

# HOW BEARABLE IS MISSISSIPPI?

AN ASSESSMENT OF HABITAT  
SUITABILITY AND HUMAN ATTITUDES  
FOR BLACK BEAR RESTORATION

**ONCE** considered abundant in the forested bottomland of Mississippi, the black bear is now limited to a few, fragmented populations with a questionable future (Figure 1). Substantial reductions in bear range have resulted from agricultural clearing, and remaining habitat is being destroyed or altered at a rapid rate. More than 80% of original habitat was gone by 1980, and today black bear occupy only 5-10% of their historic range. Current estimates place the population at less than 100 in Mississippi. Given their low number, sparse distribution, and continuing threats from human prosecution and habitat destruction, the future of the black bear in Mississippi is at best uncertain.

## FROM ABUNDANCE TO SCARCITY

Evidence of the black bear's former abundance is found in Mississippi's historical records. Early accounts tell how Mr. R.E. Bobo killed 304 bears in 1869 alone. General Wade Hampton killed 68 bears during a five-month period in 1860. Major M. Hamberlin and B. B. Lilly killed 27 bears in June and July of 1886. The most famous bear hunt in Mississippi, however, involved President Teddy Roosevelt. Attracted to Mississippi by accounts of abundant bears for hunting, he found a very different situation when he arrived. His guides offered a bear tied to a tree, but President Roosevelt refused to participate in such unsportsman-like conduct. The "Teddy Bear" originated from a political cartoon depicting the incident. The effects of excessive harvest and habitat destruction were obvious by the turn of the 20th century, and the black bear population had diminished to a dangerously low level by 1930.

Two of 16 subspecies of the black bear occur in Mississippi. The American subspecies once was found throughout most of eastern North America, the Great Plains, into Canada, and the interior portions of Alaska. The Louisiana black bear was found in east Texas, southern Arkansas, Louisiana, and the southern half of Mississippi (Figure 1). The skull of this subspecies is relatively long, narrow, and flat compared to the others. The Louisiana black bear was listed as federally threatened in 1992 because of continued habitat destruction.

In Mississippi, all black bear were protected from harvest starting

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PHOTOGRAPH BY NEAL & MARY JANE MISHLER

1932, and received a state endangered species designation in 1984. Technically, the black bear in Mississippi remains classified as a game animal with a closed season.

## WHAT WE KNOW TODAY

Black bear research in Mississippi began in 1990 with investigations of historic significance and distribution, habitat features associated with bear sightings, suitability of habitat for bear management in Mississippi, and public attitudes toward bears. While verifying that bears were once distributed statewide, investigators found no documentation of breeding in Mississippi since 1976. Another important finding was that most Mississippians were in favor of maintaining and increasing bear numbers. Recent biological research has focused on bears in southeastern Arkansas because the animals are so scarce in Mississippi. These investigations included denning characteristics, movements, and effects of land-use practices on den selection, and movements. As well, a project on

White River National Wildlife Refuge (Arkansas) evaluated infrared monitors with cameras as a method for estimating bear populations.

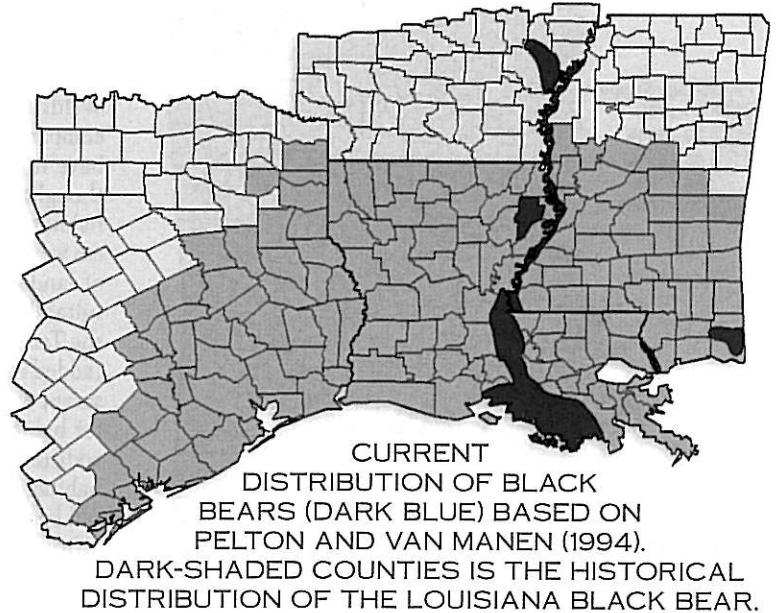
Findings from the Arkansas research suggested that bears, especially females, rarely cross the Mississippi River. Thus, bears are not likely to move from high-density areas, such as the White River National Wildlife Refuge in Arkansas, to areas in Mississippi where suitable habitat exists. If bears are to be reestablished in historical range in Mississippi, translocations may be necessary. The Louisiana Black Bear Restoration Plan, a component of the federal recovery plan for the Louisiana subspecies, sets a goal to establish a single "metapopulation" consisting of five subpopulations of bears. The Atchafalaya Basin and Tensas Basin in Louisiana were assumed to have the

largest populations of the Louisiana black bear. However, a recent study of the genetics of black bears in the southeastern United States found that bears on White River National Wildlife Refuge are genetically similar to populations of Louisiana black bears. And because the White River population appears larger than either the Atchafalaya Basin or Tensas Basin populations, the White River National Wildlife Refuge has potential to become a source population for reintroductions into suitable unoccupied habitat.

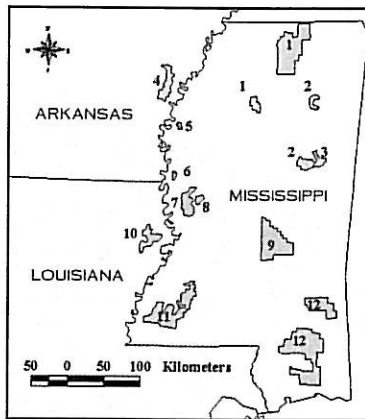
Public acceptance is important for bear recovery efforts. Understanding public attitudes and perceptions prior to reintroduction attempts is a vital element of the restoration strategy. Gaining support for charismatic species, such as the black bear, should be easier than for small, lesser-known species. In his studies of human attitudes toward wildlife, Kellert (1994:48) concluded that biologists have not acknowledged the "public's highly favorable attitudes towards bears and their population enhancement and recovery." Recent surveys in Mississippi, however, found that attitudes vary among

stakeholder groups (Shropshire 1996). These surveys determined that 88% of timber company personnel, 31% of beekeepers, 46% of landowners/private managers, and 79% of the public at large favored increasing the bear population. Moreover,

**FIGURE 1**



**FIGURE 2**



1. HOLLY SPRINGS NATIONAL FOREST
2. TOMBIGBEE NATIONAL FOREST
3. NOXUBEE NATIONAL WILDLIFE RANGE
4. WHITE RIVER NATIONAL WILDLIFE REFUGE
5. DAHOMEY NATIONAL WILDLIFE REFUGE
6. YAZOO NATIONAL WILDLIFE REFUGE
7. DELTA NATIONAL FOREST
8. PANTHER SWAMP NATIONAL WILDLIFE REFUGE
9. BIENVILLE NATIONAL FOREST
10. TENSAS NATIONAL WILDLIFE REFUGE
11. HOMOCHITTO NATIONAL FOREST
12. DESOTO NATIONAL FOREST

## STUDY AREAS USED FOR ASSESSMENT

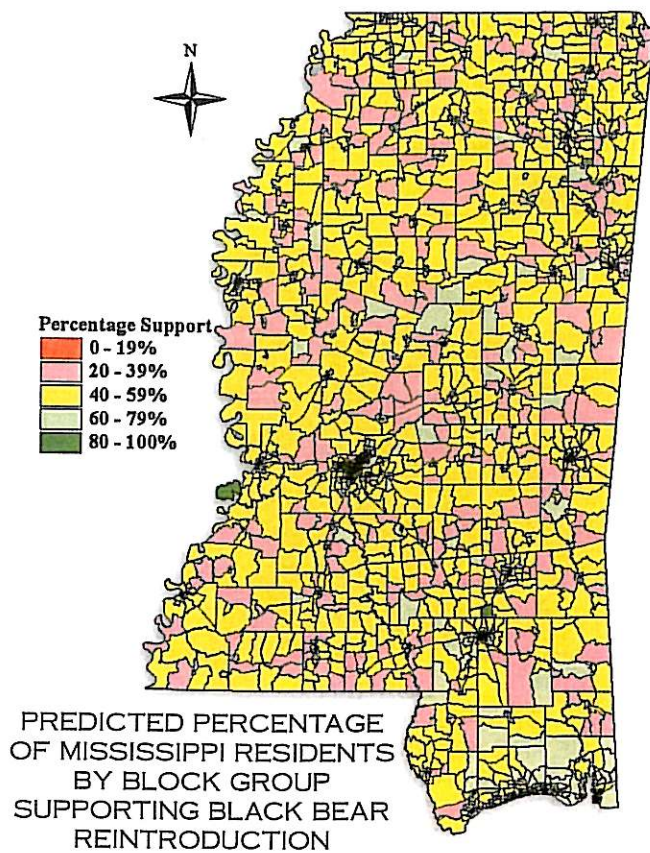
Lohr et al. (1996) warned that positive attitudes do not necessarily indicate support for reintroductions. In other words, expressing support for the idea of increasing bear populations does not necessarily translate into actual support for bear reintroduction programs.

Biological aspects such as demographic, behavioral, genetic, physiological, and habitat considerations — and technical aspects such as release site selection, release procedures, and monitoring — are all important to restoration success. The biological evaluation process must begin by locating suitable areas of existing habitat. Landscape analyses are needed to increase understanding of the spatial patterns of habitat distribution. A regional analysis of black bear habitat in the southeastern United States was performed by Rudis and Tansey (1995); however, the coarse scale of their analysis did not allow identification of important habitat characteristics.

## A NEW STUDY IS LAUNCHED

In 1995, we began a project to develop information required for black bear restoration in Mississippi.

**FIGURE 3**



These needs included identification of the location, composition, distribution, and size of habitat areas capable of sustaining viable populations of bears. Also required was an assessment of landowner attitudes and potential to obtain public support for bear reintroductions. Our study objectives were to:

- 1) Determine if differences exist among potential sites for bear restoration or between groups (Mississippi landowners versus Mississippi households) for attitudes toward bear reintroduction, and knowledge.
- 2) Determine if attitudes toward black bear reintroduction can be predicted using demographic variables; and, to identify spatial distribution of attitudes toward black bear reintroduction.
- 3) Develop a landscape-level habitat model for bear habitat in Mississippi, and combine the predicted habitat suitability map with a spatially explicit model of human attitudes to develop an integrated landscape-scale model for black bear restoration in Mississippi.

In Mississippi, six National Forests (Bienville, Delta, DeSoto, Holly Springs, Homochitto, and

Tombigbee) and four National Wildlife Refuges (Dahomey, Noxubee, Panther Swamp, and Yazoo) contain greater than 500,000 hectares of potentially suitable bear habitat (Figure 2). We consider these to be candidate reintroduction areas because they contain large enough segments of public land to sustain viable populations of bears. Additionally, our study included the White River National Wildlife Refuge (Arkansas) and Tensas National Wildlife Refuge (Louisiana) for comparative purposes because they have high bear populations and are thought to represent optimal bear habitat (Figure 2). All of these areas were included in our assessments of landowner attitudes and habitat suitability, with the exception that the Tensas National Wildlife Refuge (added in 1998, after the landowner survey was conducted) was used only for habitat assessment. Because an additional 61,827+ km<sup>2</sup> of forested habitat in Mississippi offers potential bear habitat, we also conducted attitude and habitat assessments on a statewide (Mississippi) basis to determine if suitable areas exist outside of public lands.

### WILL PEOPLE SUPPORT THE RETURN OF BEARS?

We surveyed all owners of lands adjacent to the candidate re-

introduction areas (public lands) because this stakeholder group stands to be most directly affected by bear restoration efforts. Each landowner was mailed a survey in January 1997. And because all Mississippians should have a voice in management of public resources such as wildlife, we decided that a survey of the population at large was also needed. A random sample of adults living in Mississippi households was contacted for a telephone survey in 1998.

Our surveys produced some interesting results. As other studies have found, attitudes varied among different demographic groups. Positive attitudes (indicating support for reintroduction) were associated with white male respondents, younger age groups, higher education levels, urban residence, and ownership of large properties. While most landowners favored black bear reintroductions in Mississippi, support levels varied widely among the public areas studied. For example, more than 60% of landowners around the Delta and Holly Springs National Forests supported reintroduction, whereas only 40-50% of landowners around the Bienville and Tombigbee National Forests favored the idea. Given the adjacency of their lands to candidate bear habitat areas, these landowners



would be the most likely to experience direct effects associated with bear reintroduction. We had to wonder whether their views were representative of the larger communities of rural landowners. Thus, our next step was to develop a practical tool to help clarify this issue.

We had found that age, race, and sex were significant predictors of a respondent's support for bear reintroduction, and that support generally decreased with age. Males and whites were more likely to support bear reintroduction than females and blacks. These data were applied in combination with 1990 U.S. Census Bureau block group data to produce a spatially explicit ("mappable") model of human attitudes (Figure 3). In other words, we used people's age, race, and sex to predict whether they would support black bear reintroduction. The results obtained from this approach were quite different from results based only on landowners adjacent to public areas. Although the Delta National Forest had the greatest support for reintroduction by adjacent landowners, it had very low support of the community as a whole. Landowners adjacent to this national forest were primarily whites, whereas the surrounding community was dominated by blacks. We concluded that by surveying only local land-

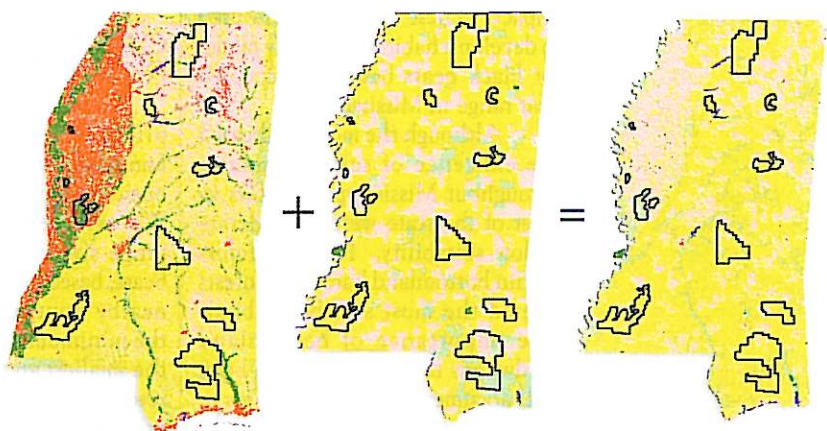
owners, we had unknowingly biased our sample. Our assessment of attitudes on a statewide basis indicated that at least moderate support for reintroduction existed throughout Mississippi, and certain areas (DeSoto National Forest) had very high support.

### WILL HABITATS SUPPORT BEARS?

Vegetation sampling to assess habitat was conducted in 1997 and 1998. Each of 1,665 plots was georeferenced using a hand-held global positioning system (GPS) unit. Using the statewide vegetation map of Mississippi's Gap Analysis Program, we evaluated seven cover types deemed suitable as black bear habitat (bottomland hardwood, clear cuts, hardwood, high density pine, low density pine, medium density pine, and mixed forest). Food, an important component of black bear

habitat, is not normally considered to be limiting in the spring. Soft mast (fruits and berries) dominate bear summer diets, but as availability declines in the fall, use of hard mast (acorns and nuts) increases. We included measures of abundance for both soft mast and hard mast in our habitat assessments. Security cover and human disturbance are also important factors of bear habitat suitability. Because bears are believed to avoid roads, we included distance to

**FIGURE 4**



### HABITAT + ATTITUDES = SUITABILITY

HABITAT SUITABILITY OVERLAID ON HUMAN ATTITUDE SUITABILITY PRODUCED THE LANDSCAPE MODEL OF BLACK BEAR RESTORATION POTENTIAL FOR MISSISSIPPI

# MISSISSIPPI BLACK BEAR



PHOTOGRAPH BY © MILO BURCHAM

nearest road, as well as human population density, as measures of human impact. These variables were used to develop a habitat suitability model for black bears based on occupied bear range in Mississippi.

Although the model indicated the existence of suitable habitat throughout Mississippi, habitats in most of the state were of moderate to low suitability. River corridors within bottomland hardwood forests offered the most suitable habitat. The importance of bottomland hardwoods to black bears has been well documented for populations in Arkansas and Louisiana. Researchers in Louisiana have found that black bears use riparian zones to travel between forest patches in the very fragmented forests of the Mississippi Delta. Additionally, many of the remnant bear populations in the Southeast are found in bottomland hardwood forests. In addition to serving as corridors for bear movements, river bottoms provide large enough areas to sustain bear populations. Although we found very suitable habitat within all public lands of the Delta Region, the surrounding areas, primarily agri-

cultural fields, are unsuitable as bear habitat.

## CAN HABITATS BE RESTORED?

The habitat model was applied to the Mississippi Gap Landcover system to predict distributions of suitable bear habitat. We assumed a minimum home range size of 10.5 km<sup>2</sup> for female bears, based on published studies on nearby populations. We defined the minimum home range size to be the smallest area in which adequate resources could be acquired. The original cell size of the map (30 by 30 meters) was aggregated into 10.5 km<sup>2</sup> units such that each represented the home range occupied by one female bear. This resulting map displayed bear habitat suitability for the entire state of Mississippi. We then overlaid the map of predicted human attitudes onto the bear habitat suitability map. Within each cell, the suitability values indicated by the two maps were added and then divided by two. The result was a landscape-level map for bear restoration in Mississippi (Figure 4).

The landscape model indicated that most of southern Mississippi is suitable for potential restoration of the black bear. Northern Mississippi has low suitability. The Delta region scored poorly, except for lands along the Mississippi River and the public lands. The model suggests that lands along the Mississippi River may provide a suitable corridor to link the White River National Wildlife Refuge with potential restoration areas in southern Mississippi. Although public lands in the Delta had high suitability, these areas were surrounded by unsuitable habitat and lacked corridors between habitat patches. Conversely, the DeSoto and Homochitto National Forests had high suitability and were surrounded by suitable habitat. These areas are capable of supporting bear populations four to five times larger than can be supported on public lands in the Delta. The areas with the most promise for bear restoration, from a connectivity and habitat corridor standpoint, are the Homochitto and DeSoto National Forests. These areas have abundant, suitable habitat within their boundaries, and surrounding habitats are at least moderate in

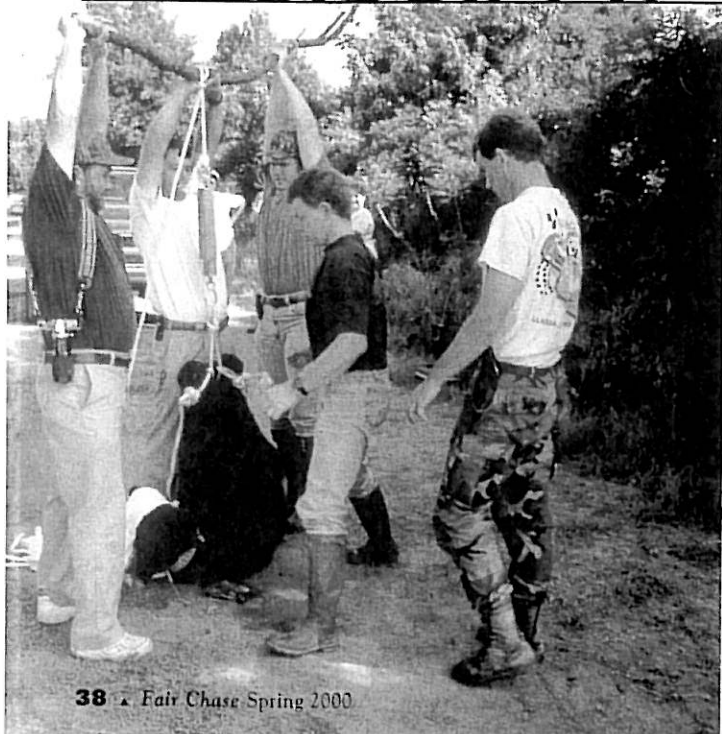
their suitability. In contrast, the highly suitable areas in the Delta region are surrounded by areas of low suitability. Here, the only area large enough to possibly support a viable bear population is the Delta National Forest, based on its similarity in size and habitat characteristics to the Tensas National Wildlife Refuge.

## PLANNING FOR BLACK BEAR RESTORATION IN MISSISSIPPI

Identification of a source population is essential for any restoration program. Whenever possible, source animals should be from the same geographic region to preserve regional variation and local adaptations. Additionally, the source population must have a surplus of animals that can be spared for reintroduction. Releases should be of sufficient size to ensure persistence and viability of the transplanted population. The detailed genetic study of black bears in the southeastern United States, mentioned earlier, found that bears on the Tensas National Wildlife Refuge are more genetically similar to bears on the White River National Wildlife Refuge than to bears from the Atchafalaya Basin. As well, the estimated population size of the White River bear population exceeds that of the Atchafalaya Basin and Tensas Basin. Given the genetic similarity and relative abundance of its bears, the White River National Wildlife Refuge may act as a source population for bear restoration activities in Mississippi. And if the Tensas and Atchafalaya Basins are found to have population surpluses in the future, those animals should be suitable for translocations. Past research produced recommendations for a release of 20-40 animals annually for at least eight years. However, if releases occur in areas of Mississippi where bears are already present, even fewer animals may be sufficient to achieve persistence and viability. We recommend that reintroductions be planned for areas that have residual bear populations, and that releases consist of eight to 15 individuals.

The behavioral and demographic characteristics of black bears are well documented, and suggest that sex and age of animals are important factors for translocation

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efforts. Studies in Arkansas noted that releasing males prior to extensive female release improved the success of bear restoration efforts. Therefore, we recommend that Mississippi restoration efforts focus on areas having resident populations of males. Males are known to be present in the lands along the Mississippi River, southeast Mississippi, Pearl River Basin, and Pascagoula River Basin/Red Creek Wildlife Management Area in the DeSoto National Forest (Figure 2). By focusing on areas that currently have male bears, managers can avoid problems associated with the extreme movement patterns of translocated males. We also recommend that females with cubs still in the den offer the best prospects for translocation, as they are least likely to wander from the release site. In view of female behavior, it is advisable to distribute release areas across the study area. Male home ranges are large compared to those of females, and a single male range can encompass numerous female ranges. Female offspring establish home ranges that overlap or abut their mother's home range. Dispersing releases should allow maximum expansion of bear range by limiting the opportunity for adult female home ranges to intersect one another.

Monitoring movements, reproduction, and survival of reintroduced animals is necessary to measure success. A restoration program is not successful unless reintroduced animals produce young that subsequently survive and reproduce. As well, tracking the movements of translocated animals can detect potential conflicts before they occur. For example, if a bear moves to private land, the owner can be notified and the bear removed if a problem is evident. Similarly, monitoring allows documentation of mortality agents so that programs to prevent or reduce mortality can be implemented. An example is the gating of Forest Service roads in core bear areas to prevent access and poaching by humans.

In Arkansas, restoration success was enhanced by releasing bears into optimal habitat within their former range. We recommend releasing bears into the public land areas (named above) because these areas have high habitat suitability. However, we caution against rein-

troductions that are likely to produce insular populations. Thus, primary consideration for release should be given to the DeSoto and Homochitto National Forests, which contain suitable habitat and are surrounded by suitable areas. In contrast, the land along the Mississippi River is surrounded by unsuitable habitat and some areas, such as the Pearl River Basin, are privately owned. Such conditions create difficulties for the reintroduction of black bears. The focal points for releases should be the public lands, where biologists have greater control compared to private lands. Proximity to established bear populations is also important; populations close enough for dispersal to occur may function as metapopulations. Metapopulations may sustain smaller subpopulations than isolated populations. The Homochitto and DeSoto National Forests are the best candidates for reintroduction because the Homochitto is mid-way between the Atchafalaya and Tensas Basin populations, whereas the DeSoto is near the Mobile Bay population in Alabama. The size of these habitat blocks also indicates they are favorable release sites.

Support for reintroduction is high in Mississippi, but knowledge about bears is poor. Educational programs to provide information about bear ecology, damage, and the implications of reintroduction are a necessary part of the recovery strategy. Educational programs should be diverse to ensure that all citizens are reached. School programs should be developed for every age group, and adults should be targeted by magazine and newspaper articles that reach a broad base of citizens. Television programs, although expensive, can be effective educational tools. Finally, extensive public meetings around release sites are necessary to promote education and two-way understanding between biologists and local residents. Blacks and females, who least approved of reintroductions, should be effective targets for education programs.

Our spatially explicit model of attitudes toward bear reintroduction provides critical information needed by managers and decision makers. As previously discussed, residents of the Delta region mostly opposed the idea of reintroduction,

whereas the DeSoto National Forest had the highest approval levels. Managers can expect greater resistance in the Delta, and should focus more public outreach there than will be necessary around the DeSoto National Forest.

Past research has warned that previous carnivore reintroductions have failed because of organizational deficiencies. A primary consideration should be "who's responsible for what?" One agency must take the lead role in restoration. We recommend that the Mississippi Department of Wildlife, Fisheries and Parks be the leader in bear restoration. A bear management group recently formed for Mississippi, which includes representatives from government agencies, state biologists, researchers, and private timber companies, should function as the advisory board. Citizens who reside near to proposed restoration sites should also be included to ensure that local communities remain involved and supportive.

Many obstacles must be overcome before bear reintroduction can proceed. A key discussion will be how to pay for restoration programs, which can be cost prohibitive. A recent restoration program in Kentucky committed one million dollars over a four-year period. Once the issue of funding is resolved, then consideration of problem animals becomes paramount. How will problem animals be handled, and who will be responsible? Groups must also assume responsibility for initiating and monitoring educational programs.

## WHAT NOW?

In 1990, when the first bear project was initiated, bear restorations seemed an impossible dream. Today the future looks brighter. Attitudes are favorable, and suitable habitat exists for bear restoration. Recently, a Mississippi Black Bear Restoration Committee was formed to coordinate restoration efforts. This committee is composed of state and federal agency personnel, timber corporations, and other stakeholders. This committee is using our findings to develop a black bear restoration plan for Mississippi. If a source population is located, translocations of black bears into Mississippi may commence within the next three to five years. We're confident that Theodore Roosevelt would have approved. ▲▲▲

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## LITERATURE CITED

KELLERT, S.R. 1994. PUBLIC ATTITUDES TOWARD BEARS AND THEIR CONSERVATION. INTERNATIONAL CONFERENCE ON BEAR RESEARCH AND MANAGEMENT 9:43-50.

LOHR, C., BALLARD, W.B., AND BATH, A. 1996. ATTITUDES TOWARD GRAY WOLF REINTRODUCTION TO NEW BRUNSWICK. WILDLIFE SOCIETY BULLETIN 24:414-420.

RUDIS, V.A. AND TANSEY, J.B. 1995. REGIONAL ASSESSMENT OF REMOTE FORESTS AND BLACK BEAR HABITAT FROM FOREST RESOURCE SURVEYS. JOURNAL OF WILDLIFE MANAGEMENT 59:170-180.

SHROPSHIRE, C.C. 1996. HISTORY, STATUS AND HABITAT COMPONENTS OF BLACK BEARS IN MISSISSIPPI. PHD DISSERTATION, MISSISSIPPI STATE UNIVERSITY, MISSISSIPPI STATE, MS.

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