LOUISIANA BLACK BEAR MANAGEMENT PLAN

Ursus americanus luteolus

January 2015

LOUISIANA BLACK BEAR MANAGEMENT PLAN

Ursus americanus luteolus

Prepared by:

Maria Davidson, Sean M. Murphy, Kenny Ribbeck, Fred Kimmel, and Jeffrey Duguay

Louisiana Department of Wildlife & Fisheries
2000 Quail Drive, Baton Rouge, Louisiana, USA

With input from
Deborah Fuller
and the
United States Fish & Wildlife Service

January 2015

For further information, please contact:

Louisiana Department of Wildlife & Fisheries
P.O. Box 98000
Baton Rouge, LA 70898
(225) 765-2800

Recommended citation: Davidson, M., S. M. Murphy, K. Ribbeck, F. Kimmel, and J. Duguay. 2015. Louisiana Black Bear Management Plan. Louisiana Department of Wildlife & Fisheries, Baton Rouge, Louisiana, USA, 74 pp.

Front cover: Louisiana black bear (*Ursus americanus luteolus*). Photo by John Flores

ACKNOWLEDGMENTS

We thank Secretary Robert Barham and Assistant Secretary Jimmy Anthony (Louisiana Department of Wildlife & Fisheries) for their support and guidance with the development of this document. We also thank Robert Gosnell (Louisiana Department of Wildlife & Fisheries) for his experienced insight and review. We thank Duck Locascio, Tommy Tuma, Cody Cedotal, David Breithaupt, Paul Link, Sutton Maehr, and Venise Ortego (Louisiana Department of Wildlife & Fisheries) for their contributions and reviews of this document. We are especially grateful for the research conducted by Joseph Clark (United States Geological Survey), Jared Laufenberg (University of Tennessee), and the numerous biologists, technicians, graduate students, and university researchers that have provided LDWF with the necessary data for conservation and management of the Louisiana black bear. We also thank Deborah Fuller and Robert Greco (United States Fish & Wildlife Service) for their insight and supply of the necessary information for the development of this document. For their cooperation and assistance, we thank the numerous private landowners of Louisiana that have helped with recovery of the Louisiana black bear.

Finally, we thank the following supporting partners for their assistance, cooperation, and efforts towards conservation and management of the Louisiana black bear: United States Fish & Wildlife Service, United States Geological Survey, United States Department of Agriculture (Natural Resources Conservation Service and Wildlife Services), United States Army Corps of Engineers, University of Tennessee, Louisiana State University, Virginia Polytechnic Institute and State University, Stephen F. Austin State University, Mississippi Department of Wildlife, Fisheries, & Parks, Arkansas Game & Fish Commission, Texas Parks & Wildlife Department,

Black Bear Conservation Coalition, Appalachian Bear Rescue, RoyOMartin Products, The Nature Conservancy, and Lower Mississippi Valley Joint Venture.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

FOREWORD

by

Kenny Ribbeck, Office of Wildlife Administrator

The history and heritage of Louisiana has always been closely associated with its natural resources. Since establishment of this state more than two centuries ago, generations of Louisianans have used wildlife resources to provide food and clothing for their families, for economic benefit, and for outdoor recreation. These close ties to the land and its wildlife make Louisiana somewhat unique in the modern world as citizens of the state appreciate wildlife for both its utilitarian and intrinsic ecological values. Louisiana has been a leader in wildlife conservation for decades, and the citizens can be especially proud of the commitment to restoring species that have faced extinction, such as the American alligator (*Alligator mississippiensis*), brown pelican (*Pelecanus occidentalis*), and bald eagle (*Haliaeetus leucocephalus*). The Louisiana black bear (*Ursus americanus luteolus*) is Louisiana's most recent conservation success story. The subspecies is a symbol of Louisiana's successful wildlife management approaches and is a prominent example of the success of the Endangered Species Act of 1973.

The Louisiana black bear was ubiquitous in Louisiana prior to European colonization. However, by the early 1900s overexploitation and habitat degradation relegated the subspecies to the Mississippi Alluvial Valley. Although reduced substantially in range and number, the Louisiana black bear garnered national attention during the early 20th century, influencing wildlife conservation in the United States forever. During a 1902 bear hunting trip in the Mississippi River Delta, Theodore "Teddy" Roosevelt, founder of the modern "conservation movement" and 26th United States President, refused to kill a Louisiana black bear tethered to a

tree, deeming it unsportsmanlike. This led to the creation of the beloved Teddy Bear and Roosevelt went on to change natural resource conservation in the United States for the better.

Roosevelt's "conservation movement" led to conservation legislation and the eventual establishment of agencies responsible for the protection and restoration of wildlife and their habitat. To allay subspecies extirpation, the Louisiana black bear would later need the legislation and agencies that were created as a result of Roosevelt's "conservation movement" nearly a century after the Teddy Bear incident. Due to low population numbers and habitat loss, the Louisiana black bear was given protection under the Endangered Species Act of 1973 by the United States Fish & Wildlife Service in 1992. Since listing occurred, substantial work has been conducted by state and federal agencies, research universities, and non-government organizations to monitor Louisiana black bear population numbers and increase the amount of suitable bear habitat. The federal protection afforded to the subspecies by the Endangered Species Act of 1973 has facilitated restoration of Louisiana black bears and their habitat in parts of their historic range.

With the return of this unique subspecies comes an increasingly complex set of management and conservation challenges for bears and society. Societal views of bears vary considerably across Louisiana, and balancing these differing opinions while promoting the restoration of the Louisiana black bear poses one of the greatest challenges to the management of this megafauna species. There are, however, numerous examples of bears and humans successfully coexisting. Advancements in research methods, experience in managing human-bear conflict, and educational efforts will play vital roles in balancing the need for a healthy and sustainable population of Louisiana black bears within the tolerances and expectations of Louisiana residents.

CHAPTER 1: INTRODUCTION

Mission Statement

The mission of Louisiana Department of Wildlife & Fisheries (LDWF) is: *To manage, conserve, and promote wise utilization of Louisiana's renewable fish and wildlife resources and their supporting habitats through replenishment, protection, enhancement, research, development, and education for the social and economic benefit of current and future generations; to provide opportunities for knowledge of and use and enjoyment of these resources; and to promote a safe and healthy environment for the users of the resources.* It is the 'use of resources' that facilitates public support for the conservation of wildlife throughout the United States, and wildlife conservation has been successful due to the availability of the nation's wildlife resources to its citizens. This is especially true in Louisiana, where fish and wildlife resources remain an important component of modern day culture.

Similarly, the mission of the Office of Wildlife reflects a philosophy of stewardship that includes management and sustained use: *To provide wise stewardship of the state's wildlife and habitats, to maintain biodiversity, including plant and animal species of special concern, and to provide outdoor opportunities for present and future generations to engender a greater appreciation of the natural environment.* As the state wildlife management agency, it is the responsibility of LDWF to ensure Louisiana black bear subpopulations persist into the future. Therefore, this management plan was created to detail current and future courses of action for promoting the continued persistence and long-term sustainability of the Louisiana black bear within Louisiana. This plan balances the needs of bears with the needs, expectations, and responsibilities of our society, and establishes a path to ensure the Louisiana black bear remains a valued part of our wildlife community.

Management Objective for the Louisiana Black Bear

The Louisiana Black Bear Management Plan (LBBMP) was developed to create a framework from which LDWF and Louisiana stakeholders can work to conserve bears and maintain their intrinsic, cultural, and recreational values. The objective for management of the Louisiana black bear is to: *Maintain a sustainable black bear population in suitable habitat for the benefit of the species and Louisianans*. To ensure the Louisiana black bear persists into the future, a metapopulation management approach will be employed (Hanski and Simberloff 1997, Larkin et al. 2004, Dixon et al. 2007, Florida Fish and Wildlife Conservation Commission 2012). This approach has several key requirements, including that sufficient suitable habitat be available within dispersal distance, connectivity among subpopulations is maintained or created, continued monitoring of subpopulation demographics occurs to allow timely and well-informed management decisions, and anthropogenic causes of mortality are mitigated so as to reduce unnecessary losses to subpopulations (Hanski and Simberloff 1997). Ultimately, the success of this approach hinges upon the social acceptance of bears. If subpopulations grow beyond a level acceptable to humans, then human-bear conflicts may increase and social acceptance of bears may decrease. This is referred to as the social carrying capacity, or the maximum number of bears that humans will tolerate in an area (Carpenter et al. 2000). In contrast, the biological carrying capacity is the maximum number of bears that available habitat can support. Sustainable bear management must account for these sometimes conflicting measurements.

While the Louisiana black bear has rebounded from historically low numbers, many conservation challenges remain. This bear management plan was created to address those challenges and ensure this subspecies will persist into the future. Although management and conservation of Louisiana black bears are the responsibilities of LDWF, interests and

responsibilities for other aspects, such as habitat protection and management, are shared with multiple state and federal agencies, organizations, and individuals. By implementing the conservation and management actions identified in this plan, Louisianans can achieve a future that includes the black bear as a valued component of Louisiana's wildlife community.

History of the Louisiana Black Bear

The Louisiana black bear is one of 16 unique subspecies of the American black bear (*Ursus americanus americanus*) in North America (Hall 1981). The subspecies historically ranged throughout Louisiana, into east Texas and southwest Mississippi, and in the southernmost counties of Arkansas (Hall 1981, Neal 1992; Fig. 1.1). Due to overexploitation and rapid habitat fragmentation and loss, the subspecies was drastically reduced in number and distribution by the early 1900s, and restricted to remnant forest patches in the Mississippi and Atchafalaya Alluvial Plains (St. Amant 1959, Nowak 1986, Pelton 2001).

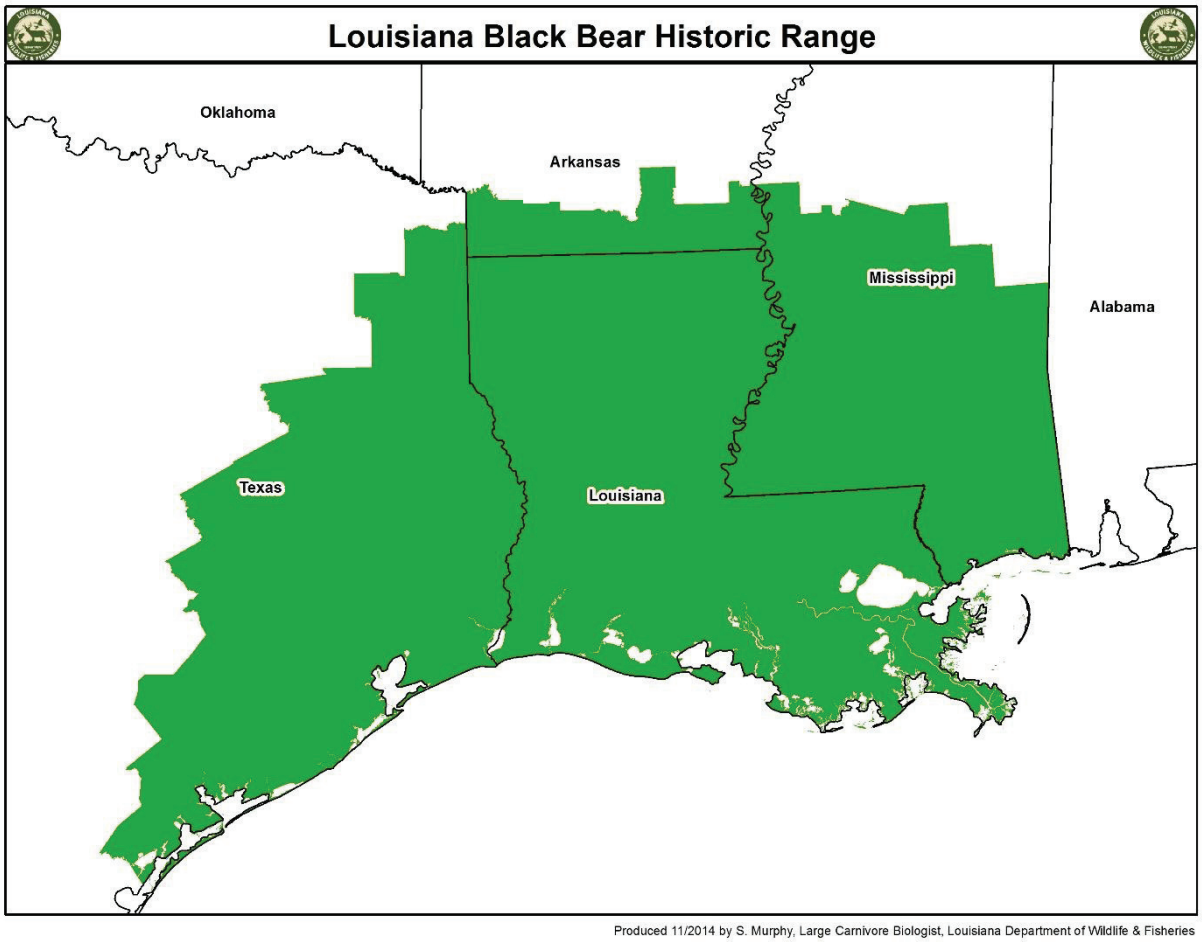

Figure 1.1. The historic range of the Louisiana black bear (*Ursus americanus luteolus*) prior to European settlement (Hall 1981). Modified from U. S. Fish & Wildlife Service (2013).

Within Louisiana, an 1890 record indicated 17 parishes harbored resident bears, all of them in the Mississippi-Atchafalaya region (Kopman 1921). According to St. Amant (1959), most extensive areas of bottomland hardwoods in the state had "at least a few bears," with the greatest numbers found in the denser woodlands along the Tensas, Red, Black, and Atchafalaya Rivers. Bear hunting was prominent in Louisiana during the 19th and early 20th centuries. Continued exploitation and habitat loss eventually restricted bears to 2 areas in Louisiana by the

mid-20th century: the Tensas-Madison area in northeast Louisiana and in the lower fringes of the Atchafalaya River Basin. The bear population in Louisiana had been so severely exploited by the 1950s that St. Amant (1959) characterized bear numbers as "sparse", and Nowak (1986) estimated as few as 80 to 120 bears remained statewide by this time.

Despite the apparent population decline in the state by the 1950s, bear hunting remained legal in portions of Louisiana through the late 1980s. Organized bear hunts were uncommon as bear abundance and density continued to decrease during the mid-20th century (Taylor 1971); however, during a December 1955 bear hunt in northeastern Louisiana, 5 bears were harvested (St. Amant 1959). The acting Director of the Louisiana Wild Life and Fisheries Commission during this time recommended that the bear season be closed due to low bear numbers (J. Herring, LDWF, personal communication), and the Commission closed all bear harvest seasons temporarily in 1956. In an attempt to augment the small, remnant population in Louisiana, 161 black bears were translocated from Minnesota to the Mississippi and Atchafalaya River basins from 1964 to 1967 by LDWF (Taylor 1971). However, continued reductions of available bear habitat continued as forested lands were converted to agriculture throughout the Mississippi Alluvial Valley (MAV) during the 20th century, which exacerbated the continued decline of bear numbers in Louisiana.

While never extirpated from Louisiana, the subspecies had been so severely reduced in number that further consideration for protection occurred by 1981 (Weaver et al. 1991). In 1987, the United States Fish & Wildlife Service (USFWS) was petitioned by Mr. Harold Schoeffler to list the Louisiana black bear on the Threatened and Endangered Species List (U.S. Fish & Wildlife Service 1988). Following recognition as a distinct subspecies of the American black bear (Hall 1981, Kennedy 1989, Pelton 1989), the Louisiana black bear was listed as

"threatened" in 1992 under the Endangered Species Act of 1973 (Neal 1992). At the time protection was granted for the subspecies, no empirical estimates of bear population abundance were available. Anecdotal evidence reported by Pelton and van Manen (1997) suggested that fewer than 400 Louisiana black bears existed in a small portion of historic range, but this may have been an overestimate. Following listing of the Louisiana black bear, the USFWS developed a recovery plan in 1995 and established the following criteria to denote recovery of the subspecies (U.S. Fish & Wildlife Service 1995):

1. At least two viable subpopulations, one each in the Tensas and Atchafalaya River Basins;
2. Establishment of immigration and emigration corridors between the two subpopulations;
3. Protection of the habitat and interconnecting corridors that support each of the two viable subpopulations used as justification for delisting.

Since listed as a federally threatened subspecies, considerable work towards restoring the Louisiana black bear has occurred, and multiple state and federal agencies, research universities, and non-government organizations have played integral roles for bear recovery over the previous two decades. To meet the recovery criteria and reduce threats, numerous research projects have been conducted to estimate the demographic vital rates of subpopulations (Nowak 1986, Boersen et al. 2003, Triant et al. 2004, Hooker 2010, Lowe 2011, Troxler 2013, Laufenberg 2014, O'Connell-Goode et al. 2014), a 9-year repatriation project was conducted to establish an additional subpopulation (Benson and Chamberlain 2007, Savoie 2007), and more than 834,000 acres of habitat have been acquired, protected, and/or restored within the bear Habitat Restoration Planning Area (HRPA; U.S. Fish & Wildlife Service 2013). Collectively, these

efforts promoted restoration of the Louisiana black bear in portions of its historic range in Louisiana and western Mississippi (Fig. 1.2).

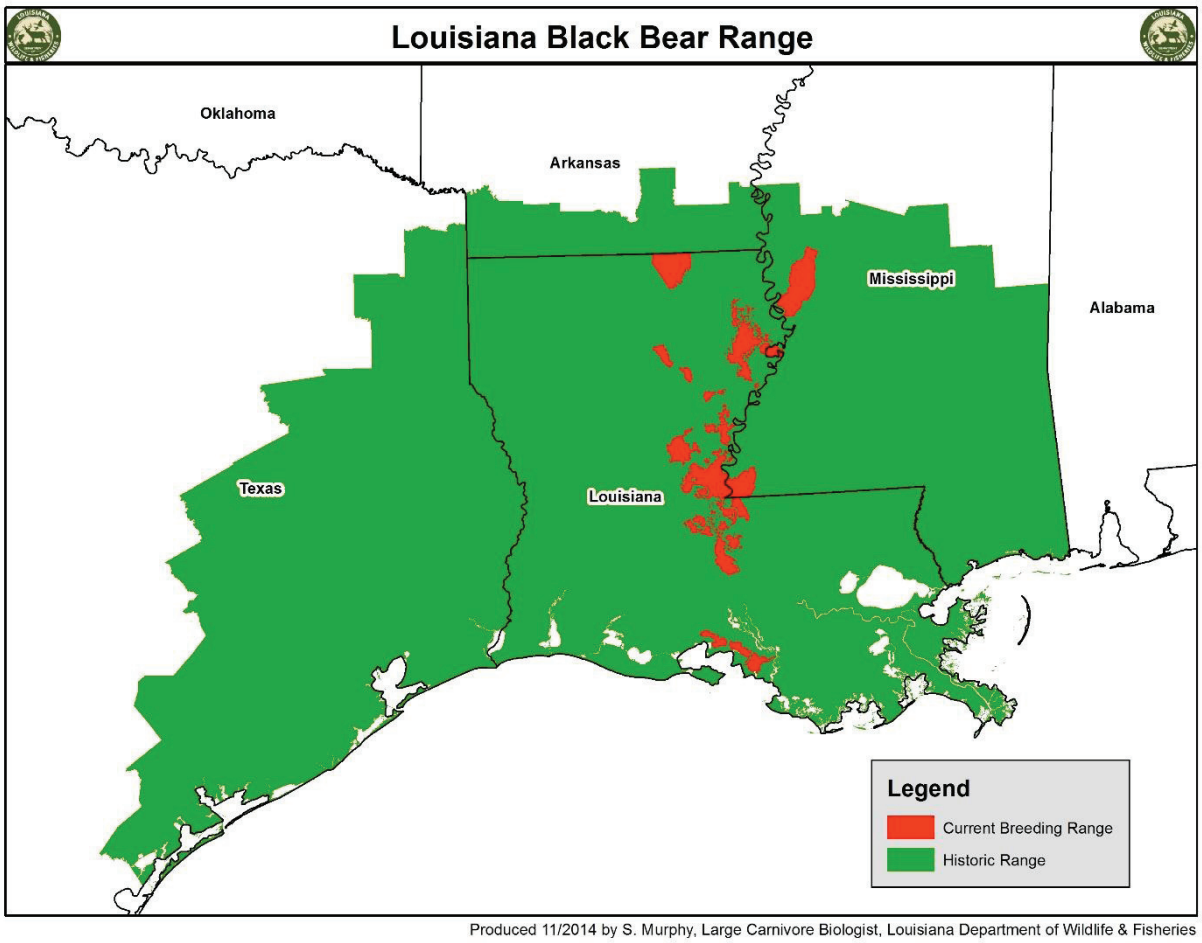

Figure 1.2. The historic range (prior to European settlement [Hall 1981]) and current breeding range* of the Louisiana black bear (*Ursus americanus luteolus*). Modified from U.S. Fish & Wildlife Service (2013). **Current Breeding Range* is defined as the areas where reproductively active adult female bears have been documented.

CHAPTER 2: BIOLOGICAL BACKGROUND

Species Description

The black bear is a large bulky mammal with long black hair and a short, well-haired tail. Their facial profile is blunt with small eyes and a broad nose pad with large nostrils. They have five toes with short curved claws on the front and hind feet. Pelage color of black bears varies between black, blonde, cinnamon, and brown. In Louisiana, bears have only been documented as black. Some individuals may also have a white or blonde chest blaze. Similar to other bear species and humans, black bears have a plantigrade walking pattern, placing their heel down first. While classified as carnivores based on tooth and skeletal structure, black bears are omnivorous in diet and ecological role. The median estimated weights of male and female Louisiana black bears are 133 kg and 67 kg, respectively (Weaver 1999). Weight varies throughout bear range and is influenced by habitat quality and distribution, intraspecific competition, and availability of food resources.

Subspecies Description

The Louisiana black bear was originally distinguished from other black bear subspecies based on physiological characteristics, including its appearance and skull morphology (Griffith 1821). Nowak (1986) described the Louisiana black bear as having a longer, narrower, and flatter skull when compared to other subspecies of the American black bear. Further analysis by Kennedy (1989) determined sufficient differentiation in skull morphology occurred that warranted recognition as a distinct subspecies. Hall (1981) identified the Louisiana black bear as one of three subspecies in the southeastern United States. Additionally, Pelton (1989) identified *U. a. luteolus* as a distinct subspecies based on blood protein electrophoresis, mitochondrial DNA, and skull characteristics. Finally, the USFWS determined that the morphological

distinctness found in Louisiana bears qualified them for listing as a distinct subspecies (Neal 1992).

Much debate has occurred over the recognition of Louisiana black bears as a distinct subspecies since federal protection was granted. Csiki et al. (2003) posited the minimal genetic differentiations observed between Louisiana black bears and bears in southern Arkansas were not substantial enough to warrant subspecies recognition, which was further supported by Kennedy (2006). Additionally, Triant et al. (2004) suggested Minnesota bear genetics persisted in the Upper Atchafalaya subpopulation following the 1960s translocation of bears from Minnesota. In contrast, van Den Bussche et al. (2009) determined the genetics of Louisiana bears had been minimally affected by the augmentation of bears sourced from Minnesota. However, Laufenberg and Clark (2014) discovered that a small percentage of bears in both the Upper Atchafalaya and repatriated subpopulations retained Minnesota genetics. Nonetheless, USFWS maintained the recognition of bears in Louisiana as a distinct subspecies following formal review (U.S. Fish & Wildlife Service 2013).

Louisiana Black Bear Biology

Black bears, in general, are forest obligates that require the dense cover and diversity of food resources that diverse, healthy forests provide (Pelton 2003). Black bear activity revolves primarily around the search for food, water, cover, and potential mates (Pelton 2003). Food quantity and quality are perhaps the most important drivers of black bear demographics and activity. Although classified as carnivores, black bears are best described as opportunistic omnivores because they eat almost anything that is available, including vegetation, berries, insects, and nuts that naturally occur in forests and other productive ecosystems (Pelton 2003). Due to their high nutritional demands and reliance on seasonal food resources, black bear

population dynamics and demographics are largely influenced by nutrition. For example, population growth rate, age of primiparity, litter size, reproductive rates, and survival of black bears may be influenced by nutritional quality to an extent (Pelton 2003).

Reproduction

Black bear breeding typically occurs during summer (May–August) and bears are highly polygamous (Pelton 2003). Age of primiparity for adult females is generally 2 to 3 years of age, whereas males typically do not reach reproductive maturity until 3 to 4 years of age (Pelton 2001, 2003). During autumn (September–November), black bears enter a period of hyperphagia, often quadrupling their caloric intake to create a fat reserve in preparation for winter when food is scarce. Acquiring sufficient fat reserves prior to winter is important, especially for prospective pregnant females that will have greater nutritional demands placed on them to raise cubs. As a result, female bears exhibit delayed implantation of the blastocyst to the uterine wall so that no nutritional loss results from fetal development until winter dormancy. When poor nutrition results in lower body mass and decreased fat reserves, the blastocyst may not implant, or if fetal development has already begun, natural abortion of the neonates may occur to allow survival of the adult female (Hellgren 1998).

Black bears do not truly hibernate, but instead go through a dormancy period termed "carnivoran lethargy" (i.e., a prolonged period of torpor enabling bears to survive food shortages and adverse climatic conditions [Rogers 1987]) during winter (December–March). During winter dormancy, bears exhibit a drop in body temperature, a 50% decrease in metabolism, and a reduced heart rate. Additionally, dormant bears may not eat, drink, urinate, or defecate (Hellgren 1998). At southern latitudes with warmer climates, where some natural foods are available during winter months, such as Louisiana, some male bears may remain active throughout winter

(Graber 1990, Wagner 1995). However, pregnant female bears give birth to cubs in their winter natal dens only, forcing this segment of the population to den during winter regardless of food availability or climatic conditions (Pelton 2003).

In Louisiana, bears den in heavy cover or tree cavities during winter and den selection is often associated with habitat type and proximity to water (Weaver 1999, Crook and Chamberlain 2010). Louisiana black bears enter dens between November and early January, depending on latitude, food availability, gender, age, reproductive status, and climatic conditions (Weaver 1990, Hightower et al. 2002). Adult female bears that are expected to give birth to cubs generally enter dens first, followed by adult females with yearlings, female subadults, male subadults, and finally adult males (Pelton 2003). The average litter size for Louisiana black bears is 2 (Laufenberg 2014), although litters consisting of 3–5 cubs have been documented (M. Davidson, LDWF, unpublished data). At the end of the dormancy period (March–April), females with cubs are usually the last to leave the den. Cubs will den with their mother the following winter as yearlings and remain with their mother until they reach 15 to 18 months of age (Pelton 2003).

Habitat Use and Home Range

Similar to other black bears, the Louisiana black bear is a habitat generalist (Weaver 1999, Pelton 2003). Habitat use varies seasonally and is often associated with food availability. Numerous habitat types may be utilized in Louisiana, including upland forests, bottomland hardwood forests, forested spoil areas along bayous, brackish and freshwater marsh, salt domes, and agricultural fields (Nyland 1995, Weaver 1999). Bottomland hardwood forests with a high tree species diversity and age class diversity appear to be the preferred habitat type of Louisiana black bears throughout their current range in the MAV (Gosselink and Lee 1987, U.S. Fish &

Wildlife Service 2009). Large cavity trees, typically bald cypress (*Taxodium distichum*) and tupelo gum (*Nyssa sylvatica*), commonly found along water courses, swamps, and bottomland hardwood forests, are the most selected for tree dens and are protected under federal law (Neal 1992). Additionally, USFWS designated approximately 1.2 million acres of lands in the MAV as critical habitat for the Louisiana black bear (U.S. Fish & Wildlife Service 2009).

Home ranges of Louisiana black bears vary annually and seasonally, and configuration appears to be influenced by available forest cover, food resources, and locations of prospective mates (Marchinton 1995). Female home range is typically determined by habitat quality (Amstrup and Beecham 1976), whereas male home range size may be influenced by the distribution of females (i.e., to allow for a male's efficient monitoring of a maximum number of females [Rogers 1987]) and food availability. In Louisiana, adult female bear home ranges vary from 15.8 km^2 to 32.4 km^2, whereas adult male bear home ranges vary from 42.4 km^2 to 323.7 km^2 (Wagner 1995, Weaver 1999). Adult females without cubs typically have larger home ranges than female bears with newborn cubs (Benson 2005).

The discrepancy in bear home range size between genders is likely due to differing nutritional requirements and the mother-offspring relationships between genders. For example, female black bears are philopatric, thus following family dissolution, female offspring commonly establish a home range partially within or adjacent to their mother's home range (Pelton 2003). Dispersal by female black bears is uncommon and is typically a short distance in comparison to movements made by male bears (Rogers 1987, Pelton 2003). Although female dispersal is rare, Noyce and Garshelis (2011) documented a relatively long dispersal event (>41 km) by a single female bear in Minnesota during 1981–1990. Noyce and Garshelis (2011) concluded that female dispersal events may be more likely in areas with little to no topographic

relief, which may force bears to travel farther and more often to meet their resource requirements. Similar movements by translocated female bears in Louisiana have been documented (Benson and Chamberlain 2006), but such movements have generally been considered homing attempts. To date, no dispersal events by non-translocated female Louisiana black bears are known to have occurred.

In contrast, young males generally disperse from their maternal home range and can travel >219 km (Rogers 1987). Changes in food resources, intraspecific competition, and availability of prospective mates can provide the stimulus for extensive movements by male bears (Pelton 2003). Additionally, older males exert social pressure on younger bears, especially during the summer breeding season, forcing young bears to disperse to other areas during summer and autumn (Pelton 2003). Male bears may occasionally go on longer than average forays, which was demonstrated by a Florida black bear (*Ursus americanus floridanus*) that traveled more than 500 km from Eglin Air Force Base, Florida, to Baton Rouge, Louisiana, during 1996 (Stratman et al. 2001).

Food Habits

In general, black bear diets vary seasonally and primarily include succulent vegetation during spring, fruits and grains during summer, and hard mast (e.g., acorns and pecans) during autumn (Pelton 2003). As forest obligates and omnivorous opportunists, black bears forage in all levels of the forest, gathering foods from tree tops and vines in the overstory, eating soft mast from bushes and shrubs in the mid- and understory, and relying on fallen hard mast and grubbing in fallen logs for insects on the forest floor. Specific food selection varies within and among black bear populations throughout North America and is influenced by climatic conditions, latitude, habitat type, vegetation, and available resources (Pelton 2003).

In Louisiana, black bears rely heavily on species of the genus *Rubus* (e.g., blackberries and dewberries) and other soft mast during spring and early summer, depending on species ripening times (Benson and Chamberlain 2006). For example, pokeberry (*Phytolacca americana*) was the most often consumed soft mast during summer months in the Tensas River Basin subpopulation, comprising more than 44% of bear diets. During late summer, Louisiana black bears still forage on berries, but anthropogenic crop resources may become an important food item during this time (Anderson 1997). A study by Benson and Chamberlain (2006) in the Tensas River Basin suggested that corn (*Zea mays*), a non-native agricultural crop species, comprised the majority of bear diets during late summer (33.3%) and early autumn (30.6%). Hard mast species, such as oaks (*Quercus spp*.) and hickories (*Carya spp*.) comprise the majority of late autumn bear diets in Louisiana, followed closely by palmetto fruit (*Sabal minor*) and corn. During winter, few foods are available from dormant mast-producing plant and tree species. As a result, bears that are active during winter consume primarily grass and herbaceous vegetation, but also scavenge for leftover acorns and pecans (Benson and Chamberlain 2006).

Among all available food items in Louisiana, Benson and Chamberlain (2006) identified beetles and other insects as the most frequently sought food resource throughout all seasons by black bears. Also, Benson and Chamberlain (2006) identified animal carrion from wild hogs (*Sus scrofa*) and white-tailed deer (*Odocoileous virginianus*) in autumn bear scats in the Tensas River Basin subpopulation. Benson and Chamberlain (2006) suggested bears scavenged on leftover remains and carcasses of animals harvested by hunters or killed in vehicular collisions on roadways, which has been documented in other southeastern black bear populations (Hellgren and Vaughan 1988). Finally, colonial species, such as honey bees (*Apis mellifera*) and their nests are often consumed by bears living at southern latitudes (Maehr and Brady 1984).

Mortality

Bears are susceptible to disease, cannibalism, drowning, maternal abandonment of cubs, and climbing accidents. Beyond age 2, the leading cause of mortality for black bears is typically human-related (LeConte 1987). This appears to be the case in Louisiana. Due to extensive anthropogenic landscape modifications, including deforestation, habitat fragmentation, and roadways, much of the historic black bear habitat in Louisiana has been degraded. Although reforestation and land acquisition has occurred in recent decades to enhance and protect available bear habitat in Louisiana, large, contiguous areas of suitable habitat are unavailable in many historically occupied areas of the state. As a result, bears often cross roads or travel through residential areas to access remnant disjunct habitat patches, leaving them vulnerable to anthropogenic causes of mortality.

Since protected under the Endangered Species Act in 1992, at least 246 black bears have been killed in vehicular collisions on Louisiana's roadways, making bear-vehicle collisions the number one cause of bear mortality in the state (U.S. Geological Survey et al. 2014). Although Louisiana black bears have been protected by state and federal laws since 1992, poaching has remained a concerning cause of mortality despite the associated hefty fines and legal penalties. Since 1992, at least 33 documented poaching incidents have occurred, but the true extent of such occurrences remains unknown. Finally, due to urban encroachment and habitat fragmentation, as well as the growth of bear subpopulations, the availability of anthropogenic food sources to bears has increased in recent decades. As a result, LDWF personnel have euthanized 15 black bears since 1992 due to conditioning to anthropogenic food sources and subsequent human habituation. In total, approximately 300 individual Louisiana black bears are known to have been killed as a result of anthropogenic conflicts since federal protection was granted to the

subspecies (U.S. Geological Survey et al. 2014). This represents an average of approximately 13 bears annually that have succumbed to anthropogenic causes of mortality since 1992.

Ecological Significance of Bears

Black bears play an important ecological role as umbrella species (Caro and O'Doherty 1999, Roberge and Angelstam 2004), having habitat and landscape requirements that encompass habitats and microhabitats of numerous other wildlife and plant species, including threatened and endangered flora and fauna (Maehr et al. 2001). Because bears are wide-ranging, have large home range sizes, and utilize a diversity of habitats, conservation of bears ultimately may result in the conservation of many other native plant and animal species (Maehr et al. 2001). Similar to Florida black bears (*Ursus americanus floridanus*) and brown bears (*Ursus arctos*) in the northwest, the Louisiana black bear may also be considered a flagship species because of its prominence in wildlife conservation (Caro and O'Doherty 1999). The subspecies is often cited as justification for land protection in Louisiana and surrounding states, making it an instrumental landscape-scale conservation icon. For example, Bayou Teche National Wildlife Refuge (NWR) is the only NWR in North America that was established specifically for bears, and in turn protection of this land benefits numerous other wildlife species. Additionally, as forest obligates, black bears may also be considered indicator species (Caro and O'Doherty 1999), their presence being a positive signal of forest and ecosystem quality and health (Maehr et al. 2001, Pelton 2001). For instance, black bears are excellent seed distributors due to their diet and extensive movements, which may promote the range expansion/recolonization of native plant and tree species (Maehr 1984, Auger et al. 2002).

Land Use and Bears

Native Americans likely had a significant impact on landscape changes in the southeastern United States. For example, Native Americans routinely cleared forests for agriculture and utilized prescribed fire for hunting and security from neighboring tribes (Komarek 1981). Although the true size of the Louisiana black bear population prior to European colonization is unknown, the population is assumed to have been quite large, based on historical records of bear occurrences (Kopman 1921, St. Amant 1959, Nowak 1986, Trani et al. 2007). Large-scale landscape alterations occurred following European settlement of Louisiana. Early Europeans deforested much of the existing Louisiana black bear range for agricultural practices, substantially reducing bear habitat (DeGraaf and Miller 1996). During the late 18th century, more forested lands were cleared to supply a high demand for wood products for ship building, dwellings, tools, and other uses. Additionally, bears were harvested for meat and hides, and to reduce a perceived threat to livestock (St. Amant 1959). Due to human population growth and expansion in Louisiana during the mid-20th century, as well as continued unregulated bear harvests, the bear population was further reduced in number and distribution, reaching historic lows by the late 1950s.

During the latter half of the 20th century, considerable efforts occurred to restore bears in Louisiana, including an augmentation using bears from Minnesota. However, few efforts focused on habitat restoration in the denuded Louisiana MAV landscape. As such, when the Louisiana black bear was granted federal protection in 1992, habitat restoration was identified as the primary component to subspecies recovery (Neal 1992). Since 1992, more than 834,000 acres of suitable bear habitat have been acquired, protected, and/or restored, aiding recovery of the subspecies. Furthermore, forests were allowed to regenerate or were restored on private

lands in Louisiana, which provided additional bear habitat. Collectively, these occurrences facilitated recolonization of portions of Louisiana black bear historic range and allowed bear numbers to increase within recent decades.

CHAPTER 3: CONSERVATION

Post-Delisting Monitoring Plan

Although the Louisiana black bear remains a state and federally protected subspecies, in the event that the bear is removed from protection under the Endangered Species Act of 1973 in the future, a post-delisting monitoring plan (U.S. Fish & Wildlife Service 2008) will be developed by USFWS and LDWF in coordination with United States Geological Survey (USGS) to monitor temporal and spatial trends of bear subpopulations and their respective habitats. The purpose of a post-delisting monitoring plan is to "monitor the species to ensure the status does not deteriorate, and if a substantial decline in the species (numbers of individuals or populations) or an increase in threats is detected, to take measures to halt the decline so that re-proposing it as a threatened or endangered species is not needed" (U.S. Fish & Wildlife Service 2008). As such, if delisting occurs, all conservation goals and strategies outlined in the prospective Louisiana Black Bear Post-Delisting Monitoring Plan will be adopted and employed by LDWF for a minimum of 7 years following delisting (U.S. Fish & Wildlife Service 2008), and are subject to change in accordance with USFWS and USGS direction if needed.

LDWF Bear Conservation Goal and Strategies

Conservation of large carnivores can be difficult due to the inherent biological and behavioral traits of these species. In general, large carnivores are cryptic, exhibit wide-ranging movements, and inhabit landscapes at low densities. Consequently, acquiring accurate and precise demographic estimates that are necessary for conservation and management strategies often require multi-year data collection and scientific studies that span decades. Furthermore, because large carnivores require vast areas of suitable habitat, habitat conservation and management must occur at a broad landscape scale.

The overall goal of LDWF for conservation of the Louisiana black bear is to: *Maintain a sustainable black bear population in suitable habitat for the benefit of the species and Louisianans*. Therefore, we will utilize a landscape scale metapopulation conservation approach for the Louisiana black bear (Hanski and Simberloff 1997, Maehr et al. 2001, Florida Fish and Wildlife Conservation Commission 2012). A metapopulation, by definition, is discontinuous and comprised of multiple subpopulations that are distributed over spatially disjunct patches of suitable habitat, separated by patches of unsuitable habitat (McCullough 1996). Because the Louisiana landscape has been fragmented by agriculture and urban development, the current distribution of Louisiana black bears conforms to this metapopulation definition. In contrast to continuous populations, discontinuous metapopulations require some level of connectivity between individual subpopulations to mitigate the risk of extinction of any individual subpopulation. The persistence of a metapopulation relies primarily on the dynamic between local extinction and recolonization rates. Therefore, a metapopulation will likely persist if the recolonization rate exceeds the rate of extinction (McCullough 1996). Because bears are capable of long-range movements via dispersal (Schwartz and Franzmann 1992), connectivity between subpopulations can be established, and if subpopulation growth rates are positive, recolonization rates that exceed extinction rates will likely promote metapopulation persistence. To date, some movement has been documented between 3 of the 4 Louisiana black bear subpopulations, all of which had positive growth rates as of 2012 (Laufenberg and Clark 2014).

To meet the criteria for our approach to black bear conservation, 2 strategies based on the guidelines for recovery were developed by LDWF in coordination with USFWS and USGS. The first, subpopulation conservation, is the responsibility of LDWF, with direction provided by USFWS. The second, habitat conservation, is the responsibility of LDWF and many partners

(e.g., USFWS, Natural Resource Conservation Service [NRCS], and Army Corps of Engineers [COE]).

1. Population Conservation – Existing black bear subpopulations in Louisiana will be monitored within a greater metapopulation framework to evaluate continued persistence and range expansion, as well as connectivity and gene flow between subpopulations.
2. Habitat Conservation – Current protected black bear habitat will continue to be managed to support black bears, and additional bear habitat areas will be identified for potential enhancement to further improve connectivity between subpopulations on the landscape and promote bear range expansion.

Population Status and Conservation

Currently, breeding subpopulations occur in four core areas within Louisiana, which collectively comprise the greater population of Louisiana black bears within the HRPA (Fig. 3.1). The Tensas River Basin subpopulation (hereafter referred to as TRB) is centered at Tensas River NWR and extends to Buckhorn and Big Lake Wildlife Management Areas (WMAs) and surrounding private lands in Tensas, Madison, Franklin, Richland, and East Carroll Parishes. The repatriated subpopulation (hereafter referred to as REPAT) is located at Richard K. Yancey, Grassy Lake, Pomme de Terre, and Spring Bayou WMAs, Lake Ophelia and Bayou Cocodrie NWRs, and surrounding private lands in Concordia, Avoyelles, and Catahoula Parishes. The Upper Atchafalaya River Basin subpopulation (hereafter referred to as UARB) is located primarily on private lands within the Morganza Spillway in Pointe Coupee Parish and extends into St. Landry and extreme southern Avoyelles Parishes. The Lower Atchafalaya River Basin subpopulation (hereafter referred to as LARB) is located on private and federally managed lands

(e.g., Bayou Teche NWR) within the coastal area of Louisiana in St. Mary, Iberia, and Vermillion Parishes. Confirmed bear sightings, conflict complaints, live-captures, and road kills have been reported in additional Louisiana parishes outside of these 4 core areas (Fig. 3.2), suggesting some range expansion has occurred. However, known breeding range still remains primarily confined to the MAV (Fig. 3.2). Nonetheless, conservation and management strategies specified in the LBBMP apply to core breeding areas, peripheral areas where bear presence has been documented, and additional areas as they become recolonized should future need arise.

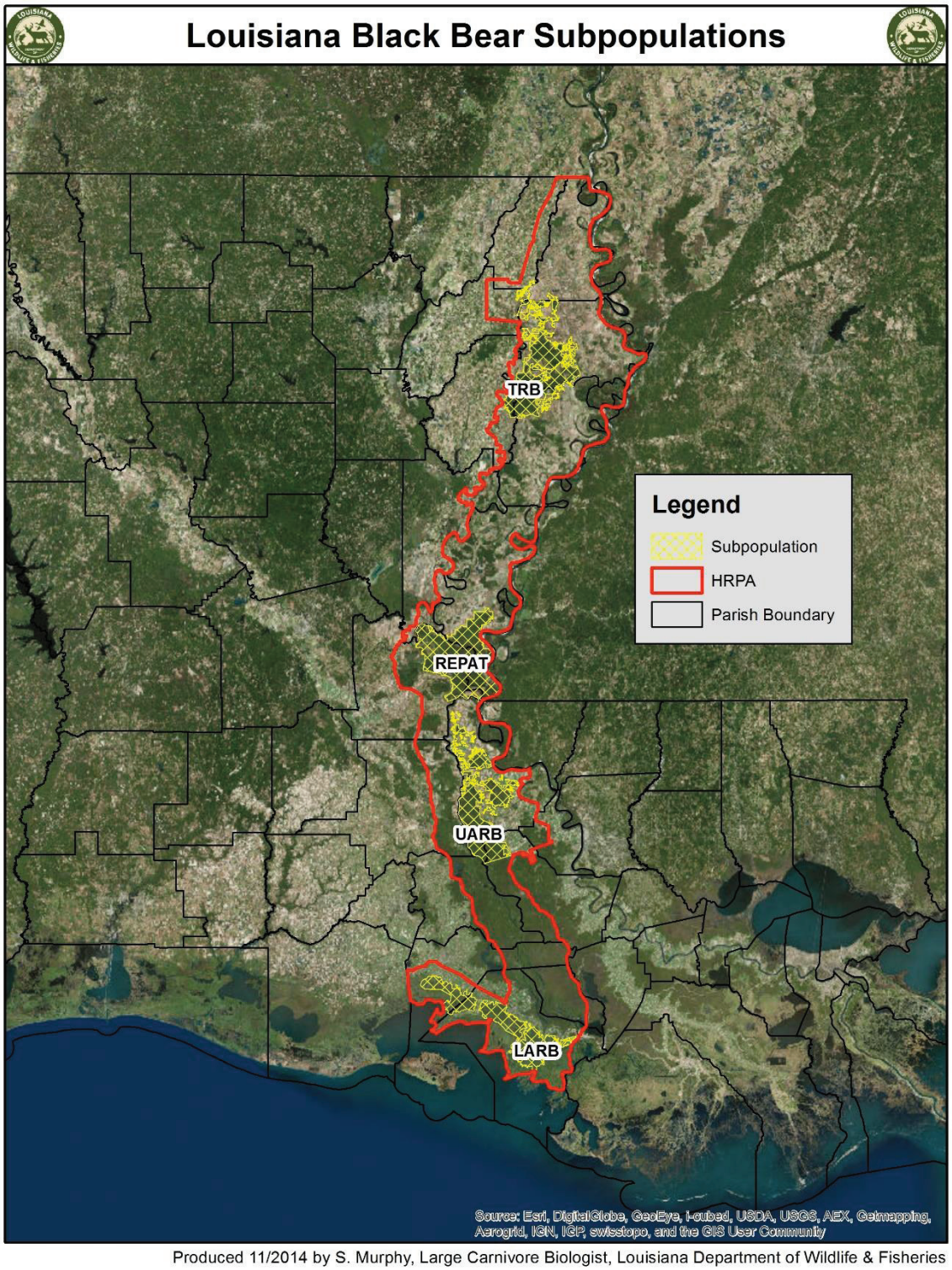

Figure 3.1. Locations of extant Louisiana black bear subpopulations in Louisiana, USA (2014).

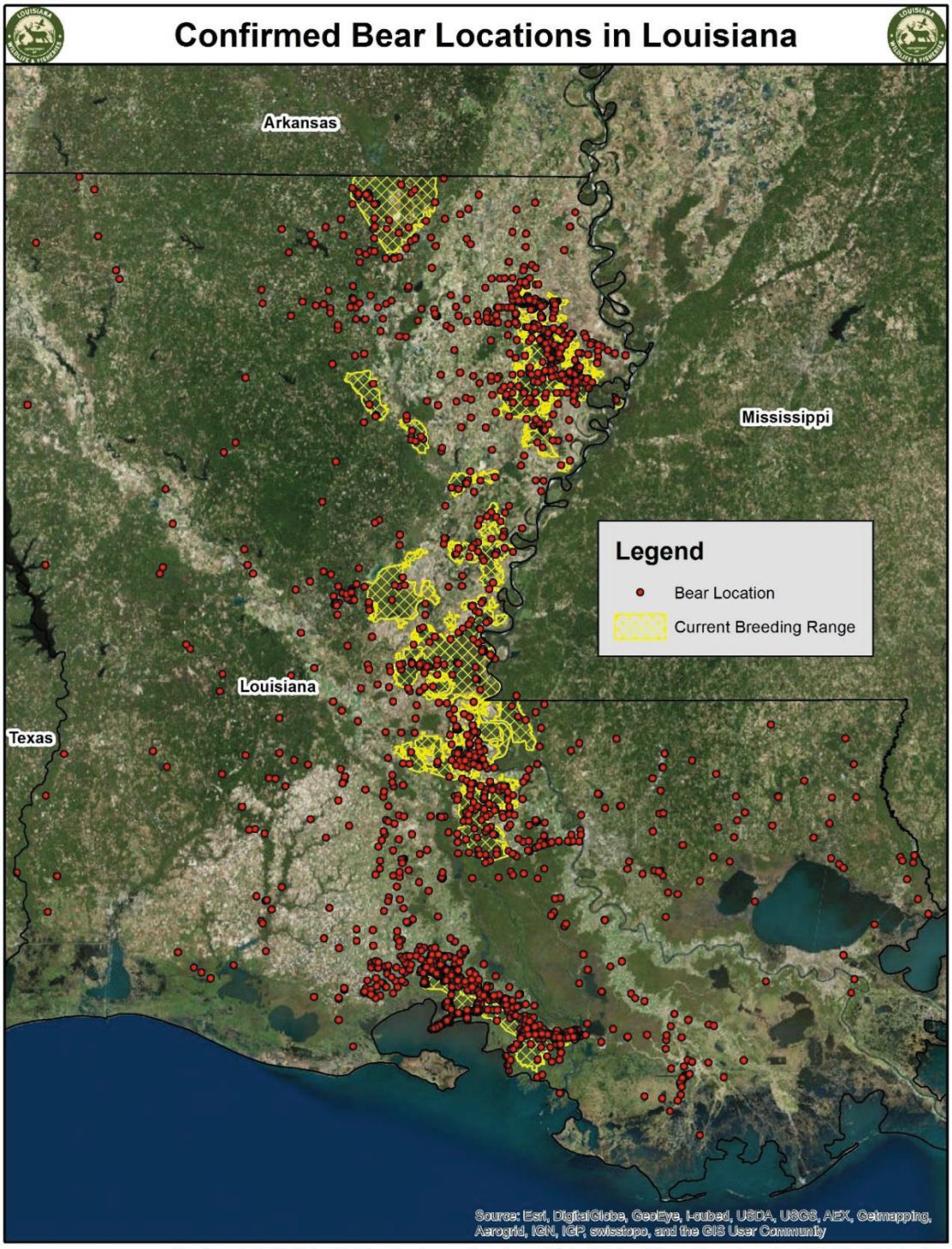

Figure 3.2. Locations of Louisiana black bear live-captures, known natal dens, and confirmed sightings and reports in Louisiana, USA (1992–2014).

Status of Individual Subpopulations

Tensas River Basin Subpopulation (TRB)

Multiple studies have been conducted to estimate abundance, density, and the genetic composition of the TRB subpopulation. Beausoleil (1999) estimated 34 bears (95% CI: 5–44) resided on private lands north of U.S. Interstate-20, and Boersen et al. (2003) estimated 119 bears (SE = 29.4) on the Tensas River NWR portion of the TRB. Hooker (2010) estimated a combined abundance (i.e. males and females) of 294 bears (SE = 31) at a density of 0.66 bears/km^2 (SE = 0.07) for a study area that included lands located on the Tensas River NWR, Buckhorn and Big Lake WMAs, and 4 privately owned forested tracts north of U.S. Interstate-20. More recently, Laufenberg and Clark (2014) estimated the number of females in that same study area varied between 133 and 165 during 2006–2012. Because those studies did not include all existing private lands in the TRB inhabited by resident bears, bear abundance for the entire TRB is likely higher than estimated. Furthermore, range expansion of the TRB subpopulation into west-central Mississippi has been documented (Young 2006, Laufenberg and Clark 2014), suggesting the subpopulation may be larger than current empirical estimates indicate.

Nonetheless, the TRB is the largest subpopulation of Louisiana black bears and has a positive annual growth rate (1.02–1.04; Laufenberg and Clark 2014). Hooker (2010) estimated annual apparent survival (φ; i.e., true survival minus permanent emigration) of male and female TRB bears at 0.91 (95% CI = 0.62–0.98), and more recently Laufenberg and Clark (2014) estimated annual adult female survival was very high ($S \geq 0.97$). Additionally, annual female fecundity (0.47) was average compared to other black bear populations in the southeastern United States, and annual per-capita female recruitment was moderate, ranging from 0.00 to 0.22 during the study period (Laufenberg and Clark 2014). Laufenberg and Clark (2014) estimated

the probability of persistence of the TRB subpopulation over the next 100 years was ≥ 95.8% given current levels of abundance, population growth, survival, mortality, and recruitment, while also considering potential demographic and environmental stochasticity and parameter uncertainty.

Genetic analyses by Boersen et al. (2003) indicated genetic diversity in the TRB was low (H_o = 0.47) and that the effective population size was low (N_E = 32) compared to the estimated abundance (N = 119; SE = 29.4). Hooker (2010) also suggested genetic diversity at TRB was low (H_o = 0.47; SE = 0.04) and had not changed during the 10-year period following the study by Boersen et al. (2003). Results from these studies suggested the TRB subpopulation may have been demographically isolated from other regional bear subpopulations due to landscape alterations and habitat fragmentation. However, more recent analyses by Laufenberg (2014) using a larger dataset indicated improved genetic diversity (H_o = 0.50, H_E = 0.50), likely due to a recent influx of bears into TRB from White River NWR in Arkansas (Laufenberg and Clark 2014). For example, nearly 30 individual bears sampled in the TRB by Laufenberg and Clark (2014) were comprised of an admixture of genetic material from TRB and White River NWR, and 3 male bears in TRB were identified as migrants from the White River NWR subpopulation. Additionally, 1 male bear at TRB was identified as having mixed ancestry with UARB. Laufenberg and Clark (2014) also discovered 6 bears in northwestern Mississippi that had mixed ancestry between TRB and White River NWR. These data indicate connectivity has been established between bears at TRB and White River NWR, that range expansion and genetic admixture has occurred in western Mississippi and northeast Louisiana, and that movement corridors likely exist between REPAT and TRB and between the TRB and White River NWR.

Repatriated Subpopulation (REPAT)

From 2001 to 2009, adult female bears with cubs were translocated to the REPAT in east-central Louisiana to establish a breeding subpopulation in the area and promote range expansion, gene flow, and connectivity between the TRB and UARB subpopulations (Benson and Chamberlain 2007, Savoie 2007, Laufenberg and Clark 2014). A total of 48 adult female bears with 104 cubs were translocated from the TRB subpopulation to REPAT during winters 2001–2009. Of these 48 adult females, 31 stayed at REPAT, 13 dispersed from REPAT or exhibited attempted homing, 7 died or had unknown fates, and 7 abandoned their respective litters (Laufenberg 2014). Two additional adult female bears were translocated from the LARB to REPAT during winter 2014. One of these females remained at REPAT and raised cubs and the other settled in southwestern Mississippi approximately 20 km east of REPAT (M. Davidson and S. Murphy, LDWF, unpublished data).

Results from Laufenberg and Clark (2014) indicated gene flow has occurred between REPAT and UARB and between REPAT and TRB, which demonstrated movement corridors likely exist between those subpopulations. Laufenberg and Clark (2014) also estimated adult female survival of bears in the REPAT at 0.93–0.97, female fecundity was 0.37, and the population growth rate was ≥0.99. However, the probability of persistence over the next 100 years estimated by Laufenberg and Clark (2014) ranged from 0.295 to >0.99, depending on model assumptions. This may have been due to data limitations, and may be improved by further research. Abundance and genetic composition for the REPAT are currently unknown. However, REPAT is currently the most genetically diverse extant Louisiana black bear subpopulation (H_o = 0.69, H_E = 0.63 [Laufenberg 2014]). Furthermore, REPAT likely functions as a stepping-stone between UARB and TRB (Laufenberg and Clark 2014); a postulation further

supported by direct evidence of a subadult male bear, born in the Morganza Spillway at UARB during 2012, that was live-captured 30-km north of REPAT and 48-km south of TRB during summer 2014 (S. Murphy, LDWF, unpublished data).

Upper Atchafalaya River Basin Subpopulation (UARB)

Nowak (1986) posited that bear numbers in the UARB were very low prior to the 1960s. During 1964–1967, LDWF translocated 130 bears to the UARB from Minnesota in an attempt to increase bear numbers in the area (Taylor 1971). However, by the late 1980s, Pelton (1989) suggested only 30 to 50 bears resided in the area. Triant et al. (2004) estimated 41 (95% CI = 35–47) bears comprised the UARB subpopulation by 1999, but more recently O'Connell-Goode et al. (2014) estimated 63 (SE = 5.20) bears were in the UARB subpopulation. Laufenberg and Clark (2014) estimated 25–44 female bears resided in the UARB and annual growth rates (λ) ranging from 0.90 to 1.30. Additionally, Laufenberg and Clark (2014) estimated annual female apparent survival at 0.84–0.90 and annual female per-capita recruitment was 0.00–0.40. Finally, Laufenberg and Clark (2014) estimated the probability of persistence over the next 100 years for the UARB subpopulation was between 0.849 and >0.999, depending on population model assumptions, indicating the long-term viability of the subpopulation is less certain compared with the TRB, but better than REPAT.

Questions have arisen in recent decades regarding the genetic composition of bears at UARB, primarily whether or not Minnesota genotypes remained present after the 1960s augmentation (Smith and Clark 1994, Miller et al. 1998, Clark et al. 2002, Triant et al. 2004). Genetic analyses by Laufenberg (2014) indicated genetic diversity in the UARB is the second highest of all existing Louisiana black bear subpopulations (H_o = 0.64, H_E = 0.63) and comparable to other genetically healthy black bear populations in the southeastern United States.

Triant et al. (2004) alluded that Minnesota genetics persisted in the UARB more than 30 years following augmentation. Further analyses by Laufenberg and Clark (2014) using program STRUCTURE (Pritchard et al. 2000) at K = 5 subpopulations indicated genetic similarities may remain between bears from Minnesota and UARB (Fig. 3.3). As such, fitness of the UARB may be relatively high because the presence of alleles from Minnesota bears may promote resistance to diseases and environmental stochasticity (Hartl 2000), thereby increasing the likelihood of subpopulation persistence.

Lower Atchafalaya River Basin Subpopulation (LARB)

Prior to Endangered Species Act listing, Nowak (1986) posited 30 bears comprised the LARB, indicating the LARB was the smallest remaining subpopulation of the Louisiana black bear at the time. Triant et al. (2004) estimated the LARB consisted of 77 (95% CI = 68–86) bears by 1999. More recently, Troxler (2013) estimated 138 (SE = 9.9; 95% CI = 118.9–157.9) bears inhabited the LARB at a density of 0.35 bears/km^2 (SE = 0.02; 95% CI = 0.30–0.41) with a positive annual growth rate (λ=1.08; SE = 0.04; 95% CI = 1.02–1.18). Additionally, Laufenberg and Clark (2014) estimated 68–84 adult females were in the LARB with annual per-capita recruitment as high as 0.31. Laufenberg and Clark (2014) also estimated annual female apparent survival ranged from 0.81 to 0.84, indicating survival of bears in this subpopulation are the lowest in Louisiana and lower than other non-hunted bear populations in the southeastern United States. A possible explanation for lower survival is greater levels of mortality in the LARB compared to other subpopulations in Louisiana due to vehicular collisions, poaching, and euthanasia of nuisance individuals; levels of mortality that are comparable to losses incurred via harvest in hunted black bear populations. For example, Pace et al. (2000) indicated 65% of all bear mortalities in Louisiana occurred in the LARB primarily from vehicular collisions; a trend

that has continued to date (U. S. Geological Survey et al. 2014). Additionally, Troxler (2013) estimated at least 10% of the subpopulation was being lost to vehicular collisions annually, primarily along U.S. Highway 90 and Louisiana Highway 317.

This low estimated annual survival is concerning given the LARB is likely genetically and geographically isolated. Genetic analyses by Troxler (2013) and Laufenberg and Clark (2014) found no immigration into the LARB from other Louisiana black bear subpopulations and relatively low genetic diversity in which expected heterozygosity ($H_E = 0.56$) exceeds observed heterozygosity ($H_o = 0.55$). Furthermore, Troxler (2013) discovered evidence of a previous genetic bottleneck in the LARB as well as intrapopulation genetic differentiation. Genetic structure in the LARB was associated with Louisiana Highway 317, suggesting historic intrapopulation differentiation possibly caused by genetic drift within formerly isolated subpopulations (Troxler 2013). However, genetic exchange has recently occurred across Highway 317, likely in response to increasing abundance and improved habitat quality and quantity, which facilitated recolonization of portions of the LARB historic range (Troxler 2013). Conversely, genetic exchange between the LARB and UARB appears to remain minimal to non-existent, primarily because habitat quality between these 2 subpopulations is poor and U.S. Highway 90 serves as a formidable barrier to bear movement. As a result, the LARB likely remains isolated and, based on genetics analyses, the LARB may be the most genetically distinct subpopulation given some level of genetic mixing has been documented among the other 3 Louisiana black bear subpopulations (Laufenberg and Clark 2014).

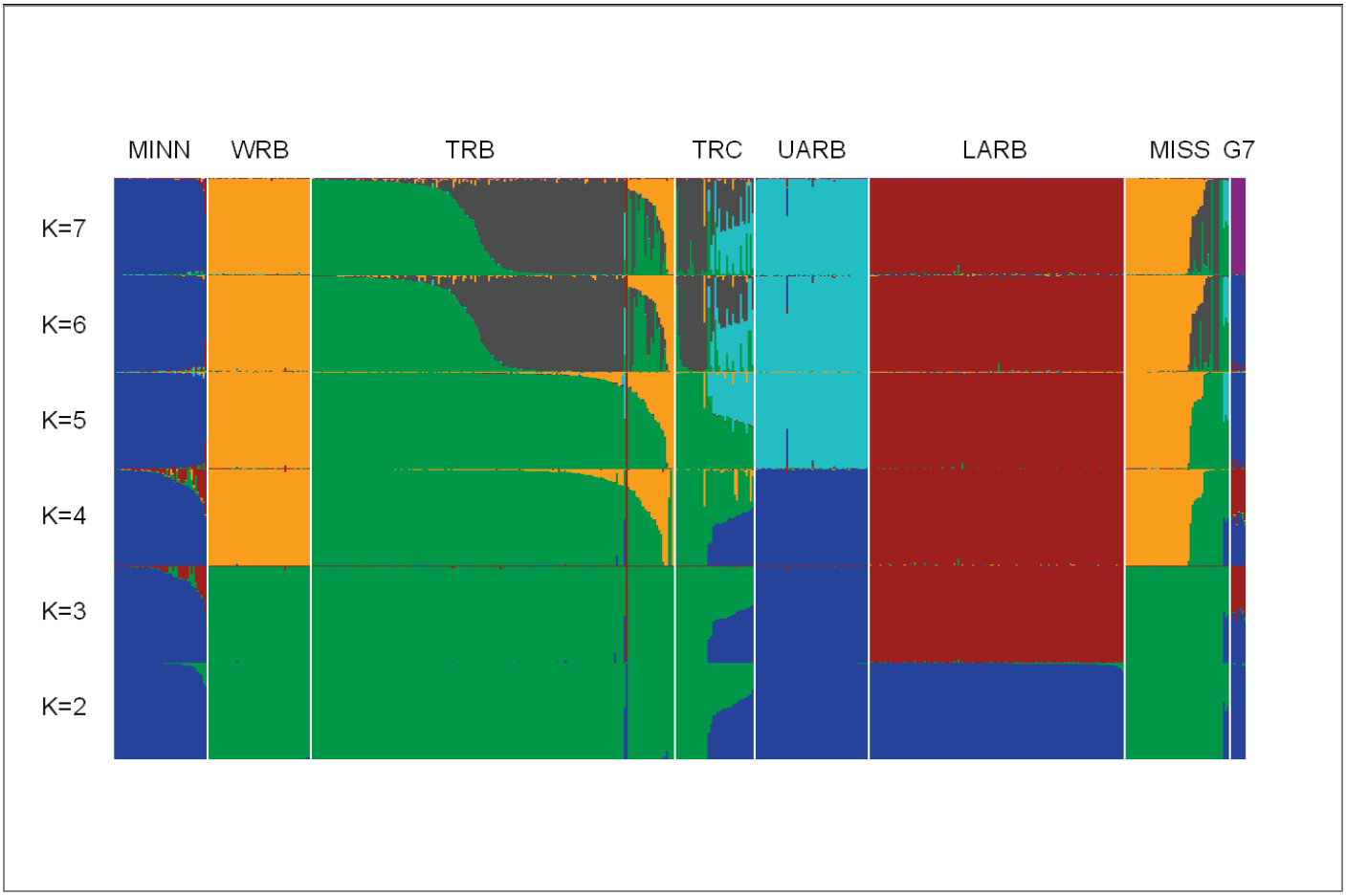

Figure 3.3. Proportional population ancestries for 556 black bears from Minnesota (MINN), western Mississippi (MISS), southeast Mississippi (G7), White River Basin in Arkansas (WRB), and Tensas River Basin (TRB), Repatriated subpopulation (TRC; referred to as REPAT in this management plan), Upper Atchafalaya River Basin (UARB), and Lower Atchafalaya River Basin (LARB) in Louisiana, 2006–12. Ancestries were estimated using models in Program STRUCTURE based on assumed values of K (number of genetic clusters) that ranged from 2 to 11. Modified from Laufenberg and Clark (2014).

LDWF Population Conservation Actions

The LDWF will continue to conduct research projects to monitor demographic and genetic characteristics of the individual subpopulations (Table 3.1). This includes annual non-invasive hair sampling to estimate abundance, rate-of-change, apparent survival, and investigate genetic characteristics. Additionally, annual live-trapping and radio-collaring of bears will occur to monitor changes in survival rates, as well as cause-specific mortality rates. Annual winter bear den checks will also occur to monitor reproductive rates and, combined with family group walk-ins during summer months, will allow monitoring of recruitment rates. Finally, range expansion will be monitored annually using movements of radio-collared bears, confirmed reports of sightings or human-bear conflict instances, and potentially non-invasive hair sampling projects. Collectively, these data will allow LDWF to monitor the status of the greater Louisiana black bear population, thereby affording LDWF the opportunities to make informed conservation and management decisions.

Additionally, to enhance connectivity among extant bear subpopulations and facilitate range expansion into other areas of Louisiana, LDWF may conduct additional repatriation projects in the future. If additional repatriation projects are warranted and deemed beneficial, they would be conducted using methods similar to those used by Benson and Chamberlain (2007) to establish the REPAT subpopulation. Specifically, extant subpopulations would be evaluated to identify where potential founders would be best sourced from based on existing demographic and genetics data and founders would be translocated using the winter soft-release method (Eastridge and Clark 2001).

Table 3.1. Current and future LDWF Louisiana black bear research projects during 2014–2019. Research projects include non-invasive hair snares to estimate demographic and genetic characteristics (A), live-trapping to deploy radio-collars for survival and cause-specific mortality estimation (B), and winter den checks to monitor reproductive vital rates (C).

Subpopulation	**Annual Research Projects**					
	2014	2015	2016	2017	2018	2019
TRB	ABC	ABC	ABC	ABC	ABC	ABC
REPAT	ABC	BC	BC	BC	BC	ABC
UARB	ABC	ABC	ABC	ABC	ABC	ABC
LARB	BC	BC	BC	BC	BC	BC

Habitat Status and Conservation

Habitat loss and fragmentation were identified as the primary hindrances to recovery of the Louisiana black bear when federal protection was granted (Neal 1992). Since listing of the subspecies occurred, 1,195,821 acres of critical habitat were designated (U. S. Fish & Wildlife Service 2009) and >834,000 acres within the HRPA have been acquired by state or federal agencies, placed under conservation easements, or have been enrolled in other land conservation programs (Fig 3.4; Table 3.2; U.S. Fish & Wildlife Service 2013). This represents a substantial increase in protected habitat from the original 227,200 acres that were protected at the time listing occurred for the subspecies (Table 3.2; U.S. Fish & Wildlife Service 2013).

To adhere to the goals of LDWF for the Louisiana black bear, current protected lands will continue to be managed to support resident bears and additional lands will be identified for potential enhancement and protection to increase the distribution of suitable bear habitat in Louisiana. The habitat conservation objective of LDWF is: *To increase habitat quality and quantity, and improve habitat connectivity to support a Louisiana black bear metapopulation*. Habitat conservation actions are unlikely to return bears to their full historic range because some landscape changes are irreversible, but continued improvement is certainly possible.

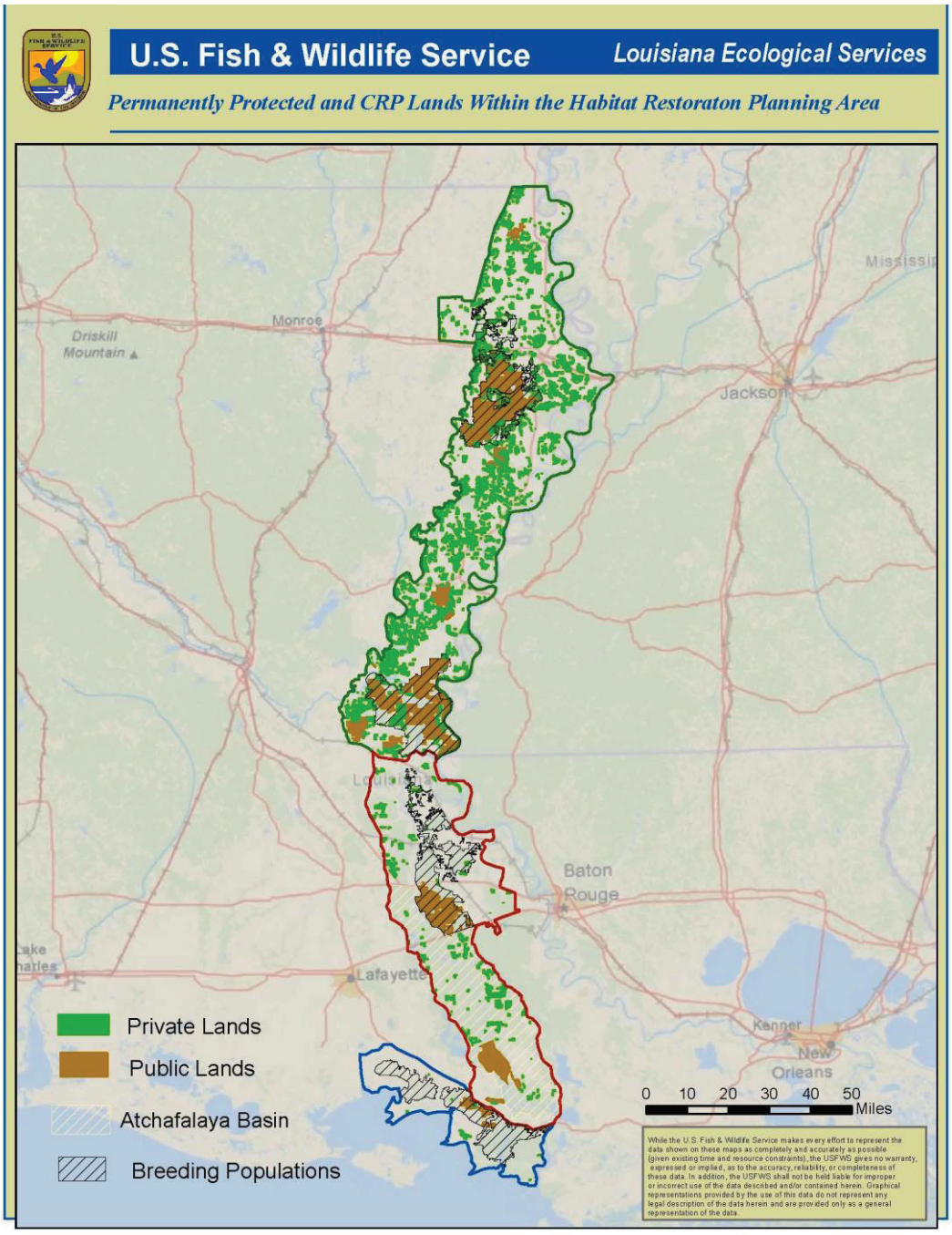

Figure 3.4. Permanently protected and conservation lands* (>834,000 acres) within the Louisiana black bear Habitat Restoration Planning Area (HRPA; U.S. Fish & Wildlife Service 2013). **Conservation Lands* refers to both permanently protected and long-term, but not permanently protected lands (e.g., CRP lands).

Table 3.2. Permanently protected and conservation lands* within the Louisiana black bear Habitat Restoration Planning Area (HRPA) in 1991 and 2014. Modified from U. S. Fish & Wildlife Service (2013). **Conservation Lands* refers to both permanently protected and long-term, but not permanently protected lands (e.g., CRP lands).

Area	**1991**	**2014**	**% of Total Area (2014)**
Tensas River Basin	85,000 ac	564,476 ac	27.47
Upper Atchafalaya River Basin	141,000 ac	257,486 ac	21.44
Lower Atchafalaya River Basin	1,200 ac	12,053 ac	3.29
TOTAL	227,200 ac	834,015 ac	23.03

Under ideal circumstances, all 4 bear subpopulations in Louisiana would be large enough to be independently viable and would be connected by a network of habitat that allows dispersal, immigration, and emigration to occur. Empirical evidence indicates that gene flow has been documented between 3 of the 4 Louisiana subpopulations (i.e., TRB, REPAT, and UARB) and with subpopulations in Arkansas and Mississippi (Laufenberg and Clark 2014). Step analysis predictions by Laufenberg and Clark (2014) indicated dispersal by male bears between the 4 extant Louisiana subpopulations is possible, and direct evidence of movement between UARB and REPAT has been confirmed (S. Murphy, LDWF, unpublished report). However, current levels of habitat fragmentation still challenge conservation efforts. For example, urban development and encroachment, such as in the area surrounding the LARB, has reduced available bear habitat and brought humans and bears into close proximity. Although LDWF intends to manage bears at their biological carrying capacity, management efforts in these areas may be influenced more by the social carrying capacity to mitigate human-bear conflicts. Therefore, to avoid such occurrences, improving habitat quality and quantity in Louisiana is a primary objective for LDWF.

Currently, the HRPA is the area most used by bears in Louisiana (U.S. Fish & Wildlife Service 2013). Although substantial habitat restoration and permanent protection has occurred within the HRPA (Table 3.2), the area remains a fragmented matrix of forested and agricultural lands primarily under private ownership (Fig. 3.4). Potential bear habitat may exist in large quantities on private lands within the HRPA and throughout Louisiana; therefore, LDWF will work with private landowners to encourage land management practices that are beneficial to bears. The LDWF Private Lands Program can provide landowners with technical assistance to

improve and manage habitat, and works to direct landowners to federal land conservation programs.

Ultimately, a variety of successional habitats are necessary for optimal productivity of bear populations in Louisiana, and multiple landowner incentive programs exist that can be used to establish or manage quality bear habitat from short-term agreements to perpetual conservation easements (information available through NRCS and the LDWF Private Lands Program). For instance, both the Conservation Reserve Program (CRP) and the Wetland Reserve Easement (WRE) have been vital to the improvement of bear habitat within the HRPA. As of 2014, CRP lands account for 122,149 acres and WRE lands account for 148,400 acres of protected lands within the HRPA, totaling 270,549 acres; which is more than all of the total protected lands available at the time listing of the Louisiana black bear occurred (Table 3.2). Soil rental payments are provided annually to landowners enrolled in CRP to maintain erodible croplands or pasture in various types of perennial vegetative cover. Participants in CRP receive a cost-share to establish and maintain wildlife habitat for 10–15 years. To date, most CRP lands in the HRPA have been reforested with bottomland hardwood tree species. Additionally, the Louisiana black bear is a priority species for WRE due to a ranking criterion that favors properties near potential bear movement corridors in the HRPA. Perpetual conservation easements are purchased by NRCS and placed in WRE to protect targeted wetlands, which includes farmed and converted wetlands for hydrological and vegetative restoration. Cumulatively, both CRP and WRE have been integral to the restoration of bottomland hardwood forests that were designated as critical habitat for the Louisiana black bear (U.S. Fish & Wildlife Service 2013).

Other beneficial land conservation programs have been developed in recent years. For example, the Environmental Quality Incentives Program (EQIP) provides a cost-share for various conservation practices on an array of lands subjected to multiple uses. Creating riparian forest buffers, forest stand improvements, and early successional habitat management can all be beneficial to bears, and are included as eligible land management practices within EQIP. Many of the forest conservation and management practices that are part of EQIP can be utilized alongside agricultural land use practices; both of which can be beneficial to bears. For instance, creating riparian forest buffers along waterways on the edges of some agricultural crops, such as corn (*Zea mays*), may provide movement corridors as well as additional foods for bears (Benson and Chamberlain 2006). Even some cattle operations that have a matrix of pasture and woodlands can provide critical bear habitat in some areas of Louisiana (Trani and Chapman 2007). Collectively, multiple land conservation programs are available to private landowners in Louisiana that allow habitat restoration for bears while also maintaining individual landowner desires for multi-use property management.

Additionally, multiple land management practices currently in use on public lands in Louisiana provide suitable habitat for bears. Forestry practices, including correctly prescribed timber harvests that allow multiple stages of forest growth to occur simultaneously, can increase habitat diversity for bears (Jones and Pelton 2003). Prescribed fire, for instance, is a forestry practice that has been used in other southeastern states to successfully provide an array of food items and various sources of cover for bears (Maehr et al. 2001), but may not be applicable in some areas of Louisiana due to hydrology. More importantly, a set of recommendations directed solely at improving forested wildlife habitat within the MAV were developed by the Lower Mississippi Valley Joint Venture (LMVJV) Forest Resources Conservation Working Group, and

adopted by LDWF and other state and federal supporting partners (LMVJV 2007). These recommendations were specifically developed for promoting habitat improvement for silvicolous species, such as the Louisiana black bear.

All state, federal, and conservation easement lands that contain forests are managed by the guidelines outlined by LMVJV (2007). These guidelines address forest management practices at both the larger landscape scale and the smaller local scale, and include recommendations for retaining 70 – 95% of the forested area under active silvicultural management to develop a matrix of habitat types (LMVJV 2007). Local, stand-level goals for protected forested lands are to provide a multi-canopy, multi-aged forest with a diversity of stand structure, tree species, and tree diameters. The timing, size, arrangement, and intensity of this stand-level management should ultimately establish forested habitat diversity at the broader landscape scale (LMVJV 2007). Because the Louisiana black bear was identified as an umbrella species for forest management purposes (LMVJV 2007), the guidelines directly address the habitat requirements of the species. For example, the retention of large cavity trees, which provide den sites for Louisiana black bears, was a specified management practice within the LMVJV (2007). Furthermore, increasing tree species diversity and distribution, as well as improving the mid- and understory of managed forests should result in increased food and cover availability to bears (Pelton 2001, Trani and Chapman 2007). As of 2014, 204,830 acres of WMAs and 137,006 acres of NWRs within the MAV were being managed by the LMVJV (2007) guidelines.

CHAPTER 4: MANAGEMENT

As wide-ranging large carnivores, bears pose numerous challenges to successful management within an increasingly human-accessible and dominated landscape. As a result, both the biological needs of bears and the social needs of humans must be considered for bear management in Louisiana. Therefore, to account for these sometimes conflicting needs of both bears and humans, LDWF developed 3 overarching bear management actions. First, education and outreach have often been considered the most important actions an agency can employ to improve bear management (Howe et al. 2010). Therefore, LDWF has been and will continue to provide bear educational materials to the public, host public meetings regarding Louisiana black bear research and management, and provide educators in Louisiana with relevant bear educational materials for teaching purposes. Second, minimizing human-bear conflicts is a necessary component of the successful management of black bears. As both human and bear populations continue to increase in Louisiana, LDWF and qualified partners will continue to take the necessary actions to mitigate human-bear conflicts and provide Louisianans with the needed assistance throughout the state. Third, bear harvests have been utilized throughout North America as effective actions to regulate bear populations and improve the social tolerances of bears. If, in the future, the Louisiana black bear is delisted from the Endangered Species Act of 1973, bear harvests may be considered as a management action. By doing so, LDWF hopes to provide Louisianans with a valuable game species while also improving support for bear persistence. However, population sustainability is a priority for LDWF, and if proposed harvests may impede sustainability, then no harvests will be allowed.

Public Support for Black Bear Conservation and Management

Overall, public support for bear conservation in Louisiana is high. Prior to the repatriation project at REPAT, Van Why and Chamberlain (2003) conducted a survey of sportsmen and sportswomen in the area. Results indicated that hunters strongly supported bear restoration (>80% support; Van Why and Chamberlain 2003). More recently, Peterson (2011) conducted a public opinion survey of Louisianans residing within current black bear range. The results indicated that Caucasian males with high incomes that resided in the LARB had more positive attitudes toward bears than older individuals and individuals that had experienced property damage caused by bears. Respondents within the TRB had comparatively more knowledge about bears than residents near other subpopulations, but had more prevalent negative attitudes towards bears (Peterson 2011). A survey conducted by Responsive Management (2013) of more than 1,200 Louisiana residents indicated the majority of Louisianans valued black bears and their habitat. The discrepancy between this study and Peterson (2011) may be due to differences in sampling methodologies. For example, Peterson (2011) only sampled residents within bear-occupied parishes, whereas Responsive Management (2013) randomly sampled residents statewide. Approximately one-half of the surveyed residents believed that humans and bears can coexist without conflict, and about 85% of respondents agreed that most human-bear conflict issues can be prevented by taking simple precautions (Responsive Management 2013).

Education and Outreach

Living with bears is a relatively new experience for the majority of current Louisiana residents because bear numbers in the state were very low until recently. As such, considerable efforts by LDWF have focused on educating the public about bears and their associated

protections under the Endangered Species Act. The availability of reliable educational materials and knowledgeable biological staff are key components to public awareness and understanding of black bears. As the managing authority for black bears in Louisiana, LDWF will continue to target residents through multiple outlets. The target audiences include hunters, trappers, landowners, teachers/educators, and those with a general interest in bears and Louisiana wildlife. Although many of the residents within the MAV have been provided educational materials, bear range expansion outside of the MAV will require additional educational effort. Furthermore, Howe et al. (2010) posited that public education and proper handling of human-bear conflict issues are paramount to social acceptance and understanding of bears, as well as public confidence in the managing agency. Therefore, LDWF will focus on providing the public with easily accessible educational information on bears, their biology, and management. This is especially important in urban areas where many residents are unaware of the existence of Louisiana black bears (Cotton 2008).

In recent decades, as bear populations have increased and the public has become more familiar with bears in Louisiana, LDWF has directed more attention to human-bear conflict abatement. Although there have been no recorded human injuries caused by bears in Louisiana, the most common public inquiry concerns human safety (Cotton 2008). As a result, outreach and education efforts by LDWF continually focus on public safety issues and concerns. The majority of human-bear conflict in Louisiana has been the result of bears having relatively easy access to anthropogenic food sources. Considerable effort has been made by LDWF and municipal and parish governments to address these problems. Additionally, a growing number of complaints have been expressed by hunters when bears damage tree stands, consume deer feed, or damage ATVs. To reach these audiences, LDWF developed bear education packets

specifically for hunters and trappers. This information is readily available and will continue to be opportunistically distributed to the public by LDWF personnel. Furthermore, LDWF will enact and adhere to the following education and outreach guidelines:

1.) Hunters and Trappers

Dependent upon where one resides within Louisiana, individual hunters may encounter a black bear during outings. Louisiana trappers may also encounter black bears while conducting trapping activities. Trappers may have concerns regarding interactions with black bears because, as a species, the Louisiana black bear is protected and trappers must comply with an official protocol if a black bear is captured. If a bear is captured, trappers must immediately contact the LDWF Large Carnivore Program to have the bear safely removed from the trap. The following educational opportunities and materials are available for hunters and trappers in Louisiana:

a. All participants in Louisiana hunter education classes receive bear identification, bear behavioral information, and conflict avoidance information.

b. The LDWF website and annual regulations booklet provides hunting and trapping rules and regulations, and highlight the legal status of Louisiana black bears.

c. Brochures specifically directed to hunters are available. The brochures provide information on how to reduce interactions with bears, how to handle an encounter, and how to deter bears from feeders and property. Signage is posted in prominent hunting areas to remind hunters that bears are protected, offer rewards for information about poaching, and to aid in distinguishing black bears from feral hogs.

d. A brochure specifically tailored towards trappers is available. This brochure provides information on how to minimize capture of bears in traps intended for other species and on the appropriate steps to take if a bear is accidentally captured.

e. LDWF staff will assist hunters and affiliated associations by providing information through public meetings and site visits regarding hunting around bears and conflict avoidance.

f. LDWF enforcement agents will reiterate applicable rules and regulations to hunters and trappers.

2.) Formal and Non-Formal Educators

Louisiana educators are an important resource for dissemination of Louisiana black bear educational information to their students and their students' families. LDWF will provide resources for formal and non-formal educators to facilitate and encourage black bear educational efforts. Those resources include the following:

a. Educational trunks that provide hands-on, interdisciplinary teaching tools designed to educate students about the Louisiana black bear. Trunk contents include items such as pelts, skulls, claws, foot casts, and informational brochures.

b. Teacher workshops and curricula are available for educators throughout Louisiana. Workshops familiarize teachers with lesson plans and materials that provide a consistent message about Louisiana black bears.

c. LDWF staff assists teachers with information regarding black bears by giving presentations in schools.

d. The LDWF website (http://www.wlf.louisiana.gov/american-black-bear) provides information applicable to both educators and students.

e. A partner website (http://www.blackbearinfo.com/teachers) provides a black bear curriculum for formal and non-formal educators.

3.) Louisiana Urban Residents

Although this target audience has the least potential for interaction with the Louisiana black bear, occasionally some urban residents interact with bears. The following outreach and education tools are made available to residents of these areas:

a. St. Mary Parish, which harbors the majority of the LARB bear subpopulation, has created a Bear Conflict Officer position. The goal of this position is to implement a bear safety regime in communities by raising public awareness, incorporating volunteer programs, and by distributing bear-resistant garbage containers.

b. The LDWF website (http://www.wlf.louisiana.gov/american-black-bear) provides information, guidance, and descriptions of deterrents to reduce the likelihood of interactions between bears and humans.

c. Brochures and posters specifically tailored toward residents are available in both digital and printed media. These materials provide information about preventing and discouraging bears from becoming habituated to humans and anthropogenic food sources. They also advise residents on how to respond to human-bear encounters.

d. LDWF staff will assist residents by providing information and presentations regarding living in proximity to black bears.

4.) Louisiana Rural Residents

Residents living in some rural areas have a moderate to high probability of encountering black bears, especially at camps and structures that are not consistently

occupied throughout the year. The following materials are available for those individuals living in rural settings throughout the state:

a. The LDWF website (http://www.wlf.louisiana.gov/american-black-bear) provides information, guidance, and descriptions of deterrents that may reduce the magnitude and frequency of bear interactions with rural residents and their property.

b. A brochure for hunters and their personal hunting camps is available. This pamphlet provides information on how to respond to interactions with bears and minimize impacts of such interactions.

c. Brochures and posters specifically tailored toward rural residents are available both via digital and printed media. These materials provide information about preventing and discouraging bears from becoming habituated to humans and anthropogenic food sources. They also advise residents about how to respond to human-bear encounters.

d. LDWF staff will assist landowners by providing information and presentations regarding black bears and the proper responses and deterrents to be used.

5.) General Interest

For visitors to Louisiana as well as recreationists that are not hunters or trappers, the following information is available about the Louisiana black bear:

a. The LDWF website (http://www.wlf.louisiana.gov/american-black-bear) provides general information about black bear biology and ecology.

b. Information is available in both digital and printed median formats that address conflict prevention and recommended responses to a bear encounter.

c. LDWF staff will distribute general information regarding black bears through presentations and individual contacts.

Human-Bear Conflict

As Louisiana black bear subpopulations continue to increase in number and recolonize portions of historic range, the likelihood of human-bear conflicts also increases. As such, LDWF retains responsibility for management and resolution of all human-bear conflict incidents within the state of Louisiana. Management of human-bear conflict in Louisiana will be governed by the guidelines in this section. Courses of action for conflict incidents will be determined on a case-by-case basis, with consideration of the impacts to both humans and bears. Agency response alternatives may include, but are not limited to:

1. No action
2. Indirect action
3. Technical assistance
4. Aversive conditioning
5. Relocation
6. Removal

Although LDWF will focus primarily on prevention of human-bear interactions and prevention of situations that put humans in conflict with bears, active management of individual bears will be necessary at times. Public safety is of the utmost priority to LDWF when determining appropriate responses to human-bear conflict. Human-bear conflict reports will receive an immediate and effective response given consideration to timing, logistics, and available personnel. LDWF will consider the incident location, cause and severity of the incident, and the known history of the bear (if applicable) when determining the appropriate response. Management of human-bear conflict complaints by LDWF personnel or appointed agents (e.g., United States Department of Agriculture [USDA] Wildlife Services) will adhere to

the following response criteria; although, other alternatives may be deemed appropriate by the Large Carnivore Program staff:

1. No Action: LDWF may choose to take no direct action following investigation of the complaint if the situation does not warrant indirect/direct action or effective action is unlikely.
2. Indirect Action: LDWF may decide to provide an indirect means of resolution through education and/or securing a safe escape for the bear. For example, complaints may be the result of a bear that is passing through an area or by an ill-placed attractant; simply removing the attractant will likely resolve the issue.
3. Technical Assistance: LDWF may choose to provide technical assistance to correct a situation, with no direct control action from agency personnel. Technical assistance actions may include installation of electric fencing or other tools to secure attractants.
4. Aversive Conditioning**:** LDWF may haze a bear away from the conflict area using any combination of aversive conditioning techniques including, but not limited to, pyrotechnics, non-lethal ammunition, electronic control devices (ECDs), or bear hounds.
5. Trap and Release on Site**:** LDWF may attempt to capture problematic bears if the landowner has complied with the recommendations to remove attractants. All captured bears will be marked and/or radio-collared. Captured bears may be released on site or in the near vicinity with or without aversive conditioning.
6. Trap and relocate: LDWF may attempt to capture problematic bears if the situation warrants such action and the bear is of the sex and age class that relocation is not likely to place the bear at greater risk. All captured bears will be marked and/or

radio-collared. Captured bears may be released with or without aversive conditioning.

7. Removal**:** Food-conditioned, human-habituated, or aggressive/dominant behaviors in bears can occasionally become so problematic that it is not practical to implement non-lethal management alternatives. Bears that are displaying any or all of these behaviors may pose a significant public safety risk and lethal removal may be warranted. In addition, some bears may not be suitable for release because of injury, illness, or poor physical condition. Removal of these bears from the population is a management option that should be utilized when appropriate, while also addressing the original cause of the conflict. LDWF may remove the animal via capture and humane euthanasia, or direct removal if in the best interest of public safety. All lethal removals in a controlled environment will occur according to the guidelines for humane euthanasia as specified by the American Veterinary Medical Association.

Large Carnivore Conflict Response Team

The Large Carnivore Conflict Response Team (LCCRT) was developed to manage and handle all large carnivore conflicts in Louisiana; specifically those involving black bears and cougars (*Puma concolor*). The LCCRT is supervised by the LDWF Large Carnivore Program Manager and field operations are directed by the LDWF Large Carnivore Biologists. Team members include LDWF personnel with adequate training and equipment to assist the Large Carnivore Program. Additionally, some USFWS and USDA Wildlife Services personnel have the required training and equipment to assist with large carnivore conflicts and may be contacted by the LDWF Large Carnivore Program for assistance. The public will be provided with appropriate conflict reporting contact information in all conflict cases.

Law Enforcement

Success of the human-bear conflict protocol outlined in this management plan will require assistance from LDWF law enforcement. Agents will be utilized as needed to assist with human-bear conflict. Primarily, LDWF law enforcement agents will be responsible for human control and safety during conflict situations as well as enforcement of laws and regulations. Alternatively, LDWF law enforcement agents may be required to assist LDWF biologists and the LCCRT with tasks such as bear captures, aversive conditioning, and conflict complaints.

Communities

In addition to the role of the LCCRT in the handling of human-bear conflict, local communities and governments can make changes to mitigate conflict. For example, a human-bear conflict and outreach program was developed in coordination with St. Mary Parish government. To date, St. Mary Parish has experienced the greatest number of human-bear conflicts throughout Louisiana (U.S. Geological Survey et al. 2014). The program maintains an employee dedicated to the reduction of bear access to anthropogenic food sources (e.g., garbage, pet foods, etc.) and to provide technical assistance with bear-resistant waste cans. Bear-resistant waste cans have been purchased and deployed throughout St. Mary Parish at residences to minimize access to anthropogenic foods by bears. Technical assistance with bears is still provided by LDWF, but the deployment and maintenance of bear-resistant cans is conducted by St. Mary Parish and Progressive Waste Services. Similar programs could be developed by other local governments to mitigate human-bear conflict in other areas of Louisiana.

Potential exists for local communities, towns, and cities to create environments that mitigate human-bear conflict as well. The Get Bear Smart Society (http://www.bearsmart.com/) is a non-profit organization that provides assistance and informative materials to help

communities reduce human-bear conflicts throughout North America. For example, the community of Wintergreen, Virginia, was plagued by high frequencies of human-bear conflict that ultimately resulted in the euthanasia of multiple bears and recurring property damage (Sajecki 2010). During 2007, Wintergreen residents joined the Get Bear Smart Society and established a Bear Smart Council comprised of 7 permanent residents of Wintergreen that governed the program. Community regulations were approved that required homeowners to stop feeding birds during April–December and also banned the use of outdoor non-bear-resistant garbage cans. The homeowners association also purchased bear-resistant waste and food containers for all public areas, including parks and picnic areas. Within 2 years of implementing these actions, human-bear conflicts in Wintergreen decreased by 80%, and the euthanasia of bears became unnecessary. With the assistance of Virginia Department of Game & Inland Fisheries, human-bear conflicts were virtually eliminated. This example from Wintergreen, Virginia, was primarily a citizen and community driven effort to reduce human-bear conflict, and could serve as a model for communities throughout Louisiana.

Bear Management Areas (BMA)

Seven individual Bear Management Areas were established (BMA; Fig. 4.1) by LDWF for conservation and management purposes. For example, LDWF will use BMAs in coordination with BearTRAK (U. S. Geological Survey et al. 2014), a digital database for Louisiana black bear research and management, to monitor bear range expansion and recolonization, to monitor anthropogenic mortality locations and frequency, and for human-bear conflict abatement. Additionally, if federal protection is removed from the Louisiana black bear in the future, the 7 BMAs may be used to provide Louisianans with the opportunity to harvest

bears under Louisiana Wildlife and Fisheries Commission (LWFC) rules and regulations. The following BMAs were established based on the locations of extant subpopulations and by Parish:

BMA 1: (LARB/Coast) – *Lower Atchafalaya River Basin* – St. Mary, Iberia, Cameron, Vermillion, Terrebonne, Jefferson, Acadia, Assumption, Lafourche, Lafayette, southern Iberville (south of Interstate-10), southern West Baton Rouge (south of Interstate-10), and southern St. Martin (south of Interstate-10).

BMA 2: (UARB/Pointe Coupee) – *Upper Atchafalaya River Basin* – Pointe Coupee, St. Landry (east of Interstate-49), northern West Baton Rouge (north of Interstate-10), northern Iberville (north of Interstate-10), northern St. Martin (north of Interstate-10).

BMA 3: (REPAT) – *Repatriation Area* – Avoyelles, Concordia, La Salle, and western Catahoula (west of Highway 15).

BMA 4: (TRB/Tensas) – *Tensas River Basin* – Madison, Tensas, West Carroll, Eastern Carroll, eastern Richland, eastern Franklin (east of Highway 137 & Highway 15), and eastern Catahoula (east of Highway 15).

BMA 5: (ORB/Union) – *Ouachita River Basin* – Union, Morehouse, Ouachita, Caldwell, western Richland, and western Franklin (west of Highway 137 and Highway 15).

BMA 6: (WGCP) – *West Gulf Coastal Plain* – All parishes west of MAV and north of BMA 1.

BMA 7: (EGCP) – *East Gulf Coastal Plain* – All parishes east of Mississippi River.

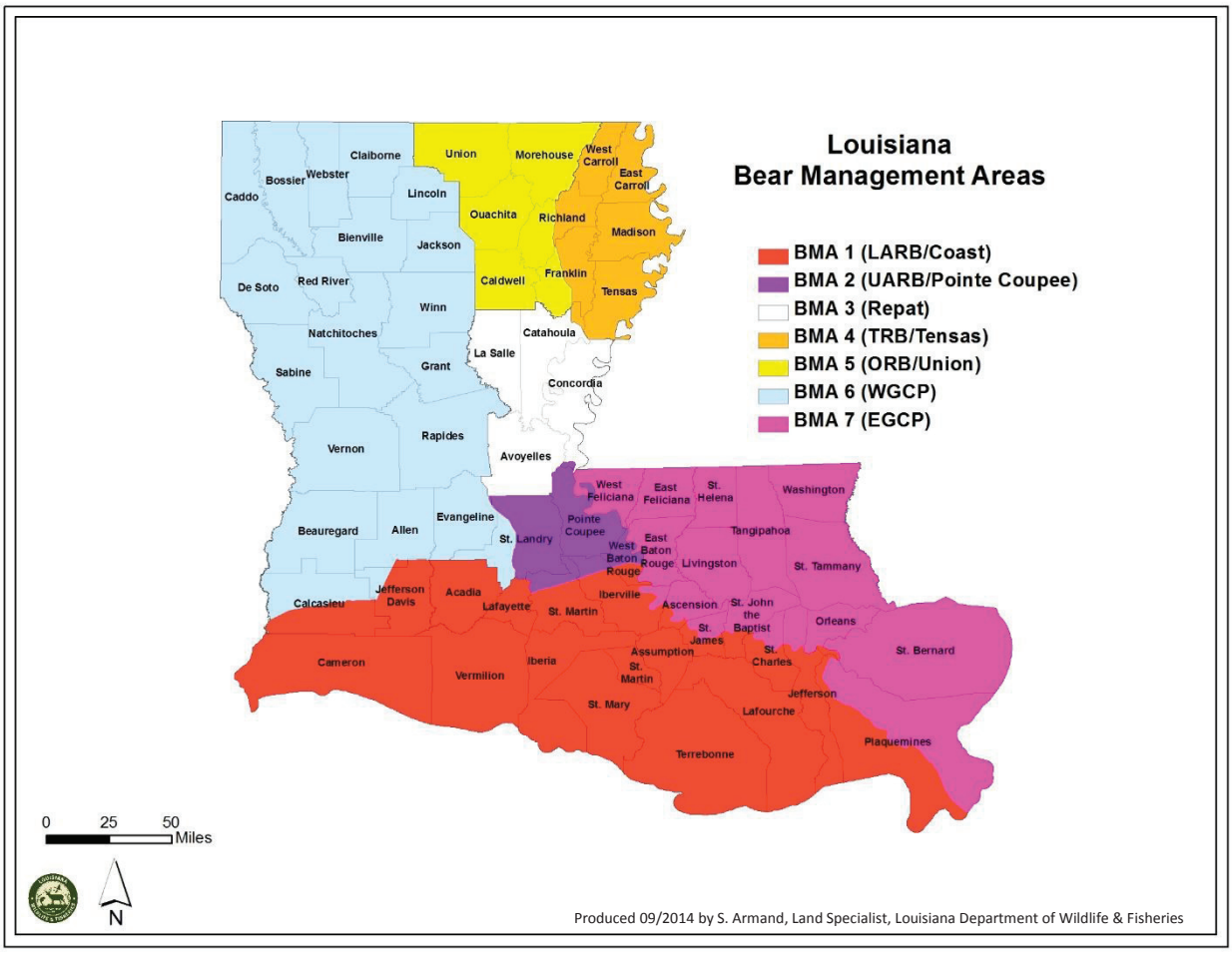

Figure 4.1. Locations of the 7 Bear Management Areas (BMA) in Louisiana, USA.

Harvest

If, in the future, federal protection is no longer warranted for the Louisiana black bear, bear harvests based on demographic monitoring data may be established with approval from the LWFC. If harvests are implemented, they would be altered annually to reflect the previous year's subpopulation dynamics. Bear Management Areas would be considered for harvest based on multiple factors that influence sustainability, including, but not limited to, subpopulation demographics, reproductive vital rates, genetic characteristics, and the magnitude of anthropogenic causes of mortality. Following the selection of appropriate BMAs for harvest, a harvest model would be constructed to determine the allowable sustainable yield while considering existing rates of non-hunting anthropogenic mortality. *At no time would harvests be allowed if existing data and simulated population dynamics models indicate harvest could potentially compromise Louisiana black bear sustainability.* A quota system would be used within a lottery framework to select hunters for bear harvest tags. If implemented, harvest may or may not occur on all private or public lands within an individual BMA. A mandatory black bear hunting training course would be required for all hunters selected for a bear harvest tag. Harvests would be monitored by LDWF, reserving the right to revoke tags and cancel harvest seasons at any time.

A considerable amount of demographic research has been conducted on the Louisiana black bear over the previous decade (Boersen et al. 2003, Benson and Chamberlain 2007, Hooker 2010, Troxler 2013, O'Connell-Goode et al. 2014, Laufenberg and Clark 2014). These data, in conjunction with recent mortality and survival data from BearTRAK (U.S. Geological Survey et al. 2014), would be used to establish baseline demographic estimates for all 4 subpopulations of bears in Louisiana. Live-trapping for radio-monitoring to estimate survival

and cause-specific mortality, den work to monitor reproductive vital rates, and non-invasive hair sampling to monitor temporal changes in population rate-of-change (λ) would all be used for annual harvest planning. Cub survivorship and reproductive rates would be estimated from natal den visits and periodic visual observations throughout summer months. Live-trapping data would be used to construct age and sex structures.

A population model would be developed in Program RISKMAN (Ontario Ministry of Natural Resources, Toronto, Ontario, Canada) to simulate subpopulation dynamics. This model is a simulation of black bear life history, incorporating age-specific survival and recruitment rates, abundance, standing or stable age distribution, removal rates, and selectivity values, and it can function either stochastically or deterministically. Harvest selectivity values would be estimated according to anticipated removals for harvest while accounting for the prior year's mortality rates. Based on the above information, the impact and sustainability of such removals can be estimated. By incorporating estimates of subpopulation abundance and growth rate, Program RISKMAN affords the opportunity to estimate the effect of harvest on growth and sustainability. Harvests would be adjusted accordingly for the management objectives of each subpopulation/BMA.

Laws and Regulations

The Louisiana black bear is protected by the federal Endangered Species Act of 1973 (Neal 1992), by state laws, and by regulations promulgated by the LWFC. Federal laws and regulations pertaining to Louisiana black bears are contained in Title 50 of the Code of Federal Regulations (CFR). State laws and regulations pertaining to bears are contained in Louisiana Title 56 and Louisiana Title 76. Of importance, the potential future removal from federal

protection would not alter or negate state penalties for poaching or harming a Louisiana black bear. Excerpts from each federal and state law Title that pertain to bears are provided below:

1. CFR Title 50B§1§17B.11h-17.40(i). By adding the following, in alphabetical order under Mammals, to the List of Endangered and Threatened Wildlife: revising the entry for "**Bear, Louisiana black**" under "MAMMALS" in the List of Endangered and Threatened Wildlife to read as follows: Threatened.
2. Title 56§8§114a. "Wild quadrupeds" means and includes any and all of the following: (i) Game quadrupeds: wild deer, **bears**, squirrels, and wild rabbits.
3. Title 56§56.2. Seizure or surrender of things illegally used or possessed: (A) Any enforcing officer may seize: (2) Deer, **bears**, or wild turkey parts thereof in possession of any person which is not tagged or identified as required by this Title.
4. Title 56§116.1. Wild birds and wild quadrupeds; times and methods of taking; penalties: Except where expressly stated to the contrary, the provisions of this Section shall apply to the taking or possession of deer, **bear**, and turkey. Where a specific prohibition and penalty relating to the taking or possession of deer, **bear**, or turkey has been provided in R.S. 56:116.3 or 116.4, the provisions of R.S. 56:116.3 or 116.4, as applicable, shall govern. Violation of any of the provisions of this Section shall constitute a class 3 violation.
5. Title 56§116.3. Special provisions applicable to deer and **bear**; times and methods of taking; penalties: No person shall do any of the following: Hunt or shoot a deer or **bear** at any time with a firearm smaller than a .22 caliber centerfire, or a shotgun using a shell loaded with shot less than buckshot or rifled slug, or a bow with less than thirty pounds of pull, or other than arrows with broadhead points. Violation of

any of the provisions of this Subsection constitutes a class 2 violation. No person shall possess any of the following: Illegally taken deer or **bear**; freshly killed deer or **bear** in the closed season. Violation of any of the provisions of this Subsection constitutes a class 4 violation. No person shall hunt or take illegal deer or **bear** in the open season. Violation of this Subsection constitutes a class 5-A violation. No person shall hunt or take deer or **bear** in the closed season. Violation of this Subsection constitutes a class 6 violation.

6. Title 56§291. Feeding of wild **bears** prohibited: No person shall intentionally feed or attempt to feed a wild **bear**. The provisions of this Section shall not prohibit legal baiting of deer. The first violation of this Section by any person shall result in the issuance of a warning ticket only. Any subsequent violation by the same person shall be a class 2 violation. The Wildlife and Fisheries Commission is authorized to promulgate, under the Administrative Procedure Act, rules and regulations for the administration and enforcement of this Section.
7. Title 76§1§315.B. Fish and Wildlife Values; Species of Special Concern: The value of a **Black Bear** is equivalent to $10,000.00/animal.
8. Title 76§1§317. Threatened and Endangered Species. Said species are deemed to be endangered or threatened species under the provisions of Louisiana Revised Statutes Title 56, Chapter 8, Part IV: **Louisiana black bear**, *Ursus americanus luteolus*, Threatened.
9. Title 76§4§115. Possession of Potentially Dangerous Wild Quadrupeds, Big Exotic Cats, and Non-Human Primates: Except as provided herein, it shall be unlawful to import into, possess, purchase, or sell within the state of Louisiana, by any means

whatsoever including but not limited to transactions conducted via the internet, any of the following species or its subspecies of live wild quadrupeds, big exotic cats, or non-human primates, domesticated or otherwise (hereinafter "listed animals"): (a) **black bear**.

CHAPTER 5: ANTICIPATED IMPACTS

Bears and humans have coexisted throughout Louisiana's history, although at times during the 20th century, interaction between humans and bears was minimal because bear numbers were low. In recent decades, the Louisiana black bear population has increased in abundance and distribution commensurate with human populations. Additionally, Louisiana now has an extensive road network throughout the state that allows human access into formerly remote areas. Combined, this has increased the likelihood of human-bear interactions in recent years. Bears typically try to avoid humans, but encounters do occur as a result of the large home ranges of bears and the land-use activities of modern humans. Negative human-bear interactions can occur when preferred bear foods are located within or near residential areas and when anthropogenic food sources are easily available to bears. Furthermore, human-bear interactions often increase in likelihood when natural bear foods are scarce or when mast failures occur. In this section of the management plan, the economic, ecological, and social impacts of implementing this plan are considered.

Economic Impacts

Positive economic benefits from the presence of bears may include the stimulation of local economies near bear subpopulations, whereas negative economic impacts may include property damage. For example, the Bayou Teche Black Bear Festival in Franklin, Louisiana, attracts visitors and temporarily stimulates local revenue. In contrast, bear-vehicle collisions, property damage, and the indirect costs of implementing management actions are expensive. The economic impacts of bears and the implementation of this management plan follow.

A potential economic benefit of bear conservation may be the economic stimulation of local communities through bear viewing opportunities. For instance, visitors to the Great Smoky Mountains National Park preferred seeing bears more than any other wildlife species inhabiting the park (Burghardt et al. 1972). Similarly, Kingdom Come State Park in Kentucky routinely attracts more visitors than any other state park in southeastern Kentucky, largely due to the viewing opportunity of elusive bears (Harris 2011). In Louisiana, the potential for ecotourism certainly exists, which may stimulate rural economies. Additionally, the potential for bear harvests may generate local income for communities within the BMAs that may be selected for harvest.

Bears, however, may also be a financial liability in some cases. Property damage, for instance, is reported annually with peak damage reports occurring during the fall when bears exhibit wide-ranging movements in search of food (U.S. Geological Survey et al. 2014). The majority of damage complaints have been by hunters that use game feeders or ATVs. Additionally, bear-vehicle collisions are especially concerning because they not only result in vehicle damage, but also jeopardize human safety. Installation of bear road-crossing signs have been utilized in Louisiana, and lowering speed limits, installing wildlife fencing, and wildlife underpasses are being considered to mitigate bear-vehicular collisions. For example, stretches of U.S. Highway 90 have bear road-crossing signs and remote cameras have been deployed at underpasses along Interstate-20 to investigate the usage of these structures by bears and other wildlife species. Ultimately, as the number of negative human-bear interactions decrease, economic losses should also decrease. Therefore, if various aspects of this management plan are not implemented with cooperation from other government agencies, NGOs, and stakeholders,

then human-bear conflicts may increase; this will prove costly to LDWF and a potential threat to bear conservation and management in Louisiana.

Ecological Impacts

As noted elsewhere in this management plan, bears are considered an umbrella species (Caro and O'Doherty 1999, Roberge and Angelstam 2004) because their home range requirements and dispersal capabilities also benefit other flora and fauna (Maehr et al. 2001). Bears are also considered indicators of quality habitat (Maehr et al. 2001), serve as highly efficient seed dispersers (Auger et al. 2002), and may fill an ecological niche (Maehr et al. 2001) as the only terrestrial large carnivore currently inhabiting Louisiana. Conserving habitat and establishing corridors for the purpose of bear conservation may maintain important ecological processes that would not be present without bears. Therefore, it may be more important to consider the ecological consequences of not implementing this plan.

Due to the prominence of agriculture in Louisiana, a concerted effort has been required to conserve habitat, typically forest, and decrease habitat loss, degradation, and fragmentation throughout the MAV. Beyond providing suitable bear habitat, forests also offer benefits to humans by storing carbon dioxide, filtering water, storing flood waters, providing wood products, and providing recreational opportunities (Allen et al. 2001). If the guidelines in this plan are not enacted, then bear subpopulations may decrease, populations of other wildlife and plant organisms that are reliant on the same habitat as bears may also decline, and the unique benefits of bear habitat to humans may disappear. Additionally, if bear habitat is lost or degraded, bears will likely be forced to rely more on anthropogenic foods, which would increase the frequency of negative human-bear interactions.

Social Impacts

Similar to other large mammals, bears are megafauna that humans typically enjoy viewing (Kellert 1994). In general, society has a positive attitude toward black bears and this appears to be the case in Louisiana as well (Responsive Management 2013). However, the societal impact of bears in Louisiana depends primarily on how different stakeholders view human-bear interactions (Kellert 1994). For example, if a group of individuals experience repeated property damage by bears, this group may have a negative connotation of bears. In contrast, individuals who feel fortunate to catch a glimpse of a bear will likely have a positive opinion of bears. The social carrying capacity requires the balancing of inherent societal benefits of bears with the tolerance of negative human-bear interactions. Because the guidelines outlined in this management plan and associated educational materials should result in fewer negative human-bear interactions, the social carrying capacity may increase. By doing so, this may allow LDWF to manage bears at the biological carrying capacity while attaining public confidence in management (Howe et al. 2010). Therefore, public education and outreach will be critical to the success of this plan.

REFERENCES

Allen, J. A., B. D. Keeland, J. A. Stanturf, A. F. Clewell, and H. E. Kennedy. 2001. A guide to bottomland hardwood forest restoration. U.S. Geological Survey Technical Report USGS/BRD/ITR-2000-0011, U.S Forest Service Technical Report SRS-40.

Amstrup, S. C., and J. J. Beecham. 1976. Activity patterns of radio-collared black bears in Idaho. Journal of Wildlife Management 40:340–348.

Anderson, D. R. 1997. Corridor use, feeding ecology, and habitat relationships of black bears in a fragmented landscape in Louisiana. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

Auger, J., S. E. Meyer, and H. L. Black. 2002. Are American black bears (*Ursus americanus*) legitimate seed dispersers for fleshy-fruited shrubs? American Midland Naturalist 147:352–367.

Beausoleil, R. A. 1999. Population and spatial ecology of the Louisiana black bear in a fragmented bottomland forest. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

Benson, J. F. 2005. Ecology and conservation of Louisiana black bears in the Tensas River Basin and reintroduced populations. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.

Benson, J. F., and M. J. Chamberlain. 2006. Food habits of Louisiana black bears (*Ursus americanus luteolus*) in two subpopulations of the Tensas River Basin. American Midland Naturalist 156:118–127.

Benson, J. F., and M. J. Chamberlain. 2007. Space use, survival, movements, and reproduction of reintroduced Louisiana black bears. Journal of Wildlife Management 71:2393–2403.

Boersen, M. R., J. D. Clark, and T. L. King. 2003. Estimating black bear population density and genetic diversity at Tensas River, Louisiana using microsatellite DNA markers. Wildlife Society Bulletin 31:197–207.

Burghardt, G. M., R. O. Hietala, and M. R. Pelton. 1972. Knowledge and attitudes concerning black bears by users of the Great Smoky Mountains National park. Pp 255–273 *in* S. Herrero (ed.). Bears – their biology and management. IUCN New Serial Publication 23. International Union for Conservation of Natural Resources, Morges, Switzerland.

Caro, T. M., and G. O'Doherty. 1999. On the use of surrogate species in conservation biology. Conservation Biology 13:805–814.

Carpenter, L. H., D. J. Decker, and J. F. Lipscomb. 2000. Stakeholder acceptance capacity in wildlife management. Human Dimensions of Wildlife 5:5–19.

Crook, A. C., and M. J. Chamberlain. 2010. A multiscale assessment of den selection by black bears in Louisiana. Journal of Wildlife Management 74(8):1639–1647.

Csiki, I., C. Lam, A. Key, E. Coulter, J. D. Clark, R. M. Pace, III, K. G. Smith, and D. D. Rhoads. 2003. Genetic variation in black bears in Arkansas and Louisiana using microsatellite DNA markers. Journal of Mammalogy. 84:691–70.

Clark, J. D., D. Huber, and C. Servheen. Bear reintroductions: lessons and challenges. Ursus 13:335–345.

Clark, J. E., F. T. van Manen, J. D. Clark, R. Eastridge, W. Abler, M. Davidson, D. Hamilton, K. R. Hersey, S. McDonald, and D. Telesco. 2005. Distribution of black bears in the Southern Coastal Plain and Interior Highlands. Eastern Black Bear Workshop 18: 243–253.

Cotton, W. 2008. Resolving conflicts between humans and the threatened Louisiana black bear. Human-Wildlife Conflicts 2:151–152.

DeGraaf, R. M., and R. I. Miller. 1996. Conservation of faunal diversity in forested landscapes. Chapman and Hall, London, United Kingdom.

Dixon, J. D., M. K. Oli, M. C. Wooten, T. H. Eason, J. W. McCown, and M. W. Cunningham. 2007. Genetic consequences of habitat fragmentation and loss: the case of the Florida black bear (*Ursus americanus floridanus*). Conservation Genetics 8:455–464.

Eastridge, R., and J. D. Clark. 2001. Experimental reintroduction of black bears to the Big South Fork area of Kentucky and Tennessee. Wildlife Society Bulletin 29:1163–1174.

Florida Fish & Wildlife Conservation Commission. 2012. Florida black bear management plan. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida, USA.

Gosselink, J. G., and L. C. Lee. 1987. Cumulative impact assessment in bottomland hardwood forests. Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana, USA.

Graber, D. M. 1990. Winter behavior of black bears in the Sierra Nevada, California. International Conference on Bear Research and Management 8:269–272.

Griffith, E. 1821. General and particular descriptions of the vertebrate animals, arranged conformably to the modern discoveries and improvements in zoology. Baldwin, Cradock, and Joy, London, England.

Hall, E. R. 1981. The mammals of North America. 2nd Edition. John Wiley and Sons, New York, New York, USA.

Hanski, I., and D. Simberloff. 1997. The metapopulation approach, its history, conceptual domain, and application to conservation. Pp. 5-26 *in* I. Hanski and M.E. Gilpin (eds.).

Metapopulation Biology: Ecology, Genetics and Evolution. Academic Press, New York, New York, USA.

Harris, H. B. 2011. The return of the black bear to eastern Kentucky: conflict and tolerance between people and wildlife. Dissertation, University of Kentucky, Lexington, Kentucky, USA.

Hartl, D. L. 2000. A primer of population genetics. Sinauer Associates, Sunderland, Massachusetts, USA.

Hellgren, E. C. 1998. Physiology of hibernation in bears. Ursus 10:467–477.

Hellgren, E. C., and M. R. Vaughan. 1988. Seasonal food habits of black bears in Great Dismal Swamp, Virginia-North Carolina. Proceedings of the Annual Conference of Southeast Association of Fish and Wildlife Agencies 42:295–305.

Hightower, D. A., R. O. Wagner, and R. M. Pace, III. 2002. Denning ecology of female American black bears in south central Louisiana. Ursus 13:11–18.

Hooker, M. J. 2010. Estimating population parameters of the Louisiana black bear in the Tensas River Basin using robust design capture-mark-recapture. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

Howe, E. J., M. E. Obbard, R. black, and L. L. Wall. 2010. Do public complaints reflect trends in human-bear conflict? Ursus 21:131–142.

Jones, M. D., and M. R. Pelton. 2003. Female American black bear use of managed forest and agricultural lands in coastal North Carolina. Ursus 14:188–197.

Kellert, S. R. 1994. Public attitudes towards bears and their conservation. International Conference on Bear Research and Management 9:43–50.

Kennedy, M. L. 1989. Systematic assessment of the black bear, *Ursus americanus luteolus*. Special Report to U.S. Fish & Wildlife Service, Jackson, Mississippi, USA.

Kennedy, M. L. 2006. An assessment of the subspecific taxonomy of black bears (*Ursus americanus*) at the White River National Wildlife Refuge, Arkansas. Final Report submitted to U.S. Fish & Wildlife Service, Jackson, Mississippi, USA.

Komarek, E. V. 1981. History of prescribed fire and controlled burning in wildlife management in the South. Pages 1 – 14 *in* G. W. Wood, editor. Prescribed fire and wildlife in southern forests. Belle W. Baruch Forest Science Institute of Clemson University, Georgetown, South Carolina, USA.

Kopman, H. H. 1921. Wild life resources of Louisiana, their nature, value, and protection. State of Louisiana Department of Conservation, New Orleans, Louisiana, USA.

Larkin, J. L., D. S. Maehr, T. S. Hoctor, M. A. Orlando, and K. Whitney. 2004. Landscape linkages and conservation planning for the black bear in west-central Florida. Animal Conservation 7:23–34.

Laufenberg, J. 2014. Population dynamics and genetic structure of Louisiana black bears in the Lower Mississippi Alluvial Valley of Louisiana. Dissertation, University of Tennessee, Knoxville, Tennessee, USA.

Laufenberg, J. S., and J. D. Clark. 2014. Population viability and connectivity of the Louisiana Black Bear (*Ursus americanus luteolus*). U. S. Geological Survey Open-File Report 2014 – 1228, 104 p., Available at <http://dx.doi.org/10.3133/ofr20141228>.

LeConte, A. L. 1987. Causes of black bear mortality. International Conference on Bear Research and Management 7:75-82.

Lowe, C. L. 2011. Estimating population parameters of the Louisiana black bear in the Upper Atchafalaya River Basin. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

Lower Mississippi Valley Joint Venture. 2007. Restoration, management, and monitoring of forest resources in the Mississippi Alluvial Valley: recommendations for enhancing wildlife habitat. Lower Mississippi Valley Joint Venture, Vicksburg, Mississippi, USA.

Lowery, G. H., Jr. 1974. The mammals of Louisiana and its adjacent waters. Louisiana State University Press, Baton Rouge, Louisiana, USA.

Maehr, D. S. 1984. The black bear as a seed disperser in Florida. Florida Field Naturalist 12:40–42.

Maehr, D. S., and J. R. Brady. 1984. Food habits of Florida black bears. Journal of Wildlife Management 48:230–235.

Maehr, D. S., T. S. Hoctor, L. J. Quinn, and J. S. Smith. 2001. Black bear habitat management guidelines for Florida. Technical Report No. 17, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida, USA.

Marchinton, F. B. 1995. Movement ecology of black bears in a fragmented bottomland hardwood habitat in Louisiana. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

McCullough, D. R. 1996. Metapopulations and wildlife conservation. Island Press, Washington, District of Columbia, USA.

Miller, D. A., E. M. Hallerman, M. R. Vaughan, and J. W. Kasbohm. 1998. Genetic variation in black bear populations from Louisiana and Arkansas: examining the potential influence of reintroductions from Minnesota. Ursus 10:335–341.

Neal, W. 1992. Threatened status for the Louisiana black bear. Federal Register 57:588–595.

Nowak, R. M. 1986. Status of the Louisiana black bear. Special Report to U.S. Fish and Wildlife Service, Jackson, Mississippi, USA.

Noyce, K. V., and D. L. Garshelis. 2011. Seasonal migrations of black bears (*Ursus americanus*): causes and consequences. Behavioral Ecology and Sociobiology 65:823–835.

Nyland, P. D. 1995. Black bear habitat relationships in coastal Louisiana. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.

O'Connell-Goode, K. C., C. L. Lowe, and J. D. Clark. 2014. Effects of a flooding event on a threatened black bear population in Louisiana. Animal Conservation DOI:10.111/acv.12114.

Pace, R. M., III, D. R. Anderson, and S. Shively. 2000. Sources and patterns of black bear mortality in Louisiana. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies. 54:365-373.

Pelton, M. R. 1989. The Louisiana black bear: status and future. Special report to U.S. Fish & Wildlife Service, Jackson, Mississippi, USA.

Pelton, M. R. 2001. American black bear. Pp 224–233 *in* J. G. Dickson (ed). Wildlife of southern forests: habitat and management. Hancock House, Blaine, Washington, USA.

Pelton, M. R. 2003. Black bear (*Ursus americanus*). Pp 547–555 *in* G. A. Feldhammer, B. C. Thompson, and J. A. Chapman (eds.). Wild mammals of North America. Johns Hopkins University Press, Baltimore, Maryland, USA.

Pelton, M. R., and F. T. Van Manen. 1997. Status of black bears in the Southeastern United States. Proceedings of the 2nd International Symposium on the trade of bear parts, Seattle, Washington, USA.

Peterson, C. 2011. Residents' of seven selected Louisiana parishes attitudes concerning and knowledge about black bears. Thesis, Stephen F. Austin University, Nacogdoches, Texas, USA.

Pritchard, J. K., M. Stephens, and P. Donnelly. 2000. Inference of population structure using multilocus genotype data. Genetics 155:945–959.

Responsive Management. 2013. Louisiana residents' opinions on black bears and black bear management in Louisiana. Responsive Management, Harrisonburg, Virginia, USA.

Roberge, J-M, and P. Angelstam. 2004. Usefulness of the umbrella species concept as a conservation tool. Conservation Biology 18:76–85.

Rogers, L. L. 1987. Effects of food supply and kinship on social behavior, movements, and population growth of black bears in northeastern Minnesota. Wildlife Monographs 97:1-72.

Sajecki, J. 2010. Virginia's first Bear Smart community. Virginia Wildlife, Virginia Department of Game & Inland Fisheries, Richmond, Virginia, USA.

Savoie, B. L. 2007. Comments on the 5-year status review of the Louisiana black bear (*Ursus americanus luteolus*). Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana, USA.

Schwartz, C. C., and A. W. Franzmann. 1992. Dispersal and survival of subadult black bears from the Kenai Peninsula, Alaska. Journal of Wildlife Management 56:426–431.

Smith, K. G., and J. D. Clark. 1994. Black bears in Arkansas: characteristics of a successful translocation. Journal of Mammalogy 75:309–320.

St. Amant, L. S. 1959. Louisiana wildlife inventory. Pittman-Robertson Section-Fish and Game Division, Louisiana Wildlife and Fisheries Commission, Baton Rouge, Louisiana, USA.

Stratman, M. R., C. D. Alden, M. R. Pelton, and M. E. Sunquist. 2001. Long distance movement of a Florida black bear in the southeastern coastal plain. Ursus 12:55–58.

Taylor, D. F. 1971. A radio-telemetry study of the black bear (*Euarctos americanus*) with notes on its history and present status in Louisiana. Thesis, University of Louisiana, Baton Rouge, Louisiana, USA.

Trani, M. K., and B. R. Chapman. 2007. American black bear (*Ursus americanus*). Pages 518–525 *in* M. K. Trani, W. M. Ford, and B. R. Chapman, editors. The land manager's guide to mammals of the South. The Nature Conservancy, Durham, North Carolina, USA.

Trani, M. K., W. M. Ford, and B. R. Chapman. 2007. Introduction to mammals of the South. Pages 1–10 *in* M. K. Trani, W. M. Ford, and B. R. Chapman, editors. The land manager's guide to mammals of the South. The Nature Conservancy, Durham, North Carolina, USA.

Triant, D. A., Pace, R. M., and M. Stine. 2004. Abundance, genetic diversity and conservation of Louisiana black bears as detected though noninvasive sampling. Conservation Genetics 5:647-659.

Troxler, J. C. 2013. Population demographics and genetic structure of black bears in coastal Louisiana. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

U. S. Fish & Wildlife Service. 1988. Endangered and threatened wildlife and plants; notice of findings on petitions to list the Louisiana black bear, lower keys marsh rabbit, and Sherman's fox squirrel. Federal Register 53:31723–31725.

U. S. Fish & Wildlife Service. 1995. Louisiana black bear recovery plan. U.S. Fish & Wildlife Service, Jackson, Mississippi, USA.

U. S. Fish & Wildlife Service. 2008. Post-delisting monitoring plan guidance under the Endangered Species Act. U.S. Fish & Wildlife Service, Washington, District of Columbia, USA.

U. S. Fish & Wildlife Service. 2009. Endangered and threatened wildlife and plants; designation of critical habitat for the Louisiana black bear (*Ursus americanus luteolus*). U.S. Fish & Wildlife Service, Lafayette, Louisiana, USA.

U. S. Fish & Wildlife Service. 2013. Louisiana black bear 5-year review: summary and evaluation. U.S. Fish & Wildlife Service, Lafayette, Louisiana, USA.

U. S. Geological Survey, Louisiana Department of Wildlife & Fisheries, and U.S. Fish & Wildlife Service. 2014. BearTRAK. Accessed 30 October 2014 (http://nwrcwebapps.cr.usgs.gov/beartrak/login.aspx?ReturnUrl=%2fbeartrak%2fdefault.aspx).

Van Den Bussche, R. A., J. B Black, D. P. Onorato, L. C. Gardner-Santana, B. R. McKinney, J. D. Villalobos, M. J. Chamberlain, D. White, Jr., and E. C. Hellgren. 2009. Mitochondrial DNA phylogeography of black bear (*Ursus americanus*) in central and southern North America: conservation implications. Journal of Mammalogy 90(5): 1075-1082.

Van Why, K. R., and M. J. Chamberlain. 2003. Hunter knowledge and opinions of Louisiana black bear restoration. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 57:299–307.

Wagner, R. O. 1995. Movement patterns of black bears in South Central Louisiana. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.

Wagner, R. O. 2003. Developing landscape-scaled habitat selection functions for forest wildlife from Land Sat Data: Judging black bear habitat quality in Louisiana. Dissertation, Louisiana State University, Baton Rouge, Louisiana, USA.

Weaver, K. M. 1990. Ecology and management of black bears in Louisiana and Mississippi. The Habitat, Anderson-Tully Co., Vicksburg, Mississippi, USA.

Weaver, K. M. 1999. The ecology and management of the Louisiana black bear in the Tensas River Basin of Louisiana. Dissertation, University of Tennessee, Knoxville, Tennessee, USA.

Weaver, K. M., J. C. Posey, and M. D. Esters. 1991. Louisiana black bear status report. Proceedings of the Eastern Workshop on Black Bear Management and Research 10:23–29.

Young, B. 2006. Conservation and management of black bears in Mississippi. Mississippi Department of Wildlife, Fisheries, & Parks, Jackson, Mississippi, USA.

Louisiana Department of Wildlife & Fisheries
2000 Quail Drive, Baton Rouge, Louisiana, USA