committee 1975) but not listed as state endangered until 1984 (Shropshire 1996).

Legal conservation measures

In 1992, black bears in the historic range of the Louisiana black bear (*U. a. luteolus*) were federally protected in Mississippi (USFWS 1992). The federally-designated range of Louisiana black bear in Mississippi includes the southern two-thirds of Mississippi (Fig. 1). Based on similarity of appearance, other bear subspecies (e.g., *U. a. americanus*) occurring within this designated range were also listed as federally threatened. Because black bears had already been listed as a state endangered species in Mississippi, direct improvements for bears and bear conservation in the state from federal protection were unclear. However, recovery efforts in neighboring states of Louisiana and Arkansas likely facilitated increasing numbers of bear within their borders, and may have contributed dispersing bears to bolster recolonization of Mississippi bear habitat. Anecdotal evidence suggested the bear population size in Mississippi was insufficient to restore bears through population augmentation; MDWFP was concerned that without sufficient resident black bears, population augmentation would be unsuccessful (MDWFP files, Jackson, Mississippi, USA). Additionally, research indicated that the Mississippi River may form a partial barrier for bear movements between Mississippi and Louisiana and Arkansas (White et al. 2000). Therefore, MDWFP emphasized providing habitat and continued species protection (Young 2006).

Another possible advantage to federal protection has been the increased penalty associated with killing a bear within the Louisiana black bear range. Presently, intentionally killing a black bear in

Table 1. Prominent events for American black bear management in Mississippi, 1902–2008.

Year	Event
1902	President Theodore Roosevelt came to the Mississippi Delta to hunt black bear. Holt Collier was hired as the president's guide on this hunt. After a long pursuit on the first morning of the hunt, Collier offered a lassoed and injured bear for President Roosevelt to harvest. President Roosevelt refused to shoot the injured bear, stating it would be unsportsmanlike. This event led to the creation of the Teddy bear.
1932	Mississippi Game and Fish Commission was created and closed hunting of black bear; bear population estimated at 12 individuals (Cook 1943).
1934–1935	3 pairs of bears released as part of a restocking program.
1955	Miller and Kellogg (1955) designated the Louisiana black bear as a subspecies of the American black bear, <i>Ursus americanus luteolus</i> .
1975	Black bear included on the list of rare and threatened vertebrates of Mississippi.
1976	Last reported reproduction before 2005 occurred in Issaquena County (5 bears observed including 2 assumed cubs of the year).
1984	Mississippi Department of Wildlife Conservation classified the black bear as a state endangered species with estimated population of 25.
1987	US Fish and Wildlife Service was petitioned to list the Louisiana black bear as an endangered species under the Endangered Species Act of 1973.
1990	US Fish and Wildlife Service proposed Federal listing of the <i>U. a. luteolus</i> subspecies as threatened within its historic range.
1992	US Fish and Wildlife Service listed the <i>luteolus</i> subspecies as threatened. All other bears occurring within the range of the <i>U. a. luteolus</i> were protected due to similarity of appearance. Protection also includes den and candidate den trees within occupied Louisiana black bear habitat.
2005	First documented occurrence of reproduction in Mississippi since 1976. Adult traveled from Louisiana into Wilkinson County, Mississippi and produced 5 cubs.
2006	Mississippi Department of Wildlife, Fisheries, and Parks published a black bear management plan outlining primary focus topics which include: education and training for MDWFP personnel, education for Mississippi citizens, bear research, managing human–bear conflict, human-induced mortality (Young 2006).
2007	Two cubs known to have been produced from a single litter in Sharkey and Issaquena Counties, Mississippi.
2008	Mississippi was granted funding through the US Department of Agriculture, National Resource Conservation Service (2011) for State Acres for Wildlife Enhancement Habitat Initiative to restore 32.2 km ² of bottomland hardwood forests and wetlands in 18 western Mississippi counties.

Mississippi is a state, and if within the Louisiana black bear range, a federal offense. The state sanctioned Class I violation carries a fine of \$2,000–\$5,000 and loss of hunting privileges for 1 year;

whereas the federal offense carries a fine up to \$50,000 and up to 1 year imprisonment. However, it is unclear if greater fines associated with killing bears within Louisiana black bear range have reduced bear mortality. Although critical habitat as defined by the USFWS (2012) has not been designated for black bears in Mississippi, protection from harvest has been extended to den and candidate den trees (bald cypress and tupelo gum [*Nyssa sylvatica*]) occurring along streams, rivers, bayous, sloughs, or other bodies of water within the subspecies' occupied range, and exhibiting the following characteristics: visible cavities and diameter breast height >91.4 cm. These den-tree characteristics were considered primary constituent elements by the USFWS for the Louisiana black bear (USFWS 1992, 2009).

In 2002, MDWFP created a permanent biologist position to oversee the newly developed black bear program, and in 2006, developed a black bear management plan that identified programmatic goals (Young 2006). Goals were designed to educate staff on bear ecology, capture, and handling techniques; provide improved assistance to residents who may encounter black bears and minimize negative encounters; address development of long-term databases; enhance habitat; and minimize mortalities to facilitate black bear population recovery. The 2006 management plan is scheduled for review at 5-year intervals to evaluate effectiveness and revise objectives as warranted.

Black bear research in Mississippi

Black bear research in Mississippi has been limited. During the 1990s, several research projects were supported through Mississippi State University. Miller et al. (1994) tested efficacy of bait stations and remote cameras to monitor bear populations. Shropshire (1996) examined the history, distribution, and abundance of black bears and investigated stakeholder support for black bears. She suggested that increasing reports of bears in Mississippi may have been dispersing males from increasing populations in neighboring states. Shropshire (1996) also quantified suitable bear habitat by combining land use and overstory vegetation in counties with reliable sightings, identifying Adams County as the most suitable (Fig. 1). She also included a template for an educational program to address the lack of accurate knowledge people had about bears in Mississippi. Bowman (1999) further modeled estimates of black bear habitat suitability using habitat associations

reported in the literature and human attitudes toward bear restoration (Bowman et al. 2001, 2004). Bowman et al. (2004) identified areas in southern and western Mississippi with most suitable habitat but these areas lacked connectivity. Current research in Mississippi is further assessing black bear habitat suitability, connectivity, and recolonization potential (e.g., Waller et al. 2012).

Additional black bear research supported by Mississippi State University was conducted in Louisiana and Arkansas during the 1980s and 1990s (Oli et al. 1997, 2002; White et al. 2000). Research conducted in Louisiana and Arkansas has improved our understanding of black bear isolation and recolonization in Mississippi through documenting black bear movements, dispersal, space use, and denning ecology (Oli et al. 1997, 2002; White et al. 2000). Other studies have suggested that bears living north of the USFWS subspecies line in Mississippi (Fig. 1) may be hybrids of *U. a. luteolus* and *U. a. americanus* or more closely related to *U. a. luteolus* (Kennedy 1989, Csiki et al. 2003, Van Den Bussche et al. 2009).

Current status of black bears in Mississippi

We documented 846 bear occurrence reports in 70 of 82 counties from 1967 to 2010. Recent (2002–10) reports were predominately from southeastern and western Mississippi (Fig. 1). Most reports (80%) occurred during 2002–10, with 28% from 3 counties along the Mississippi River; Bolivar ($n = 94$ total; 61 from 2002 to 2010), Sharkey ($n = 79$ total; 62 from 2002 to 2010), and Issaquena ($n = 65$ total; 42 from 2002 to 2010). Overall, sightings were the most reported type of occurrence (72%). Observations of bears from 2002 to 2010 were most frequently reported as sightings (52%), followed by photographs (23%), and bear sign (15%).

Recording of black bear occurrence reports in Mississippi has improved since formation of the MDWFP black bear program in 2002. Increased number of bear occurrence reports suggests improved reporting of bear sightings, an increasing bear population, or greater human interest in and support of black bears (Simek et al. 2005). Each of these explanations is consistent with the objectives of the MDWFP black bear management plan (Young 2006).

Prior to 2005, the last recorded black bear reproduction in Mississippi occurred in 1976, when 5 bears were observed in Issaquena County, 2 of which were identified as cubs-of-the-year. In 2004 a

radiocollared female from Louisiana moved to southwest Wilkinson County, Mississippi, and produced 5 cubs observed in March 2005. Since 2005, at least 1 litter of cubs has been documented annually except in 2009. In 2011, 6 litters were documented, comprising at least 10 cubs. All recent documented reproduction has occurred in counties along the Mississippi River (i.e., Bolivar, Issaquena, Warren) and in Delta National Forest (Sharkey County).

We documented 30 adult bear mortalities (4 females, 19 males, and 7 undetermined) and one cub (female) mortality that occurred from 1972 to September 2011 in Mississippi. Additionally, we documented 3 mortalities of bears (all males) that were initially captured in Mississippi but died elsewhere: 2 in Arkansas (unknown cause of death) and one in Alabama (vehicle collision). Humans were the leading cause (80%) of known adult bear mortalities in Mississippi. Eleven adult bears (2 females, 5 males, 4 undetermined) were killed by vehicles, 10 (1 female, 7 males, 2 undetermined) were illegally killed, 2 males and 1 female died during capture efforts, one male died from electrocution after contact with a transformer, and 5 (4 males, 1 undetermined) died from unknown causes. Vehicle collisions and illegal take have also been identified as leading causes of black bear mortality in other southeastern states (Pelton et al. 1998, Simek et al. 2005). However, without knowledge of population size, it is difficult to assess overall effects of human-caused mortality on black bears in Mississippi.

Human–bear conflicts

Before inception of the MDWFP black bear program, no formal mechanism existed to file conflict complaints. Thus, conflict complaints were informally noted and often addressed by USDA Wildlife Services, MDWFP staff, or government entities from adjacent states (Young 2006). Informal conflict complaints during the 1990s included damage to houses, raiding garbage, eating pet foods, and apiary or agriculture damage (Young 2006). In 1994, an adult female bear was captured after raiding several beehives in or near Wilkinson County. This bear continued to damage apiaries and was relocated in 1996 to Stone County, then recaptured in the backyard of a residence in Hinds County and relocated to Wilkinson County. In 1995, an adult male was captured and ear-tagged after raiding watermelon patches and apiaries in Wilkinson County. In 1998, this bear was struck by a vehicle in Amite County (Young 2006). In 2000, another male

bear was captured after damaging houses in Pearl River County. One year after being ear-tagged and released along the Pearl River, this bear was observed raiding garbage and eating pet food in Mobile County, Alabama and was recaptured. The bear was brought back to Mississippi and placed in the Jackson Zoo (Young 2006).

In 2002, a formal process for recording conflict complaints was initiated by the MDWFP black bear program. Between 2002 and 2006, no conflict complaints were recorded; however, 21 conflict complaints have been reported since 2006. The 3 most common damage complaints since 2006 have been damage to apiaries ($n = 7$), wildlife feeders ($n = 5$), and fruit crops ($n = 3$). Conflict complaints in Mississippi have been similar to those reported in other areas of the eastern United States and Canada, except that garbage was reported as a primary attractant in these regions (Pelton et al. 1998, McMullin and Parkhurst 2008). Conflicts have been resolved by MDWFP personnel using management techniques such as electric fencing and removing attractants. In addition, translocation has been used to resolve 2 conflicts.

Both government agencies (including MDWFP and USFWS) and private entities (e.g., Bear Education and Restoration Group of Mississippi [BEaR]), have promoted human–bear coexistence and developed and distributed educational materials (e.g., presentations, education pamphlets) to inform citizens, sportsmen's groups, civic clubs, and natural resource professionals on bear ecology, behavior, and conflict prevention measures (e.g., electric fencing, removal of bear attractants) to minimize negative encounters and encourage conservation to benefit bears (Young 2006). Public festivals, such as the Great Delta Bear Affair, which has attracted >6,000 individuals annually, have been sponsored by local, state, and federal governments, together with private businesses and citizen volunteers. These events have provided opportunities to illustrate the history of black bears in Mississippi and inform citizens about bear ecology, management, and current research. Other states, such as Florida, have used similar festivals to increase citizen awareness of black bears and participation in practices to prevent conflicts with bears (Masterson 2006).

Bear habitat in Mississippi

Bear habitat in Mississippi, although estimated at <20% (20,234 km²) of historic levels by 1980, continued to decline in quality due to fragmentation

and intrusion by humans (Young 2006). Recently, the black bear has been a focal species considered for conserving and restoring hardwood habitat in Mississippi. For example, the USFWS identified areas of Mississippi along the Mississippi River and throughout the Delta, in addition to counties in southeastern and southwestern Mississippi, as potential bear corridors that could connect larger tracts of land presently occupied or that contain suitable bear habitat (Young 2006). The State Acres for Wildlife Enhancement habitat initiative (SAFE) under the Conservation Reserve Program (CRP) has been designed to improve priority wildlife habitat (USDA 2011). The SAFE practice was approved to restore 32.2 km² of native bottomland hardwood forests and semi-permanent wetlands in Mississippi over 5 years and represents the only SAFE practice program specifically approved for black bear conservation (USDA 2011).

Other programs that are likely to create habitat suitable for black bears include CRP and the Wetlands Reserve Program (WRP; Ferris and Siikamaki 2009). Over 3,156 km² of Mississippi forest have been enrolled in CRP, and over 741 km² of land were under WRP easements as of summer 2011 (K. Nelms, National Resource Conservation Services [NRCS], Grenada, Mississippi, USA, personal communication, 2011). About 18% (579 km²) of CRP lands have been planted to create riparian buffers on agriculture lands (Young 2006). Ninety three percent (688 km²) of habitat restored through WRP in Mississippi has occurred on private lands (K. Nelms, personal communication, 2011). Additionally, private programs sponsored by other entities including Delta Wildlife, Ducks Unlimited, Wildlife Mississippi, and USFWS Partners Program have planted trees to provide black bear habitat (Young 2006). Bowman (1999) estimated that 5,000 km² of suitable bear habitat on public lands within 6 national forests and 4 national wildlife refuges remained in Mississippi. Through the CRP, WRP, and SAFE practice, suitable bear habitat in Mississippi could increase Bowman's 1999 estimate by an additional 78%.

Conclusions

Our data suggests that occupied black bear range in Mississippi has increased and that bears have been returning to areas within their historic range. Because of habitat loss and overharvest, abundance of American black bears declined markedly in Mississippi from

the late 1800s to mid-1900s. Human-induced mortality remains the leading known cause of bear mortalities in Mississippi. However, through legal protection, the black bear population appears to be increasing, as suggested by recent high numbers of sightings reported annually and observed reproduction. The resident bear population in Mississippi is likely in part a consequence of bears dispersing from adjacent states of Louisiana, Arkansas, and Alabama. Continued and coordinated education, legal protection, habitat management, and research will facilitate population expansion and ensure the long-term persistence of black bears in Mississippi.

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