A Review of Bear Management in Michigan

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Table of Contents

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Introduction

Black bears (*Ursus americanus*) are an important natural resource for the residents of Michigan, and as trustee of this resource, the Department of Natural Resources (DNR) uses a scientific approach to management. Scientific management considers the status of bear populations, bear ecology, and the social issues associated with bear-human interactions (both positive and negative). Scientific information is obtained from research, in-state surveys, and published literature. Scientific management also incorporates the concept of adaptive resource management, an iterative process by which changes in management actions (e.g., hunting regulations, or educational efforts) are evaluated to determine if these changes achieve management goals. Management efforts over time are modified as new information is obtained, new analyses are conducted, or factors that influence bear ecology change.

Michigan's bear management program includes research to help understand bear ecology and social acceptance capacity of Michigan's residents. In addition, the DNR provides information to the public about bears and technical assistance to landowners with unwelcome bear encounters. Sport hunting has the capacity to influence abundance of black bears, provides recreational opportunities, and is an important tool used to manage the size of Michigan's bear population.

The purpose of this review is to present general information on black bears and specific information relevant to the situation in Michigan. It is hoped this review will provide information to assist with the development of recommendations by the Bear Management Consultation Team.

Biology of Black Bears

Range and Distribution

World-wide there are only eight species of bears. Three of those species occur in North America, and the black bear is the only species found in Michigan. Black bears have a scattered distribution throughout most of temperate and boreal North America from the edge of the Arctic prairies in Alaska and Canada, south to central Mexico (Baker 1983). They are found in at least 35 states and all Canadian provinces. During European colonization and expansion, black bears were largely extirpated from many of the Midwestern states, yet today populations are thriving in the Upper Great Lakes and western states and remain in parts of most eastern and southeastern states. In Michigan, black bears are common in the Upper Peninsula (UP) and areas of the Northern Lower Peninsula (NLP). Bears are occasionally observed in the Southern Lower Peninsula (SLP) and these observations have become more frequent in recent years.

Life History of Black Bears

Physical Characteristics
In the Upper Great Lakes Region, most black bears have black or extremely dark brown fur. Other color variations including brown, cinnamon, grayish-blue, and blonde are found mostly in western North America (Baker 1983). Color is generally uniform except for a brown muzzle and occasional white blaze on the chest (Ternent 2005).

Average adult black bears stand less than three feet tall at the shoulder and are approximately three to five feet in length. Males are typically larger than females. Adult female black bears weigh approximately 90 to 300 pounds, and adult males weigh about 130 to 500 pounds. All bears tend to gain weight in the fall and lose weight during the winter period of inactivity (Ternent 2005). However, despite losing up to thirty percent of their fall body weight in the winter, many bears emerge from dens in the spring in relatively good condition (Gerstell 1939, Alt 1980).

Reproduction and Growth
Generally, female black bears are sexually mature at three to five years of age (Pelton 1992), yet are known to breed at two years of age in the NLP (Etter et al. 2002). Sows from the NLP typically bred earlier (2-3 years of age) and had above average litter size (2.6 cubs per sow) compared to sows from other Midwestern states (Bunnell and Tait 1981, Etter et al. 2002, Rogers 1987a). Males are sexually mature at two years of age but typically do not participate in breeding until four to five years of age (Ternent 2005).

Breeding season for black bears occurs during the summer, the peak being from mid-June to mid-July (Alt 1982 and 1989). Female's exhibit delayed implantation (Wimsatt 1963); eggs are fertilized immediately but development is suspended at the blastocyst stage. In Pennsylvania, implantation typically occurs between mid-November and early December (Kordek and Lindzey 1980). Delayed implantation postpones any nutritional investment until after the critical fall foraging period (Ternent 2005). If a fall food shortage results in a reduction in fat reserves the blastocysts can be absorbed. A reduction in nutritional investment in a poor food year allows the female to breed again the following summer if nutritional resources are more favorable (Ternent 2005).

Cubs are born helpless and hairless, typically in January while females are in the den. Cubs weigh 10 to 16 ounces at birth but because of high fat contents in their mother's milk, they grow quickly (Ternent 2005). By the time the female and cubs exit the den (generally late April), the cubs will weigh between five and nine pounds. By the end of their first summer, cubs typically weigh 50 to 60 pounds. Cubs stay with their mother for about a year and a half, denning together the winter after birth and separating in late May the following spring. Adult females typically breed every other year.

Mortality
Black bears are relatively long lived, and disease and starvation contribute little to adult bear mortality. Black bears in Michigan have few natural predators and are rarely killed by wolves in

the UP (DNR, unpublished data). Most recorded mortality in Michigan is from hunting or vehicle collisions.

Intestinal parasites such as roundworms and tapeworms are common in bears but they rarely interrupt digestion or affect nutrition (Quinn 1981). The tissue parasites *Toxoplasma gondii* and *Trichinella spiralis* are found in black bears but are not thought to cause mortality (Schad et al. 1986, Briscoe et al. 1993, Dubey et al. 1995).

Bovine tuberculosis has been detected in bears in northeastern Lower Michigan, an area known to have bovine tuberculosis (TB) in the white-tailed deer herd. From 1996-2003, 3.3% (7 of 214) of bears tested from this area were positive for bovine TB (O'Brien et al. 2006). Bears likely contract this disease while feeding on carrion or deer gut piles left behind by hunters. Bears which test positive for bovine TB do not show the physical signs (e.g., lesions in the lungs) and bears likely serve only as a dead end host and not as a source of infection for other animals or humans (O'Brien et al. 2006).

In Michigan, black bears have been known to live up to 28 years of age (DNR, unpublished data). Annual survival for yearling and older bears in Michigan's NLP was 78% and hunting accounted for nearly 60% of annual mortalities (Etter et al. 2002). Overall cub survival for the NLP was 75% and within the range reported by other studies (Kasbohm et al. 1996, DeBruyn 1997, McLaughlin 1998). However, cub survival varies annually and has been linked to the availability of natural foods, particularly soft and hard mast (Jonkel and Cowan 1971, Rogers 1976, Young and Ruff 1982). Additionally, cub mortality occurs at a higher rate in a sow's first litter than in subsequent litters.

Human related mortality (e.g., hunting, vehicle collisions), is the primary source of mortality for black bears in Michigan (Etter et al. 2002) and across North America (Bunnell and Tait 1981, Schwartz and Franzmann 1992). Mortality rates for males are typically greater than females (Hamilton 1978, Bunnell and Tait 1981, Hellgren and Vaughan 1989) and are associated with greater vulnerability of males (particularly yearlings) to human and natural mortality factors (Bunnell and Tait 1981, Rogers 1987a).

Motor vehicle-bear collisions account for fourteen percent of bear mortalities in the NLP (Etter et al. 2002); the frequency of these events increases with increased bear density, human populations, and traffic volume. However, other factors (e.g., habitat and natural food availability) likely contribute to localized and seasonal variation in vehicle-bear collisions.

Habitat Requirements
Black bears are most frequently found in large, heavily forested areas. In Michigan, bears tend to use a mixture of vegetation cover types including deciduous lowland forests and coniferous swamps, mature and early successional upland forests, and some degree of forest openings consisting of grasses and forbs. Diverse forests are prime habitat as they provide the variety of cover and food sources which bears require to meet their seasonal needs.

Forested swamps and regenerating clear cuts provide much of the escape and resting cover bears require. Mature upland forests provide hard mast (e.g., acorns, beechnuts, hickory nuts,

hazelnuts), while early successional forests provide soft mast (berries) and diverse herbaceous ground flora. Forest openings are important for food resources such as emerging grasses, herbaceous vegetation, insects, and soft mast.

As black bears continue to move into the SLP, it has become clear they can inhabit a highly fragmented landscape, provided some forested areas exist, especially along riparian zones (Carter 2007). Black bears are also becoming more common in suburban and exurban areas throughout their range (McConnell 1997, Lyons 2004, Wolgast et al. 2005, Beckman and Lackey 2008). Some aspects of human activity contribute to suitability of these areas including abundant food from row crops, orchards, apiaries, bird feeders, and human refuse.

Food Habits
Black bears are omnivorous and opportunistic feeders, using both plant and animal matter. Approximately seventy-five percent of their diet consists of vegetation (Ternent 2005). In early spring, bears frequent wetlands feeding on plants such as skunk cabbage, sedges, grasses, and squawroot (Ternent 2005). Fruits and berries are important during summer and fall, including blueberry, elderberry, blackberry, June berry, pokeberry, wild grapes, chokecherry, black cherry, dogwood, and hawthorn. Hard mast from oaks, beech, hickory, and hazelnut become important in the fall as bears accumulate significant fat reserves for the winter. Bears feed heavily in the fall and can gain as much as 1 to 2 pounds per day. Bears are capable of doubling their body weight between August and December when mast is abundant (VDGIF 2002). When fall foods are scarce, bears tend to den earlier which can impact hunter harvest.

The majority of animal matter consumed by bears includes colonial insects and larvae such as ants, bees, beetles, and other insects (Pelton 1992). However, bears are opportunistic feeders and they are capable of preying on most small to medium sized animals including mice, squirrels, woodchucks, beaver, amphibians, and reptiles. Under certain conditions bears may actively hunt for newborn white-tailed deer fawns. In north-central Minnesota 86% of fawn deaths from birth to 12 weeks of age were caused by predators and bears accounted for 29 to 36% of the kills (Powell 2004). Bears in Pennsylvania accounted for 25% of fawn mortalities to 34 weeks of age (Vreeland 2002). When available, bears also feed on carrion.

Human-related foods include agricultural crops (e.g. corn, apples, peaches, and cherries), apiaries, bird feed, and garbage. Pet and some livestock foods are sometimes eaten by bears, especially when readily available or in years when natural food supplies are poor.

Denning Behavior
Black bears enter a period of winter dormancy for up to six months as an adaptation to food shortages and severe weather conditions. In Michigan, bears typically enter the den by December and timing of denning varies annually depending on food availability. Pregnant females tend to den first and adult males are the last to den. Den emergence typically occurs in late March and April; adult males generally leave dens earlier than females, and females with newborn cubs generally emerge latest (Rogers 1987a, O'Pezio et al. 1983).

Unlike true hibernators who have body temperatures that drop to near ambient conditions, black bear body temperatures decrease only slightly to 31-36°C from a normal range of 37-38°C (Folk

et al. 1972 and 1976). Heart rates and metabolism decrease in the den and although they appear lethargic, bears are easily awakened and capable of fleeing immediately if they feel threatened. Bears do not eat, drink, or defecate during winter dormancy and basic protein and water needs are partially met by recycling urea, while other adaptations such as shivering and nutrient recycling reduce the loss of muscle tone and bone density (Ternent 2005).

Black bears use a variety of den locations and generally select sites that minimize heat loss and allow conservation of energy. Dens may be excavated or constructed as ground nests. Bears will also den in rocks cavities, root masses, standing trees, openings under fallen trees, and brush piles. Dens are often lined with dead grass, leaves, and small twigs. Locations vary from year to year; however, the occasional reuse of dens has been documented in Michigan.

Bears can lose up to 25-30% of their body weight during denning, and after emergence, bears may continue to lose weight while searching for scarce early spring foods that tend to be low in nutritional value (VDGIF 2002). Lactating females raising cubs may be stressed nutritionally after leaving their dens

Home Range, Movements and Activity
Black bears shift activity patterns seasonally in response to the availability of food. The area that a bear occupies seasonally or annually is referred to as its "home-range." The size of home-ranges typically varies by the sex and the age of the bear. The home-range size of a mature female is influenced by whether or not she has cubs. Females with newborn cubs have smaller home ranges that gradually increase as cubs mature (Ternent 2005). Annual male home ranges are generally larger than females. In Michigan, mean annual home range size for males and females were among the largest reported for the species (Etter et al. 2002). Females in the NLP had an average home range size of about 50 square miles, and males had an average home range size of about 335 square miles. Home ranges of female bears generally overlap, but overlap of mature male home ranges is less common. The home range for a single adult male may encompass several female home ranges. Young males disperse away from their natal home range before establishing a new territory, whereas young females are less likely to disperse and sometimes occupy areas that include portions of their mother's home-range (Ternent 2005). In the NLP, 32 percent of radio-collared yearling females dispersed from their natal home range and 95 percent of radio-collared yearling males dispersed from their natal home-range (Etter et al. 2002). Male bears dispersed an average of 14 miles in Pennsylvania (Alt 1977 and 1978).

Black bears are most active at dusk and dawn. Nocturnal activity is uncommon, but may occur if bears are avoiding daytime disturbance by people (Ternent 2005). Black bears can travel long distances to exploit concentrated food sources such as soft and hard mast, human refuse, and agricultural crops (Garshelis and Pelton 1981, Rogers 1987b). Activity intensifies during the breeding season and again in the late summer and fall when foraging increases.

Social Structure
Black bears are solitary animals with the exception of females accompanied by cubs or yearlings, and during the breeding season when mature males and females can be seen together. Bears establish and maintain a dominance hierarchy by using threatening gestures and sounds including stamping feet, charging, huffing and chopping jaws (Rogers 1977). Fights among bears are

uncommon except by males during the breeding season when they are competing for females or when females are protecting young (Ternent 2005). A communal rubbing tree where bears rub, bite and claw is another of communication and these trees are assumed to be used as part of the process of establishing a social structure within the population. Tree rubbing peaks during the summer and multiple bears may mark the same tree (Ternent 2005).

Assessment of Bear Populations

The DNR estimates the long-term trend and size of bear populations to help understand bear population dynamics, evaluate whether annual harvests achieve desired management objectives, and to help make recommendations for annual harvest quotas to the Michigan Natural Resources Commission (NRC). For the purpose of assessing bear populations, the State is divided into three ecological regions or land types (Albert 1995). The regions include, Eastern Upper Peninsula (EUP), Western Upper Peninsula (WUP), and NLP. The DNR uses a combination of multiple population indices, population estimators, and population models to assess the bear population on a regional and statewide basis. Primary sources of data used in population indices, estimators and models are derived from a combination of information from the published literature, field surveys, mandatory registration of harvested bears, and an annual mail survey of bear hunters. Field surveys include historical radio-telemetry projects, bait station surveys, and additional research projects found in DeBruyn (1997), Etter et al. (2002), Etter and Mayhew (2008); Mayhew and Etter (2008); Visser (1993; 1995; 1996; 1997; and 1998) and Winterstein and Scribner (2004).

Since 1982, all successful Michigan bear hunters have been required to register their bear at a DNR registration station within 72 hours of the time of harvest. A bear patch was developed in 1985 to encourage hunters to register their bear and to make the carcass available for the collection of biological data. Patches were given free to successful bear hunters who brought their bears to registration stations until patches were discontinued in 2007 as a cost saving measure by the DNR. Starting in 2008 patches will be available for a fee from Michigan Bear Hunters Association (MBHA). Profits from the patch program will be donated by MBHA to the DNR for use in bear and wildlife education efforts.

Registration information collected by the DNR includes the harvest location of the bear, date harvested, and sex of the bear. A pre-molar tooth is extracted and used to age the bear by counting cementum layers after the tooth is cross sectioned (Hildebrandt 1976, Willey 1974) and the reproductive tracts of female bears have been collected periodically to assess reproductive history. Knowing the age of bears harvested is essential for calculating several population indices and helps in the development of population models. The pre-molar tooth provided by successful hunters is also essential for estimating bear populations in the UP and NLP using capture-recapture methods (described below).

Annual mail surveys of a randomly selected subset of bear license holders have been conducted in most years since 1982 (Frawley 2008). The purpose of these surveys is to provide an estimate of bear harvest and to collect additional data used in the calculation of several bear population indices.

Bear Population Indices

The use of indices to monitor wildlife populations is a common wildlife management practice (Lancia et al. 1996), and many agencies use a variety of indices for evaluating bear populations. Bear population indices measure an attribute of the population and can be used independently to monitor changes in population status. While indices do not estimate or enumerate the number of bears in a population, they can be used to determine whether the population is increasing, decreasing, or is stable over time. Indices determine population trends over multiple years and are not reliable indicators of annual changes in population size unless a known relationship between the index and the population is determined. The DNR considers the logistics of data collection including cost, data reliability, and ability of the index to detect population change when selecting an index. Use of multiple indices strengthens the assessment of population status and the DNR uses several indices (described below) to monitor regional bear populations.

Hunter Harvest
In theory, mandatory registration provides a total count of the number of bears harvested annually. Hunter compliance with mandatory registration is high based on comparisons between registration results and mail survey estimates of the harvest (Frawley 2008). Changes in the harvest from season to season are related to changes in the size of the bear population as well as population-independent factors such as the availability of natural foods, weather, and hunter experience.

Hunter Success and Hunter Effort
The responses of hunters to questions in the annual mail survey are used to estimate the number of bears harvested, the days of "effort" required to harvest a bear, and overall success of hunters in a region. When other factors are equal, trends in hunter effort and hunter success are believed to reflect changes in the bear population. Hunter effort is inversely related to population size, that is, as the population declines, the effort required to harvest an individual animal increases. Hunter success is positively related to population size because as the population increases, individual hunter success also increases.

Bait-station Surveys
Bait-station surveys have been used to monitor the status of Michigan's bear populations since the mid-1980s. Annual changes in visitation rates by bears to a baited area are used as an indicator of changes in the bear population. Baits, usually bacon or sardines, are suspended from a tree in a fashion that makes it difficult for animals other than a bear to access the bait. Baits are spaced approximately one-half mile apart along roads and trails to reduce the chances of a single bear taking multiple baits. Baits are checked after one week and the number of sites visited by bears is determined to produce a visitation rate. Visitation rates are related to population size because it is assumed that as the population decreases, fewer baits are visited by bears.

Harvest Age and Sex Distribution
Changes in the age distribution of harvested bears may reflect real changes in bear reproduction and survival. If natural mortality and reproduction of a population are stable, a change in age distribution over time towards a higher proportion of younger animals is thought be indicative of

an exploited population. Younger black bear populations can be less productive because most female bears in Michigan are not sexually mature until 3 to 5 years of age.

Bear Population Estimators

Population estimators attempt to enumerate population size.   Some population estimators allow calculation of confidence intervals around a mean estimate, effectively providing a range of estimates. Efforts are made to track and estimate populations at the regional level, but some of the estimators lack sufficient data to produce separate estimates for the EUP and WUP. In those cases all the UP data are combined to produce a single UP estimate.

Population Reconstruction
The bear population can be "reconstructed" by using known ages from individual bears. Mandatory registration of all harvested bears and the cementum aging of bear teeth provide the data necessary to reconstruct bear populations. However, population reconstruction from harvest data provides only an estimate of the minimum population size in the relatively recent past (i.e., 5 to 7 years ago) because bears can live to greater than 20 years of age. Additionally, hunting is only one source of mortality for bears. An estimate of the total population can be obtained from harvest data by dividing minimum estimates by a lifetime recovery rate (Roseberry and Woolf 1991) which for UP bears is less than fifty percent (Mayhew and Etter 2008).

UP Tetracycline Capture-Recapture Estimator
Since 1989, a tetracycline based capture-recapture survey has been used to estimate the size of the UP bear population (Garshelis and Visser 1997, Mayhew and Etter 2008). Tetracycline is an antibiotic that binds to calcium in bones and teeth, and fluoresces under ultraviolet light. Tetracycline-laced baits are placed across the UP in the summer. Baits are suspended from a tree in a fashion that makes it difficult for animals other than a bear to access the bait. A bear becomes "captured" or "marked" when it consumes bait laced with tetracycline. By marking a large number of bears using tetracycline-laced baits and later collecting and examining the teeth from hunter-harvested bears ("recaptured"), an estimate of population size can be calculated.

Tetracycline-based population estimates have not been derived for Drummond Island (DI) or the NLP. Tetracycline-based population estimation was attempted for these areas in the mid-1990s. On DI, an insufficient sample of marked bears was obtained without risking "double-marking" bears (i.e., bears that take greater then one tetracycline bait). Additionally, the low number of bear harvested annually on DI reduces the probability of recaptures and influences the estimate. An additional issue in the NLP was the inability to identify an unknown source of tetracycline in some bears. This may have been the result of bears consuming honey or bees from apiaries because bee keepers often use tetracycline to treat bees.

NLP Genetic Capture-Recapture Estimator
The same principles that are used for the tetracycline capture-recapture estimator also apply to the NLP Genetic Capture-Recapture Estimator. The difference is that individual bears can be "captured" or "marked" and later identified with genetic techniques using hair and tissue samples (Dreher et al. 2007, Etter and Mayhew 2008). Bears are attracted with bait to a barbed wire "snare" configured around three to four closely spaced trees. Bears deposit hair samples while

navigating through the barbed wire to access the bait. For several weeks during the summer, hair snares are checked and samples collected. Deposited hair follicles, which contain DNA, are used to identify individual bears from each sample period (one week). A final recapture event includes collection of tissue samples (contained in teeth) from each bear harvested from the NLP. This technique has advantages over the tetracycline capture-recapture technique because individual bears can be identified using DNA, whereas the tetracycline technique does not allow for identification of individual bears unless they are recaptured in the harvest. This difference allows for the use of more sophisticated statistical models potentially increasing the accuracy and precision of the bear population estimate. However, the genetic technique is much more labor intensive and costly than the tetracycline technique, making it prohibitive to operate in the UP where the bear population is considerably larger and many more bears are harvested annually.

Bear Population Model

Population models also attempt to describe the population based on past and present demographic information including harvest data. The population model currently being used by the DNR was developed in 1984 by the Minnesota DNR (Garshelis and Snow 1988), and was subsequently upgraded by Minnesota and Wisconsin researchers. The model is a conceptually simple accounting type model based on a variation of the equation:

$$N_{t+1} = N_t + B_t - D_t$$

where N_t is the population size at time t, B_t is the number of bears recruited to the population through births, and D_t is the number of deaths of bears alive at time t. In the model, immigration (bears moving into the population from an outside source) and emigration (bears dispersing from the population) are considered equal. The model is deterministic which means that each run with the same inputs will produce identical results. There is no component of random variation and therefore no confidence intervals are produced in the output. The necessary model inputs include: 1) a starting and ending year, 2) a starting population size, 3) an initial sex and age composition, 4) reproductive parameters (litter size, cub sex ratio, and percentage of females producing cubs at each age), 5) natural and other human-caused mortality rates, and 6) harvest mortality (actual number). All mortality parameters are sex and age specific. Input parameters used to model the bear population are derived from population estimates from Michigan surveys, information from the published literature, research conducted in Michigan, and data from the annual bear harvest.

Current Population Status and Range in Michigan

Bear populations in Michigan have been steadily increasing since at least the 1990s (Figure 1). An estimated 19,000 bears (including cubs) occupy approximately 35,000 square miles of suitable bear habitat in the UP and NLP. Greater than eighty-five percent of the bear population resides in the UP where large tracts of state, federal, and private commercial forest lands contain good to excellent bear habitat. Bear populations in both Peninsulas are believed to be stable to increasing, and an increasing number of bear observations in southern Michigan suggest that bears are expanding from the NLP into the SLP.

Simulated Late Summer Model Estimates of the Number of Bear (including cubs of the year) in Michigan, 1990-2007.
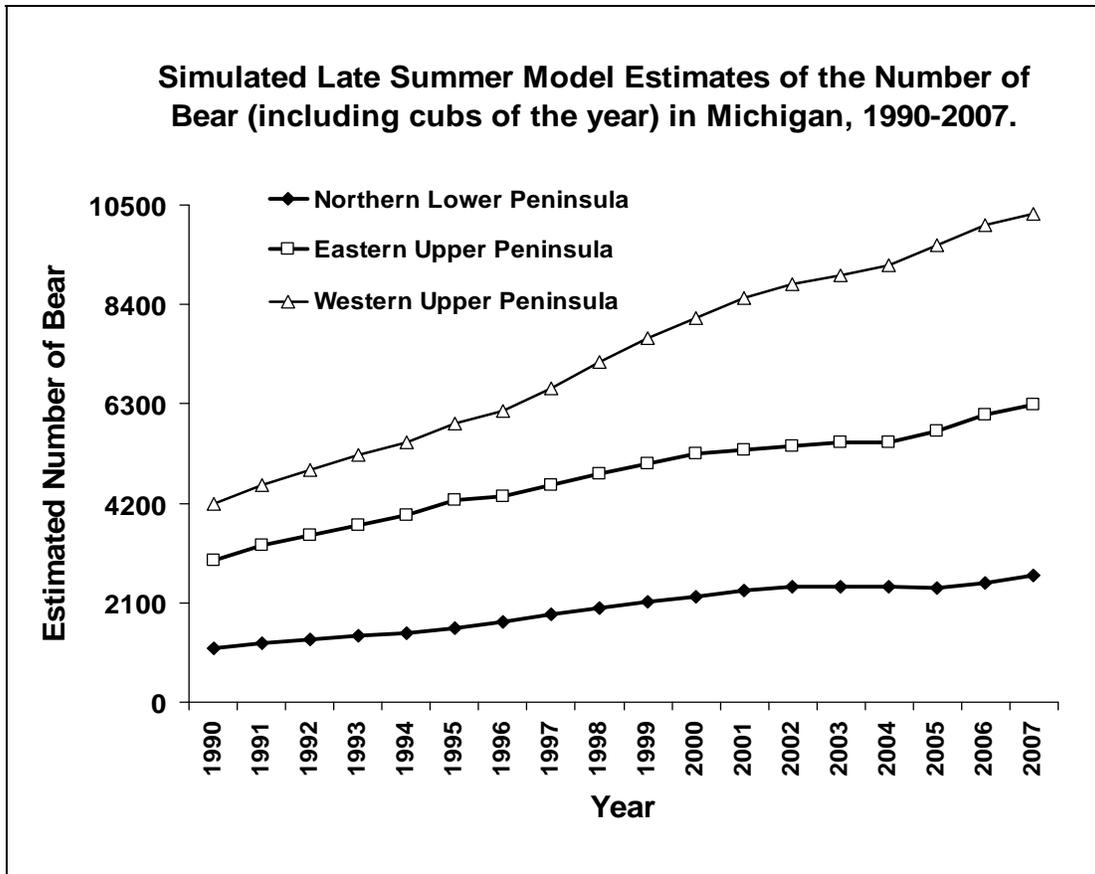

Figure 1. Simulated late summer model estimates of the number of bear in Michigan, 1990-2007.

Black bears are relatively common north of a line from Muskegon to Saginaw. Bears are less common and in some cases likely only seasonal transients in much of the area south of this line. A simulated model of preferred bear habitat indicates that less than three percent of the landscape in southern Michigan is suitable for black bears (Carter 2007). However, this model was based on data collected from radio-collared bears that resided in the NLP and may not fully describe the potential for bears to become established in southern Michigan. For example, bear populations are expanding and growing rapidly in New Jersey, the most densely populated state in the nation (McConnell 1997). Bears living on the fringes of suburbs in Southern California have altered their foraging times to later at night when human activity is minimal (Lyons 2004). Based on these references and an increasing number of bear observations, southern Michigan may provide better bear habitat than predicted by the simulated model.

Harvest Management

Legal Authority

The DNR has a public trust responsibility for the management of all wildlife species and populations. Primary legal authority for wildlife management and regulation comes from the Natural Resources and Environmental Protection Act, Public Act 451 of 1994. Part 401 of Public Act 451 gives authority to the NRC and the DNR Director to issue orders (the Wildlife Conservation Order) specific to wildlife management and hunting.

In 1996, Michigan voters supported a hunting ballot initiative requiring the NRC to use "principles of sound scientific management" in making decisions concerning the taking of bear and other wildlife. This legislation also gave exclusive authority to the NRC over the method and manner of take for game species. Following passage of the initiative, it was codified as Section 40113a of Public Act No. 451 of the Public Acts of 1994, MCL 324.40113a.

A Brief History of Bear Hunting in Michigan

Sport hunting of black bears was first regulated in 1925 when the Michigan legislature declared the species a game animal. Prior to 1925, bears could be taken at any time and by any means. In 1939, the legislature rescinded statewide bear regulations, but authorized the Conservation Commission (now the NRC) to grant protection for bears in counties requesting it. Using bait for bear hunting has always been legal in Michigan and hunting bears with dogs became legal in 1939. Cubs were first protected in 1948, and in 1952 the legislature empowered the NRC to open or close bear hunting seasons as necessary, and to prescribe methods of take. Also in 1952, bear trapping was outlawed except under special permit.

In general, bear hunting opportunities coincided with the firearm deer hunting season through 1952. The first and only spring bear season (April 1-May 31) was held in 1953. Early (August 15-September 15 in the UP, and October 1-November 5 in the LP) and late fall (November 15-30) hunting seasons were established and continued through 1964. In 1965, bear hunting was closed in the NLP due to concerns about a declining bear population and limited hunting opportunities in the NLP resumed in 1969.

The first bear hunting stamp (license) was issued in 1959. However, only small game license holders who were interested in hunting bear were required to affix the stamp to their license. The stamps were issued through 1963. From 1959-1963, firearm deer license holders were not required to possess a stamp to harvest a bear during the firearm deer season. During the 1964 and 1965 seasons, a separate bear license was required of all bear hunters. Again, between 1966 and 1979, firearm deer license holders were not required to possess a stamp to harvest a bear during the firearm deer season. It was not until 1980 that a separate bear license was required. In 1990, bear hunting was placed under a zone and quota system which is still in use today, and during the same year it became illegal to take bear during the November firearm deer season.

When regulated, the bag limit has been one bear per year per person in Michigan. Beginning in 1995, it became unlawful to take a female bear accompanied by cubs. Hunters in Michigan usually use bait, dogs or a combination of both to pursue bear (Frawley 2008).

Current Management Areas

Regions
To facilitate the management of bears, primary bear range in Michigan is broken into three ecological regions; the Eastern Upper Peninsula (EUP), Western Upper Peninsula (WUP), and Northern Lower Peninsula (NLP). Drummond Island (DI) at the east end of the Upper Peninsula is semi-isolated and a unique habitat for bears and thus is managed separate from the UP and NLP. Population dynamics are assessed relative to the ecological characteristics of each distinct ecoregion. Although populations of bears are not physically isolated by ecological boundaries (i.e., there is not complete demographic closure among regions), differences in genetic population structure are evident between the UP and NLP suggesting that movements of bears between the two peninsulas are infrequent (Lopez 2004).

Bear Management Units
In 1990, a zone and quota system was established to regulate the bear harvest and limit the number of bear hunters in specific areas. Ecological regions (EUP, WUP and NLP) are presently divided into 11 zones called Bear Management Units (BMUs; see 2008 Michigan Bear Hunting Guide). Bear Management Units are designed to help distribute hunters and thus the bear harvest throughout the entire ecological unit, rather than allowing hunters to target animals only in optimal habitats. Some BMUs have only one time period when hunting is allowed, while others have several, sometimes overlapping, hunt periods. By distributing hunters throughout the ecological region, BMUs also help to assure that biological information obtained from harvested bears is representative of the entire region's population. Boundaries of BMUs typically are established as clearly recognizable roads, rivers or county lines for the benefit of hunters and to assist with law enforcement.

Quota System for Distributing Bear Hunting Licenses

Because of increasing demand for bear hunting opportunities, in 1990, a quota system was established to limit the number of bear hunters and to better influence the distribution and density of hunters in the different BMUs. Under the quota system, the number of hunters participating in each unit and hunt period is limited by the number of licenses issued to achieve a desired bear harvest but still maintain a high level of recreational opportunity. Under this system, beginning in 2000, individuals that apply for a bear license receive a preference point each year that they apply for a bear license but are unsuccessful at drawing a license. In the drawing, applicants with the greatest number of points in each BMU and hunt period are issued licenses first. Applicants may opt to receive a preference point only, and bank the point for future drawings. Beginning in 2007, applicants could indicate a second choice hunt which is considered if all licenses for the first choice hunt are awarded. The second choice hunt was established to provide additional hunting opportunities and meet the desired harvest levels. Black bear populations have increased over the years (Figure 1), leading to more hunting opportunity and increased license availability. However, during the same period, there has also

been an increase in the number of bear hunters (Frawley 2008). This has lead to increased competition for licenses in some BMUs. Odds of drawing a license are specific to each BMU and hunt period. The number of hunters applying for licenses increased most years from 1990 to 2004, but has been relatively stable for the last four years.

Because approximately 85 percent of Michigan's black bears are in the UP, there are also more bear hunting opportunities in the UP. Over 80 percent (approximately 10,000) of the 12,000 possible licenses were available in the UP in 2007 and similar opportunities are available in 2008.

Current Bear Hunting Periods

The timing and length of bear hunting seasons varies throughout the state in order to achieve desired harvest levels, while at the same time providing ample recreational hunting opportunities. Additionally, the number of hunters who desire to hunt in a particular region also varies. In general, bear hunter demand is highest in BMUs with a combination of high bear densities and close proximity to higher human populations. Currently, bear hunting seasons occur in mid-September in the NLP and from September 10 through October 26 in the UP. There is also an archery-only season in early October in the Red Oak BMU in the NLP. The season in the UP is arranged in three overlapping hunt periods. The first hunt period has a five day quiet period from September 10-14 during which dogs may not be used.

These seasons were determined over time using a combination of biological and social factors. Hunting success, particularly for hunters not using dogs, is most closely tied to periods of natural food availability. When there is an abundance of natural food, hunting success tends to decrease (MacDonald 1994). Prior to mid-September, both soft and hard mast is available in abundance, suggesting that in most years hunting success would be relatively low during this time. A second consideration is the effect of weather, both on bear movement patterns and the resulting hunter success levels. Meat care may also be an issue in some areas. Higher temperatures, particularly in inland areas and earlier hunt periods, may result in meat spoilage.

Land Ownership

Black bears are generally forest animals and forested cover types and land management practices within these cover types can impact available habitat for bears. Michigan has nearly 19 million acres of forest land, and approximately 65% is privately owned. The DNR manages approximately 3.9 million acres of forest land scattered across the UP and NLP. Slightly more than half (51.6%) of DNR owned forest land is located in the NLP eco-region. The EUP and WUP eco-regions contain 26.5% and 21.9% of forested cover types, respectively (Michigan State Forest Management Plan 2008).   Approximately 35,000 square miles of suitable bear habitat is located in the UP and NLP (Bostick et al. 2005).

Ownership patterns provide unique challenges for bear management. In general, public lands consist of good bear habitat (mostly forested); whereas private lands vary in the quality of habitat they provide. Individual bears have large home-ranges and seasonal movements of ten to twenty miles are common for black bears. Mature males in Michigan have been known to move even greater distances during the breeding season. As bears move across the landscape they cross

multiple jurisdictional boundaries and private land parcels. Land uses and management practices vary widely across bear range, particularly on private lands. Because of these various uses and practices, bears may be in conflict with some private land owners while others may want to attract bears to their property for viewing or hunting opportunities. Additionally, access to private lands to hunt bears is also limited by the property owner which can influence bear harvest in different areas of the state. In the UP, approximately 40 percent of lands are in public trust (state and federal lands), 20 percent are in private ownership, but open to the public through the Commercial Forestlands Act, and the remaining 40 percent are in private ownership. In the NLP (Zone 2; see 2008 Michigan Hunting and Trapping Guide), approximately 31 percent of lands are in public trust, less than 1 percent are in CFA agreement, and 68 percent are in private ownership. In the SLP (Zone 1, see 2008 Michigan Hunting and Trapping Guide) less than 5 percent of lands is in public trust, with the remainder in private ownership.

Population Goals

Wildlife managers often develop goals for wildlife species whose numbers can be influenced through management actions. Population goals can be important targets sometimes established as a function of the biological and social carrying capacity (see below). If population goals are established, factors such as a species' life history, available habitat, land use and ownership patterns, habitat management plans, wildlife-human interactions, and social tolerance must be considered. Natural resources decision makers can use established population goals to direct management policies and impact resource allocation for wildlife species.

There are two different types of population goals that can be developed for black bear populations: qualitative goals and quantitative goals. Qualitative goals are based on the social desires for a particular abundance of bears in an area. The actual population does not need to be enumerated, but rather stated as "not enough," "too many," or "just the right amount" of bears relative to a desired social attribute. From a management standpoint, biologists can state desired population goals as increase, decrease, or maintain the bear population relative to current levels. Qualitative goals can also be stated relative to quantitative measures. For example, there may be a social desire to maintain a certain level of bear hunter satisfaction, or minimize bear-nuisance complaints. Both of these "indices" can be measured quantitatively, but they still reflect a social desire relative to attitudes towards bears. Qualitative goals also can be measured against enumerated population levels if the bear population can be estimated accurately. However, this approach should be viewed with caution because accurate estimates of wildlife populations are difficult and expensive to obtain, and social attitudes towards wildlife change frequently due to factors that may or may not be related directly the relative abundance of a species.

Quantitative population goals attempt to identify a desired population size or a numeric range within which the population is considered to be at the desired goal. Black bear management plans that establish quantitative population goals require more intensive data collection and analysis compared to those using qualitative goals. Population size estimates are generated from data sets that often require intensive field collection efforts. Staff time and available funding can be constraints to conducting this level of data collection. Although more data intensive, numeric population goals and their requisite population size estimates can offer an advantage over qualitative goals by determining the degree to which a population is over or under goal.

Regardless of the type of goal used, it is important that population goals be adaptive to changes in the landscape, relative abundance of bears, number of hunters, and social attitudes. Presently, the DNR uses a combination of qualitative and quantitative goals to manage the state's bear population.

Management Strategies

Public Act 451 requires that the DNR use sound science when making bear management decisions. Scientific information is obtained from research, in-state surveys, and published literature. Social issues associated with bear-human interactions (both positive and negative) are also important factors that must be considered when making decisions regarding the harvest of bears in Michigan. Qualitative social information is obtained from discussions with tribal governments, stakeholders, DNR field staff, and other agency staff. Quantitative social information is obtained from surveys such as the annual "Michigan Black Bear Hunter Survey", which asks questions pertaining to specific management options or objectives. Additional quantitative social information, not necessarily associated with hunting, is also obtained through surveys (e.g., Peyton et al. 2001).

Scientific management incorporates the concept of adaptive resource management, an iterative process by which changes in management actions (e.g., hunting regulations, or educational efforts) are evaluated to determine if these changes achieve management goals. Management efforts over time are modified as new information is obtained, new analyses are conducted, or factors that influence bear ecology change.

The current bear management program includes research to help understand the ecology of bear and social acceptance capacity of Michigan's residents. In addition, the DNR provides information to the public about bears and technical assistance to landowners with unwelcome bear encounters. Sport hunting has the capacity to influence abundance of black bears, provides recreational opportunities, and is an important tool used to manage the size of Michigan's bear population.

The mission of the Department's black bear management program is to maintain a healthy black bear population that provides a balance of recreational opportunities for residents while at the same time minimizes conflicts with humans. To fulfill this mission, the DNR has established six strategic bear management goals focusing on populations, recreational opportunity, and education.

Population

1) Maintain long-term, viable populations of bear within habitats suitable for the species.

2) Maintain bear populations at levels compatible with land use, recreational opportunities, and the public's acceptance capacity for bears.

3) Manage black bear habitat to provide for the long-term viability of the species.

4) Use hunting as the primary tool to help achieve population goals.

<u>Recreation</u>

5) In addition to hunting, provide bear-related recreational opportunities which recognize the aesthetic value of bears.

<u>Education</u>

6) Promote education about bears, bear-related recreational activities, and how to minimize negative human-bear interactions.

Regulatory Process

Establishment of Bear Harvest Objectives and License Quotas

Each year, population estimators, indices, and models are updated by the state bear specialist and research biologist. This information is forwarded to members of the Bear Management Workgroup, Management Unit Supervisors (MUS), tribal governments in the 1836 ceded territories, and other interested agencies. Workgroup members and the supervisors meet with the wildlife habitat biologists in their respective areas to assess the status of local bear populations and determine harvest levels necessary to manage populations at desired levels. They also discuss any issues relevant to bear management that would require changes to regulations. Government-to-government consultations with the 1836 Treaty Tribes are conducted to discuss harvest quotas and any proposed regulations changes. Additional meetings with US Forest Service or other agency biologists may occur to discuss management issues of particular interest to these groups. Further, the DNR receives feedback and information on bears and bear management on a continual basis from user groups interested in bears, from agricultural groups, and from the general public. Perceived or measured social tolerance (which varies geographically) is given strong consideration when making harvest recommendations. After taking all of the available biological and social information into consideration, and weighting the factors appropriately for their management unit, MUSs forward to the field coordinator and statewide bear specialist their regional population trajectory recommendations (e.g., increase, decrease, or stabilize the regional population) and any other proposed changes to bear hunting regulations. The bear specialist reviews these recommendations in the context of statewide issues and needs. Any conflicts are moved to the species section supervisor and field coordinator for resolution.

The regional (EUP, WUP or NLP) bear population model is used to determine the level of harvest required to achieve these goals. This harvest level is termed the "desired harvest" and is represented by the number of bears in a region that would have to be harvested during the hunting season in order to allow the population to reach the population trajectory goal.

Once the desired harvest levels for each region have been established, the MUSs distribute the proposed regional harvest among BMUs within that region. In the UP where there are three hunt periods, the desired harvest is first distributed equally among hunt periods and then the number

16

of licenses is calculated to achieve this harvest in each period. The number of licenses (quota) that will be recommended for each BMU and hunt period is determined using a three-year running average of license success (bears harvested/number of licenses issued) by hunt period for each respective BMU. If past license application rates do not appear to be high enough to achieve the desired harvest in a given hunt period, the harvest is adjusted into other hunt periods to try to maintain the overall desired harvest and have no leftover licenses. Applicants may select a first and second hunt choice. If any licenses remain after first and second hunt choices are awarded, leftover licenses become available to unsuccessful applicants for a week and then become available to individuals that have not applied for a bear license.

Once these recommendations have been reviewed and approved by all of the DNR Resource Bureau Division Chiefs and the Director, they are forwarded to the NRC for consideration.

Natural Resources Commission Process

The NRC has an established process for review and approval of all Wildlife Conservation Order amendments. While a 60-day public review is built into that process, 30 days of public review are required by Act No. 451 of the Public Acts of 1994.

1) The process begins on the Monday following the regularly scheduled monthly NRC meeting when the Department submits a memo outlining the recommendations to the NRC. This action puts the recommendations on the NRC calendar for the following month and opens a public review period.
2) At the following month's NRC meeting, the Department typically makes a presentation "for information" on the recommendations, and questions from the NRC are addressed. At this time the public has an opportunity to speak before the NRC to voice their concerns, support, or opposition to the recommendations. The NRC does not take action to approve the recommendations at this meeting.
3) At the subsequent NRC meeting (approximately 60 days after the recommendation memo was submitted), the NRC typically takes action on the recommendations. There is another opportunity for the public to voice their concerns, support, or opposition to the recommendations. At the end of the meeting, most often the NRC votes on the recommendations, yet can defer the decision to a later meeting following additional public comment. If approved, the recommendations become part of the Wildlife Conservation Order and the Department can take actions to ensure the approved recommendations are implemented.

Economic Impacts

There are a variety of economic impacts of having bears in Michigan. One economic benefit is from bear hunting. For example, in Michigan during 1998, an estimated 7,196 hunters spent an average of 474 dollars per bear hunt, for an estimated total of $3.4 million (Etter et al. 2002). Baiting and hunting bears with dogs lend themselves to outfitting, and a significant bear outfitting industry has developed in some areas.

Wildlife viewing also contributes to the economy of Michigan. While it is difficult to assess what portion of wildlife viewing funds are generated due to bears specifically, bears are a popular, large animal that visitors often seek to encounter. United States Forest Service surveys indicate that National Forest visitors rank seeing a bear high on their list of desired activities when recreating in the National Forest system. Over three million people participate in wildlife viewing annually in Michigan and Michigan ranks sixth in the nation in dollars contributed ($2.68 million) to the economy from wildlife viewing activities (Leonard 2008).

Bears can also cause negative economic impacts. Bears visit apiaries, orchards, row crops, individual residences and cottages in search of food. Although economic cost estimates are not available for bear damage on a statewide basis, bears can cause considerable damage. An individual bear can cause significant damage to bee hives and one bee keeper reported bear damage costs of $24,000 in a single year (DNR unpublished). Fruit growers and bee keepers incur costs to erect electric fences and other deterrents to protect their crops from bear damage. Damage can also occur within privately-owned cervid facilities, when bears consume deer feed and prey on fawns.

Bear-Human Interactions

Biological and Social Carrying Capacity

The abundance and distribution of black bears in Michigan is influenced by biological carrying capacity (BCC) and social carrying capacity (SCC). The concept of BCC proposes the abundance of any wildlife species is limited by the ability of the available habitat to support the population.   The concept of SCC proposes the abundance of a wildlife species is limited by the human social environment or human tolerance for that wildlife species.

Biological carrying capacity is determined by habitat components such as food, water, shelter and space, and addresses the maximum population size that can be sustained under varying availability of these factors. It can be influenced by bear social behavior which is influenced by bear density. If a population is at BCC, bear productivity may be limited because of later ages of first reproduction, longer intervals between litters, smaller litter sizes, decreased cub and yearling survival rates, and greater social conflict. The high productivity and low natural mortality rates observed in Michigan suggest that the bear populations are below BCC.

While BCC only addresses the maximum population that can be sustained by the available habitat, SCC is defined by both the maximum and minimum population sizes that society will tolerate. Issues and conflicts occur when stakeholders disagree on acceptable levels of bear-human interactions. Bear management often focuses on managing issues created by bear-human interactions and dealing with the differences in stakeholder values, beliefs, and tolerances regarding those interactions.

Bear-human interactions can be positive or negative. Positive interactions may include knowing bears are present in an area, observing bears, and bear hunting. Negative interactions may include bears causing property damage and people fearful of bears for a variety of reasons. Both positive and negative interactions are important to stakeholders and influence their tolerances

and preferences for bear abundance. Social carrying capacity is determined more by the type of interactions people have with bears than bear population size per se.

A SCC model was developed in the Lower Peninsula (LP) of Michigan in 2000 by Michigan State University and the DNR (Peyton et al. 2001). As part of the study, surveys were sent to 6,000 LP residents. Four zones from north to south were identified based on the approximate density of bears, and mailings were stratified accordingly. Results of the study indicated that 10 percent of the respondents were intolerant of the presence of bears, while 60 percent indicated they would only become intolerant if they perceived a personal threat by a bear. A greater proportion of respondents in the most southern stratum were intolerant of the presence of bears and this proportion decreased in the northern strata. Over 60 percent of the respondents indicated the existence value of bears was an important benefit, and "the role bears play in nature" and recreational viewing also were considered important. Recreational hunting was not seen as a personal benefit by a majority of the respondents.

For addressing problem bears, the most accepted management option was to "leave the bear alone, provided no one was injured." The next preferred options were "a carefully regulated hunt," and then "capture bears which repeatedly cause problems for people and relocate them to another part of the LP." The option to "destroy bears which repeatedly cause problems for people" was the least favored.

Respondents desired a clear policy and guidelines for managing nuisance bears. They desired agency employees with training and equipment to implement the policy, and good communication with the agency concerning the policy and rational. Since completion of this study, the DNR has developed the *Michigan Problem Bear Management Guidelines* and annually conducts training of personnel in the safe capture and handling of bears. A *Living With Bears* slide presentation has been created and presented to a number of interested stakeholder groups. Additional public education materials have been developed and shared with the public, including a *Preventing Bear Problems* section on the DNR website at www.michigan.gov/dnr.

Bear-Human Encounters

Black bears are shy, elusive animals, usually flee when encountered, and are generally not a threat to humans. However, bears are large and powerful animals that have been known to injure and even kill humans if they feel threatened. Fatal human encounters are rare; from 1900 through the summer of 2005, 57 people in North America have been killed by black bears, while it is estimated that millions of interactions between people and bears occur annually (Masterson 2006).

Based on reported bear observations in recent years, it is assumed that bears will continue to expand their range southward into more populated areas of Michigan. At the same time, residents from urban areas have continued to move into areas traditionally occupied by bears to the north. These shifts in human and bear demographics suggest that bear-human interactions are likely to become more common.

Baiting and Supplemental Feeding

Black bear hunting is an established tradition in Michigan, and has strong statewide support among hunting groups. The majority of Michigan bear hunters use bait to attract bears and improve harvest opportunities. Over 90% of Michigan bear hunters either hunt directly over a baited site, or use bait to attract bears to a specific site so that they can be hunted with dogs (Frawley 2008).

Some individuals or special interest groups contend that baiting bears for hunting habituates bears to human foods and thus increases the likelihood that individual bears will become a nuisance. However, others contend that bear that visit baits placed by hunters are less likely to survive or have negative associations with humans (hunters) at bait sites and are thus less likely to become a nuisance. Neither of these hypotheses have been tested, so it uncertain whether either is true.

Supplemental feeding of wildlife involves the deliberate placement of foods for the purpose of enhancing viewing opportunities or augmenting naturally occurring food resources. Supplemental feeding is not advised by the DNR because of the potential for habituating bears and making them more likely to become involved with negative bear-human interactions.

Recreational Viewing

Historically, some northern Michigan restaurants and towns maintained open garbage dumps as feeding sites for the purpose of attracting and viewing bears. Today this practice has been discontinued in most areas because of improved sanitary requirements meant to protect people and wildlife. Many Michigan residents and visitors still desire to see black bears in the wild, or have the opportunity to photograph one. However, recreational viewing of a species that exists at low relative density is likely to remain a function of local bear abundance, seasonal habitat quality, time spent afield, and random chance. The best viewing times would coincide with prime bear activity times of dawn and dusk. Black bears are naturally reclusive animals that tend to prefer habitats with thick vegetative cover; most bear observations are likely to remain a rare event.

Orphaned Cubs

Female bears rarely abandon their cubs, but if unexpected sow mortality or persistent site disturbance (especially den sites) occurs, cubs are sometimes orphaned in the wild. Depending on the time of year when cubs are orphaned, the chances for their survival are very low. Because this is a very rare event, the population level implications are minimal. However, popular public opinion is that the DNR should respond to instances regarding orphaned cubs and make efforts to return cubs to the wild. The DNR maintains a small number of radio-collared female bears to act as foster mothers for orphaned cubs. If cubs are orphaned soon after their birth in the winter den, in many instances they can be successfully added to the existing liters of nursing, radio-collared sows. After den emergence, female black bears will sometimes accept a foster cub if the orphan's scent can be masked and it is placed in the same setting with the sow's own cubs. In rare instances if placement with a surrogate mother is not possible, orphaned cubs can be held

and cared for by a trained wildlife rehabilitator. After July 1, cubs are considered old enough to survive on their own and cubs obtained after that date are released to the wild. Zoos or accredited wildlife facilities are sometimes used as a permanent home for orphaned cubs when other options are not available.

Bear-vehicle accidents

Most recorded bear mortality in Michigan is from hunting or bear-vehicle collisions. However, unlike deer-vehicle collisions, the Michigan State Police does not maintain an official database to track bear accidents. In some areas where bear-vehicle accidents are common, caution signs similar to deer crossing signs have been placed to alert motorists of the potential for bear crossings. As the bear population expands into areas of the state with higher human densities, the possibility of bear-vehicle accidents increases not just in the traditional northern bear range, but statewide. In the last five years, bear-vehicle accidents have been reported in a number of southern Michigan counties including Barry, Kent, Genesee, and Muskegon. A mechanism to gather bear-vehicle accident information has not been established, nor have protocols been developed to recover bear carcasses resulting from vehicle collisions.

Problem Bear Protocols

The issue of nuisance or problem bear management is complicated, and involves human behaviors and perceptions, as well as bear behavior. There is a wide range of public opinions as to what constitutes a bear problem, or a problem bear. To some, the mere presence of a bear is a perceived problem, while others may enjoy seeing bears on a regular basis. Publications such as *Preventing Bear Problems in Michigan* provide useful and proactive suggestions to minimize the chance of negative bear-human interactions and people can often solve their own bear concerns before they become a nuisance. However, when bear incidents do occur, the DNR response follows steps outlined in the *Michigan Problem Bear Management Guidelines.* Responses range from providing technical assistance to landowners, to physically removing a bear, to euthanizing individual bears when public safety is threatened. The information in this guidance document is part of an educational effort that integrates personnel from DNR Law Enforcement, Wildlife, and Office of Lands and Facilities staff, as well as local law enforcement agencies and emergency dispatchers, and in some unique cases, zoos or accredited rehabilitation facilities.

Additional Bear Hunting Issues

Hunter Conflicts

Conflicts sometimes arise between bear hunters and other outdoor users in part due to limited opportunities to hunt bears and because bear season(s) coincide with a time of increased outdoor recreation (e.g., other hunting seasons, wildlife viewing). Historically, bear hunters in Michigan have been permitted to use bait and/or dogs to hunt bears. Both methods are effective, particularly in rugged areas of Michigan with limited access. Greater than ninety percent of Michigan bear hunters use bait to attract bears (Frawley 2008). Approximately twelve percent of hunters use dogs or a combination of dogs and bait.

Bear hunters are permitted to establish no more than three bait stations per hunter. Baits cannot be placed for bears prior to August 10 in the UP or prior to 30-days before the opening of bear season in the LP (August 19 in 2008). It is unlawful to use man-made materials or a container at a bait site on public or commercial forest lands (CFL) however, these materials are legal on private land. One issue related to baiting for bears is that some individuals assume "territorial ownership" of public lands and they attempt to exclude all other hunters (including hunters of game species other than bear) from the area they are baiting. Additionally, although bait containers are illegal on public land some hunters use and leave them when their hunt is done. Removing this refuse is then at the expense of the land owner (e.g., DNR, USFS, CFL owner). Complaints about disturbance of bear bait hunters by other outdoor recreationists is also common, particularly in the NLP where bear season does not open until after many of the small game (e.g., grouse, rabbit, hare) hunting seasons open. There are additional special deer hunting seasons open during the bear hunting season in portions of the NLP and these overlapping seasons also have potential to cause conflicts among hunters.

Bear hunters may pursue bears with dogs except during certain times of year and during certain periods of the open bear hunting season. These periods of no bear dog activity are commonly referred to as "quiet periods". Most bear hunters who use dogs will train their dogs during the summer before bear hunting season begins. In order to protect nesting birds and young wildlife during the time of year in which they are most vulnerable, a quiet period was established between April 15 and July 15; no hunting dogs (includes all hunting dogs) may be trained on game between those dates except on specially designated state lands or unless the dog handler receives a permit from the DNR to conduct a special dog hunting field trial. Under current regulations in the UP, hunters may not pursue bears using dogs the first five days of the first hunt period. This quiet period was put in place to reduce potential conflicts between hunters using bait and hunters using dogs. However, in the NLP both methods are permitted simultaneously throughout the general one-week bear hunting season. Dogs are not permitted for hunting bear in the Red Oak BMU during the archery-only season (October 5 to 11 in 2008).

Conflicts between bear bait and dog hunters sometimes occur on public lands. Hunters using bait sometimes complain that dogs chase bears off of their baits, while dog hunters claim that other factors, not their dogs, are the reason for decreased bear activity at an individual bait site. Controversies have also occurred between private landowners and dog hunters. Bears have large home ranges and can potentially cross multiple parcels of land (in both private and public ownership) while being chased by dogs. This can lead to conflicts between bear dog hunters and private land owners who do not want dogs or hunters on their property.

Another issue arises when some dog hunters alter road conditions to facilitate locating fresh bear tracks. Dog hunters will sometimes drag a chain link fence or other object down a dirt road or on the shoulder of a paved road to scarify the soil. They return at a later time to locate fresh bear tracks from which they can start a bear chase with their dogs.

Standardization of Bear Hunting Regulations

In recent years, constituents have proposed regulation changes that vary but fall under the general category of standardization of bear hunting regulations. These changes typically center

on the concept of having similar start dates and seasons including a bait-only season or portion of a season in the NLP as exists in the UP. Current season structures vary significantly between the UP and the NLP (see 2008 Michigan Bear Hunting Guide). The ability to achieve desired bear harvest levels in the two Peninsulas, with very different season structures, is a complex interplay of many factors including, overall bear density and distribution, land ownership patterns, available bear habitat, hunter access, and hunter success. Based on the harvest location of bears reported by hunters, distribution of bears in the UP is relatively uniform with the exception of around human population centers (e.g., Marquette, Sault Ste. Marie, Escanaba). In the NLP, bear harvest centers around three core areas, the Luther-Mitchell Swamp in Lake and Newaygo Counties, the Dead Stream Swamp in northeast Missaukee County, and an area in the northeast NLP around the intersection of Montmorency, Alpena, Oscoda, and Alcona Counties (also commonly referred to as "Club Country"). Bear harvest intensity is likely an index to bear density and distribution. Bear hunter success varies by BMU and hunt periods in the UP (Frawley 2006, 2007 and 2008). However, in most years overall hunter success is only slightly higher (1 to 5 percent) in the UP compared to the NLP. Additionally, the number of days (effort) spent by hunters pursuing bears can influences bear hunter success and harvest. From 1996-2007, the average number of days spent by hunters pursuing bears was greater in the UP (7-8 days) compared to the NLP (5 days). However, the number of days each hunter can possibly hunt for a bear in a given season in the UP is 32 to 42 days compared to 7 to 14 days in the NLP. These discrepancies are likely due in part to the interplay of the factors listed about as well as economic (e.g., influence of fuel prices) and social factors (e.g., proximity to human population centers) which are difficult to measure.

As an example of how standardization of UP and NLP bear seasons could potentially influence bear hunter recreational opportunities, in 2008 the NRC approved a significant season change on Drummond Island (DI) from a 7-day season with no quiet period to a 42-day season with a 5-day quiet period (i.e., identical to the first hunt period in the remaining UP BMUs). Because of the anticipated increase in bear harvest success rates on DI, the number of available licenses recommended by the DNR to the NRC was reduced from 15 for a 7-day season to 8 for a 42-day season. We are awaiting harvest results from 2008 to evaluate this change in regulations on DI. However, if additional days were added to lengthen the bear season in the LP, it is likely that license quotas would need to be reduced in some or all NLP BMUs to maintain current desired bear harvest levels.

BMU Boundaries

The primary function of BMUs is to distribute hunters and thus hunting effort to achieve desired regional bear harvest objectives. Bears are not evenly distributed across the landscape and the majority of bear hunters hunt bears where they perceive the population to be at highest density (Frawley 2008). There are alternative views to present BMU boundaries with respect to bear distribution and distributing hunter harvest. Some hunters request that the size of BMUs be reduced to address perceived localized bear density. Others contend that BMU boundaries should be representative of bear ecology and natural landscape features as opposed to the desires of hunters.

Recommendations regarding the establishment or expansion of BMUs must take into account land ownership, the landscape or eco-region, bear home-range size, the ability to collect meaningful population level data, and clearly defined boundaries for easy identification by hunters, biologists and law enforcement personnel. Potential future expansion or creation of new BMUs in southern Michigan (areas presently closed to bear hunting) may also need to consider hunting methods or season dates to affect a desired bear harvest in a landscape dominated by private ownership.

Baiting/Disease Issues

Baiting for bear is defined as, "a site where food or lure is placed that attracts bear." Bear baits may include meat and meat products, fish and fish products, and bakery/confectionery products (see 2008 Michigan Bear Hunting Guide for a list of products) without quantity restrictions in both peninsulas. Additionally, prior to October 1 in the UP, baits may include up to 2 gallons of grains, fruits, vegetables, salt and minerals per bait station provided these materials are made inaccessible to deer. After October 1 these items may be used, accessible to deer, provided hunters abide by deer baiting regulations (quantity and distribution of bait). Grains, fruits, vegetables, salt and minerals are no longer permitted for baiting bears in the LP because since the discovery of Chronic Wasting Disease (CWD) in a deer in the LP. This discrepancy in legal materials for baiting between the UP and NLP may cause confusion among bear hunters using bait.

In the past, there have been some concerns expressed to the DNR regarding the possibility of poisoning of wildlife with chocolate at baits established for bears. Theobromine or Chocolate poisoning has been observed in Michigan in the past, occurring in raccoons in 2002 and 2005. These poisonings occurred at bear bait sites in Alpena, Otsego, and Dickinson counties and in all cases involved finding multiple dead raccoons on the bait sites. It may be possible for a bear to be poisoned by chocolate, but due to the size of the animal and the amount of chocolate that would need to be consumed, mortalities have not been observed and would not be likely. This and additional future disease issues may require further changes to bear baiting regulations in Michigan.

Bear Participation/No Kill Tag License

In the late 1980's, a concern was voiced by Michigan bear hunters regarding group hunting for bears by non-resident hunters using dogs. In 1989, an Opinion of the Attorney General clarified that "A person shall not hunt bear without a bear license," and further "hunt and hunters means the pursuing, capturing, shooting, killing, or taking of wild animals, and including attempting to take a wild animal." The Attorney General concluded that all persons engaged in hunting—or pursuing—bear must possess a bear hunting license. This opinion also concluded "that any person who pursues a bear with dogs must have a valid bear hunting license …, regardless of whether the individual is carrying a firearm, and regardless of whether the person intends to kill the bear or is merely engaged in the training of dogs." Based on this Opinion of the Attorney General, a valid license is required to actively participate in "pursuing" bears with dogs during the open season. For hunters not in possession of a valid kill tag, this license became known as a "participation license." In 2008 the reference to "participation license" was dropped and the

license is now known as a "No Kill Tag Bear License." Currently, hunters pursuing bear are required to possess a no kill tag bear license or a bear license with a kill tag. This is a statutory requirement in Public Act 451 of 1994 and is not within the authority of the NRC.

Guides

Some bear hunters hire a bear hunting guide. Hunters typically have an expectation that, for a fee or compensation provided to the guide, they will experience a quality hunt with an opportunity to harvest a bear. Guides can assist bear hunters in a number of ways including scouting for bear sign, finding a hunting location, providing dogs and setting and maintaining baits. Often, guides are hired by bear hunters that live outside of their hunt area, are unfamiliar with the hunt location, or are not able to scout and set up a bait site in preparation for the hunt.

Guides must follow all applicable bear hunting regulations. However, although individual bear hunters are permitted to establish no more that three bait stations per hunter, an authorized representative (i.e., bear guide) can maintain multiple baits for multiple hunters without limit. For example, an authorized representative for ten hunters could establish and maintain thirty total baits. The issue of "territoriality over bait sites" has the potential to be further magnified by commercial bear guides who may represent multiple clients and whose source of income is in part dependent on providing an undisturbed, quality hunting experience, often on public land. Similar issues may also arise for bear guides using dogs.

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