MANAGEMENT PLAN FOR THE BLACK BEAR IN MISSOURI

Missouri Department of Conservation October 2008

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FOREWORD

This black bear management plan provides the guidance and continuity for their conservation and management in Missouri. It was organized and prepared by a team of inter-agency resource professionals. The team was composed of:

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TABLE OF CONTENTS

A MANAGEMENT PLAN FOR THE BLACK BEAR IN MISSOURI

EXECUTIVE SUMMARY:

The Missouri Department of Conservation is charged with the "control, management, restoration, conservation and regulation" of the state's wildlife and this includes the black bear (*Ursus americanus*). Sightings of sows with cubs, nuisance complaints, and other incidents involving black bears in Missouri have increased significantly over the past 10-15 years suggesting that bear populations are increasing in the state. In an effort to proactively address bear issues, resource personnel from the Missouri Department of Conservation, United States Forest Service, Missouri Department of Natural Resources, and the National Park Service outlined goals and strategies to ensure that bears are managed in ways that minimize conflicts with humans while encouraging population expansion into compatible habitats. The group identified key information needs for black bear management in Missouri as population and habitat assessment, increased understanding of movement patterns, dissemination of information about bear biology and nuisance problems, control of unacceptable mortality, and continual review and update of management needs. The group recognized that management of bears should include hunting, when biologically feasible, to reduce nuisance conflicts and to maintain bear populations that are compatible with social tolerance.

INTRODUCTION:

This document describes the historical and current status of the black bear (*Ursus americanus*) in Missouri, identifies the goals and objectives of management programs for black bears, and provides a brief description of basic biology and habitat needs. The Missouri Department of Conservation has authority and responsibility to cultivate and maintain a viable black bear population. The Black bear is an increasingly significant wildlife resource in Missouri, and represents an integral part of our native ecosystems.

Black bears are generalists adapted to a forested environment, and are likely to do well in Missouri's southern rural regions. They are valued as a game species and for their ecological role and aesthetic value as a recovering species of Missouri's native biota. Managing the black bear as a game species requires reasonable population and sex ratio estimates; data requirements which are addressed in this plan. In addition, some bears can become a nuisance or hazard, requiring various types of corrective measures to be taken by landowners assisted by Department personnel. Accordingly, this plan provides guidelines for black bear management in Missouri. Bear management issues were identified and recommendations developed within the plan. Plan implementation will be reviewed annually by the inter-agency committee that drafted it, and revised as necessary.

Goal statement*:* To encourage black bear population expansion within their natural range in Missouri, and to manage black bears consistent with the available habitat and within the limits of human tolerance.

Black bear program goals

1. Increase knowledge needed to manage and conserve black bear populations.
2. Increase knowledge of black bear ecology in Missouri, identify populations, how they move, disperse and travel on a landscape level.
3. Develop black bear conservation and management strategies based on information gathered through research, monitoring, and surveys.
4. Educate the public, media, and other resource professionals in Missouri and the Midwest about black bears and their management.

HISTORY

The Black bear is the most common and widely distributed of the three ursids in North America. Their historic range included the forested areas of North America, including Mexico. Black bears are now found primarily in sparsely populated, forested regions in the U.S. and most of Canada. Their status, density, and ecology vary considerably within existing ranges. In the eastern United States, they now exist primarily on public lands (Pelton 1982).

Black bears were "found in abundance" according to many early pioneers and settlers in Missouri during the 18th and 19th centuries (McKinley 1962). Many early county histories contain notes and reports of the remarkable number of bears in all areas of the state. Bears were a staple item for early settlers and were widely used for food as well as for their fat and skins. In fact, bears were more commonly killed by pioneers and early travelers than any large mammal, other than deer (McKinley 1962).

Henry Rowe Schoolcraft's (1821) notes of travel in the Ozarks during 1818-1819 contain interesting accounts of settlers' dependence on bear meat and fat, and income from the hides, illustrating the abundance of bears in Missouri. However, by the 1830s and 1840s, bears were rare in north Missouri, and by 1894, bears were reported to be almost extinct in the Ozarks. Schwarz (1920) reported the bear was still present in southeastern Missouri in 1920, and they were "occasionally seen in the Bootheel" until the flood of 1927 (Godsey 1933). One of the last records of a verified wild bear in Missouri (during the early 1900s) came from this area, one killed in 1931 (Bennitt and Nagel 1937).

McKinley (1962) reports no claims of bears being present in the Ozarks during the 1890s-1950s, other than rumors during the 1940s and 1950s. He acknowledged, however, that some rumors may have been reliable, and cites two incidents of bears killed in the Ozarks during the 1950s. A 35-pound bear cub was shot in southwest Dent County in 1950, in a barn lot near the community of Darien. Reports in the July 1950 *Missouri Conservationist* claims it had no markings or condition which indicated it had been confined. The *Conservationist* also cited other reports of bears sighted near Willow Springs and near Norfork Lake, one supposedly to have weighed about 200 pounds. There were a few other reports of black bears in portions of the Ozarks in the 1950s (K. Sadler, pers. comm.).

G. E. Moore, writing in the July 1954 Audubon Society of Missouri's *The Bluebird*, a quarterly newsletter/journal, states that although it was formerly widely-believed that there were no bears left in Missouri, his views had changed. He stated it was well-established that there were black bears in some parts of the Ozark region and that they were increasing. However, he didn't cite any evidence to support this belief. A 250-pound adult of unknown sex was later shot in Iron County in 1958 (Schwartz and Schwartz 1959). It is not known whether these were released. Department personnel were aware of instances of bears being released during this time period.

The Arkansas Game and Fish Commission quietly initiated a black bear restoration program in 1959. During 1959-1967, 254 black bears were captured in Minnesota and Manitoba, Canada and released in the

Ozark and Ouachita Mountains of western Arkansas. Since that time the Arkansas population has expanded in both size and distribution. Estimates increased from 600-700 bears (Conley 1978) to 1,200-1,500 (Pharris 1984) in just six years. Present populations are estimated at 3,500 (Eastridge 2007). Black bears have been a legal game animal in Arkansas during a conservative fall season annually since 1980.

Since 1959, black bear sightings have become more numerous in Missouri, as have nuisance complaints and illicit shootings. Frank Sampson, former Department Wildlife Research Biologist, described the circumstances and occurrences of black bears in Missouri in 1972 (Dept. memo), noting 54 occurrences in 27 counties during 1950-1972. Some records of sightings of black bears were maintained during the 1970's and 1980's. In 1988, personnel on the Doniphan District of the Mark Twain National Forest recorded 15 sightings of bears in Ripley County alone.

In 1990, a request for sighting information published in the June Conservationist magazine resulted in 55 reports of sighting in 26 counties.

Additionally, 31 bears are known to have been killed in Missouri from 1959-1992. All but two were males; one female was tagged as one of the original bears released in Arkansas. She had been captured as a yearling and released near Mena, Arkansas on August 9, 1968 and killed 160 miles north near Branson, Missouri on October 27, 1968 (Clark 1985). Arkansas Game and Fish personnel did not tag any of the bears they released until the final year (1968). Twelve bears were killed in Missouri during 1959-1970 (25% of all sightings), the period coinciding with the Arkansas restoration program.

CURRENT STATUS

The black bear is currently listed as "vulnerable" in Missouri. Our primary source of information is from a public sightings, occasional road kills, or bear shootings. Otherwise, little is known about the population's current status.

We have better information regarding the distribution of bears in Missouri. In 1991 we began a survey to better determine the distribution of black bears in Missouri and the status of their habitat (Hamilton 1992). As part of this effort we distributed report forms to Conservation Agents and other Department field personnel to document sightings of bears and their sign. We recorded 95 sightings in 1991 and 152 sightings in 1992 in 34 counties. Since 1987, 829 sightings have been recorded in 91 counties (Figure 1). Of these counties, 27 reported between 1 and 4 sightings, with single-sighting reports in 13 counties. Fifteen counties had more than 20 sightings; Ozark (>100), Carter, and Taney counties had the most reported sightings. Few of these reports indicated problem or nuisance bears. Recent bear sightings suggest bears are continuing to occupy more forested range. From January through May 2008, 17 bear reports have been received, and three of the reports included cub sightings. These reports include confirmed/probable bear sightings and confirmed sign such as tracks and scat.

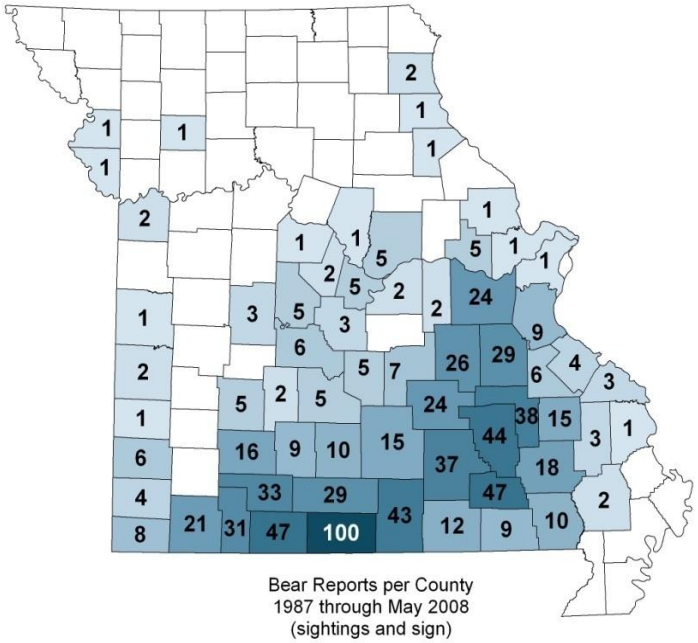

Figure 1. Bear reports by county for Missouri from 1987 to 2008.

Sightings of sows with cubs or young have increased fairly dramatically. There were 8 sightings of cubs during the 1960's, few records of reproduction during the 1970s and 1980s (3), and 16 reports during 1990-1992. The total number of reported cub sightings since 1987 totals 107 (Fig 2).

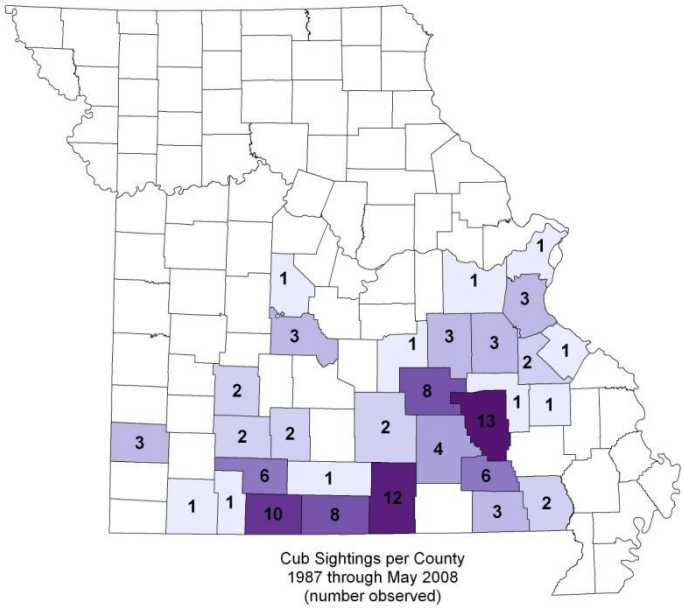

Figure 2. Reports of cub sightings by county for Missouri from 1987 to 2007.

Many resource professionals in the Ozark and Southwest regions believe that bear sightings have become so common that the public and agency folks no longer report them. Black bear sightings tend to be seasonal, with a distinct peak of activity occurring in May and June, during breeding and when natural foods are scarce and bears forage in areas where they are likely to be seen. Sighting rates decline in mid-summer as natural foods become widely available and pick up again in fall during the "fall shuffle" as bears move to new feeding areas.

From 1991 to 2003, bait-station surveys were sporadically conducted across a large portion of potential bear habitat in an effort to identify occupied areas. Preliminary results suggest small populations in areas of southwest Missouri and the Current River watershed (Fig. 3).

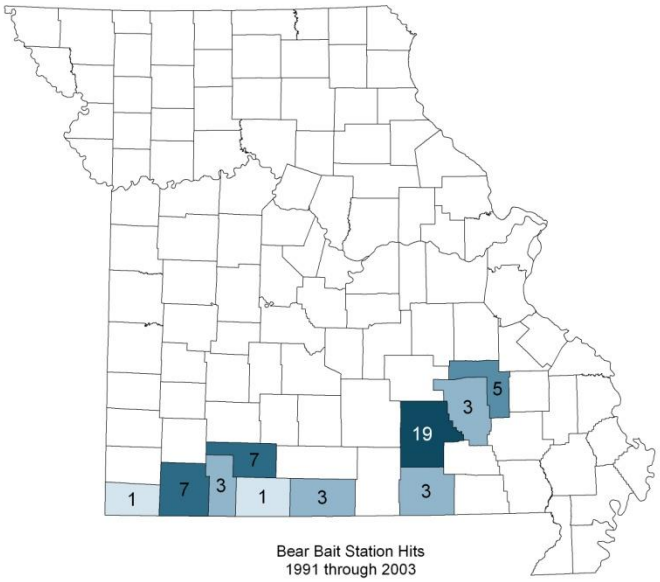

Figure 3. Bear visits to bait station surveys sporadically conducted from 1991 – 2003.

Bait-station surveys have been conducted in Arkansas since 1985 (Clark 1990) and in Oklahoma since 1989. Rates of visitation have increased dramatically, especially in Oklahoma during 1991 and 1992 as the Ouachita bear population expanded along east-west mountain ridges (J. Whitaker-Hoagland, pers. comm.). Generally, bait station data are not well correlated with population densities and their most valuable attributes are in defining bear presence (but not necessarily absence).

According to recent research in Arkansas, the black bear population in the central Ozark Mountains is nearly stable, while the population in the Ouachita Mountains is growing at an incredible rate of 26% annually (Clark 1991). Average litter sizes were higher in the Ouachitas (2.26 cubs) than in the Ozarks (1.41), and survival of cubs much higher (90% vs. 31%), explaining the difference in growth rates of those two distinct bear populations.

Although sightings of bears in Missouri have increased substantially during the past 10 years or so, the origin of these bears is not clear. Some of these sightings may be dispersing sub-adult males traveling from breeding populations in Arkansas. Sub-adult male bears disperse long distances and occasionally wander through areas of marginal habitat, but females rarely disperse from natal home ranges, and usually establish home ranges within or adjacent to their natal area (Pelton 1982, Elowe 1984). Geographic expansion of black bear populations is relatively rare, especially across gaps in habitat.

A small scale pilot hair snare study conducted with the University of Missouri in 2006 identified 16 individual bears. Analysis of DNA suggests most bears were from the Ozarks of Arkansas but some were from the Ouachitas, one bear was a "hybrid" offspring from animals linked to these 2 populations. Given these findings it is likely that a portion of Missouri's bear population is the result of dispersals from the original releases in Arkansas during 1959-1967; perhaps a few were females who survived in Missouri's Ozarks and

have persisted at low densities. Lastly, it could be that black bears were never completely eradicated from Missouri, and it has simply taken 40 years for the descendants of the few survivors to begin a recovery. The two bears killed in Missouri immediately prior to the Arkansas restoration effort are evidence in support of this possibility.

While we are still unsure of their origin, and more importantly, their viability, road-killed sows and photos of sows with cubs provide evidence that female bears and their cubs reside in Missouri. Such incidences have occurred in two areas: one in southwest Missouri and the other along the Current River watershed in the eastern Ozarks. More intensive study is now needed to better define the status of black bears and their viability in Missouri.

MANAGEMENT GOALS AND OBJECTIVES

A number of objectives and programs have been identified to aid in the management of black bears in Missouri, including population and habitat assessment, increased understanding of movement patterns, dissemination of information about bear biology and nuisance problems, control of unacceptable mortality, and continual review and update of management needs. Although presented here in priority order and as distinct elements, these objectives are interrelated and will be integrated during implementation.

Justification:

The black bear was a common resident throughout Missouri's woodlands during the early 1800s, but was becoming rare by 1850 due to over harvest (McKinley 1962). A few survived in the Mississippi lowland swamps until 1931 (Bennitt and Nagel 1937). During the period 1890-1920, much of the Ozark forestland was systematically logged and was cleared for homesteading. The Mississippi lowland hardwood forest, originally 2.4 million acres, was also cleared and drained, and less than 2% remains (Korte and Fredrickson 1977). Similar patterns of bear extermination and habitat loss occurred in adjacent areas of Arkansas and Oklahoma, thus most likely eliminating the entire bear population from the Interior Highlands (Ozark and Ouachita Mountains) (Clark 1988).

Many habitats capable of supporting bears have since recovered and human populations are much lower in the Interior Highlands of Missouri, Arkansas and Oklahoma. Black bears were successfully re-established in the Ouachita and Ozark Mountains of Arkansas between 1959 and 1967 by the Arkansas Game and Fish Commission (Rogers 1973, Pharris 1981). Black bear populations have grown dramatically in Arkansas and in adjacent areas of Oklahoma, and sightings of black bears have increased in Missouri as well.

Increased reports of black bears and cubs suggest we have a growing population of bears in Missouri. Missouri citizens and Department personnel have expressed both interest and concern regarding this growing population. The fate and perception of bears in Missouri will likely be influenced by the management actions taken by MDC. Most state agencies suggest that raising bears and other large carnivores to a game species actually elevates the animals' status in the publics' view. Clear and effective nuisance control actions are important to minimize conflicts with humans and remove bears that may become a perennial nuisance. Also, given the generalist nature of bears it seems likely that bear populations will continue to grow and colonize suitable habitats. We consider the natural bear range in Missouri to include the 42 county area contained within the Ozark Highlands section (Nigh and Schroeder 2002) and excluding metropolitan counties and those with greater than 15% in row crop agriculture (Fig 4). As bear populations grow within this range it will be important to implement management strategies that support a bear population. Many information needs exist and this plan identifies both short-term and long-term program objectives.

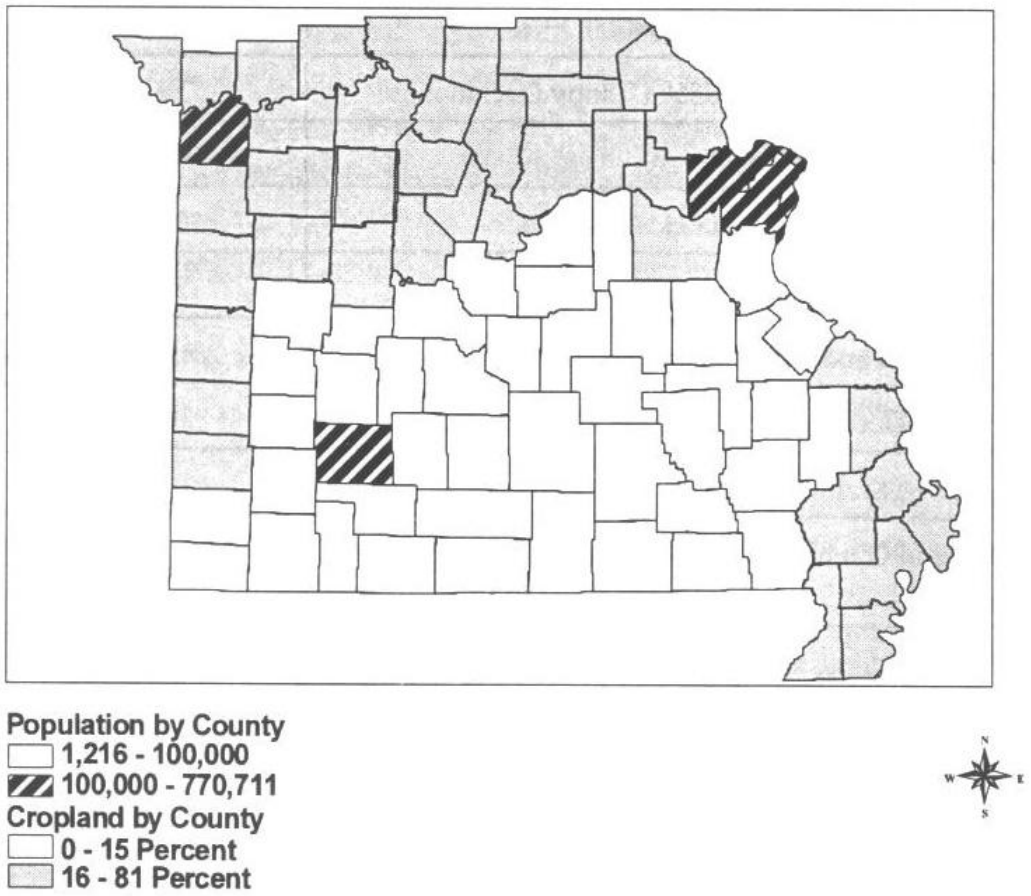

Figure 4. Counties in Missouri (white) with suitable bear habitat, low human populations, and <15% row crop agriculture.

Bear management objectives:

Goal 1: Increase knowledge needed to manage and conserve black bear populations

- Objective 1.1: Provide a scientific estimate of bear densities, sex and age distribution and occupied range in Missouri (Priority 1)
    - Strategy 1.1A: Implement systematic, quantitative population estimates using the best available technology, including, but not limited to: hair snares, DNA analysis, and radio-telemetry combined with a mark-recapture program to estimate the number of individual bears, sex, and possibly age distribution. Assignment: Resource Science
    - Strategy 1.1B: Continue to use public bear sightings, nuisance complaints, road killed bears, annual hunter observations and surveys, and bait station surveys as a means to identify occupied bear range on a statewide basis. Assignment: Resource Science

Strategy 1.1C: Coordinate management efforts and population information with neighboring states. Assignment: Kevin Hedgpeth, Wildlife

Rationale:

Missouri black bear populations are estimated to be around 300 (Dave Hamilton, pers. obs.), primarily in the southern part of the state. Approximately 3,500 black bears are present in the Interior Highlands of

Arkansas, Oklahoma, and Missouri, and are likely genetically inter-connected, although it is unknown to what degree Missouri bears are linked to or dependent upon those to the south.

Understanding population structure provides important information for management strategies. Missouri black bear population densities are relatively low, making trend estimates difficult and less meaningful. Traditional mark-recapture methods such as trapping and tagging individuals are very labor intensive and are problematic because of the impermanence of the tags on relatively long-lived animals (Woods et al. 1999, Mills et al. 2000). Recently, non-invasive sampling of hair to obtain genetic tags has been utilized as an alternate method to study bear populations in Canada, North Carolina, Michigan, Oklahoma, and Wisconsin. Genetic tags obtained from remotely collected hair samples are unique to the individual throughout its lifetime and can be used to reveal crucial characteristics about a population such as relative size, sex ratio, genetic diversity, and even the age of individual animals (Taberlet et al. 1997, Woods et al. 1999, Mowat and Strobeck 2000). Molecular markers can also determine migration patterns between populations, genetic differentiation between populations, and relatedness between individuals. These new technologies will help to define a starting point from which population growth can be modeled. This information will be crucial in designing conservation strategies to manage black bears consistent with the available habitat and within the limits of human tolerance. A population estimate and sex/age distribution will provide the foundation of information for establishing a long-term black bear harvest management program. Results from this work may reveal future research needs regarding population demographics and movement corridors.

We will continue our effort to collect bear sighting information from agency personnel and the public. Periodic media campaigns will be used to remind field personnel of the need to report sightings. We periodically distributed "wanted posters" and mail-in bear observation forms at various locations requesting the aid of citizens in reporting sightings of bears and sign of bear activity. Bait-station surveys may be conducted in the vicinity of repeated bear sightings if they are occurring in previously unoccupied regions.

Department field personnel are requested to report all black bear observations to Resource Science personnel in Columbia. Reports should include name and address of observer, county, date, number and description of animals or sign, and the specific location (township, range, section, road numbers, and distance to identifiable landmarks, such as intersections or towns). These sightings are indicators of bear range in Missouri and helpful indices of population trends. All sightings are recorded in a long term database. We recognize that there is a tendency for reporting rates to drop over time and that this sighting report system has become less effective. Sightings do, however continue to be useful in defining occupied and new bear range in the state.

Goal 2: Increase knowledge of black bear ecology in Missouri, identify populations, how they move, disperse and travel on a landscape level

- Objective 2.1: Identify source and sink populations of black bears in the state and use this information to aid in decision making regarding translocation of nuisance bears and integration into management strategies. (Priority 1)
    - Strategy 2.1A: Use sex ratio and age distribution data collected under Strategy 1.1A for the basis of decisions regarding bear management. Assignment: Resource Science
    - Strategy 2.1B: Use best available technology, including, but not limited to: GPS, radio-telemetry, DNA analysis, remote sensing to identify resource selection and availability. Assignment: Resource Science
- Objective 2.2: Identify movement, dispersal and travel patterns in order to conserve corridors and limit barriers caused by human development
    - Strategy 2.2A: Use best available technology to monitor black bear movements and identify significant travel corridors and habitats. Assignment: Resource Science
- Objective 2.3: Identify, delineate, and describe suitable black bear habitat types in the state
    - Strategy 2.3A: Use spatial mapping and resource selection investigations in order to represent important bear habitats. Assignment: Wildlife- Lee Hughes

- Strategy 2.3B: Update/verify existing black bear habitat use model. Assignment: Wildlife- Lee Hughes and US Forest Service Research Section

Rationale:

The idea of managing bear populations relative to source-sink areas is compatible with established nuisance guidelines and promotes expansion only in areas most suited for bears in Missouri. In many situations it is likely that a source-sink dynamic is artificially created. Sinks are likely to result in areas where conflicts with humans are common, habitat quality is poor, or mortality from illegal harvest is high. On the other hand, source populations in Missouri are likely areas with established female populations, with low human densities and good habitat. One such example in Missouri appears to be the areas around Roaring River State Park were bear sightings have been common for 20 years and reproduction is increasing (based on sightings). Identification of similar areas will be helpful when making bear management considerations.

The breeding range of bears in Arkansas is believed to extend north to the Missouri border (J. Clark pers. comm.), and the breeding habitat in Arkansas is contiguous with that in Missouri (Figure 5).

Figure 5. Current breeding bear range in Arkansas, 2008

In order to adequately address future black bear population challenges, we need to better define the distribution and density of bears in Missouri and describe the nature of these occurrences. Identification of source populations (areas with reproducing female bears) will allow the Missouri Department of Conservation to better target education efforts and nuisance bear control programs in Missouri. By determining sex and age distributions of the current breeding population in the Ozark Highlands and identifying the potential habitat blocks available and corridors linking them, we will be better able to conserve corridors and limit barriers caused by human development. In addition, identifying areas occupied by bears in Missouri will provide the basis for studies to measure reproductive status, recruitment and population dynamics – essential parameters if we wish to model or forecast population growth and harvest potential.

The question of population connectivity has many potential implications, including long-term viability, genetic diversity, and population growth rates. Ultimately, answers to this question may also affect future land management decisions and mitigation measures for future development projects.

Goal 3: Develop black bear conservation and management strategies based on information gathered through research, monitoring, and surveys

- Objective 3.1: Maintain a viable population of black bears in the state (Priority 1)

- Strategy 3.1A: Evaluate and recommend regulation changes pertaining to the protection and management of existing and future populations. Assignment: Protection and Resource Science
- Strategy 3.1B: Incorporate black bear habitat requirements in developing and implementing Missouri Comprehensive Wildlife Strategy, Forestry Resource Assessment and Strategy (FRAS) and other agency strategic land management plans. Assignment: Wildlife- Tim Russell and US Forest Service- Jody Eberly
- Strategy 3.1C: Implement project-level management activities to the benefit of black bear populations. Assignment: Wildlife- Larry Rieken and DNR- Ken McCarty
- Strategy 3.1D: Identify and link suitable blocks of black bear habitat within Missouri and adjacent states. Assignment: Wildlife- Lee Hughes

- Objective 3.2: Manage black bear populations consistent with other big game animals in the state to meet public desires and legal obligations
  - Strategy 3.2A: Consider establishing a limited black bear hunting season when, based on data collected under Goals 1 and 2, the population exceeds 500 animals.
  - Strategy 3.2B: Educate hunters about bear hunting techniques and ethics and how season timing is used to protect sows from harvest. Assignment: Resource Science, Outreach & Education
  - Strategy 3.2C: Collect appropriate biological samples from road killed, hunter-harvested bears, and other available carcasses including tooth and DNA samples in order to monitor sources of mortality on the population, general health, and reproductive indices. Assignment: Private Lands- James Dixon and Scott McWilliams

- Objective 3.3: Proactively manage human-black bear conflicts:
  - Strategy 3.3A: Review and update nuisance black bear policy by developing criteria-driven triggering actions to deal with nuisance black bears. Assignment: Private Lands- Rex Martensen
  - Strategy 3.3B: Evaluate efficacy of current methods to handle nuisance black bears and revise as needed. Assignment: Private Lands- Rex Martensen and staff
  - Strategy 3.3C: Implement bear-proofing practices on public-use areas where feasible to prevent human-black bear conflicts. Assignment: Wildlife- Kevin Hedgpeth

Rationale:

As bear populations increase to levels that require or can support hunting, our efforts to manage populations on a scientific basis will include the need for population estimates, models, harvest quotas, and regulations that target male bears. Males are more likely to cause conflicts with humans and hunting can be used to reduce these conflicts. Public support for bear hunting will be stronger if we make clear our intentions of maintaining robust populations but minimizing nuisance situations through targeted harvests. Hunters and hunting will be used to manage bear populations at levels that minimize human conflicts and maintain healthy populations. Collecting biological samples from hunter-harvested and road killed animals can aid in measuring reproductive potential, (counting placental scars in females), survival/age data, and general health. These data may be important during early hunts but will become less important as more meaningful data are obtained through scientific studies.

Other states have taken similar approaches to bear management. Recently, Nevada implemented its first modern era black bear season with an estimated population of 300 animals. This decision followed increased human-bear conflicts as well as interest in hunting bears from the public. Kentucky initiated its first modern day bear season in 2009. Oklahoma completed a hair snare study in 2006 to determine the abundance and composition of bears in the state. Results suggested a statewide population of 500-1000 bears. In 2007 they proposed a bear hunting season but were stymied by the legislative process. Another attempt is planned for

2008. In 1980, after a 52-year moratorium, and 12 years following their reintroduction effort, bear hunting was resumed in Arkansas. Conley (1978) estimated that the statewide bear population exceeded 1000 animals prior to the initial bear season. The objectives of the hunts were to provide recreational opportunity, collect biological data for management purposes, and aid in the reduction of nuisance bear problems. An annual harvest goal of 200 bears was set in 1993; this goal was reached in 1996. Today, AGFC estimates there are 3,500 bears in the Interior Highlands and a harvest of 10% of the Ozark population and 15% of the Ouachita population is sustainable. Currently Arkansas is harvesting around 350 bears annually. Current research objectives are designed to provide a sustainable harvest strategy for the White River bear population. Studies using a long-term mark-recapture study with multiple captures of individual bears (e.g. Jolly-Seber estimators) supplemented with DNA testing from hair follicles collected from barbed-wire surrounding bait stations should provide necessary data (Estridge 2000). While there is no scientific basis for our benchmark population of 500 bears prior to a hunting season, this number does make biological sense. First, if we took 10% of the population the harvest of 50 animals is large enough to be meaningful and justify the investments towards creating the season. Second, and most importantly, a population of 500 animals would necessitate a significant portion of female bears and the impacts of a properly timed hunting season would not slow population growth.

Besides hunting, seeing a bear or bear sign is a very significant event for outdoor enthusiasts in the state. Black bears are an important resource for Missouri citizens and their management will require protection from illegal exploitation or molestation, and harvest regimes that are science based. The establishment and strict enforcement of regulations pertaining to bear feeding, baiting, and running with dogs are important components of the bear management plan in Missouri.

Outdoor programs with a conservation message are important to developing public awareness about bears and in promoting ethical conduct by the public when hunting or running bears with dogs. Bear programs geared towards hunters will be helpful in educating the public about bear biology and curtailing illegal activities. Season timing will be designed to protect female bears and cubs, and workshops should help minimize mistakes in the take of females and cubs.

Although black bear habitat needs are fairly general in terms of forest types used, bears are wide-ranging animals and need larger blocks of forest land than what most resource managers normally consider for other wildlife species. Because bears range widely in landscapes, habitat relationships must be evaluated on a broader context than habitat types per se. Human activities and land uses must be factored into bear habitat relationships. Deforestation and road building, in particular, are common problems for the conservation and management of bear populations in North America. The processes of habitat fragmentation that cause localized bear extinction must be understood to maintain viable bear populations in the face of increasing habitat destruction and isolation. Even though many habitats in Missouri have recovered, some are at risk due to road building, development, and land clearing. Publicly-owned forest lands will provide a substantial portion of bear habitat in Missouri. Currently, the habitat needs of black bears are not directly addressed in many management plans for public forests in Missouri (see Appendix I). Intensive forest management and road building changes bear habitat more than any other activity on public lands. Bear foods are often more abundant in logged areas than in completely uncut forests, due in part to increased sunlight at the shrub-level (see Appendix I).

Because black bear habitat needs must be met at both local and landscape levels, conservation of black bear habitat will also support many other rare, threatened and/or endangered plants and animals. Thus, management programs that meet black bear needs should be considered in future planning efforts for public forests within potential bear range in Missouri.

The Missouri Conservation Wildlife Strategy has been formed to 1) coordinate the conservation of biological diversity: 2) conserve ecosystem diversity; 3) conserve species and genetic diversity; and 4) increase knowledge and awareness of biodiversity. It is widely recognized that the long-term conservation of biological diversity will require planning and management of large, landscape-scale ecosystem emphasis areas. Conservation efforts for wide-ranging animals such as black bears are an important way to focus conservation efforts at the landscape scale. A complex of conservation areas in southern Missouri could benefit plants and a diversity of animals and natural communities, including black bear. The proposed “Conservation Opportunity Area” concept may fit well with management needs for female black bears in Missouri by providing areas of

limited access, as long as periodic forest disturbances (such as prescribed fire or other specific prescriptions) stimulate summer food production.

Additionally, many of the processes that lead to loss of biodiversity in Missouri (habitat destruction and degradation; artificial habitat fragmentation; hybridization; population reductions; species eliminations; and species introductions) also affect black bears and their habitat quality directly. Thus, the black bear may be a good species to use as a model when designing strategies to conserve biodiversity. Bear management and conservation efforts need to incorporate the diverse disciplines of genetics, demography, and community and ecosystem ecology.

Ultimately, an assessment of bear habitat in Missouri will be used to predict population growth and set population goals, identify habitats in need of conservation, and to implement mitigation measures, if and when needed. Also, habitat assessments can be used to recommend nuisance bear translocation, release sites (if necessary and appropriate), and can be re-evaluated through time to monitor trends of bear habitat quality.

Consistent with the existing Wildlife Damage Control policy for nuisance black bears, the goal of the nuisance bear control program is to minimize property damage without posing a threat to local bear populations, and without endangering human safety. As Missouri's black bear population increases, and as more people move into black bear habitat, nuisance problems will undoubtedly increase.

At present, we have relatively few problems with bears in Missouri. However, the few experienced thus far have occasionally caused confusion regarding appropriate approaches to solve nuisance problems. Department staff is also in need of updating their knowledge of control techniques. A number of training workshops is recommended in the near future to bring all appropriate field staff up to date on nuisance control procedures.

Unprotected apiaries, improper herding practices, inadequate garbage disposal and food storage tend to create bear-human conflicts. These conflicts almost always involve competition for food, and can be minimized.

Preventive measures are the best way to respond to potential nuisance bear conflicts. Proper nuisance control management is necessary to help prevent these behavioral changes in bears. Spring and early summer are peak times for nuisance problems.

Trapping and transferring nuisance bears is costly, time consuming, and does not always solve the problem in the long run. Numerous state conservation agencies have emphasized the problems involved with trapping and transferring nuisance bears, and advise others to use this technique as a last resort in urgent or unusual circumstances (Hostick 1990). Destruction of the bear is also short term, expensive (in terms of public relations and bear conservation), and controversial. In many cases, both techniques are ineffective solutions.

A better educated and responsible public, through management and education efforts, will assure compatibility of bears and humans. We encourage the distribution and use of bear life-history and nuisance booklets to landowners. As people become more aware of bears, these educational booklets can alleviate many potential problems stemming from either misunderstanding of bear life-history or nuisance control protocol.

Techniques to prevent conflicts:

- Bear-proof garbage containment
- Proper food storage (includes pet and livestock food)
- Information-Education through various media
- Enforcing a **NO FEEDING** philosophy among public
- Locate garbage dumps away from campsites, or eliminate in bear habitat
- Use electric fencing to protect bee hives

The availability of human-related food sources can change bear behavior. The use of these food sources may lead to human-bear conflicts, and ultimately, indirect sources of bear mortality via illegal shooting, translocation, or mandated destruction of the bear.

Goal 4: Educate Missouri's public, the media, and other resource professionals in Missouri and the Midwest about black bears and Missouri's black bear management program

- Objective 4.1: Improve outreach and education on bear issues (Priority 1)
    - Strategy 4.1A: Promote black bear programs as core MDC messages and to use available media outlets for reaching target audiences by Outreach and Education employees. Assignment: O & E
    - Strategy 4.1B: Update and distribute educational black bear publications to specific target audiences and other land management agencies. Assignment: O & E- Joan McKee
    - Strategy 4.1C: Update the black bear page on the MDC website and establish links to other agency websites. Assignment: O & E- Bonnie Chasteen, Resource Science – Liz Forbes

- Objective 4.2: Improve intra and inter agency education and communication
    - Strategy 4.2A: Provide black bear information in annual furbearer status report. Assignment: Resource Science
    - Strategy 4.2B: Develop File Transfer Protocol (FTP) site for the exchange of information among agency professionals. Assignment: US Forest Service- Jody Eberly
    - Strategy 4.2C: Develop communications protocol and a common database to maintain current records of black bear sighting, mortality, and relocation information. Assignment: Resource Science

An information program regarding black bears can target non-traditional and non-hunting publics. Black bears now enjoy wide public appeal (according to our recent attitude surveys), especially in urban areas. Campers, hikers and other nature enthusiasts need information about how their hobbies can be enhanced simply by being aware of bears' presence. Rural landowners alive during the 1930s and 1940s when attitudes towards all predators were much more intolerant and when bounties were common are less enthused about having bears in Missouri. These education/information programs should stress ways of generating respect, not fear, and ways of preventing problem encounters with black bears

One of the most important aspects of any effective management program is communication of information. Scientific communications reach a small, specialized audience and the public many times only receives anecdotal accounts which are often inaccurate and incomplete. In order for the public to accept black bears as a part of Missouri's natural heritage and support management programs, the public must be provided with sound, biologically-correct information which is readily understood.

The presence of black bears in Missouri has caused a degree of controversy. Public opinion varies and runs the full spectrum from those who think all bears should be shot because they represent a threat to personal safety and property, to those who consider them a potential trophy animal, and to a growing number who feel they are endangered throughout their range and should be completely protected. Also, a considerable number value the black bear as a part of our native fauna because of its status as a quality habitat indicator, or "deep woods" species.

The secretive but sometimes bothersome nature of black bears contributes to the wide range of emotions among people living in or visiting bear habitats. Also, great misunderstanding about black bears and frequent confusion with habits of grizzly bears contributes to the range of opinions regarding bears. Hughie (1979) stated that human attitudes toward bears are one of the main factors controlling bear numbers.

Although people problems are currently the primary management challenges, attitudes toward bears and other large carnivores have improved dramatically in the U.S. and in Missouri. As an indication of this change, the "shoot on sight" philosophy that once prevailed in Missouri seems to have declined. Missouri citizens shot and killed all five bears that were reported in Missouri during 1950-1959, and eight of twelve by 1962. However, of the 366 reports of bears from 1980 - 1993, only seven (2%) have been reported killed. Even though the illegal shooting of bears is still a problem (most likely tied to an unreasonable fear), attitudes appear to have improved during the past 25 years.

MDC has a number of publications pertaining to black bears and most need only updates to remain relevant. If bear populations continue to grow and a hunting season is warranted, additional information geared

towards hunters will be created and distributed through regional offices and other print and electronic media. Currently we believe the most efficient manner to reach the public and MDC staff is through MDC's website. Black bear outreach efforts will include a user-friendly, attractive, web page dedicated to black bear biology, status in Missouri, nuisance issues, and other timely information. We have created a recent and relevant power point program for presentation and distribution to outreach staff from MDC, DNR, USFS, NPS, and other interested agency personnel. This will ensure that information and messages about black bears in Missouri are uniform and consistent. Communication among agencies will be facilitated through a file transfer protocol site.

SUMMARY

The black bear is native to Missouri's woodlands and its comeback is a welcome addition to the state's biodiversity. It appears that many citizens in Missouri are in favor of bear population recovery.

This plan outlines several key objectives designed to hasten population growth and enhance the Department's ability to manage black bears. Successful management will necessitate efforts from all Department divisions. Educational programs and products designed to inform the public and Department personnel regarding bears and their biology are essential to allow recovery. Additionally, a responsive nuisance bear control program is critical if the public is to continue to accept black bears and for the Department to maintain credibility. An effective nuisance bear program should be aggressive and is an important tool in public education. Personal contact between the Department staff and citizens with black bear complaints must be emphasized.

This plan also outlines strategies to determine the extent and quality of bear habitat in the state, the distribution and abundance of bears, and identifies a need to determine the status of female bears. Although bear numbers seem to have increased in recent years, the viability of a breeding population is still unknown.

Finally, this plan identifies strategies to help incorporate black bear habitat needs into management plans for the Department and other agencies. Black bears use a variety of forested habitats, but require large blocks of forests that are connected to other blocks of habitat with suitable corridors, and therefore, may provide a useful model in regional and landscape level management planning.

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APPENDIX I

GENERAL INFORMATION ABOUT BLACK BEARS AND HABITAT MANAGEMENT

CHARACTERISTICS

The black bear is the smallest bear in North America and the only bear native to Missouri. Their historic range covered all forested regions of North America, but in the eastern United States they now exist primarily on public lands. Adult males generally weight 200 to 600 pounds, and adult females weigh 100 to 300 pounds. Although most bears in Missouri are black, the brown color phase also occurs (approximately 20-25%).

The black bear has acute senses of hearing and smell, but has relatively poor eyesight. The black bear is highly intelligent, and its extreme wariness is an example of that intelligence. Although the black bear is not considered one of the more dangerous animals, it can sometimes have a fragile temper and be unpredictable in its behavior. However, although occasional physical injuries do occur during contacts between people and black bears, virtually all involve people feeding bears or attempting to touch or capture them. In most cases these incidents occur in a campground setting and involve a "panhandler" bear. The black bear possesses great strength and agility, and is an excellent climber, runner, and swimmer.

Even though the black bear is a forest-dwelling animal, it is quite adaptable and inhabits a variety of forest habitats. Black bear populations have declined or have been eliminated in areas because of land use changes that have converted forest cover to agriculture or urban developments. Increased human access because of roads has also impacted black bears where forests remain intact. Bear populations become patchy as developments fragment the forest and travel corridors are eliminated. Because of its sensitivity to habitat changes, the black bear is often used by resource agencies as a management indicator species.

Breeding Biology

Generally, both male and female black bears become sexually mature at about 3.5 years of age. Sexually mature females will usually produce young every other year until they are 18 to 20 years old or older. Except for females with cubs and during the breeding season, black bears are solitary animals.

The breeding season for black bears occurs during June and July. Female bears will chase their yearling cubs away just prior to coming into estrous. Many yearling males began dispersing soon after that and may wander long distances and for many months, while yearling females usually maintain a home range within or adjacent to their mother's. Some males may not disperse until they are 2.5 years old.

The gestation period is approximately seven months. Development of the embryo is delayed for approximately five months and the embryo does not begin developing until six to eight weeks before birth. This delayed implantation may be an adaptation to prevent the developing young from using the female's metabolic reserves until the fall foods become abundant. Cubs are born while the females are in winter dens,

usually late January or early February. Normally, two cubs are born, but three or four are not uncommon. Cubs are born blind and helpless and weigh about 8 ounces. The cubs stay with the female throughout the next year and normally den with her as yearlings. There is a critical relationship between black bear's breeding biology and food availability. The nutritional condition of the female as she enters the winter den can affect production of cubs – if she's in poor condition, the fertilized egg may not implant in the uterus, or the cubs may not survive because of poor milk production.

HABITAT AND FOOD

Black bears can be found in a wide range of forested environments. Bear populations can be found in habitats as diverse as the subtropical areas of Florida to boreal and sub-arctic areas of Canada and Alaska. As the geographic distribution of bears has diminished, the remaining suitable habitats have become increasingly important. Substantial range expansions by bears are generally limited; however, because of their generalist nature and intelligence they have become able to persist despite human encroachment.

Preferred black bear habitat is characterized by large forested tracts of mast- bearing trees or shrubs. Areas of dense understory also seem to be an important component. Dense refuge cover or inaccessible areas are important to bears for denning and to escape persecution from humans and/or free running dogs. Areas of old growth forest that provide den trees are a valuable, but not essential, habitat.

Black bear habitat in Missouri is likely similar to that used by bears in the Southern Appalachians and parts of Arkansas. Bears in these areas are found in oak-hickory and mixed mesophytic forests. Seasonal use of specific cover types are often tied to the chronology of ripening hard and soft mast. Being generalists, bears tend to utilize those food sources that are most abundant. Habitats used by bears can be grouped as spring-summer ranges and late summer-fall ranges. Overall, seasonal differences in home range size, activity centers, and movement patterns are nearly always related to the phenology, production and geographic distribution of food resources. Generally, female bears have smaller spring-summer ranges and this is likely due to the low mobility of their offspring. Adult males travel extensively during the spring and also the summer breeding season, and often throughout the fall. Males typically have larger home ranges than females (approximately 10 square miles for females), sometimes twice or triple their size (up to 60 square miles for males).

Spring-Summer

During spring and early summer bears seem to prefer forest openings, pine cover-types with blueberries in the understory, and recently clear-cut areas. These early successional cover-types provide bears with grasses, forbs and fruits when other food sources are absent. Also, some biologists speculate that grasses and forbs are important in "reactivating" the bear's digestive system after its winter dormancy. Seeps, balds, and glades likely provide similar foods. Specific foods consumed by bears during spring include nettles, touch-me-not, and soft mast from Heath (*Ericacae*) and Rose (*Rosaceae*) families. Carrion and newborn white-tailed deer (*Odocoileus virginianus*) are also eaten by bears, when available. However, overall, bears tend to lose weight during spring.

As summer approaches bears take advantage of ripening fruits and berries and often spend considerable time in recent clear cuts and habitats with a high shrub component. Bears also seem to spend considerable time in forested areas with low site indices, probably because these areas often contain mats of huckleberries, *rubus* sp., and other soft mast. Bears typically recover weight lost over winter by mid-summer, as there is a diversity of foods available. Food habit studies show that bears utilize insects, tree-borne soft mast, and shrub-borne soft mast prior to fall when diets shift towards hard mast.

Fall-Winter

Mast, especially acorns, is a critical component for bears during fall (see Appendix II). Bears seek out foods with high fat and protein content, and this is especially evident during fall when bears are attempting to replenish fat stores prior to hibernation. Fall mast has been termed "the single most important factor limiting

reproduction, growth and survival of black bears" (Elowe 1987, Pelton 1989). During summer-fall bears seek out areas of heavy mast production. Extensive movements and home range overlap often occurs at available food sources. Some females and their cubs have been known to move 20 miles or more to locate a concentrated nut crop. Mature stands of mixed oak and oak-hickory cover types with good site indices are most often used by bears during fall. These older stands also provide bears with den trees.

Denning

During late fall and winter bears enter pre-selected dens and undergo a winter dormancy, or hibernation. Bears probably den to circumvent food shortages during winter. Adult females with cubs tend to den first, followed by females without cubs, and males. During hibernation bears rarely eat, defecate, or urinate. Their body temperature and heart rate are reduced and their metabolism functions at about 40% while in hibernation. Both sexes lose foot pads during hibernation.

Denning sites are important components to bear habitat. They provide bears with protection from adverse weather, harassment from humans, and perhaps even intraspecific aggression. Females and their cubs benefit from secure den sites in areas with high bear densities or predators, such as free running dogs, wolves, or coyotes. Typical den sites include rock caves and crevices, tree blow-downs, slash piles, ground nests, and tree cavities. Bears don't often reuse den sites and may vary den types from year to year. Approximately 5-10% of winter dens are reused, sometimes by different bears. While den sites probably are not a limiting factor for bears, protecting quality sites is an important management objective. Trees capable of serving as den sites should be protected from timber harvest activities, and from timber stand improvement.

NUISANCE CONTROL

Bears tend to be secretive and shy, yet their daily movements and activities sometimes bring them into conflict with humans. Most people will never encounter a black bear; however, for those that do, the single encounter will likely shape their image and perceptions of bears as a whole. Unfortunately, some of these encounters will involve a nuisance bear.

For those people having problems with bears, it is especially important that 1) they receive immediate attention and are educated about bears, and 2) the bear is deterred, if possible (i.e., scare cannons, electric fence). Ideally, a human-bear conflict can be resolved as a positive experience for the landowner and a negative experience for the bear. Proper handling of human/bear conflicts is essential to curb negative public attitudes, maintain public support and tolerance for bears, and maintain agency credibility among rural landowners. A reasonable and responsible bear damage policy is also an important factor of the bears' survival, especially given the uncertain status of Missouri's bear population. If the public has an avenue for proper advice, technical information, and equipment loan, a "first time offender" nuisance bear can be reformed rather than killed.

Bear/human conflicts range from mere observations of bears to actual damage caused by bears seeking food. Bears causing damage to property are almost always after food. Young bears 1.5 to 3.5 years old are more often involved in nuisance complaints than cubs or adults, and males more often than females. Young bears (especially dispersing males) no longer have their experienced mother to show them locations of food sources and they sometimes become bold and hungry enough to approach campgrounds, garbage dumps, or human residences. While female bears don't usually disperse outside of their mother's home range, males often travel extensively, seeking to establish their own home range. It is during this dispersal that male bears will raid garbage dumps, gardens, bee hives, and cause trouble. Fortunately, most bear complaints will resolve themselves as those dispersing panhandlers often never return. Repeat visits by damage-causing bears would merit more aggressive actions ranging from electric fencing to trapping and relocating, depending upon severity.

BLACK BEAR HABITAT MANAGEMENT

Black bears are generalists using a wide variety of mostly-forested habitat types and forest age classes. Specific habitat management for bears consists simply of providing them a stable food source with abundant mast producing tree and shrub species and adequate escape cover. Any habitat modifications that decrease mast or cover, or increase human access, will likely adversely affect bear populations. Practices that eliminate potential dispersal corridors between large tracts of timber or fall feeding grounds will likely have dramatic long-tern affects on bear populations. Since bears are forest dwellers their populations are greatly influenced by forest management practices.

Roads

Bears can survive under a diversity of habitat types and conditions, yet their mortality rates and likelihood of becoming a nuisance animal are often related to human access. Bears that have high road densities within their home range are susceptible to human-caused mortality from hunting (where legal), collision with vehicles, dogs, and poaching. Bear movements do not seem to be inhibited by logging roads with low traffic volume. However, interstate highways (and some secondary roads) have been shown to act as barriers to movements. Human access into bear range via logging roads is likely a more important factor to bear survival. Poaching and harassment by dogs can be a very important mortality factor, particularly in remote areas with low bear densities.

Forest Management

Forest management can enhance bear habitat by providing food and cover. Timber harvest allows increased sunlight to the forest floor, thereby stimulating growth and fruit production of soft mast species such as blackberries, cherries, grapes, and pokeweed. Decomposing logging slash residue provides bears with a food source of insects and invertebrates. Slash piles are used as den sites and the regeneration provides excellent escape cover. Detrimental effects of forest management include the conversion of oak stands to other cover types, excessive logging that greatly reduces mast production, and increased human access due to road construction. Also, if large timbered tracts are even-aged, they provide only seasonal foods and are of lower quality.

Forest management for black bears in Missouri should maintain a diversity of oak species and age classes. Oak species should be favored in any silvicultural treatments. Persimmon, sassafras, and dogwood are other species that should be protected and encouraged. Even-aged management of oak forests creates escape cover and soft mast. Clear cut blocks should be scattered, small (fewer than 15 acres), and irregularly shaped to provide maximum edge and an overall patchy distribution of age classes. Timber harvest rotations of 100-120 years provide bears with adequate mast. Potential den trees and areas of old growth should be protected from any logging; 5-10% of the forest should be maintained as old growth >200 years old. Permanent forest openings also provide important food resources to bears and should be maintained or created at about 15% of the forest. Openings can be maintained through selective herbicide and burning. Edge feathering the borders increases soft mast production and benefits bears and other species. Also, frequent prescribed fire in some habitats, such as savannas and pine, can promote berry production. Sometimes these sites need 3 or more burns before blueberry production is enhanced.

Dispersal and travel corridors merit special attention. In Missouri these habitats are essential if a viable bear population is to become reestablished. Bears are known to use forested strips as narrow as 10 meters through agricultural areas in Louisiana. Travel corridors are important for dispersal of sub-adults, genetic interchange among populations, and throughways to seasonal feeding areas. Travel corridors should be identified and protected from major disturbances. These general guidelines may help when integrating bear needs into management plans:

1. Conserve habitat in large, contiguous areas (150 sq. mi for 30 female territories).

2. Consider shape, type and size of appropriate habitat, and accessibility and juxtaposition to adjoining habitats.

3. Vehicle access may seriously reduce habitat suitability for bears. Minimize public use of interior roads whenever possible.

4. Corridors of natural habitat between habitat blocks will increase their utility and the wider the corridor, the better. Wider corridors will be needed for long stretches between major habitat blocks, or if adjoining habitat is subject to intensive human use.

If major roads cross critical corridors, naturally vegetated underpasses should be incorporated to provide wildlife crossing. Use of tunnels under major ridges, instead of blasting gaps completely through, the ridge is also preferred. In many areas, wide-ranging animals such as black bears are now confined to the few remaining pockets of unfragmented landscape Corridors are simply an attempt to maintain or restore some of the natural landscape connectivity (Noss 1986).

*APPENDIX II**
Contents of 59 black bear stomachs collected in Arkansas, fall 1981 to 1986a

FOOD ITEM	AGGREGATE VOLUME	PERCENTAGE FREQUENCY
	Plant material	
Fruit		
Acorns	34.1	66.1
Pokeweed	18.6	28.8
Hickory	11.6	18.6
Persimmon	5.1	11.9
Black gum	1.7	18.6
Grape	2.5	23.7
American Beech	2.0	1.7
Devil's walkingstick	1.4	10.2
Blueberry (Vaccinium spp.)	1.2	1.7
Carolina buckthorn	0.7	22.0
Greenbriar (Smilax spp.)	0.5	6.7
Dogwood (Cornus florida)	0.2	5.1
Unidentified fruit	0.2	10.2
TOTAL	**79.8**	**96.6**
Leaves		
Pokeweed	2.3	8.5
Unidentified leaves	0.5	37.3
Unidentified grasses	2.2	33.9
TOTAL	**5.0**	**69.5**
	Animal material	
Insects		
Walkingstick	4.4	35.6
Bee	0.1	6.8
Honeycomb	0.1	1.7
TOTAL	**4.6**	**49.2**
Other Animal		
Domestic pig	9.5	1.7
White-tailed deer	0.2	3.3
TOTAL	**9.7**	**15.3**
Non-natural Foods		
Cooked fish	0.7	1.7

TOTAL	**0.7**	**1.7**

a Trace items are included in totals but are not individually listed.
* Taken from Clark et al. 1987.