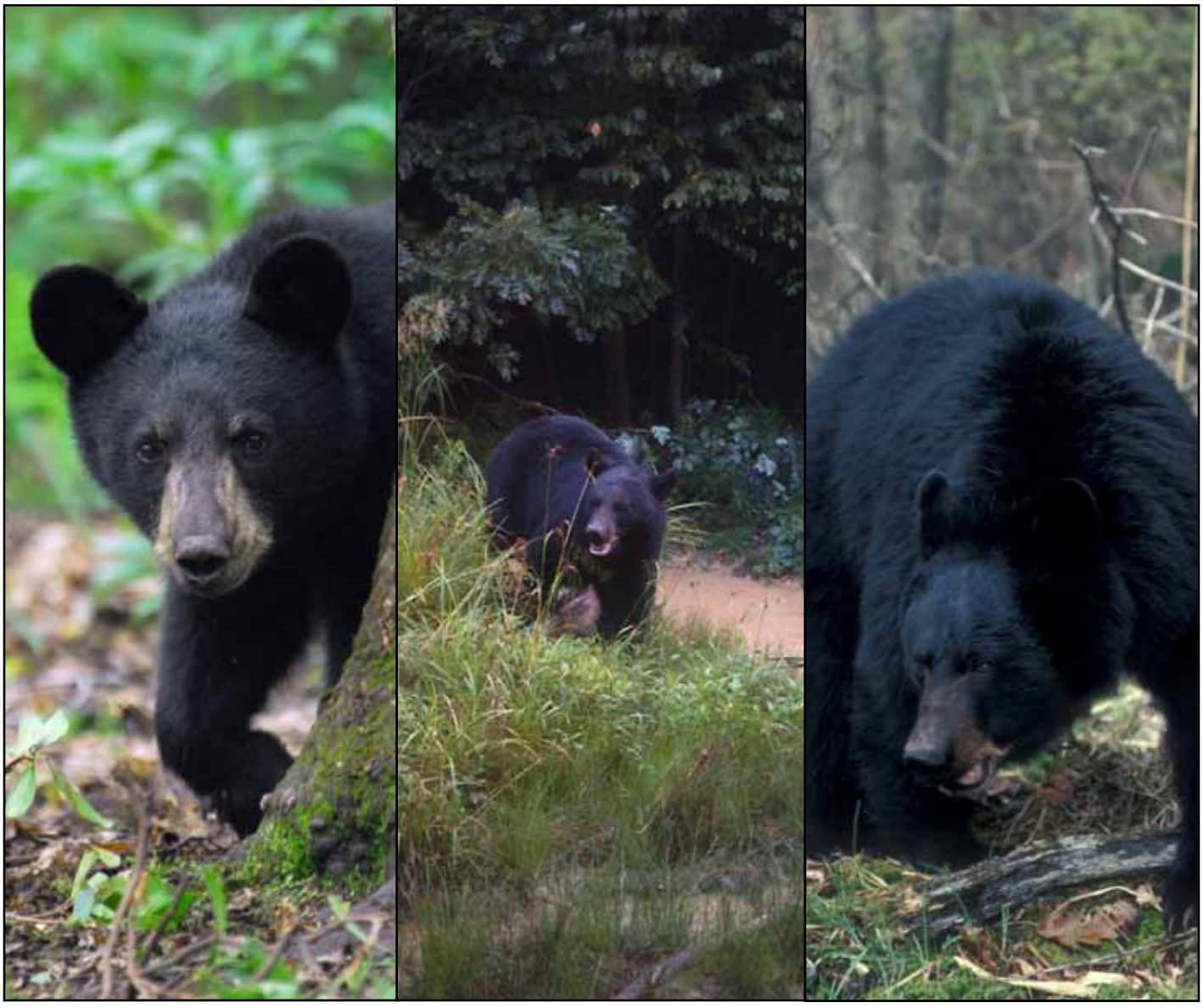
An Evaluation of Black Bear Management Options

Northeast Black Bear Technical Committee, August 2012



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The Northeast Black Bear Technical Committee
is a group of professional bear biologists from northeastern United States and eastern Canadian provinces committed to the study and wise management of our black bear resources.

A contribution of Federal Aid in Wildlife Restoration

Introduction

Archaeological excavations and historical records indicate that Native Americans and early European settlers had a strong connection to the black bear. Bear meat was used as a source of protein, hides were fashioned into garments and blankets, fat was used to fuel lanterns and as a waterproofing agent, and bones and claws were made into tools and decorations. Today, black bears are used for many of the same purposes and are prized as a trophy animal for hunters and trappers alike. In addition, black bears provide a unique wildlife viewing experience and add a touch of wildness to the habitats in which they occur. Black bears are the most common and widespread of the three bear species in North America. Although their historical distribution was larger, today black bears are found in at least 40 states and all Canadian provinces. In the eastern United States, black bear range is continuous throughout New England and the Appalachian Mountains but is fragmented throughout the southeast and along the eastern seaboard. The incredibly adaptable nature of black bears enables them to occupy a greater range of habitats than any other bear species. This ability coupled with recent increases in black bear numbers and humans moving into black bear habitat have led to increased human-bear conflicts. In addition, black bears are drawn in to human occupied areas by easily acquired food sources. As both bear and human populations expand, there is increased concern for public safety and property damage and need for management agencies to employ a variety of bear management options. The objective of this booklet is to explain the rationale behind bear management decisions and to discuss the utility of various management options.

Pennsylvania Game Commission (PGC) photo

Brief History of Bear Management in the Northeast

Throughout much of northeastern North America, management of black bears has followed a similar trend. Following the near extirpation of bears due to extensive cutting of forests, market hunting and bounties, many states and provinces enacted laws that regulated the taking of bear in the 1900s. Bears were listed as game species in some jurisdictions and were fully protected in others.

Passage of the Federal Aid in Wildlife Restoration Act (better known as the Pittman-Robertson Act) in 1937 marked the beginning of modern-day wildlife management in the United States. This act earmarked income from an existing excise tax on sporting arms and ammunition for use in wildlife management, restoration, research, and land acquisition. Early bear management efforts featured protection from unregulated hunting. Today, efforts are directed toward maintenance of bear populations at levels intended to: (1) ensure sustainable bear populations now and in the future; (2) provide hunting and viewing opportunities of bears for licensed hunters, wildlife photographers and wildlife viewers; and (3) minimize conflicts between bears and people.

Chemically immobilized bear.

Through the combined benefits of regulated hunting, public land purchases, forest maturation, bear restoration efforts, and management-based research, bear populations have grown and expanded their range across eastern and northeastern North America. Black bears now occur in nearly every northeastern state and province in North America.

Black bear hunting is a long-standing tradition for many families in the northeast, providing a valuable source of food, a means of shared recreation and an opportunity to pass-on family traditions and appreciation for nature. Additionally, black bear harvest through regulated hunting remains the most effective tool for managing bear populations throughout the region.

These cultural, social, and management values of hunting are reinforced in the North American Model of Wildlife Conservation (Geist et al. 2001), a series of principles that underpin black bear management in the northeast and throughout North America. At the heart of the model is the concept of wildlife as a public resource, owned by no one but held in trust by the government for the benefit of the people. Further, access to wildlife by hunters is provided equally to all, regulated by law or rule-making with public involvement rather than market pressures, wealth, social status or land ownership. Management policy and decisions are rooted in science and support an ethic of fair-chase and legitimate use (e.g., fur and food) of harvested wildlife. Adherence to these tenets has allowed game management to function successfully while retaining strong support among the generally non-hunting public. For this reason, black bear management programs throughout the northeast are based upon the principles of the North American Model of Wildlife Conservation.

Animal Rights and Black Bear Management

Trends in wildlife-related recreation and public attitudes toward wildlife use have implications for black bear management. Non hunting wildlife recreation (e.g., wildlife viewing) has increased significantly over the last several decades (Duda et al. 1998), and advocates of animal rights and animal welfare have begun to exert more influence on wildlife management decisions (Muth et al. 2002). Proponents of animal welfare believe that human use of animals is appropriate as long as practical measures are taken to ensure that human use does not cause undue pain and suffering to animals. Professional wildlife biologists, hunters and trappers are supporters of animal welfare (Organ et al. 1996). However, animal rights proponents advocate equal moral and legal rights for all species with a motive to end any human use of animals (Cockrell 1999, Muth and Jamison 2000).

In several northeastern states and provinces, activism by animal rights proponents has in some cases compromised bear managers' ability to control black bear populations by limiting bear hunting opportunities (e.g., periodic cancellation of bear seasons) or specific harvest techniques (e.g., restrictions on bear trapping or the use of dogs to hunt bears). Yet the dependence on and use of renewable natural resources such as black bears, fosters stewardship of those resources.

The Changing Landscape of Bear Management and Human-Bear Conflicts

As bear populations have increased throughout northeastern North America and begun to reoccupy more of their former range, human settlement patterns have also shifted away from urban centers into more rural settings. Conflicts between humans and bears have become common in many areas and epidemic in others. As people go about their daily lives, they often unknowingly create potential food sources that attract bears into close proximity with people. Common activities, such as feeding birds and other wildlife, cooking food outdoors, feeding domestic animals in outdoor locations and improperly storing trash set the stage for conflicts between humans and bears.

Each year, state and provincial wildlife agencies allocate substantial staff and fiscal resources to reduce human-bear conflicts that impose financial burdens to many communities. Most human-bear conflicts can be alleviated or resolved by removing or adequately protecting whatever served to attract the bear. Modifications to human behavior are critically important in resolving human-bear conflicts, but various options and techniques for managing bears are also applicable.

Determining Appropriate Black Bear Populations

Decisions about the appropriate distribution and abundance of bears are of primary importance to bear managers. These decisions are influenced by the suitability of a particular landscape for bears and the public's desire for and tolerance of bears.

The concept of biological carrying capacity (BCC) suggests that maximum bear abundance is limited by the availability of habitat resources such as food, water, shelter (e.g., den sites) and space. As bear populations approach BCC, increasing bear social pressures may influence population dynamics and population growth may be limited by later ages of first reproduction, longer intervals between litters, smaller litter sizes, decreased cub and yearling survival rates, and greater social conflict.

Conversely, cultural carrying capacity (CCC) is the maximum number of bears humans will tolerate in a certain area. The types of interactions people have with bears, positive and negative, influence CCC. Typically, in areas where bear and human populations overlap, the upper limit of CCC falls well below BCC. Thus, black bear management often centers on CCC, and populations are managed by accounting for differences in stakeholder views, beliefs, and tolerances regarding human bear interactions.

Black Bear Management Strategies

Black bear managers frequently employ a variety of bear management options to address diverse stakeholder interests and achieve desired bear population levels. These strategies include options that address black bear population levels, human-bear problem resolution, recreational opportunities, and ecosystem requirements. Options that address population management of black bears and human-bear problems are of primary interest. A thorough understanding of the implications of the various bear management options will be important to the success of bear management programs.

Snyder County, PA bear harvest, PGC photo

Population Management

Population objectives for black bears generally are designed to increase, decrease or stabilize population levels in a given area. These specific population objectives can be achieved through a variety of appropriate management strategies. Several management strategies also affect the rate of population growth (e.g., increase or decrease), influencing the time required to reach desired population levels.

Human-Bear Conflict Management

Human-bear conflicts are greatly influenced by natural food abundance and human behaviors associated with food and waste management, though bear abundance may also influence the frequency of human-bear conflicts. In addition to general population management for bears, other management options can more specifically target human-bear conflicts.

Black Bear Population Management

Bear harvest locations, PGC photo

Regulated Hunting and Trapping

As early as 1910, regulated hunting and trapping have been used to manage wildlife populations and foster the wise use of wildlife resources for food, fur, and other utilitarian purposes. Specific population levels can be achieved by adjusting season length, season timing and legal methods of take to manipulate the number of animals and sex and age composition of the harvest. Specifically, wildlife managers collect information from hunting harvest (hunting effort, success rates, age/sex structure, etc.) to determine if we are meeting black bear population objectives (e.g. stabilize growth) and in turn modify hunting regulations as necessary to meet management goals.

Black bear hunting is the major factor controlling most bear populations (Obbard and Howe 2008). Depending on harvest levels, black bear populations can increase, decrease or remain the same in the presence of hunting. A recent survey of 23 states with black bear hunting indicated that 57% had increasing populations and the remaining states had stable populations (Kocka et al. 2001).

Black bear populations may decrease with heavy hunting pressure. Because female bears produce only a few cubs every other year, depleted bear populations are slow to recover. Thus, black bear hunting seasons should be conservative, unless population reduction is the objective (Miller 1990). Bear populations will grow when the number of juvenile bears that reach adulthood (i.e. recruitment) exceeds the number of bears that die (hunting and non-hunting mortality) that year. Populations are stabilized when deaths equal annual recruitment.

Black bear populations can withstand regulated hunting on an annual basis (CA FED 2000, Williamson 2002, PGC 2005) and historically, managed hunting has been an effective system for protecting bear populations because it has enlisted a clientele interested in the continued abundance of the resource (Garshelis 2002).

Adjusting the hunting season structure to coincide with bear damage periods or to enhance hunter effort may provide greater opportunities to remove problem bears from the population. The establishment of a September black bear hunting season in Wisconsin increased the harvest of black bears that were causing damage and decreased the average number of nuisance black bears destroyed per year using kill permits from 110 to 19 (Hy-

Maine

Regional Example
Regulated Hunting & Trapping

In Maine, black bears are an important game species that is both hunted and trapped. The Maine Department of Inland Fisheries and Wildlife monitors and regulates bear hunting in Maine by adjusting bag limits, season dates, and legal methods of harvest. Between 1985 and 1989, Maine's black bear population declined from 21,000 to 18,000 bears. This decrease was attributed to increased interest in bear hunting, where annual harvests increased from 1,500 to 2,500 bears. In response to declining bear numbers, the Department shortened the bait, hound, trapping and still-hunt seasons for black bears in 1990. The bear population slowly increased. By 1994, there were nearly 21,000 bears in Maine. Through the 1990s, Maine's bear population continued to increase slowly despite increased interest in bear hunting and was attributed to improved habitat conditions for black bears.

gnstrom and Hauge 1989). Similarly, a season extension in Pennsylvania to allow concurrent bear and deer hunting seasons resulted in increased harvest rates of nuisance bears (Ternent 2008).

Regulated harvest of black bear populations is occasionally a controversial social issue. Perhaps the most contentious issues involve fair chase and the ethics of certain methods of harvest, especially trapping of bears, hunting bears over bait, hunting with dogs, or hunting in the spring. Possible physical effects on black bears from hunting and the expense of regulating various hunting methods also have been questioned by critics of black bear hunting (Beck et al. 1994, Loker and Decker 1995). Additionally, regulated hunting with certain methods may not be socially acceptable or feasible near urban areas.

Regulated hunting provides economic benefits in the form of hunting-related expenditures (food, lodging, equipment and transportation) and may have a significant economic impact in rural communities. However, economic benefits of regulated black bear hunting are not limited to hunting expenditures. A complete economic evaluation of bear hunting should also include added damage costs (e.g., increased agricultural losses, increased vehicle collisions) that would be incurred with growing bear populations in the absence of hunting. Additionally, by purchasing licenses to hunt bears, hunters pay to provide a public service (i.e., bear population control), thereby reducing the tax burden and generating revenue that supports wildlife conservation and management.

Lycoming County, PA bear camp, PGC photo

Implications for Population Management:

Regulated black bear hunting and trapping are compatible with increasing, decreasing, or stable population management objectives. Wildlife managers have the potential to effectively control black bear population levels through the manipulation of season structure and length. Increasing bear populations can be achieved through conservative hunting seasons designed to protect certain segments of the black bear population (e.g., mature females). Stable or decreasing bear populations can be achieved through more liberal hunting seasons that offer reduced protection for adult females.

Implications for Human-Bear Conflict Management:

Regulated bear harvest may reduce human-bear conflicts by controlling population levels. Some potential also exists for targeting nuisance black bears by adjusting timing and length of hunting seasons, bag limits and legal methods of harvest (e.g. implementing seasons coinciding with high levels of agriculture damage).

Control Non-Hunting Mortality

In black bear populations, non-hunting mortality is highest among young bears and includes vehicle collisions, poaching, predation, starvation, drowning (i.e. flooding of dens) and disease (Higgins 1997, Ryan 1997). The most promising approach to control non-hunting mortality of black bears would be to reduce human-induced mortality (i.e., vehicle collisions, poaching).

Bear-vehicle collisions can be a significant source of black bear mortality. Highways may also impact bears indirectly by altering bear movements and increasing human-bear interactions. Roads appear to offer no barrier to bear movement and habitat use (Carr and Pelton 1984, Van Manen et al. 2012), but bears cross roads less as vehicle traffic increases (Brody and Pelton 1989). However, food availability may cause bears to use areas adjacent to roads or cause bears to cross highways, increasing bear vulnerability. Bear-vehicle collisions and habitat fragmentation by high-volume roadways are important considerations in areas with threatened, endangered or geographically isolated bear populations.

Wildlife passes (above or beneath a roadway) are designed to facilitate safe passage across roadways and are often used as mitigation for bisecting wildlife habitats with roads. Black bears use highway underpasses where convenient (Foster and Humphrey 1995, Clevenger and Waltho 2000), but annual fluctuations in food availability, weather patterns and bear behavior may influence the evaluation of bear movements and underpass utilization (Donaldson 2005). While underpasses may benefit some wildlife species, no

Wildlife crossing structures under construction in Ontario. The highway was realigned/ twinned and this overpass (above) is the first of its kind in Canada east of the Rockies, 2011. The 5m X 5m underpass (left) is intended to be a joint wildlife/forest access structure. Photos by Ontario Ministry of Natural Resources.

Florida

Regional Example
Control Non-Hunting Mortality

Crossing structures developed specifically for black bears are uncommon. In several northeastern states and provinces, crossing structures have been used to reduce vehicle collisions with moose, elk, or deer primarily, but black bears are also known to use these structures.

However, in Florida, black bear populations are isolated, numbers are low, and new roads are being constructed at alarming rates. As a result, Florida Fish and Wildlife Conservation Commission and Florida Department of Transportation have designed a wildlife underpass, posted signs to alert motorists of bear crossing areas, and reduced speed limits to reduce bear-vehicle collisions. In addition to black bears, bobcats, gray foxes, white-tailed deer and other wildlife have used the underpass.

conclusive evidence is available to suggest that highway fencing or underpasses reduce the non-hunting mortality of black bears. Long-term (10-15 year) studies are necessary to answer complex ecological questions regarding roads and long-lived wildlife species, such as black bears.

Adequate assessments of the impact of poaching on black bear populations are difficult to obtain. The motives for poaching can vary from taking for personal use to taking for commercial purposes (Williamson 2002). Activities of poachers are secretive, complicating quantification of their effects. Black bear populations throughout most of their range are stable or increasing suggesting that poaching is not having serious negative impacts on established black bear populations. However, poaching losses may impact population growth rates in areas of low bear densities.

The costs associated with controlling non-hunting mortality can be great. The cost of a box culvert underpass in Florida was estimated to be $870,000 (Land and Lotz 1996), the cost of a bridge extension was $433,000 (Macdonald and Smith 1999), and the cost of a wildlife overpass in Alberta, Canada was estimated to be $1.15 million (Forman et al. 2003). Increased levels of law enforcement to control poaching are also costly. Unless black bear populations are small, isolated, and significantly impacted by non-hunting mortality, the cost of controlling non-hunting mortality may be prohibitive.

Implications for Population Management:

In general, controlling non-hunting mortality may increase bear numbers in small isolated populations.

Implications for Human-Bear Conflict Management:

Except for potentially preventing a few bear-vehicle collisions, controlling non-hunting mortality does not reduce human-bear conflicts at the site of the problem

Habitat Management

Black bears are adapted to use a wide variety of habitat types. Habitat type diversity is important for satisfying black bear habitat requirements. Managed forests that provide young and older forest likely provide better black bear habitat than unmanaged forests. Forest management that provides sustained and abundant food supply throughout the year (e.g., hard mast, soft mast, herbaceous foods and invertebrates), denning sites and escape cover benefits black bears. Because hard mast is an important fall food source for bears, management strategies should encourage the sustained availability of mature, hard mast producing trees (oak, hickory, beech, etc.). Integration of timber cuttings, prescribed burning and management of woodland openings affords the greatest potential for improving, maintaining, and establishing black bear habitat.

Habitat quality, through its influence on food abundance, affects reproduction and survival of cubs. Poor nutrition can delay the onset of the breeding season, increase the age of sexual maturity and lengthen the normal 2-year interval between litters. In years of limited fall food availability, females may produce fewer cubs and cub survival decreases.

Habitat fragmentation and subsequent isolation of black bear populations is a concern for small bear populations. Corridors connecting isolated black bear populations have been recommended to ensure the long-term persistence of bears (Rudis and Tansey 1995). However, human activities such as urbanization, intensive agriculture and construction of high traffic volume roads can affect corridors and linkages among populations. As human populations grow, corridor protection and/or development may become necessary to ensure the long-term persistence of bears. As human population growth and development continue, landscape planning will be needed to reduce the impacts of these factors on bear habitat.

Although habitat has important consequences for black bears, the ability to effectively manage habitat is limited. Management of public lands has been hindered by increased public resistance to timber harvesting, increased environmental regulation and decreased budgets (Weaver

Vermont

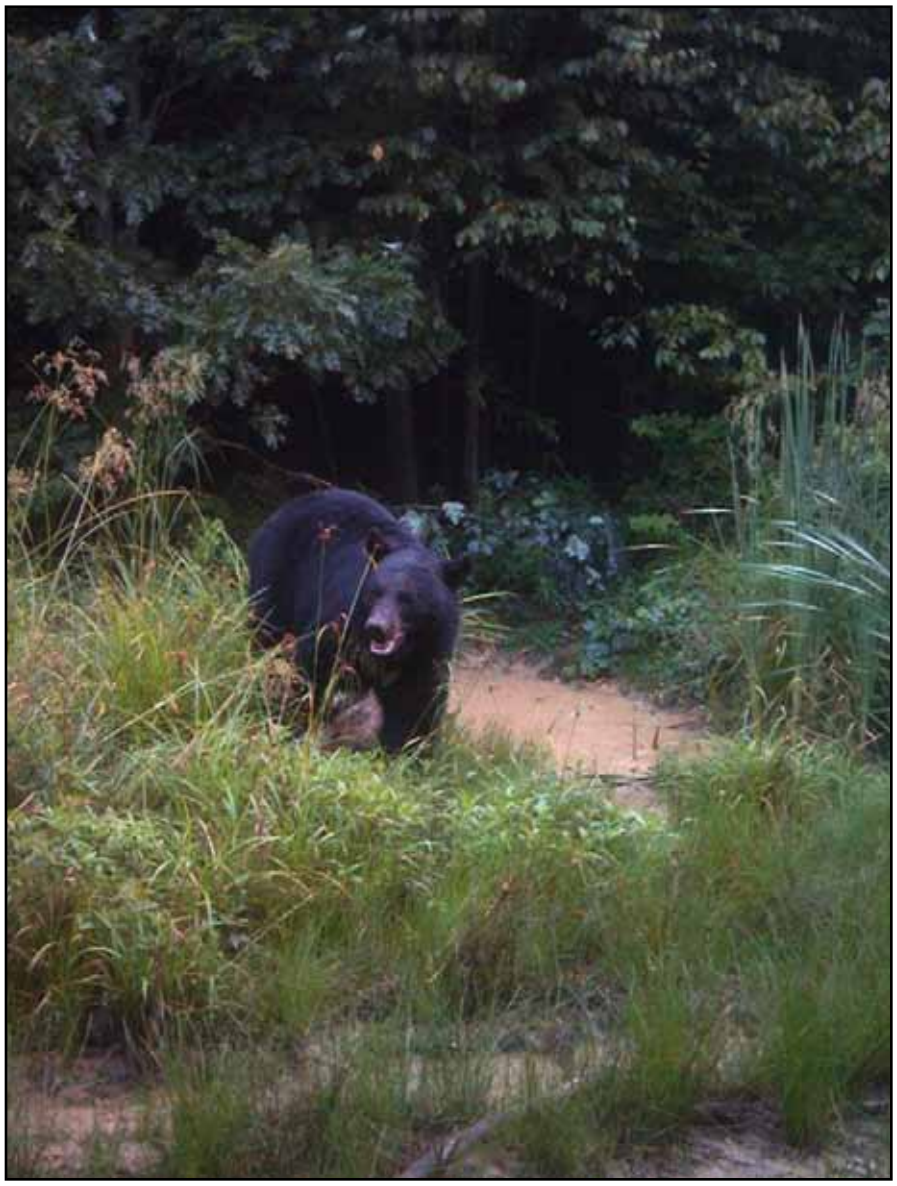
Regional Example
Habitat Management

Hard mast production, especially beech, is considered by wildlife officials to be a key component to black bear survival in Vermont due to the absence of alternative hard mast species throughout most of the state. The largest and most densely stocked beech stands are found in the Green Mountain range and the northeastern most part of Vermont. Loss of these critical feeding areas and indirect impacts due to human developments such as ski resort expansion (trails, golf courses, condos, etc.), second home development, and wind farm construction force bears to travel further from their home ranges in search of food and increases the levels of bear nuisance activity. Vermont's land use statute, Act 250, gives the State authority to regulate development that threatens this critical habitat. Beginning in the early 1980s the Fish and Wildlife Department has recommended permit conditions on high elevation residential, resort, and wind farm developments that have led to the permanent protection of thousands of acres of black bear travel corridors and bear-scarred beech stands.

2000). Prescribed burning also meets resistance due to traditional public views about fire suppression. Further, wildlife managers do not have a direct control on private and corporate land management.

Costs associated with habitat management for black bears depend upon the management activities conducted. Most timber cutting practices produce revenue for the landowner. However, prescribed burning, maintenance of woodland openings and activities designed to alleviate site-specific human-bear conflicts may generate additional landowner costs.

PGC photo



Implications for Population Management:

Habitat management activities that promote forest diversity, abundant food resources, den sites, protective cover and corridors serve to increase black bear population levels. Restoring these desirable habitat components requires long-term planning as these habitat features may take several decades to develop. Habitat management activities that reduce forest diversity and productivity and isolate black bear populations serve to decrease bear population levels. Unlike habitat enhancement efforts that may take decades to develop, immediate impacts will be apparent with habitat changes such as deforestation, intensive agriculture and urbanization.

Implications for Human-Bear Conflict Management:

Maintenance of diverse, productive black bear habitat provides a variety of natural food sources that can serve to reduce human-bear conflicts. Additionally, removing protective cover or locating commodities or property away from protective cover may reduce site-specific human-bear conflicts.

Fertility Control

Fertility control involves the use of chemical contraception (e.g. steroids, estrogens, and progestin) that is injected into a segment of the population. Federal authority to regulate fertility control agents on wildlife is handled by the Environmental Protection Agency (EPA) in the United States and Health Canada in Canada. Neither EPA nor Health Canada has approved any chemical fertility control on an experimental basis for any wild population of bears.

The concept of immunocontraception (vaccines that stimulate the body's immune system to stop production of antibodies, hormones, or proteins essential for reproduction) is a recent technology that might lead to fertility control as a population control option for bears.

In most situations, fertility control agents may only slow population growth or stabilize the population at current levels (Garrott 1991). In reality, it is doubtful the cost or efficiency of delivery for contraceptive tech-

New Jersey

Regional Example
Fertility Control

The New Jersey Division of Fish and Wildlife (NJDFW) is responsible for managing black bears to assure their continued survival, while addressing the property damage and safety concerns of NJ residents and farmers. The NJ black bear population has been growing and its range expanding, leading to an increasing number of conflicts with humans. Although NJDFW biologists have determined that the bear population can support a regulated hunting season, state officials are investigating the development of non-lethal management methodologies, recognizing that alternative methods of controlling wildlife populations may be necessary because traditional means, such as recreational hunting and trapping, may not always be appropriate or effective in certain environments.

Based on reports that PZP was successful in limiting cub production in captive black bears at Bear Country USA, South Dakota and that the FDA approved Neutersol® as a permanent sterilant for male puppies in 2003 allowing extra-label use of Neutersol in any nonfood animal, the NJ Department of Environmental Protection (NJDEP), parent agency of NJDFW, entered into a Memorandum of Understanding with the Humane Society of the United States to investigate the feasibility of fertility control to control NJ's black bear population. An immunocontraception pilot project on six captive female black bears at Six Flags Wild Safari was initiated in 2003 despite concerns, including cost, side effects, lack of efficacy and production problems with Neutersol. This project was discontinued after Neutersol was found to cause tumors in the treated male bears.

*I*n 2006, NJDEP's Division of Science and Research commissioned a literature review of fertility control. The authors of *"An Analysis of the Feasibility of Using Fertility Control to Manage New Jersey Black Bear Populations"* concluded that managing black bear populations using fertility control is unlikely to be a feasible means to manage bear populations (Fraker et al. 2006).

PGC photo

Implications for Population Management:

At the present time, fertility control is not a viable option to manage free ranging black bear populations.

Implications for Human-Bear Conflict Management:

Should fertility control techniques be developed for bears, changes in bear density would only occur over a long time frame during which human-bear conflicts would continue. Fertility control is not considered to be a viable option to manage human-bear conflicts.

niques would allow their use on free-ranging game populations outside of urban areas (Fagerstone et al. 2002). From a population perspective, removing animals to directly reduce population levels is the most effective means of controlling population size (Garrott 1995). While use of fertility control agents may limit population growth, it does not reduce the current population size, which is usually the major objective of population control. Although long lived species are least suited for population reduction through use of fertility control, most fertility control research and applications have been directed at the management of white-tailed deer and wild horse populations, both long lived species (Fagerstone et al. 2002). Because research on the use and effectiveness of fertility control agents on black bears is insufficient, fertility control should not be considered a viable option for black bear population management until the efficacy, health impacts, behavioral changes, method of administration and costs are scientifically evaluated. However, fertility control is unlikely to be a feasible means to manage bear populations due to the inherent expense in capturing bears, low population densities, and expansive movements (Fraker et al. 2006).

Allow Nature to Take Its Course

If bear populations were to persist in the absence of human intervention, populations would increase until reaching Biological Carrying Capacity (BCC). The point at which black bear populations achieve BCC is not known throughout much of the northeastern United States or Canada but would vary regionally with habitat quality and food availability. It is highly probable that in most locations BCC for black bear populations exceeds Cultural Carrying Capacity (CCC), the number of black bears the public will tolerate.

Allowing nature to self-regulate black bear populations is generally best suited for areas with low-density black bear and human populations where the incidence of human-bear conflicts is limited or areas where increased bear population levels is desired. In the absence of control measures, bear population growth rates will be elevated.

Humans have had a dramatic effect on the ecosystems of North America. Among many perturbations, humans have altered landscapes, changed and manipulated plant communities, displaced large predators, eliminated native species, and introduced numerous exotic spe-

West Virginia

Regional Example
Allow Nature to Take Its Course

In the Cranberry Black Bear Sanctuary in West Virginia, and in other areas that prohibit hunting, there was no active management program to control black bear populations. Consequently, on many of these lands, bear management was not focused on population control and managers allowed nature to take its course with respect to bear population growth rates and demographic parameters. Rather, the primary focus was on reducing the impacts of visitors on local bear populations. To accomplish this goal, agency personnel attempted to educate visitors and eliminate the intentional or unintentional feeding of bears. In addition, agency personnel were trained to aversively condition or relocate bears that caused problems with visitors to the sanctuary. However, because many bears lost their fear of people or became accustomed to human food sources, repeat offenders were ultimately killed. Moreover, because bear populations have become so high in West Virginia and other eastern jurisdictions, there was not an area to relocate animals that did not already have a population meeting or overshooting population goals. In many of these areas protected from hunting, bear population growth is relatively high, and visitors often note that observing a black bear in its natural habitat is a highlight of their experience. However, areas surrounding these refugia can experience unusually high levels of human-bear conflicts through increased crop and residential damage and bear-vehicle collisions. The presence of large refugia where bear population growth is not actively managed is a challenge to state and provincial wildlife biologists who seek to mitigate the impact these bears have on surrounding landscapes and communities. The West Virginia Division of Natural Resources opened the Cranberry Black Bear Sanctuary to hunting in 2007 and has begun to regulate the population through hunting seasons. This, coupled with the installation of bear proof garbage cans, has reduced the nuisance complaints and allowed the agency to effectively control the bear population.

Four cub litters are common in bear refugia that prohibit hunting, VDGIF

cies. Natural systems and their regulatory processes have changed as a result of these effects. Neither intensive management, nor adopting a "hands off" policy will restore North American ecosystems to their original state.

Costs associated with allowing nature to take its course vary with black bear population density. For low-density black bear populations, the cost of implementation is probably limited. However, as black bear populations grow and exceed CCC, costs associated with the increased loss of agricultural crops, damage to private property, vehicle collisions, and managing nuisance complaints may be substantial.

Implications for Population Management:

Allowing nature to take its course increases population levels until BCC is approached.

Implications for Human-Bear Conflict Management:

Allowing nature to take its course may have site-specific impacts on human-bear conflicts. Generally as populations increase, human-bear problems also will increase.

Human-Bear Conflict Management

Black bear showing aggression, PGC photo

Public Education

Public education about black bears is an essential component of all successful black bear management programs and provides an important proactive measure to prevent human-bear conflicts from developing or progressing. Educational efforts should provide an understanding of bear natural history and feeding ecology, the process of food conditioning and human habituation, the importance of removing attractants and techniques for waste storage and disposal. Agencies should emphasize that responsible management, not passive preservation, is necessary when managing natural resources like bears, or protecting property and human health and safety (USDA WS WI 2002). Guidance on how to interpret bear behavior, react in an encounter and the role of lethal and non-lethal measures for managing bear populations and reducing human-bear conflicts are also important.

People tend to view bears as intelligent, culturally significant, charismatic and similar to humans (Kellert 1994). This attitude may contribute to human-bear conflicts because people are tempted to encourage (or not discourage) bear viewing opportunities around their homes. They may feed bears or make no effort to keep bears from accessing garbage and other foods until significant property damage occurs. Furthermore, the number of people moving into bear habitats is growing, and in some cases, bear populations are expanding into new areas. The result is that many people, with relatively little previous experience or knowledge about bears and methods to prevent human-bear conflicts, are now living in bear country. The importance of public education and distribution of information about bears is continuous and growing.

Educational programs may increase public awareness of bears, but the critical challenge is to initiate behavioral and attitude changes in people that result in reduced potential for human-bear conflicts. For such programs to be successful, educational efforts must be persistent, multi-faceted and address individuals, communities, institutions and organizations (Gore and Knuth 2006, Beckmann et al. 2008). Effective campaigns often involve partnerships of local, state and federal agencies with conservation groups and universities.

Ontario

Regional Example
Public Education

The Bear Wise Program in Ontario, Canada, works in partnership with communities to educate people about bears and establish local prevention programs to reduce bear attractants. To successfully manage community conflicts with bears, a commitment from the state and provincial agencies, municipal governments, waste management companies, home and business owners and visitors is necessary. The critical ingredients include providing education, removing bear attractants, enforcing laws and using innovative bear management techniques. Changing people's beliefs and behaviors is challenging, therefore the motivation to change and the message on the need to change has to be compelling.

Implications for Population Management:

Education is essential for developing a public awareness of the need for managing bear populations and the importance of regulated hunting as a management tool.

Implications for Human-Bear Conflict Management:

Because bears exploiting human-related food resources are responsible for most human-bear conflicts, public education is essential to resolving current and preventing future conflicts. Often public education and other measures (i.e. fencing, aversive conditioning) are needed to resolve human-bear conflicts. Public education is the cornerstone of conflict management efforts.

Exclusion Devices for Food and Waste Management

Exclusion devices are physical barriers that prevent access of bears to human property, food or commodities. Exclusion devices, including electric fencing and bear-resistant containers, can eliminate individual, site-specific bear conflicts.

Bears are very adaptable and will modify their behavior to take full advantage of their environment. Often, this trait can lead to bears becoming conditioned to human-related food through access to intentional or unintentional feeding and may lead to habituation (loss of fear) to humans. Food conditioned and habituated bears are typically responsible for increased human-bear conflicts. Eliminating bear access to human-related foods in areas of high human use (e.g., parks, campgrounds) helps reduce human-bear conflicts. In such areas, management plans and strategies for mitigating human-bear conflicts usually recommend eliminating the bears' access to human-related food sources.

Fencing, bear-resistant containers, and garbage incinerators have been used to address broad-scale solid waste management associated with industrial development in northern Alaska (Follmann 1989). On smaller scales, electric fencing is extremely effective in eliminating bear access to garbage, food stores

Bear resistant food canister, NYSDEC.

New York

Regional Example
Exclusion Devices for Food & Waste Management

For many years the New York State Department of Environmental Conservation (NYSDEC) and the Wildlife Conservation Society (WCS) have worked together to resolve bear conflicts in the backcountry of the Adirondack Park. In 2005, a regulation mandated the use of bear resistant canisters in one highly used area of the Park. The combination of education, enforcement of the regulation and providing proper food storage options to backpackers resulted in a dramatic drop in bear encounters and human-bear conflicts.

and agricultural crops, and preventing beehive destruction in apiaries (Creel 2007). Incidences of bears obtaining human-related food in Denali National Park, Alaska decreased 96% when hikers were provided with bear-resistant containers for food storage (Schirokauer and Boyd 1998). Human-bear conflicts also decreased in areas of Yosemite National Park, California where access for bears to human-related food sources was eliminated (Keay and Webb 1989).

Major limitations to exclusion devices are cost and practicality. Depending upon the type of electric fence constructed, the expense (ranging from $1.50 to $3.00 per foot of fencing) may be cost prohibitive for large sites. Bear-resistant containers and portable electric fences are cost effective for camping, backpacking, and other recreational activities in bear habitat. Bear resistant trash containers have a wide range of costs depending on residential or commercial use. Residential containers can range from $50.00 - $250.00, while trash enclosures or dumpsters can cost $400.00 and up. In addition to cost, "bear resistance" is variable, quality of bear proof exclusion devices varies between manufacturers and a limited number of cases have occurred where bears have been able to break into poorly fabricated or damaged garbage enclosures. Fast learners, some bears have been able to figure out how to gain entry to certain food storage devices as well. However, these occurrences are very rare and are accomplished by a select number of bears. Exclusion devices for garbage and food storage prevent bears from accessing those attractants.

Costs associated with broad-scale solid waste management can be highly variable depending upon the specific needs of each area. However, for development sites, adequate advanced planning designed to reduce bear access to trash can significantly reduce the costs associated with managing human-bear conflicts, reducing property damage and decreasing work stoppages.

Implications for Population Management:

Exclusion devices are not an effective tool for obtaining bear population objectives; however, exclusion devices may increase cultural carrying capacity by reducing some bear conflicts.

Implications for Human-Bear Conflict Management:

Food and waste management is the primary reason for many human-bear complaints. Reducing the availability of human related food sources to black bears would eliminate many nuisance bear calls. Exclusion devices secure food and waste and are effective at reducing human-bear conflicts.

Aversive Conditioning

Aversive conditioning is a technique designed to modify undesirable behavior of black bears and cause them to avoid specific places or objects (McMullin and Parkhurst 2008). While aversive conditioning has been used for many years, it is becoming an increasingly important non-lethal, short-term tool for wildlife management agencies to address human-bear conflicts. Yet aversive conditioning should only be considered as part of an Integrated Wildlife Damage Management (IWDM) approach (USDA WS WI 2002) for minimizing human-bear conflicts that also emphasizes public education to understand bear behavior and reduce intentional and unintentional feeding of bears.

Aversive conditioning techniques include the use of pepper spray (Capsaicin), emetic compounds, loud noises, non-lethal projectiles (e.g. rubber buckshot or slugs), pyrotechnics, chasing with dogs or live trapping and releasing bears at the capture site. In practice, the effectiveness of aversive conditioning for reducing human-bear conflicts is mixed. Survey responses from bear managers across North America indicated that there was no clear consensus about the effectiveness and use of aversive conditioning methods (Kocka et al. 2001, McMullin and Parkhurst 2008). Most respondents believed aversive conditioning techniques are only occasionally effective. Indeed, use of non-lethal projectiles, pyrotechnics and pursuit dogs has demonstrated only short-term (<1-6 months) alteration of bear behavior, particularly if access to food sources are not managed (Beckmann et al. 2004, Leigh and Chamberlain 2008).

The effectiveness of aversive conditioning at altering a bear's problem behavior may be affected by a bear's previous experiences associated with that behavior. It is unlikely that

Biologists prepare to aversively condition a trapped bear upon release. Aversive conditioning tools including pepper spray, rubber projectiles, and pyrotechnics.

sufficient negative reinforcement could be directed at bears that have learned behaviors that lead to conflicts with humans (McCullough 1982). Even infrequent rewards serve to perpetuate such behavior. Thus, aversive conditioning is likely to be most successful for young bears and first-time offenders. Additionally, the effectiveness of aversive conditioning is likely impacted by the timing and proximity of treatment to the nuisance activity, intensity of the treatment and repeated application of treatment.

Maryland cooperators with bear-chasing hounds used to deter bears from returning to agricultural fields, MD DNR.

While aversive conditioning is unlikely to provide long-term relief from human-bear conflicts, application of aversive conditioning techniques may provide immediate relief for agricultural damage and provide public satisfaction that a problem is being addressed. Effective aversive conditioning may be expensive and impractical because trapping is often required before conditioning can occur. It also requires specialized equipment, professional training and time to implement.

Maryland

Regional Example
Aversive Conditioning

In the images below, Maryland Department of Natural Resources (MD DNR) biologists prepare to aversively condition a female bear that was captured in September 2003 after attempting to gain entry to a freezer on an enclosed porch. This female had been aversively conditioned one previous time in September 2001 after entering an enclosed porch to gain access to trash. After the conditioning event in 2003, the female was not reported again until May 2004 when it returned to the same residence and attempted once again to gain entry. After this 3rd attempted entry to the enclosed porch, the bear was killed.

Implications for Population Management:

Aversive conditioning is not effective at managing bear population size.

Implications for Human-Bear Conflict Management:

Aversive conditioning may temporarily alter some specific black bear behaviors and yield a short-term reduction in human-bear conflicts. However, aversive conditioning must be accompanied or preceded by efforts to address the attractant that instigated the problem behavior.

Repellents

Repellents are sensory deterrents that are intended to keep bears from entering certain areas or prevent the close approach by bears. Depending on the method of application, repellents may also function as an aversive conditioning tool. Common repellents include chemical compounds, loud noises or guard animals. When sprayed directly in a bear's eyes, Capsaicin was effective at repelling captive and free-ranging black bears (Herrero and Higgins 1998) but only at distances less than 30 feet (Hygnstrom 1994). However, objects or sites sprayed with Capsaicin may not repel black bears but rather attract them to the object or site (Smith 1998). Thus, Capsaicin is applicable only in situations of close human-bear contact and probably doesn't have broad application for reducing most forms of human-bear conflicts.

Certain chemical compounds, such as human urine or ammonia, have had mixed results in deterring bears (Creel 2007). Any potential effect of the compounds is likely to decrease over time as the compound degrades or bears become accustomed to the odor. However, ammonia is useful to reduce odors associated with garbage storage in some situations. Karelian bear dogs and sheep dogs have proven effective in keeping bears from frequenting areas guarded by these animals (Jorgensen et al. 1978, Green and Woodruff 1989). The use of chemical compounds or guard animals is likely ineffective in urban situations where bears are used to people.

As a non-lethal form of control, repellents appear to be socially acceptable and are relatively inexpensive. Capsaicin is sold commercially and often recommended for individuals hiking in bear habitat. Ammonia is also widely available but use of these compounds may be limited. Dogs are used in certain situations with a limited degree of success, based on the circumstances.

Implications for Population Management:

The use of repellents is not an effective tool for obtaining bear population objectives; however, the use of repellents may increase cultural carrying capacity by reducing some bear conflicts.

Implications for Human-Bear Conflict Management:

Repellents have shown minimal success at reducing human-bear conflicts. Most are economical and readily available and may provide a cost-effective means of reducing damage for site specific human-bear conflicts.

Maryland *Regional Example Repellents*

Maryland Department of Natural Resources (MD DNR), Wildlife & Heritage Service staff frequently responds to human-bear conflicts. The primary method of mitigating conflicts at residences, businesses, and campgrounds is to identify and remove the attractants, though deterrents are also occasionally used. In agricultural settings such as crop fields (e.g. corn and oats), however, removing the attractant or excluding them with fencing is often expensive and impractical.
In these situations, bear-chasing hounds are often used to chase bears from the crop fields and deter them from returning. Corn fields are especially attractive to bears while the corn is in the milk stage. The use of bear-chasing hounds seems to be an especially effective mitigation tool when employed frequently at this stage of the corn's development.

Kill Permits

Many states and provinces issue permits that authorize landowners experiencing bear-related damage to kill the offending bears. Kill permit programs are designed to alleviate human-wildlife conflicts, particularly damage to agricultural commodities. While kill permits are used to alleviate human-bear conflicts, wildlife agencies have not used kill permits to manage black bear population levels. Kill permit programs for human-bear conflicts generally do not occur on a large enough scale to affect black bear populations except at small, localized levels.

Kill permits can effectively target and remove specific black bears involved in human-bear conflicts. Additionally, Horton and Craven (1997) suggested that kill permits might increase farmer tolerance for damage by giving them a sense of control over the damage situation. Kill permit programs have some limitations. Kill permits may not be practical for some urban areas where the discharge of firearms may be prohibited. Further, the wide-ranging, nocturnal habits of black bears can complicate removal efforts, requiring substantial time investments to remove specific animals.

As a lethal control measure, kill permit programs may not be socially acceptable. In New York, 52% of survey respondents were opposed to the killing of bears that repeatedly cause problems for people (Siemer and Decker 2003). Animal rights groups often support non-lethal means for managing wildlife. Additionally, perceiving a loss in recreational opportunities, some hunters object to bear removal from the population via kill permits. However, controversy surrounding a kill permit program in Wisconsin appeared to come from a vocal minority, and hunters and farmers accepted the use of kill permits for reducing crop damage (Horton and Craven 1997).

Bear damage to a corn field in Virginia, VDGIF.

Virginia

Regional Example
Kill Permits

If a bear is damaging fruit trees, crops, livestock or personal property used for commercial agricultural production, the Code of Virginia authorizes the property owner to receive a kill permit if certain requirements are met. Once damage occurs and the owner contacts the Virginia Department of Game and Inland Fisheries (VDGIF), a site visit is usually conducted by a Conservation Police Officer in cooperation with a District Biologist. If there is clear and convincing evidence the damage has been caused by a bear, the damage has been reported in a timely manner and safety concerns allow for it, a kill permit is written for a specific number of animals for a limited amount of time. The bear (or bears) can only be killed within the area where the damage is occurring as designated on the kill permit, the kill must be reported to VDGIF and the carcass disposed of within 24 hours of being killed. Kill permits are most commonly written for damage to corn fields followed by fruit orchard damage, livestock depredation, and apiary destruction. Typically, kill permits are written for the minimum number of bears presumed to be causing the damage but have been written for up to 10 bears at a time and renewed in areas that are adjacent to bear refuges. Kill permits are for use in areas where electric fencing or other bear deterrent methods are cost prohibitive or logistically impractical.

Implications for Population Management:

Generally, population impacts of kill permit programs are minimal. However, if extensively used, kill permits could stabilize or decrease black bear population levels. Efficacy of using kill permits, as a population management option, would depend on the age, sex and number of animals removed.

Implications for Human-Bear Conflict Management:

Kill permits can effectively alleviate human-bear conflicts by targeting the problem individuals. Kill permits are used as a last resort in situations where substantial damage has occurred or human life and safety are threatened.

Capture and Kill

Capture and kill can effectively target and remove specific bears involved in human-bear conflicts, eliminating future problems with that individual. The destruction of bears is generally applied in situations where the black bear presents an immediate threat to human safety or has repeatedly been involved in human-bear conflicts. Use of non-lethal techniques (e.g., translocation, aversive conditioning, etc.) as alternatives to killing may provide a short-term solution.

Residential property damage, VDGIF.

In unhunted areas where information on bears may be lacking, capturing and killing bears could provide additional opportunity to collect data and assist wildlife management agencies in monitoring population health and growth. Bears killed by gunshot could be consumed, while bears killed by chemical means are generally not safe for human consumption.

Capture and kill is expensive and labor intensive. Cost estimates for the capturing and killing of bears vary by locality and are likely to be similar to that of capturing and moving bears. Time and labor costs are nearly equal, with the cost of moving a bear to a new site replaced by the cost of removing and disposing of the killed bear.

New York

Regional Example
Capture & Kill

New York State Department of Environmental Conservation staff use capture and kill as a means to eliminate bears that have exhibited behaviors that are clearly dangerous toward humans, domestic pets or livestock. From 2008-2010, 15 bears were trapped and killed in separate incidences of home entry, livestock depredation, or serious, repeated property damage in the Catskill region of southeastern New York. The situations were resolved with the removal of the bears causing damage.

Implications for Population Management:

The efficacy of capture and kill to stabilize or decrease black bear population levels would depend upon the number, sex and age of bears removed from the population. Generally applied to remove specific problem individuals, with insignificant population management consequences.

Implications for Human-Bear Conflict Management:

Capture and kill can effectively remove problem bears from the population.

Translocation

Translocation involves capturing and moving bears to a new area. Translocations may be used to introduce bears into new or previously occupied habitats, to establish, reestablish or augment bear populations, or to remove nuisance animals from the capture location. Translocation has been used to restore black bear populations in areas where native bear populations have been extirpated (Shull et al. 1994).

Translocations receive wide public acceptance as a wildlife damage control technique because they avoid the killing of bears and provide satisfaction that a problem is being addressed. However, identifying and selecting suitable release sites can complicate translocation efforts. For many areas, bears already occupy the best release sites. Releases of translocated bears need to be compatible with the population management objectives of the area. Release sites must contain enough suitable habitats to meet a bear's life requirements. Release sites would ideally be located away from highways to reduce the likelihood of vehicle collisions. Additionally, for bears involved in human-bear conflicts, release sites should provide habitat conditions where bears cannot continue to exhibit problem behaviors. Wade (1987) noted that human safety and damage to agricultural commodities are common negative values associated with bears. Social concerns surrounding these negative values must be addressed to ensure successful implementation of a translocation program.

Translocation has numerous effects on black bears. The first few months following translocation bears often travel more, which can cause bears to be struck by vehicles or shot by hunters, farmers or homeowners (Massopust and Anderson 1984, Stiver 1991, Comly 1993). However, mortality rates of black bears >2 years old did not increase following translocation in Minnesota (Rogers 1986). Translocation appears to have some short-term effects on reproduction. Comly (1993) and Godfrey (1996) reported females did not give birth to cubs the winter following translocation, but reproduced normally in subsequent years.

A black bear's age, reproductive status and distance moved from the capture location affects the success of translocation. It is less likely that bears moved > 40 miles would return to the capture location; translocation of subadult bears is more successful

Pennsylvania

Regional Example Translocation

In June of 2004, multiple complaints about black bears were received from a neighborhood in Mifflin County, Pennsylvania. Sighting descriptions suggested a young, likely dispersing, bear was the main culprit. Conservation Officers talked with homeowners about the importance of securing birdfeed and garbage attractants, and compliance was generally good. However, bear sightings continued, and officers decided to relocate the bear as a preventative measure against further habituation. An 80-pound yearling male was captured in the backyard of a residence, fitted with ear tags, and relocated to a remote region of the county. Sightings subsided while officers reminded homeowners about their responsibility to avoid attracting additional bears. The bear has not been handled since. Approximately 250 bears are relocated from nuisance situations annually in Pennsylvania; most have no previous relocations. Relocation is typically considered an alternative only after food attractants are removed and sightings persist. Fifty-one percent of the nuisance bears relocated in Pennsylvania are juveniles of dispersal-age.

than movement of adult bears (Sauer and Free 1969, Alt et al. 1977, Rogers 1986, Shull et al. 1994).

Despite these challenges, translocation has been effective at reducing nuisance activity (McArthur 1981, McLaughlin et al. 1981, Fies et al. 1987). In eastern North America, 24 of 28 states/provinces use translocation as one method to manage human-bear conflicts (Warburton and Maddrey 1994). However, translocation fails to address the situation which led to the nuisance behavior, and translocated nuisance bears may cause problems while attempting to return home or after returning (Massopust and Anderson 1984).

Translocation is labor intensive and expensive and costs vary by state and location. Costs include administrative expenses, capture and handling equipment (i.e., traps, carrying cages and immobilization equipment), purchase of specialized vehicles and various overhead expenses in addition to staff time.

Release of a relocated black bear, PGC photo

Implications for Population Management:

Translocations may be used to introduce bears into new or previously occupied habitats, to establish, reestablish or augment bear populations.

Implications for Human-Bear Conflict Management:

Translocation may reduce local nuisance activity. However, translocation does not address the behavior causing the human-bear conflict or remove the root of the problem (normally human food sources) at the capture location. Thus, black bears need to be relocated to areas where they cannot exhibit the same problem behavior. Effective, long-term nuisance control would probably require continual translocation efforts and may not be cost effective.

Damage Compensation Programs or Reimbursement Fund

Damage compensation programs, also called reimbursement funds, are seldom used by management agencies. While damage compensation programs may satisfy those receiving damage to property or agriculture, they are not a viable technique for preventing damage. Aside from the cost and identification of a permanent funding source, they do not address the problem causing the damage. Without addressing the causal factors, damage is likely to persist; and compensation programs may be self-perpetuating. To avoid this problem, Jorgensen et al. (1978) recommended that programs allocate a portion of reimbursement monies for establishing and maintaining damage prevention measures.

Other limitations of reimbursement programs involve the assessment of damage, determination of the damage payment and program equitability. Under Wisconsin's Wildlife Damage Compensation Program (1930 -1979), landowners were dissatisfied with damage assessments and damage payments, while legislators and wildlife management personnel were concerned about the equity of the program (Hygnstrom and Hauge 1989). In Virginia, Engel (1963) reported that equity of damage compensation payments hindered program implementation. Ideally, damage assessment and determination of payments would be standardized to ensure equitable distribution of program funds.

The acceptability of damage compensation programs is unclear. Some private organizations are willing to establish compensation funds for damage caused by some species. However, farmers in the United States have preferred other nuisance management options to damage compensation (Arthur 1981, McIvor and Conover 1994). Compensation programs may be appropriate in areas where bear populations are protected and lethal means of damage abatement is unacceptable.

Costs associated with damage compensation programs would vary according to program guidelines. Small-scale compensation programs that restrict

West Virginia

Regional Example
Damage Compensation or Reimbursement

The West Virginia Division of Natural Resources (WVDNR) uses a reimbursement fund to help mitigate personal property destruction caused by black bears to private landowners. Hunters that pursue black bears are required to purchase a $10.00 "Bear Damage Stamp" that is put in a fund for redistribution to private landowners experiencing "real or personal property" damage. The fund was established in the 1970s, at a time when bear populations were low, and was intended to protect bears from being killed for damaging property. However in 2007, the WVDNR paid out $188,004 in bear damage. In addition, the WVDNR spent $116,624 investigating and processing bear damage complaints. With approximately 23,000 bear damage stamps sold each year, the WVDNR would quickly bankrupt the fund if they charged their costs for processing bear damage claims. The reimbursement fund, while good in principle, may not pay for itself in years of high bear damage.

Bear damage to apiary, VDGIF

reimbursements for only the most significant damage may be more affordable, where large-scale programs aimed at reimbursing individuals for any damage incurred are costly.

Implications for Population Management:

Reimbursement funds are not an effective tool for obtaining bear population objectives; however, reimbursement funds may increase the cultural carrying capacity by reducing some bear conflicts.

Implications for Human-Bear Conflict Management:

Reimbursement funds have been successful at mitigating the impacts of human-bear conflicts. Unless compensation programs emphasize measures to reduce damage, the incidence of human-bear conflicts would not decrease.

Supplemental Feeding

Supplemental feeding augments natural food supplies by providing additional food sources to bears through cultivated wildlife plantings or strategically located wildlife feeding stations. Supplemental feeding may have application for managers seeking to restore bear populations or protect threatened populations, as feeding programs may mitigate the impact of temporary natural food shortages. Supplemental feeding is not widely used by bear managers; however, some individuals feed bears to view or photograph. Unfortunately, these activities often lead bears to seek out human food sources (i.e. food conditioned) and/or to lose their fear of people (i.e. habituated).

Research suggests that black bears utilizing high-energy, human foods grow faster and mature earlier than bears that utilize only natural foods (Alt 1980, Tate and Pelton 1983, Rogers 1987, McLean and Pelton 1990). Improved fertility through earlier sexual maturation, increased litter sizes and fewer skips in the reproductive cycle appears to

be common for black bears with supplemented diets. However, estimates of survival rates for bears with supplemented diets are limited.

Supplemental feeding presents logistical challenges of acquiring and distributing enough feed to accomplish the management goal. This may be confounded by bear social hierarchies and the ability of dominant bears to monopolize the food. Additionally, as bears congregate around supplemental feed sites, the potential for disease transfer or aggressive competition increases. Use of feed sites by other wildlife may generate unintended population effects or disease concerns. In Michigan, supplemental feeding is believed to be one of the main reasons for the occurrence and maintenance of tuberculosis in several wildlife species, including black bears.

The economic costs and benefits of supplemental feeding are not well defined or understood, though wide-scale programs would likely be cost prohibitive. Costs are associated with acquiring and distributing the supplemental feed, mitigating human-bear conflicts that arise from the program and any negative impacts the program would have on other wildlife populations (e.g., disease concerns or habitat destruction).

Virginia

Regional Example
Supplemental Feeding

In July 1999, the Virginia Department of Game and Inland Fisheries (VDGIF) adopted a regulation that prohibited the feeding of wildlife on national forest and department-owned lands. In July 2003, another regulation was passed to prohibit all feeding of bears year round statewide. Prior to the regulation change in 1999, bear hunters annually spent an average of $163/person for supplemental feeding of bears. The mean amount of food provided by an individual was 10,437 kg/year, or 63 kg food/person/day (Gray 2001). Most feeding occurred in July, August, and September. Shelled corn, pastries, grease and bread were most commonly used items for supplemental feed. Supplemental feeding may have provided a substantial amount of food to bears in years of mast shortage, but potentially only about 2% of the bears' diet during good or excellent mast years.

Implications for Population Management:

Supplemental feeding is intended to maintain bear numbers and overall health. However, the impact of supplemental feeding on black bear populations is unknown, but is likely to increase population size and spread disease.

Implications for Human-Bear Conflict Management:

Bears that exploit human-related food resources are responsible for most human-bear conflicts. Supplemental feeding by the public has increased human-bear conflicts in areas of high human use. The effects of supplemental feeding in areas of minimal human use are unknown.

Conclusions

Management of black bear populations and mitigation of human-bear conflicts involve integration of many management options, and no single option is best for every circumstance. However, the importance of public education and changes in human behavior for decreasing negative interactions between people and bears cannot be overemphasized. Many tools used in bear management programs only result in short-term solutions to resolving conflicts between people and bears. Successful bear management programs must incorporate bear population control measures with comprehensive education and attractant management programs to reduce human-bear conflicts. Selection of the appropriate population management options must be consistent with the cultural carrying capacity of the management unit, recreational interests, available habitat and societal concerns for bear related impacts. For human-bear conflicts, appropriate management options are determined by public concerns, extent of damage, type of problem or damage, black bear biology, public safety, animal welfare and available control methods.

PGC photo

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