BLACK BEAR MANAGEMENT PLAN 2012-2021

DRAFT

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EXECUTIVE SUMMARY

Black bears (*Ursus americanus*) capture human admiration and interest like few other wildlife species. As a reflection of strength, images of bears are often used as icons for countries and athletic teams. Because of their intelligence and ingenuity, bears are perceived to have human-like emotional qualities. Black bears are recognized as indicators of ecological health and symbols of the American wilderness. Many citizens simply value bears because they exist in their native ecosystems. Although many residents take pleasure in watching, hunting, or photographing this fascinating mammal, bears may also inflict damage to personal property and crops, and may sometimes be perceived as a safety risk.

Bears were plentiful and widespread when Jamestown was settled in 1607. By 1900, habitat changes and over-harvest of bears for food and hides had nearly extirpated the species but for isolated small populations in remote areas. Since the early 1900s, harvest management, reforestation, public land purchases, oak forest maturation, bear restoration efforts, and natural range expansions have all contributed to bear population growth in Virginia. With the resulting increase in bear populations, bear management objectives have changed from restoring to stabilizing populations over much of the Commonwealth. Although many people have welcomed this growing population, the abundance of bears can also create concerns for other citizens. Active bear management is necessary to maintain bear populations at optimum levels to meet the needs of citizens of the Commonwealth.

The first Virginia Black Bear Management Plan, completed in 2001, has provided the blueprint for black bear management to meet the Virginia Department of Game and Inland Fisheries (VDGIF) mission of managing "*wildlife…to maintain optimum populations…to serve the needs of the Commonwealth*". Optimum bear populations balance positive demands (e.g., hunting, viewing) with negative demands (e.g., agricultural damage, nuisance demands). The Virginia Black Bear Management Plan identified areas where bear populations should be managed to increase, decrease, or remain the same.

Although VDGIF has traditionally incorporated public input into bear management decisions, it was not until development of the first Virginia Black Bear Management Plan that a diverse cross section of stakeholders formally participated in a process to establish direction for bear management. To revise the Virginia Black Bear Management Plan through 2021, a similar stakeholder involvement process was used incorporate public values (e.g., economic, sociological, and political) and biological considerations.

Embodying the interests of all Virginians, the revised Virginia Black Bear Management Plan reflects the values of a diverse public about what should be accomplished with bear management in Virginia. Bear stakeholders focused on making value choices about bear management, while wildlife professionals focused on the technical aspects of bear management. Three regional Stakeholder Advisory Committees (SAC) each represented a cross section of bear-related interests: landowners, homeowners, hunters (bear and non-bear), wildlife watchers, farmers, environmental organizations, resource management agencies, and animal welfare interests. The SACs were responsible for identifying the goals that should drive bear management. VDGIF staff with technical expertise in bear management designed objectives and strategies based on values identified by the SACs. Additional public values were considered via stakeholder surveys and broad public review of the draft plan.

The revised Virginia Black Bear Management Plan will guide bear management across the Commonwealth through 2021. This plan describes the history of black bear management, current status (supply and demand) of the bear resource and management programs, and the future of the bear management program in Virginia. The plan identifies a framework of what needs to be done, how it should be done, and when it should be done. Guided by the VDGIF mission, the Virginia Black Bear Management Plan includes six goals that address the areas of (1) populations, (2) habitat, (3) recreation, and (4) human-bear problems.

Specific objectives help guide the attainment of each goal. Potential strategies then clarify how each objective should be achieved. By clarifying goals and directions of bear management, this plan will assist the VDGIF Board of Directors, VDGIF administrators and staff, and the public in addressing bear issues across the Commonwealth for the next 10 years.

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INTRODUCTION

Many people would consider black bears to be the monarchs of Virginia's wild kingdom. Most Virginians may never see a wild bear, but many citizens are interested in observing, photographing, or hunting bears, or just knowing they exist in the Commonwealth. Unfortunately, bears sometimes damage agricultural crops or residential property, and safety concerns involving black bears have increased in recent years. Black bear management throughout the United States has become increasingly complex with a growing number of contentious issues surrounding bear hunting, human-bear problems, bear habitat conservation, and trade in bear parts. Diverse public values and opinions associated with black bears provide unique management challenges for the Virginia Department of Game and Inland Fisheries (VDGIF).

The VDGIF, under the direction of a Governor-appointed Board of Directors, is charged specifically by the General Assembly with the management of the state's wildlife resources. The Code of Virginia expresses many legal mandates for the Board and VDGIF, prominent among which are management of wildlife species (§29.1-103), public education (§29.1-109), law enforcement (§29.1-109), and regulations (§29.1-501). To help clarify and interpret the role of VDGIF in managing wildlife in Virginia, the Board of Directors has adopted a mission statement:

- To manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;
- To provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation and to work diligently to safeguard the rights of the people to hunt, fish and harvest game as provided for in the Constitution of Virginia;
- To promote safety for persons and property in connection with boating, hunting and fishing;
- To provide educational outreach programs and materials that foster an awareness of and appreciation for Virginia's fish and wildlife resources, their habitats, and hunting, fishing, and boating opportunities.

What the Virginia Black Bear Management Plan Is

The Virginia Black Bear Management Plan describes the history of the bear management program, its current status (supply and demand), and the future management directions. The plan establishes a framework through 2021 of what needs to be done, how it should be done, and when it should be done. By clarifying management goals and objectives of the VDGIF relating to bears, this plan will help Board members, VDGIF administrators, VDGIF staff, and the public to effectively address bear issues. As the basis for guiding black bear management activities, decisions, and projects, the plan also informs the General Assembly and the public of what the VDGIF intends to accomplish. This is a strategic plan to provide an overall direction and goals(e.g., proposing regulated hunting as the preferred method to control bear populations) and not an operational plan that would provide the details of specific strategies (e.g., establishing specific number of days of hunting).

How the Plan was Developed

Wildlife managers traditionally have focused on technical or scientific aspects of resource management. Science-based principles have played a major role in the success of bear management programs in the past, but consideration for public values was often lacking. Because VDGIF's mission is "*…to serve the needs of the Commonwealth*," the process used to develop the bear plan incorporated both public values (e.g., economic, sociological, and political) and biological considerations.

The 2001 Virginia Black Bear Management Plan was VDGIF's first statewide Black Bear Management Plan developed to fulfill its mandate to manage black bears in Virginia. The 10-year plan was developed to represent the bear-related interests of all citizens, not just select groups of people. Diverse stakeholders representing homeowners, agricultural producers, naturalists, and recreationists

contributed unselfishly toward this end. The planning process encouraged black bear stakeholders to focus on making value choices about their resource, while wildlife professionals focused on the technical aspects of bear management.

To ensure that the 2001 Bear Plan would represent all citizens, a 17-member Stakeholder Advisory Committee (SAC) was created; the SAC met six times between May 2000 and June 2001. The SAC embodied a cross section of Virginia citizens from across the state with diverse interests and/or expertise in bear management issues (see Appendix I in the 2001 Bear Plan). Additional input and comments on the plan were obtained through five facilitated focus group interviews (Appendix III in the 2001 Bear Plan), five facilitated regional meetings (Appendix III in the 2001 Bear Plan), four targeted stakeholder surveys, public review of a four page newspaper version of the draft bear management plan (63,000 copies distributed), news releases, and media interviews. While considering all forms of public input, the joint efforts of the Stakeholder Advisory Committee and the Black Bear Technical Committee resulted in a draft plan for VDGIF Board consideration. The final draft was approved by the VDGIF Board of Directors on March 28, 2002.

The original 2001 Bear Plan was due to expire in 2010; the process to revise the Plan began in 2009. Like the original 2001 Bear Plan, the revision process was designed to incorporate value choices from diverse public stakeholders with technical guidance from wildlife professionals. VDGIF partnered with Responsive Management of Harrisonburg, Virginia (www.responsivemanagement.com) to facilitate meetings and guide the revision of the Bear Management Plan. Responsive Management specializes in assisting natural resource agencies with human dimensions needs, including constituent surveys and planning processes.

The Stakeholder Advisory Committee for the Plan revisions included representatives from 38 different members/stakes divided into three Regional SACs (Appendix A). Compared to a single statewide SAC, three Regional SACs provided additional opportunities for citizen involvement at a more local level. The primary responsibilities for the SAC were to identify the important values to address bear management issues, formulate plan goals, consider public comments, and review management objectives. The SAC members represented homeowners, sportsmen, nonconsumptive interests, animal welfare concerns, agricultural interests, commercial timber industry, environmental concerns, and resource management agencies. For a total of nine different meetings, each Regional SAC met five times between June 2010 and March 2012 (two times as independent groups within their region and three times with the whole group combining the Regional SACs). Between meetings, the SAC remained active via email and a website designed for SAC members.

VDGIF staff with responsibilities and expertise in bear management provided technical facts for informed SAC deliberations about public values and goals. VDGIF staff updated technical chapters about bear population status and management programs, drafted objectives and strategies to achieve SAC goals, and provided technical writing and administrative support for Plan development. To broaden input, DGIF staff also solicited citizen opinions about bear management through a randomized statewide telephone survey of Virginia residents co-developed and conducted by Responsive Management (http://www.responsivemanagement.com/download/VABear/VABear_2010_Public_Opinion_Survey_Report.pdf), considered results of VDGIF hunter surveys, solicited public input on draft population objectives during the 2011 biennial hunting regulations review process, circulated draft technical chapters among wildlife professionals, and will be receiving public comments about the draft plan revision via the internet and in writing.

Plan Format

The revised Virginia Black Bear Management Plan includes updated sections relating to the life history of black bears, the bear program history in Virginia, Virginia's bear program status (supply and demand), a technical evaluation of bear management options, and accomplishments of the 2001 Bear Plan. Within the context of the VDGIF mission statement, the Stakeholder Advisory Committees developed six bear program goals in the broad context of populations, habitat, recreation, and problems that specifically address bear population viability, desirable population levels (population and CCC),

habitat conservation and management, bear-related recreational opportunities, ethics of bear-related recreation, and human-bear problems. Specific objectives have been established to help guide the attainment of these goals, whereas potential strategies clarify how each objective might be achieved.

Interim Changes to the Objectives and Strategies of the Plan

The Virginia Black Bear Management Plan is designed to provide guidance and priorities to help manage Virginia's bear population through 2021. A Plan life of 10 years was chosen for several reasons; goals should remain relatively constant over that time, a mechanism exists for interim changes in objectives and strategies, and limitations in staff and resources preclude more frequent revisions. However, the plan should be a dynamic and flexible tool that remains responsive to changing social, environmental, technical, and administrative conditions. To keep the Plan relevant and responsive to the programmatic goal directions provided by the public, specific objectives and strategies may be added, deleted, or amended by VDGIF as new circumstances demand. Substantial and thoughtful public investments have produced the final revised Virginia Black Bear Management Plan. Even so, the current SAC has recognized and endorsed the need to make adaptive changes in management approaches. VDGIF will submit these interim updates to the SAC for review before implementing changes; updated objectives will be provided as addenda to the Plan on the VDGIF website.

Acknowledgements (to date)

The meaningful involvement of stakeholders from throughout the Commonwealth was key to successfully represent the bear-related interests and public values of all Virginians. The major commitment of time and expense, unselfish dedication, and enthusiasm provided by the Stakeholder Advisory Committee (Appendix A) not only made a substantial difference in the quality of the final plan, but enriched the process throughout; we greatly appreciate their efforts.

Appreciation is extended for the work of the Black Bear Technical Committee (BBTC Appendix B) for summarizing, reviewing, and updating the revised technical information. This committee was comprised of VDGIF staff with responsibilities and expertise in bear management. Technical research for and writing of the revised Virginia Black Bear Management Plan primarily were provided by Jaime Sajecki and David Steffen. Black Bear Management Options were derived from a publication of the North Eastern Black Bear Technical Committee. Edits and thoughtful insight were also provided by the published author Linda Masterson (www.livingwithbears.org), who has extensive knowledge of global issues surrounding bear management and is a leader in promoting human-bear coexistence.

Guided by Dr. Steve McMullin (Department of Fisheries and of Wildlife Sciences at Virginia Tech) and Nelson Lafon (VDGIF), the 2001 Black Bear Management Plan provided the foundation for the 2012 Bear Plan revision. The 1999 Deer Management Plan and the 2001 Black Bear Management Plan have both provided the fundamental basis for the publically developed management plans at VDGIF.

We also greatly appreciate the work of Responsive Management Staff in conducting the statewide survey and facilitating all nine SAC meetings. Special thanks is extended to Andrea Criscione of Responsive Management who managed the logistics before, during, and after every one of the nine meetings, provided guidance for stakeholder involvement, helped facilitate Stakeholder Advisory Committee meetings, communicated with SAC members between meetings, and whose process guidance kept everyone on track, ensured the efficient use of time, and integrated technical concerns with public values.

HISTORY

LIFE HISTORY OF BLACK BEARS

Black bears are the most common and widespread of the three bear species in North America. Although their historical distribution was larger, black bears are still found in at least 41 states and all Canadian provinces except Prince Edward Island. Largely extirpated from the Midwestern states, populations remain in parts of most every eastern state (including all the southeastern states). As the subject of keen human interest, much is known about the life history and population characteristics of black bears in Virginia and throughout their range.

Physical Characteristics

The fur of the eastern black bear is most commonly uniformly black, with an occasional V- or Y-shaped white blaze on the chest. Other color phases of the black bear (e.g., brown, cinnamon, white, and bluish) are rare in the east and usually associated with populations in western North America.

Black bears have non-retractable claws used for gathering food, climbing trees, and defense. Unlike most carnivores that walk on their toes, bears walk on the soles of their feet like humans. Even so, a running bear can reach speeds of 30 mph. Black bears are excellent tree climbers and swimmers.

Although their vision is likely poor at extended ranges, black bears have better eyesight at short distances and can see in color. This helps them find insects and small colorful berries while foraging. Relying primarily on their nose, bears have a keen sense of smell and can detect odors up to several miles away. Like most mammals, their hearing also is good.

The black bear is Virginia's largest land mammal. Male bears are typically larger than females. In Virginia, adult male bears are typically five to six feet long, two to three feet tall, and weigh 175 - 400 pounds. Some males, however, may weigh in excess of 500 pounds. Adult females generally weigh 150 - 200 pounds and rarely weigh more than 250 pounds.

Bear size and weight vary widely depending on time of year and differences in habitat quality. An 880-pound bear harvested in eastern North Carolina during the 1998-1999 hunting season is the largest black bear documented in North America. Although unconfirmed, a 962-pound black bear reportedly was killed in Madison County, VA in 1887. A 740-pound male was harvested in Suffolk, VA during the 2000 hunting season. Western black bears are generally smaller than the bears found in the eastern United States.

Food Habits

Eating both plant and animal matter, black bears are omnivorous and opportunistic feeders. More than 75% of the annual black bear diet consists of vegetative matter. The other 25% consists mostly of insects, insect larva, carrion, and very rarely, small rodents or other mammals. Bears consume a wide variety of foods including berries and fruits (soft mast), nuts and acorns (hard mast), grasses and broad leaf vegetation, insects and beetles, animals, and carrion. Although bears can kill, rabbits, mice, squirrels, groundhogs, and occasionally livestock and deer fawns, they are more likely to feed on vegetation.

When bears emerge from winter dens in spring, food is scarce. The spring diet of bears in Virginia consists primarily of succulent new plant growth; especially forbs, grasses, skunk cabbage, and squawroot. Squawroot is believed to be an important source of protein for lactating females emerging from dens. In early spring, bears may focus on foods associated with humans (e.g., birdseed, dog food, garbage) due to their high caloric value and limited amount of natural food sources. As spring progresses, bears find insects and larvae in snags, decaying logs, and under rocks.

Soft mast (fruits and berries) becomes an important source of nutrition during both summer and fall. Important summer fruits include blueberries, huckleberries, blackberries, wild grapes, dogwood, serviceberry, wild strawberries, mountain-ash, hawthorn, common chokecherry, pokeberry, and sassafras. By summer's end (like early spring) , especially when mast crops are poor, bears may once again focus

more heavily on agricultural crops (e.g., corn, orchards, peanuts) and other foods associated with humans (e.g., birdseed, dog food, garbage).

Foods that are high in protein, carbohydrates, or fat that promote weight gain prior to denning are critical for bears in the fall. During the fall, bear diets consist mostly of soft and hard mast including acorns, hickory nuts, beechnuts, hazelnuts, grapes, and black gum fruit. Bears feed heavily in the fall and can gain as much as one to two pounds per day. During good mast years, bears may more than double their body weight between August and December while foraging for up to 20 hours a day. Availability of fall foods may influence reproductive success, survival, food habits, nutrition, habitat use, movement patterns, home range, denning behavior, and bear interactions with humans. Field and sweet corn, peaches, cherries, apples, and other fruits attract bears, especially when natural foods are scarce.

Home Range, Movements & Activity

To meet nutritional and social needs throughout the year, black bears have relatively large home range sizes. Home range size is determined by habitat quality, time of year, population density, sex, reproductive status, and age. Productive and diverse habitats result in smaller home range sizes with more overlapping bear use. Although bears may occupy the same general area, social intolerance results in mutual avoidance among individuals (e.g., females and subadult males avoid feeding areas used by adult males).

Males have larger home ranges than females. In Virginia's mountains, female home ranges vary from 1 - 51 square miles while male home range sizes are 10 - 293 square miles. Bears have similar home ranges in the Dismal Swamp area of eastern Virginia.

Females raising cubs generally use smaller home ranges than solitary females. Adult females usually allow their grown female offspring to occupy a portion of their home range. Male offspring are only tolerated for an additional year or so before their mother and other adult males force them to disperse. As a result, these young males may travel great distances in search of new home ranges.

Black bears are generally most active at dawn and dusk, but activity and significant movements may occur during daylight hours. When food is scarce, bears may travel extensive distances. In poor mast years, bears have been known to range two to four times further than during good mast years. In years of mast crop failure, bears may move from forested areas in search of more abundant foods such as agricultural crops or other human related food sources like birdseed or trash. Human-bear problems also increase when bears respond to natural food shortages and move into nontraditional habitats (for example, black bears were observed on the outskirts of Phoenix, AZ during the summer of 2000 when the western droughts created food shortages).

Habitat Requirements

Like all wild animals, bears need food, water, cover, and space to exist. Bears are commonly associated with forested cover, but make use of a variety of habitat types to meet all their seasonal needs. In spite of expanding human populations and land-use changes, bears have persisted because of their adaptability to a variety of habitat types.

Important black bear habitat components include adequate access to food, escape cover, den sites, and travel corridors. Ideal habitat includes combinations of mast producing trees, early successional habitats (i.e., young forests created and maintained by timber/land management practices or other natural perturbations), edges of various successional stages, streamside management zones, and wildlife clearings.

Despite their adaptable food habits, black bears require extensive areas of diverse habitat types. Although they are often considered a wilderness species, black bears also thrive in areas where forested habitats are interspersed among other land uses. Black bears are often found in large, contiguous tracts of forested lands, smaller blocks of forested habitat that are linked by forested corridors will also satisfy daily and seasonal needs. Based on known and apparently viable black bear populations within the

southeast, the observed minimum areas that supported bear populations were 79,000 acres for forested wetlands and 198,000 acres for forested uplands.

Land-use changes that create isolated populations through fragmentation of black bear habitats have serious implications for population viability. Roads with heavy traffic volumes have been shown to limit bear movements. Bear movements that are restricted by heavily used roads may interrupt habitat linkages and contribute to fragmentation concerns.

Denning Behavior

Bears enter a period of winter dormancy for up to six months as an adaptation to food shortages and severe weather conditions. With body temperatures that drop only 9-14 degrees Fahrenheit, black bears are not considered true hibernators. Body temperatures of true hibernators drop to within one degree Fahrenheit of the surrounding conditions. Bear metabolisms fall by 50-60% and heart rates decrease 40-80%. While in the den, bears do not eat, drink, defecate, or urinate. Unlike true hibernating mammals, bears may be easily aroused from their winter dens.

Bears often den in confined spaces in order to reduce heat loss and conserve energy. Brush piles, snags, rock cavities and crevices, hollow trees, ground excavations, open ground nests, and even man-made structures may serve as den sites. In western Virginia, nearly 70% of all den sites are in hollow trees. Large northern red and chestnut oaks are almost exclusively selected as den trees. In eastern Virginia the majority of dens are on the ground. Den reuse in Virginia is less than 10%, although some bears may prefer the same type of den (e.g., trees, rock cavities) year after year.

Timing of den entrance depends upon age, sex, female reproductive status, weather conditions, and food availability. Bears may enter winter dens earlier during poor mast years, which conserve accumulated resources. When mast crops are good, bears typically enter dens later in order to take advantage of additional opportunities to feed and gain weight. During particularly mild winters, some bears (especially males and females with yearlings) may not den at all.

Usually pregnant females enter dens first, followed by subadults, and then adult males. Individual bears enter dens in Virginia as early as the end of October or as late as the beginning of January. Den emergence usually occurs in reverse order of den entrance. Males emerge first, followed by subadults. Females with cubs are last to emerge from winter dens, typically between mid-March and mid-April.

Bears may lose up to 25-30% of their body weight while they are denning. Even after den emergence, bears may continue to lose weight while they search for scarce early spring foods, most of which may be of low nutritional value. Female bears nursing cubs are particularly nutritionally stressed after leaving their dens because they have allocated a great deal of their much needed reserves to their offspring.

Reproduction

Black bears in Virginia breed between mid-June and mid-August, with a peak in mid-to-late July. However, the fertilized eggs do not implant on the uterine wall and begin to grown until early December. Implantation will not occur if the female bear has not put on enough weight for both her and the cubs to survive the long denning period with no food. This delayed implantation ensures that cubs are born in the security of the winter den when females are in the best nutritional condition. If the female has not had enough nutrition or is sick or injured, the fertilized egg will be resorbed so she can breed again the following summer.

In Virginia, cubs are born in mid-to-late January (with a typical range between January 1 and March 2) after a six to seven week gestation period. Cubs are born helpless, hairless and with their eyes closed, weighing only about eight ounces (only $1/300^{th}$ to $1/500^{th}$ the size of their mother). Common litter sizes are usually one, two, or three cubs; but four cubs are not uncommon in areas with abundant food sources. There have been a few anecdotal reports in Virginia of females with five cubs. Litters generally have equal numbers of male and female cubs.

Females usually become sexually mature in Virginia at three to four years of age. Females may breed as early as two and a half years old and give birth at age three, or may delay reproduction until age seven or older. Although rare, one and a half year-old females have been found to breed at times in Virginia, but none are known to have successfully raised litters.

The timing of the breeding season, the age at which cubs are first produced, the interval between litters, and the number of cubs produced per litter may be linked to female nutritional condition. Females normally give birth once every two years. Cubs remain with their mother through their first summer and the following den season. Females rarely breed while they are still raising cubs, although if a female prematurely loses her entire litter prior to the regular breeding season, she may breed again. Inexperienced or young mothers may lose their first few litters before successfully raising any cubs. Approximately 16-18 months after birth, the cubs leave their mother when the female is ready to breed again.

Mortality

In Virginia, the annual rate of cub mortality in the first year is about 20%. Cub losses are primarily due to predation (e.g., birds of prey, foxes, bobcats, coyotes, other bears) or separation from their mother by loss or abandonment.

Adult black bears in Virginia have no natural predators except the occasional other adult bear. Black bear survival also is relatively unaffected by parasites and diseases. Therefore, adult bears have very low natural mortality rates (<2% per year), and bears in unhunted (and some hunted) populations may live up to 30 years or longer.

Mortality related to human activity has the greatest impact on black bear survival in Virginia. While road kills, poaching, and bears killed to reduce property damage all contribute to population losses, the annual hunter harvest is undoubtedly the most significant mortality factor for adult bears in areas of Virginia where hunting is allowed.

As they concentrate around available food sources, bears may become more vulnerable to harvest by hunters when food is scarce (especially in poor acorn years). Older bears (especially males), displacing younger bears, may have higher harvest rates around the available food. Archery hunter success increases in Virginia during years with poor mast conditions.

As bears prepare for winter dens, most vehicle collisions occur during the fall when feeding activity has increased. Especially during poor mast years, road kills become a more significant mortality source as bears exhibit even greater movements in search of food.

Refuges can help improve black bear survival by reducing the impact of direct human mortality factors (primarily from hunting). Bear sanctuaries have been used effectively to protect core populations of breeding females.

Population Dynamics

Bears have the second lowest reproductive rate of any North American land mammal (muskoxen have the lowest). Although this low reproductive potential is offset by low natural mortality rates, population growth rates for bears still are relatively low compared to other mammals. When densities are low and resources abundant, unhunted black bear populations have a maximum growth potential of about 25% per year where populations could double every three years. One study in the Catskill Mountains of New York observed a population to almost double within a two-year period. By comparison, deer populations may increase at a maximum rate of about 100% per year (doubling the population annually). Because the population growth rate is influenced by a variety of factors such as available food, habitat quality, availability of males, number of breeding females, population size, and human-induced mortality, actual growth rates are usually much less than the maximum.

Black bear hunting mortality is generally considered to be an additive loss to the population (that is, hunting losses add to the existing natural mortality) and results in reduced population growth. Unlike deer populations, reductions in bear densities (via hunting) generally do not stimulate added reproduction

and population growth rates. Despite the additive impact of hunting losses on total mortality, bear population growth still will occur when annual hunting remove fewer than the annual recruitment, or simply, bears added to the population through births. Low population growth capability and limited reproductive potential result in relatively slow population recovery from over-harvest or low population levels.

In some situations, selective hunting may not always be an additive mortality factor. The removal of adult males from a previously unhunted bear population in Alberta seemed to stimulate population growth. With fewer adult males, this population increase was attributed to decreased dispersal by subadult bears (largely males) and increased subadult survival rates.

Bear populations cannot grow indefinitely. Bear population growth and density will become limited as habitat resources (e.g., food supplies, den sites) and social behaviors become limiting. Eventually the biological carrying capacity (BCC), which is the maximum number of bears an area can support over an extended period of time, will be reached. The BCC for black bears is unknown for Virginia and other areas around North America. Certainly lower than the BCC, black bear populations have been documented to reach densities as high 2.2 bears/mi^2 in Alberta, Canada. In Virginia, recent research indicates that the Great Dismal Swamp National Wildlife Refuge has densities of about 1.5 bears/mi^2 with even higher densities (3.5 bears/mi^2) in some Alleghany Mountain areas of Rockingham County.

The population regulating mechanisms at BCC for black bears are unknown. Theories include BCC regulation through socio-biological factors (e.g., dispersal), increased predation by large male bears on younger bears, and increased cub mortality resulting from poor nutritional condition of the mother.

A minimally viable black bear population is the smallest isolated number of individuals that are able to reproduce and maintain the population from one generation to another. Population viability depends on changes that may occur in reproduction and survival. Based on computer modeling, black bear populations in Florida that consisted of at least 40 animals remained viable for over 100 years. Long-term viability was not affected by inbreeding depression, periodic reproductive failures, or survival declines. Smaller populations ($n < 40$) had increased risks for long-term survival.

BLACK BEAR PROGRAM HISTORY

Population Declines

Although black bears probably were abundant and occurred throughout pre-colonial Virginia, specific information is very limited. Prior to European settlement, Native Americans throughout the southeastern United States used bears for food, clothing, weapons and ornaments. The first recorded description of black bears in the southeastern United States came from the Roanoke Island Colony of North Carolina during the 1580s. Bears were abundant in the vicinity of Jamestown when settlers arrived in 1607 and were found in all regions of Virginia.

Rapidly growing human populations had early impacts on Virginia's bear population due to habitat changes and overexploitation. By 1739, bears reportedly were only found in the western mountains and swamp areas of Virginia. By 1836, bears seemed to have been eliminated from most of the Tidewater and Piedmont areas of Virginia, but were still plentiful in the mountains and in the Dismal Swamp. During the mid-1800s, bear skins and meat still were commonly shipped to other markets from rail yards in western Virginia. Bounties which had been offered since the American Revolution provided added incentive for the demise of bear populations in Virginia. By 1900, the majority of the bears had been extirpated in Virginia with only remnant populations remaining in the Dismal Swamp and in the mountainous regions of some western counties. Typical agricultural practices during the late 1800s and early 1900s involved extensive deforestation, burning, grazing, and cultivation, which further reduced habitat for bears. Large areas of forested lands were also stripped during the 1800s to support the iron smelting furnaces. Introduced around 1900, the narrow gauge railroad also accelerated the removal of timber from the southern Appalachians.

Population Recovery

Following deforestation, agricultural practices of the late 1800s and early 1900s reduced soil fertility and limited productivity. Once productivity declined, farmlands were abandoned, and began reverting back to forest. These reverting farmlands enabled bears to reoccupy newly forested habitats.

Congressional approval of the Weeks Act in 1911 made it possible to purchase and protect deforested land in Virginia and begin forest reformation. The first land purchase for National Forests in Virginia was 13,450 acres in the Mt. Rogers area that was bought in 1911. This purchase later became part of the Unaka National Forest in 1920. Established in 1916, the Natural Bridge National Forest was Virginia's first National Forest. The Jefferson National Forest was created in 1936 by combining lands from the Natural Bridge and Unaka National Forests. Shenandoah National Forest was created in 1917, and eventually renamed the George Washington National Forest. There are currently some 1.7 million acres of National Forest in Virginia, assuring large forested areas for bear habitat. The creation of Shenandoah National Park in 1936 provided additional protection for bears and habitat on its nearly 200,000 acres.

In 1938, the Virginia Game Commission and the U.S. Forest Service executed a formal agreement (the oldest of its kind in the United States) to fund additional wildlife habitat and management work on National Forests within the state. A required purchase by hunters and fishermen, the National Forest Permit continues to support wildlife management on Forest Service lands in Virginia today.

To help control harvests, black bears were listed as a game species during the 1930-31 season when statewide bear hunting was permitted only between November 15 and January 31. There were no daily or seasonal bag limits. If reported immediately to the game warden, bears damaging property could be killed throughout the year. Because county Boards of Supervisors retained the right to prescribe additional bear hunting seasons, Alleghany and Highland counties had extended bear hunting seasons due to incidences of livestock predation.

With harvest controls and improving habitats, bears had started reclaiming their range in Scott, Wise, Washington, and Russell counties by 1937. In 1942, bears were being reported in Grayson and Greene counties.

In 1945, bear numbers appeared stable in the Dismal Swamp area but were increasing in the mountainous portions of Rockingham, Highland, and Augusta Counties. Low populations south of Rockbridge County limited hunting opportunities. More bears also were being seen in Frederick, Warren, Rappahannock, Madison, Bland, Wythe, Smyth, and Lee counties by 1947. The establishment of the Great Dismal Swamp National Wildlife Refuge in 1974 has helped protect some valuable habitat for Virginia's eastern bear population.

Despite a wealth of bear research in Virginia, historic population estimates and distributions are of questionable accuracy. In 1950, reports indicated that bears could be found in 35 of 95 Virginia counties with an estimated population as high as 1,500 bears. In 1957, the bear population in Virginia was estimated to be just over 1,100 animals, inhabiting 4,296 square miles of Virginia, with an additional 750 square miles of potential range.

Through the combined benefits of hunting regulation controls, reforestation, public land purchases, oak forest maturation, bear restoration efforts and management-based research, bear populations have grown and expanded their range. Figures 1-5 reflect past bear distributions in Virginia since 1950 while Figure 6 reflects the current distribution. These figures clearly show the impact of management actions that have fostered expanding distributions of bears in Virginia.

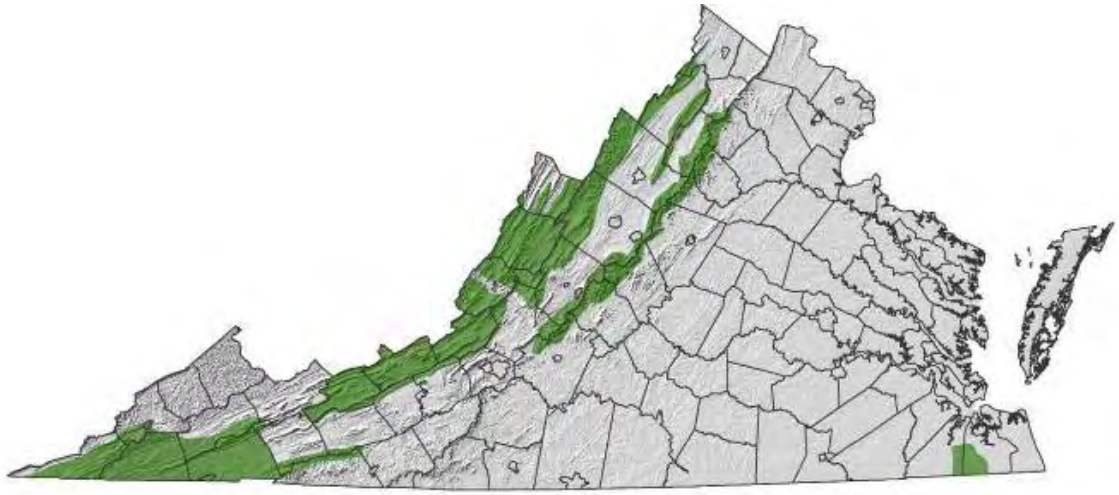

Figure 1. Distribution of black bears in Virginia in 1950.

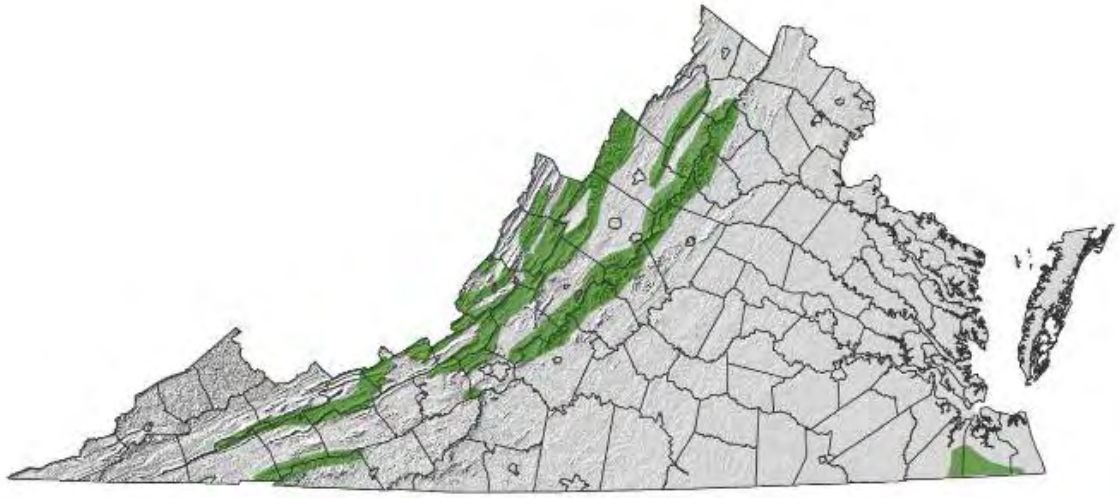

Figure 2. Distribution of black bears in Virginia in 1974.

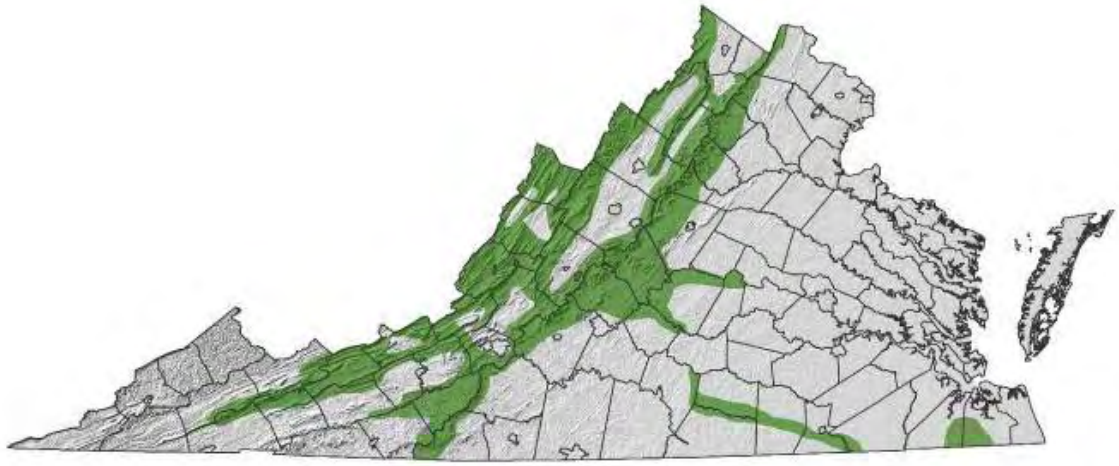

Figure 3. Distribution of black bears in Virginia in 1983.

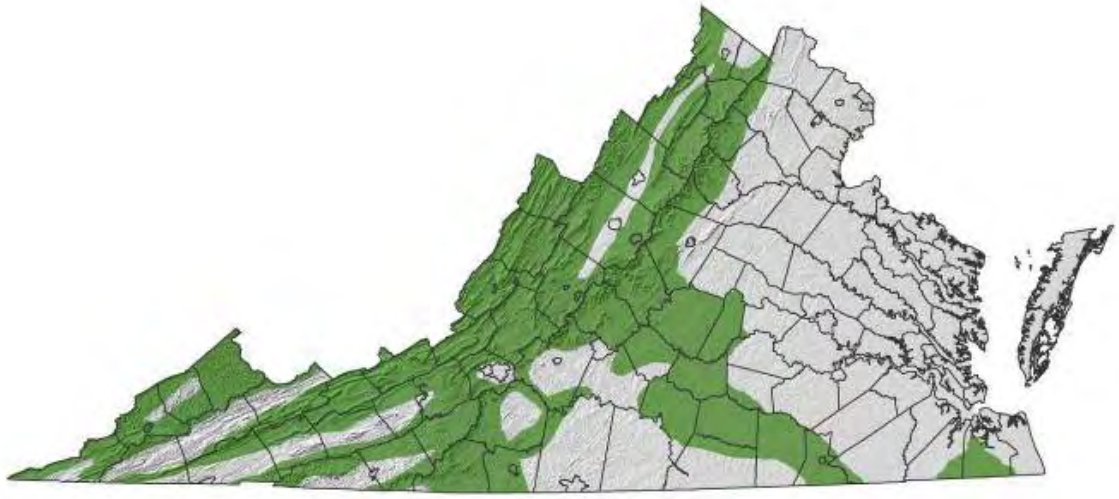

Figure 4. Distribution of black bears in Virginia in 1999.

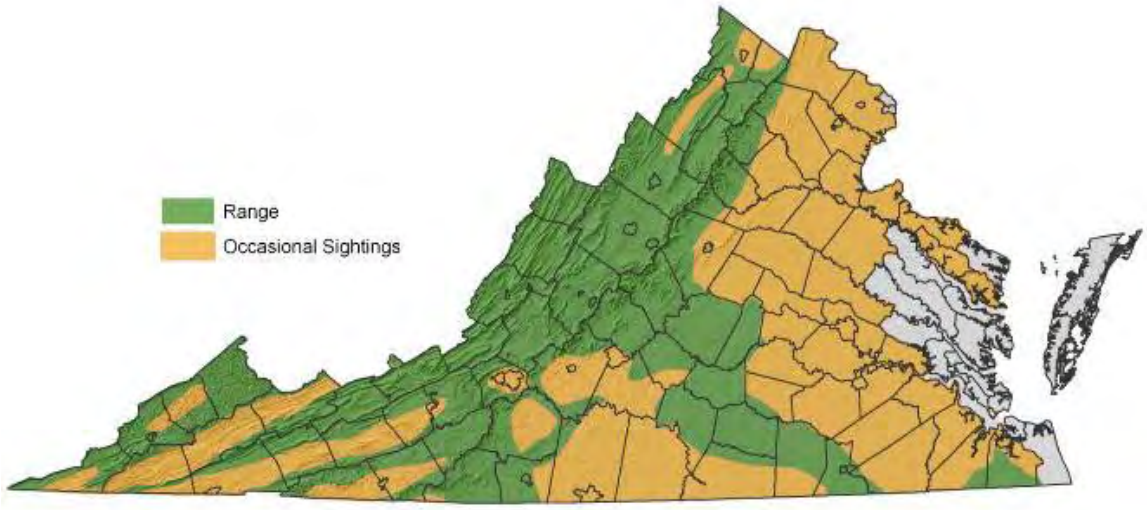

Figure 5. Distribution of black bears in Virginia in 2001.

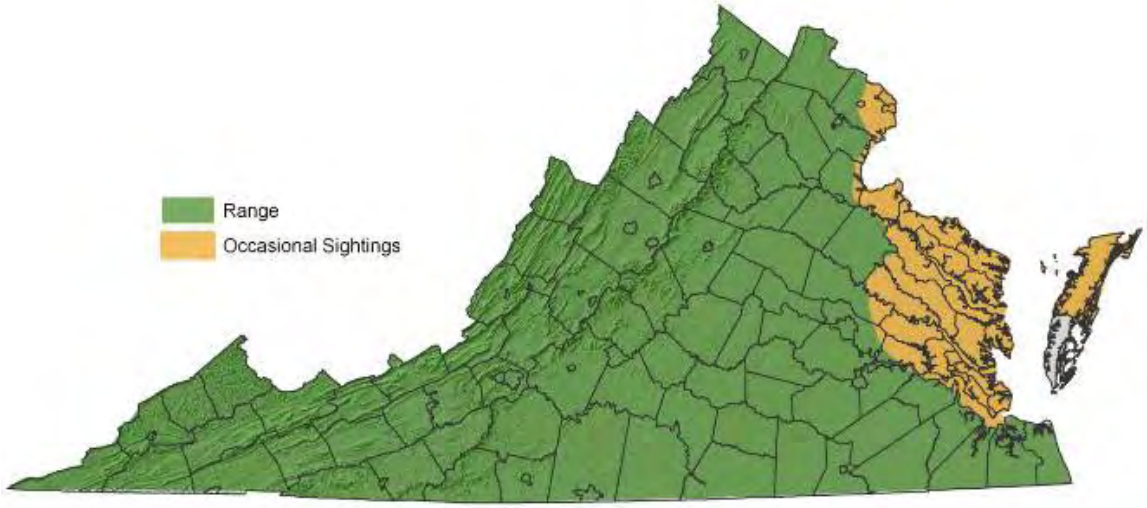

Figure 6. Current black bear distribution in Virginia.

Historical Hunting Regulation Changes

Since the establishment of the first hunting season in 1930, Virginia bear hunting regulations have changed frequently to address population management, damage control, and hunting recreation objectives. Prior to the 2001-2010 Virginia Bear Management Plan that called for stabilized populations in many areas of Virginia, hunting regulations historically encouraged bear population growth.

Seasonal bag limit

The Virginia Game Commission established a seasonal limit of one bear per hunter in 1940.

Protection of cubs

To protect cubs from hunter harvests, a minimum weight requirement was established in 1954; harvested bears needed to weigh at least 100 pounds (live weight). In 1955, the minimum weight was reduced to 75 pounds (live weight). In 1972, the minimum live weight for harvest was changed back to 100 pounds (or 75 pounds with the internal organs removed). Harvesting a female accompanied by cubs was outlawed beginning with the 1973-1974 season.

Bear trapping

Beginning with the 1959-1960 season, the use of steel, leg-hold traps to capture black bears were made illegal.

Bear hounds & overlap with deer hunting season

Beginning with the 1956-1957 hunting season, bear and deer seasons in the western mountains were separated to minimize bear harvest by deer hunters and to eliminate conflicts between bear dogs and deer hunters. The separation of bear and deer hunting lasted four years. Beginning with the 1960-1961 season, the bear and deer seasons again ran concurrently, but bear hounds were not allowed during the first week.

Season length & timing

Starting with the 1967-1968 season, an additional week of bear hunting with dogs, prior to the opening of deer-gun season, was allowed. As a result, more than 60% of the annual bear harvest occurred during the first two weeks of the bear season (i.e., the week prior to deer season and the opening week of deer season). These two weeks of early bear hunting were closed beginning in 1974, effectively shortening and delaying the bear hunting season. Shortening the bear season resulted in a temporary decrease in bear harvests that appear to have stimulated population growth. Harvests have steadily grown through the 1980s and 1990s. Not only did shortening the bear hunting season in 1974 appear to reduce the mortality on all bears, but delaying the season may have produced even greater reduction in female mortality. Because females enter winter dens earlier than males, the later opening helped reduce the proportion of females in the harvest. The average percent females in the harvest during the period 1962-1973 was 46.4%, while the annual average during the subsequent decades of population growth (1974-2009) has been lower at 37.7%.

County closures

In 1974, a statewide bear season was eliminated when 67 low-density counties were closed to all bear hunting. The newly closed counties were those that had fewer than 10 bears legally harvested since 1947. These closures helped protect bears in low-density areas. Currently, some form of bear hunting occurs in every county.

Omnibus Bill

To simplify wildlife regulations and allocate more responsibility to the VDGIF, a bill passed in 1987 rescinded local legislative acts related to bear management. This bill allowed the VDGIF to change the long, liberal bear hunting seasons found in Bland, Giles, Grayson, Montgomery, Pulaski, Smyth,

Tazewell, Washington, and Wythe counties. More restrictive bear season regulations were implemented in these counties during 1989. The bill also enabled season changes in the Tidewater counties/cities of Isle of Wight, Nansemond (Suffolk), Norfolk, and Princess Anne (Virginia Beach).

Dismal Swamp regulations

Since the 1930s, bear hunting seasons in eastern Virginia traditionally have been different from those found in the mountainous region. In 1987, to protect females and promote population growth, the opening day of the bear season was moved from October 1 to the fourth Monday in November and coincided with the rest of the state. In response to population increases and nuisance concerns around the Great Dismal Swamp National Wildlife Refuge, the opening date in 1997 was moved to the first t Monday in November for the cities of Chesapeake and Suffolk. Tied to the earlier gun deer seasons, the earlier opening date for bear hunting was designed to increase the harvest of bears by sportsmen in this region.

Bear-dog training season

To provide hound hunters additional recreation and the opportunity to train and condition dogs before any other harvest season, a September bear-dog-training season was initiated in 1992 for 24 counties/cities. Neither carrying weapons nor harvesting bears are permitted during the bear-dog-training season. Depending on the calendar year, this season was generally four weeks long; but in some years, it was a 5-week season (e.g., 1995, 2000, 2001). Beginning in 1995, Sunday hunting during the dog-training season was permitted because weapons were not allowed. Although the season length was not changed, the entire dog-training season was shifted 1 week earlier (i.e., the last Saturday in August through the last Saturday in September) in 1997 to avoid a 1-day overlap with the opening of deer archery season. The localities for dog training were expanded to 27 and 31 counties/cities in 1997 and 1999, respectively.

Recent Hunting Regulation Changes

Based on public bear management directions provided by the 2001-2010 Virginia Black Bear Management Plan, several notable changes in hunting seasons recently have occurred to address recreation, population, and nuisance objectives.

Archery season expansions

To help address growing populations, provide additional recreational opportunities, and/or to collect additional population information, a statewide archery season was established for bears in 2003. Prior to 2003, archery bear hunting was limited to only those counties or cities (n=31) that also had firearms hunting for bears. In 2009, the archery season for bears was extended in length by two weeks to run concurrently with the deer archery season.

Muzzleloader seasons established

A 4-day muzzleloading season was implemented in 2003 for the counties surrounding Shenandoah National Park and most of the Piedmont and Tidewater areas of Virginia (this included over 65 counties/cities). Especially targeting objectives to stabilize population growth around Shenandoah National Park, this season also provided additional recreational opportunities and population information in other areas. To address unmet population objectives, the 2009 muzzleloading season was expanded into 12 additional counties and increased in length to either a 6-day or a 12-day season. In addition, to meet population objectives, in 2011, the season was expanded in area and changed to a 1-week uniform statewide season.

Firearms season expansions.

Responding to increasing bear populations and Plan objectives, a 2-week firearms season (with and without hounds) was added to 21 additional counties (or portions of counties) in 2003. Hound

hunting was generally not allowed in the Piedmont portions of these new areas, but additional bear-hound hunting opportunities were expanded for three southwest Virginia counties during 2006.

In a continued attempt to attain unmet population objectives, firearms hunting seasons for bears were expanded in 2009 to include all counties/cities in Virginia (except for the Eastern Shore). These additional firearms hunting opportunities included a new 6-week season for the northern Piedmont (dogs permitted), a new 1-week season for the southern Piedmont (dogs permitted), and an extra firearms hunting day that was concurrent with the deer season for the northwestern mountains. Except for some restrictions during the western deer seasons, dog hunting for bears is allowed during firearms seasons in most counties in Virginia (unless prohibited by local ordinance). In 2011, firearms season was expanded in southwest Virginia by one week.

In response to bear population increases and nuisance concerns around the Great Dismal Swamp National Wildlife Refuge, the southeast firearms seasons have also been expanded. Virginia Beach was included in the hunting area during 2003 with an earlier opening (October 1) established for the entire area in 2008.

Bear-dog training expansions.

With the expansion of firearms hunting opportunities in the southwestern counties, the bear-dog-training season was also added to new areas of eight additional counties in 2003. In 2006, an earlier opening date (second Saturday of August) provided additional recreational time by increasing the bear-dog training season length from the usual 4-week season to generally a 7-week season (in some years, like 2010 and 2011, the new season will only be six weeks long). As a precursor to firearms hunting with hounds, a 2-week training season (Sundays excluded) also was opened in the southside counties of Lunenburg, Mecklenburg, Brunswick, and Greenville during 2006. In 2009, the second week of this training season was incorporated into the new 1-week firearms season established for these counties. Legislative amendments to dog training hours were made in 2008, where hunting hours for dog training were extended to 4½ hours after sunset instead of a half hour after sunset and 2012 where hunting hours were extend to 4:00am to 10:00 pm.

Other Bear Management Actions & Research Programs

Feeding.

Because of concerns associated with supplemental feeding that include littering, habituation of bears to people, disease implications for other wildlife, changes in bear behavior, hunting in the area of feeding locations and an abnormal reliance on artificial foods, supplemental feeding of bears on VDGIF-owned lands and national forest lands was banned in 1999. Further feeding restrictions were imposed in 2003 to address human-bear conflict concerns when any feeding of bears (even inadvertent feeding) was made illegal anywhere in Virginia. In 2010, legislative action was taken to strengthen VDGIF's ability to regulate and enforce the advertent and inadvertent feeding of bears (Code of Virginia §29.1-501), in large part to enhance nuisance management programs. The current regulation reads:

> *It shall be unlawful for any person as defined in § 1-230 of the Code of Virginia to place, distribute, or allow the placement of food, minerals, carrion, trash, or similar substances to feed or attract bear. Nor, upon notification by department personnel, shall any person continue to place, distribute, or allow the placement of any food, mineral, carrion, trash, or similar substances for any purpose if the placement of these materials results in the presence of bear. After such notification, such person shall be in violation of this section if the placing, distribution, or presence of such food, minerals, carrion, trash, or similar substances continues. This section shall not apply to wildlife management activities conducted or authorized by the department.*

The enhancement of the regulation specifically identifies trash in the list of attractants and expanded the definition of responsible parties to include the legal definition of a person (Code of Virginia §1-230). This definition of person includes *any individual, corporation, partnership, association,*

cooperative, limited liability company, trust, joint venture, government, political subdivision, or any other legal or commercial entity and any successor, representative, agent, agency, or instrumentality thereof.

Reactive Human-Bear Conflict Management.

Dating back to the colonial period, Virginians have had concerns about the damage caused by black bears. Following World War II, when bear populations were still relatively low, the Virginia Game Commission felt bear populations should not be allowed to increase due to their negative impact on livestock, particularly in the western counties of the state.

Bounties on bears have had a long tradition in Virginia since the first bounty during the American Revolution. By 1920, bear bounties were worth $20. Although county bear bounties were abolished in 1977 by the General Assembly, the bounties had not been paid in some 35 years. Highland County probably had the last remaining bounty on bears in the country.

To help relieve depredation conflicts, the Virginia Game Commission began moving bears that had become accustomed to human related food sources or involved in depredation or damage incidents to remote locations in 1969. Typical depredation incidents included damage to agricultural crops (primarily field corn), stored livestock feed, livestock (cattle, sheep, hogs, goats, chickens), fruit trees (peach, cherry, apple) and apiaries. Personal property damage included trash dispersal, bird feeder or building damage, and other problems. During the period from 1980-2001, more than 50 bears were being moved annually. With a new emphasis on local homeowner and landowner responsibility for managing bear attractants, the number of bears moved every year has declined since 2001.

Beginning in the 1930s or 1940s and under the supervision of a Game Warden, livestock-killing bears could be pursued with dogs at any time within 24-hours after the act of depredation. The provision immediately to pursue livestock killing bears with dogs has since been rescinded.

Based on the provisions of §29.1-529 and prior to 1998, Game Wardens were required to issue kill permits to landowners experiencing bear damage. A legislative change in 1998 gave the VDGIF the option of translocating depredating bears before issuing a kill permit. Additional changes in 1999 stipulated that only commercial agriculture operations experiencing damage were eligible to receive a kill permit. Further changes to the code in 2008 allowed for the option of authorizing additional non-lethal control measures including the option to use dogs for pursuit of bears in agricultural damage situations where appropriate. The number of bears killed under kill permits has annually averaged about 80 bears per year over the last 10 years. Currently both lethal and non-lethal options are available under §29.1-529.

Since 1942, some counties in Virginia have administered a program to compensate landowners for damage caused by deer or bear. To fund these programs in participating counties, deer and bear hunters were required to purchase “Damage Stamps”. Mostly concerned with deer damage, the damage stamp program has declined since county interest peaked in the late 1970s when 18 counties participated. Dropping the damage stamp requirement in 2009, Smyth County was the last county to participate in the damage stamp program.

Restoration in southwest Virginia.

To bolster populations in the Mt. Rogers area, bears (typically involved in a human-bear conflict situation) were relocated to southwest Virginia. In 1989, the first of 210 bears was relocated to closed portions of Grayson, Smyth, Washington, and Wythe Counties. These supplemental stockings appear to have firmly reestablished bear populations in this region. In 2009, VDGIF biologists located a female bear that had a long history with the Agency. This bear may have been one of the oldest living bears in Virginia that had contributed to the bear population expansion in that area of Southwest Virginia. This bear was originally captured at the Coors Brewing facility in Rockingham County on August 23, 1990. The bear was eight years old at the time and was taken to the Virginia Tech Bear facility for the winter where she gave birth to four cubs. The bear was released with her cubs May 20, 1991 on Matney Flats in Wythe County. At the time of her death the bear was 27 years old, was found only three and a half linear miles from the original release site and was presumably dying of age-related natural causes. She was one of the two oldest wild bears on record in Virginia.

Population monitoring programs.

No simple methods exist for estimating key population parameters (e.g., recruitment rates, mortality rates, population growth rates, density) to assess black bear population status over large regions. Definitive estimates of these parameters can only be obtained through expensive and site-specific research. As in most other states, Virginia uses a combination of indices derived from harvest, nuisance activity, age structure, habitat conditions, and miscellaneous mortalities to monitor status of black bear populations.

Hunting harvest data are a principal source of information for monitoring black bear population status in Virginia. Black bear harvest data have been collected since 1928 when harvest numbers were estimated by county Game Wardens. Beginning in 1947, a mandatory check station system was initiated. Through the years, as many as 1,500 check stations across the state have provided annual harvest information on black bears, white-tailed deer, and wild turkey.

To ensure additional quality in bear harvest data, regulation changes for the 1991 bear hunting season designated special bear checking stations. In addition to recording the usual harvest data (e.g., sex, weapon, location), these special bear check stations also: (1) determine presence of ear tags or lip tattoos, (2) record whether bear hounds were used, (3) and extract a small premolar tooth for age determination. Currently, approximately 130 volunteer bear check stations collect these important bear data across Virginia.

The quality harvest information (e.g., hunter-submitted tooth samples have a 95% return rate for ages) historically collected in Virginia has enabled detailed assessments of population status. Population reconstruction is especially useful as an analysis method that provides minimum population estimates based on age-specific enumeration of bears that die over time. Population reconstruction models also provide indices of mortality rates, recruitment, and trends in bear population size. Using over 15 years of bear harvest data, age structure, and mortality factors, trend analysis and population reconstruction has resulted in a statewide estimate of bear numbers as well as specific trends in bear population growth by management zone.

Because of the importance to bears and other wildlife, Virginia game managers began recording estimates of mast production in 1950. Den entrance dates and bear harvests are both influenced by mast production. These estimates have helped to establish trends between mast crops, hunter harvests, and population trends. In 1957, the mast ratings changed from a single estimate for all mast to individual ratings for different mast-producing species. Today, several mast surveys (both hard and soft) continue to be conducted across the Commonwealth.

Important Bear Research in Virginia.

Contributing to the wealth of knowledge about bears in the Commonwealth, Virginia has been fortunate to have many significant research studies conducted on black bears within the state. These studies have resulted from collaborative efforts among the Virginia Department of Game and Inland Fisheries, the Department of Fisheries and Wildlife Sciences at Virginia Tech, the Cooperative Wildlife Research Unit at Virginia Tech, Shenandoah National Park, the Great Dismal Swamp National Wildlife Refuge, the U.S. Forest Service, the Virginia Bear Hunters Association, Westvaco, and the Virginia Department of Transportation. Some of the key Virginia studies have been:

(1) 1955-57: This study collected information about the distribution, population, cub growth rates, productivity rates, and damage of black bears throughout Virginia.

(2) 1958-60: A black bear tagging study obtained basic mortality and population information on Virginia's bears. Areas included in the study were the Big Levels Game Refuge in eastern Augusta County in the Blue Ridge Mountain Range and the North River section of western Augusta and Rockingham Counties in the Allegheny Mountain Range.

(3) 1972-77: A 5-year black bear sexing and aging study on Shenandoah National Park (SNP) lands established baseline biological information needed to develop sound bear management strategies.

(4) 1982-94: Continued research in Shenandoah National Park focused on population dynamics, movements, habitat requirements, and impacts of gypsy moth deforestation.

(5) 1984-87: Conducted on the protected population of the Great Dismal Swamp National Wildlife Refuge, this study gathered information on sex ratios, age structure, reproduction, survival rates, mortality factors, population size, food habits, home range, and denning ecology.

(6) 1988-2009: Using captive bears at Virginia Tech, the goal of this research was to develop an understanding of the role of nutrition in bear reproduction, the role of females in regulating populations, and bone density changes in denning females.

(7) 1990-1992: This study evaluated the survival, reproduction, movements, costs, and efficacy of translocating nuisance bears to establish a population at Mt. Rogers National Recreation Area.

(8) 1994-2004: The Cooperative Alleghany Bear Study (CABS) was initiated in spring 1994 to fill gaps in knowledge about demographics of Virginia’s hunted bear population. Initially planned as a 5-year study on 1 study area (Rockingham County) in western Virginia, the project eventually grew into a 10-year study on 2 study areas (with the addition of Giles County). The objective was to develop an understanding of the dynamics of Virginia's hunted black bear population so wildlife managers could evaluate population trends to effectively manage the population.

(9) 1999-2001: A 2-year study of black bear denning ecology on the industrial forestlands of the Westvaco Corporation involved trapping and monitoring bears in Botetourt County in Virginia and Hardy, Hampshire, Pendleton, Randolph, and Greenbrier Counties in West Virginia.

(10) 2000-2002: Focusing on the Great Dismal Swamp National Wildlife Refuge, a multiple-year study was designed to evaluate the impact of roads on bear movements, document the incidence of bear-vehicle collisions, and estimate bear population size.

(11) 2002-2004: With an emphasis on bear (and deer) applications, research focused on evaluating the accuracy of population reconstruction models and provided guidance to managers on how to best use this population analysis approach and interpret the results.

(12) 2003-2005: Population densities and genetic isolation of black bears were investigated at three national wildlife refuges including the Great Dismal Swamp National Wildlife Refuge and 2 additional refuges in eastern North Carolina.

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SUPPLY

Bear Habitat Supply

There are six ecoregions (Middle Atlantic Coastal Plain, Southern Appalachian Piedmont, Blue Ridge Mountains, Northern Ridge and Valley and Northern and Southern Cumberland Mountains) representing two major landscape units (Atlantic Coastal Plain and Appalachian Highlands) in Virginia (Figure 7). These different landscapes create a diversity of habitat types and forest communities. Northern hardwoods or oak/hickory/pine forest types characterize mountainous areas. Oak/hickory forests are the typical climax forests in the Piedmont. Coastal Plain habitats include coastal marshes along with pine, pine/oak, and bottomland/hardwood forests.

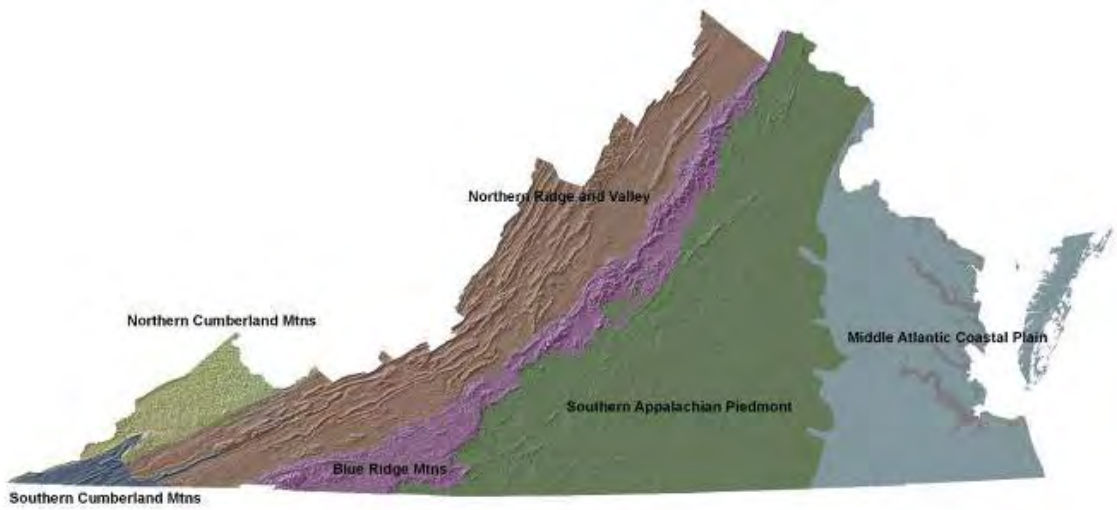

Figure 7. Virginia's ecoregions (VDGIF)

Soils along narrow ridges and steep slopes in the Cumberland Mountains and Ridge and Valley provinces are usually shallow and low in fertility. Valley soils, derived from shale and limestone, are relatively fertile. Blue Ridge soils tend to be deeper and more fertile than Ridge and Valley and Cumberland Mountain soils. Piedmont soils are characterized by sandy loam soils with red clay subsoils. They are generally acidic and low in organic material, phosphorus, and nitrogen. Coastal Plain soils are typically sandy and low in fertility.

Forests (24,688 mi^2) represent 62% of Virginia's land area. Agricultural lands constitute 32% (13,281 mi^2) of the Commonwealth. With extensive forested areas and a variety of habitat types in all ecoregions, most of Virginia can be considered potential bear habitat. Only a few areas in Virginia with landscapes composed of limited or fragmented forested cover, very intensive agriculture, and extensive urbanization would be considered unsuitable for bears (Figures 8-10).

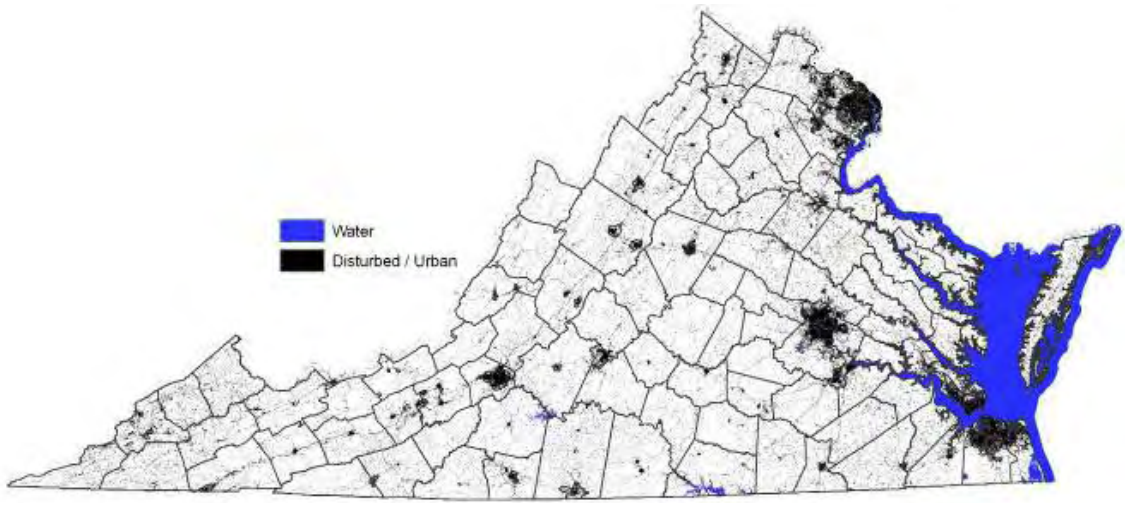

Figure 8. Land cover of Virginia: Disturbed, urban, and water areas.

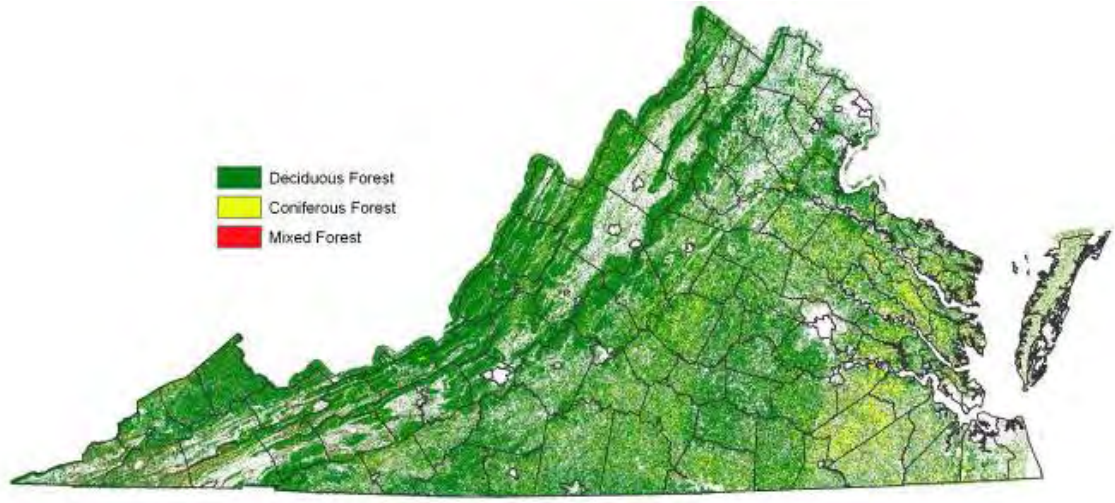

Figure 9. Land cover of Virginia: Forested areas by type.

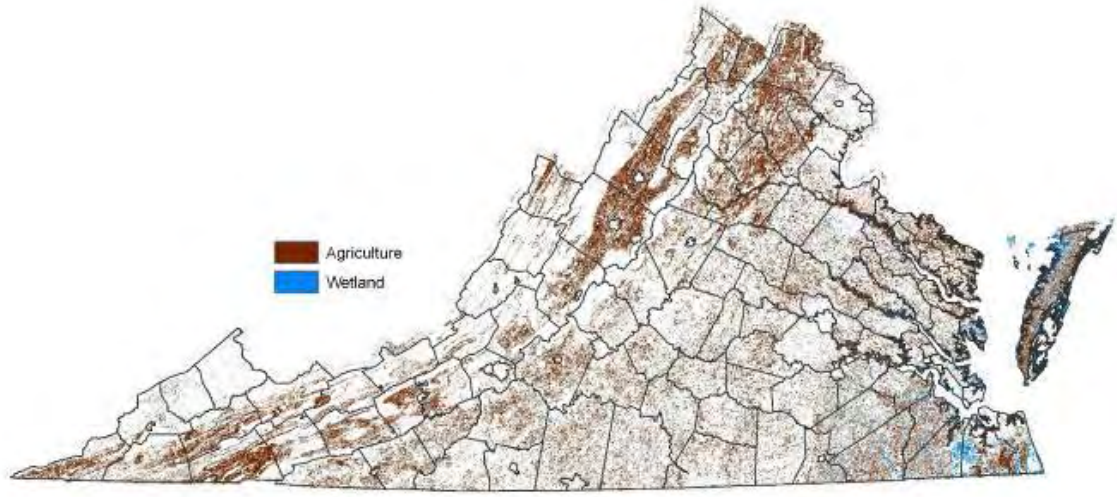

Figure 10. Land cover of Virginia: Agriculture and wetlands.

Despite reversions to forestland from other land use changes, a recent forest inventory by the Virginia Department of Forestry (VDOF) determined that there has been a net loss of forested acres statewide. According to the Virginia Department of Forestry (2009), since 1992, over 961 mi^2 of forested land have been lost to land-use changes; the majority (62%) was cleared for urban development followed by losses for agricultural use (37%) and conversion to water impoundments (1%).

As of 2008, it was suggested that if the current long-term trend continues, there may be a loss of one million acres in the next 25 years. Although there have been reversions back to forestland statewide in the latest survey period (2001-2007), for every four acres diverted to non-forest, only three acres have reverted back (VDOF 2009). Hardwood forests made up only 57% (8.1 million acres) of timberland in 1940 compared to 78% (>12 million acres) in 2009. Softwood forests made up 43% (6.2 million acres) and 22% (3.4 million acres) of forested habitat in 1940 and 2009, respectively.

Most forested lands are in private ownership (80%) with 16% publicly owned and 4% Forest Industry owned. The largest public land holding is the USDA Forest Service National Forest lands with 1.6 million acres.

Changes in forest composition and interspersion may impact future bear populations in some areas. For instance, decreased timber harvesting during the last 20 years on National Forest lands probably has reduced forest habitat diversity on public lands in western Virginia.

Concerns about habitat fragmentation are due to recent conversions of forested wetlands to agriculture in the coastal plain and other loss of habitat to development. Bear population viability in the Great Dismal Swamp may be reduced as habitat fragmentation and loss of linkages to other coastal bears in North Carolina create a more isolated bear population. High traffic volume roads are barriers to bear movement and may add to fragmentation effects.

Bear Population Supply

Population Distribution

Black bears occur in all 13 of the southeastern states. The bears in Virginia's western mountains belong to the largest contiguous bear population in the southeast. Virginia's largest bear populations are found primarily in and around the Great Dismal Swamp National Wildlife Refuge in southeastern Virginia, along the Blue Ridge Mountains, and in the Allegheny Mountains. However, Virginia's bears are established across most of the state and may occasionally be seen in almost any county (Figure 6).

Population Status

Bear populations have increased in Virginia and throughout the eastern United States during the past quarter century. Harvest management controls, reforestation, public land purchases, oak forest maturation, bear restoration efforts, and natural range expansions have all contributed to bear population growth in Virginia.

As with most wildlife species, no economically practical methods exist to accurately and precisely estimate black bear population size in Virginia. Bear population status is obtained by monitoring indices derived from harvest and age structure, and to a limited extent from nuisance activity. While monitoring indices may provide rough estimates of bear population size, their primary values are to reflect population trends and relative densities. These indices, coupled with some computer modeling, provide a current statewide population estimate of roughly 16,000 -17,000 bears.

Multi-year trends in harvest data generally correspond to overall population trends. Harvest trends have indicated significant increases since 1974 when hunting regulations were changed to reduce the hunting mortality on adult females. Consistent with this harvest trend, over 2,000 black bears have been harvested by hunters since the 2008 hunting seasons (Figure 11). Since 2001, trends in harvest and population modeling suggest that the statewide bear population has been increasing at about 9.0% annually.

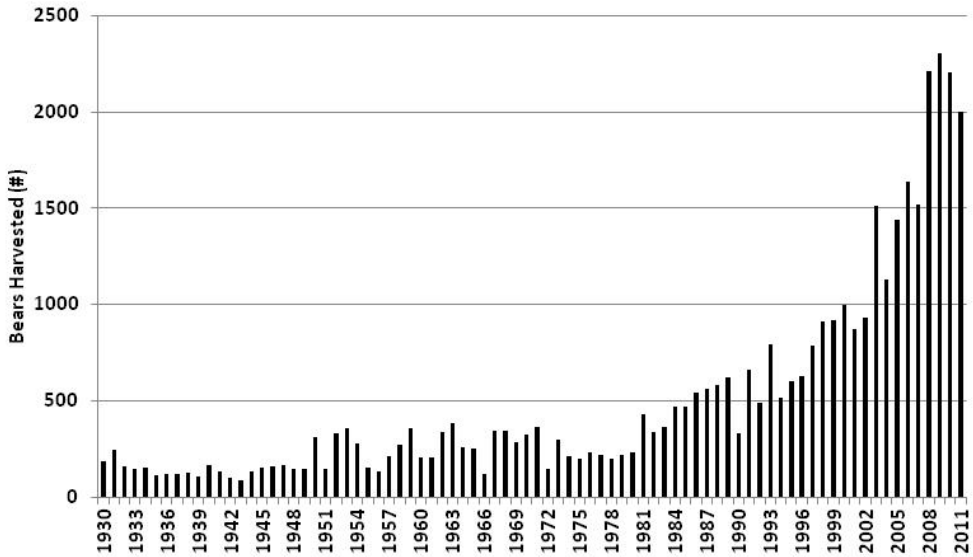

Figure 11. Virginia's annual black bear harvest (1930-2011 seasons)

Population trends in each bear management zone (Table 1, Figure 12) were evaluated by determining the annual rate of change (λ) in population indices (e.g., harvest, population reconstruction) over time. Exponential regressions,

$$N_t = N_0 * \lambda^t ,$$

where N_t = population index at time t and N_0 = initial population index at $t = 0$),

were used to estimate the finite population rate of change (λ). The finite population rate of change (λ) can be expressed as an average percent rate of change (R) where

$$R = 100*(\lambda-1).$$

Population reconstruction indices were based on models derived from tooth sampling of hunter-harvested bears and the annual age-specific bear harvests.

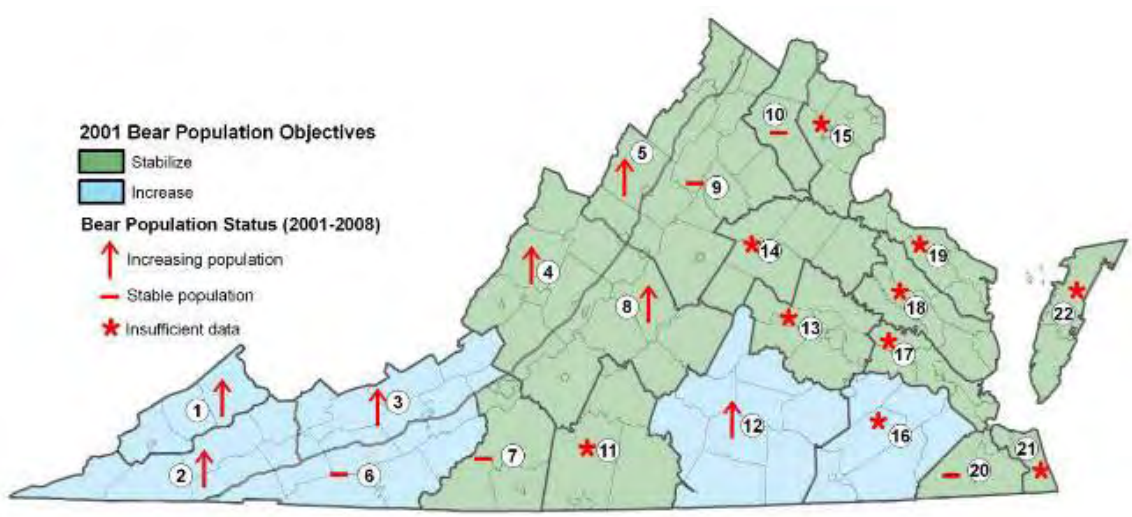

Figure 12. Bear population trends by Bear Management Zone (2001-2008)

Table 1. Zone estimates of bear population growth rates (λ) based on population reconstruction and hunting harvests. To ensure unbiased trend estimates, Zone trends were based on inclusion of counties with consistent seasons between either 2001-2008 or 2003-2008. Cells containing numbers indicate $\lambda \neq 1.0$ ($p < 0.10$). Cells with dashes (—) indicate no significant trend (i.e., $\lambda = 1.0$). Analysis was only performed on Zones with an annual harvest of < 10 bears. Blank cells represented Zones that did not meet the minimum criteria for analysis.

	Population Reconstruction		Archery [a]			Muzzleloader [b]			Firearms [c]			Total Harvest [d]		
Zone	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1			**1.43**									—	—	
2	**1.08**	**1.09**	—	—	—				**1.18**	—	**1.35**	**1.18**	—	**1.27**
3	**1.11**	**1.11**	**1.15**	**1.09**	**1.09**				**1.18**	**1.16**	**1.19**	**1.17**	**1.15**	**1.20**
4	**1.05**	**1.09**	—	—	—				**1.13**	**1.12**	**1.17**	**1.13**	**1.11**	**1.16**
5	—	—	—	—	—				**1.11**	**1.11**	**1.11**	**1.12**	**1.12**	**1.12**
6			—	—	—				—	—	—	—	**1.12**	—
7			—	—	—				**1.35**	—	**1.60**	—	—	**1.35**
8	**1.03**	**0.97**	**1.12**	**1.16**	—				**1.11**	**1.11**	**1.11**	**1.11**	**1.11**	**1.10**
9	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10												—	—	
11														
12												**1.31**	**1.47**	—
13														
14												—		
15														
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18														
19														
20	—	—	—	—	—							**1.19**	—	—
21														
22														

[a] Trends in Zones 3, 4, 5, 8, 9, and 20 were based on harvests from 2001-2008; other zone trends were based on 2003-2008.
[b] All Zone trends were based on harvests from 2003-2008.
[c] Trends in Zones 3, 4, 5, 8, 9, and 20 were based on harvests from 2001-2008; other Zone trends were based on 2003-2008.
[d] Trends in Zones 3, 4, 5, 8, and 20 were based on harvests from 2001-2008; other Zone trends were based on 2003-2008.

The most significant recent increases in bear populations have been found in the Allegheny Mountains (especially Zones 2, 3, 4 and 5) and in the southern Piedmont (Zone 12, Figure 12). Bear harvests around the Shenandoah National Park have remained relatively stable during this time. Additionally, as of 2009, bear populations have been growing in bear management Zones 1, 2, 3, 4, 5, 8 and 12, and have been stable in Zones 6, 7, 9, 10 and 20. The relative shortage of hunting information from previously unhunted areas of Virginia (e.g., Piedmont) makes the assessment of population status in those areas more uncertain and speculative.

The 2001 bear population objectives (stabilize or increase) are generally being met in most areas of the state. However, bear populations are continuing to increase significantly in Zones 4, 5 and 8 where

objectives have been to stabilize populations. Research results from the Cooperative Alleghany Bear Study (CABS) at Virginia Tech estimated that a bear hunting mortality rate of 0.16 still allowed for annual population growth ($\lambda = 1.0416$ or R = 4.16%, Klenzendorf 2002). Population modeling conservatively indicated that the annual bear hunting mortality rate would need to be 0.21 (an increase of 31%) to stabilize populations. Guided by these results, a new 2003 muzzleloader season increased harvests in Zone 9 and seems to have stabilized the previously growing populations in the counties surrounding Shenandoah National Park (Table 1, Figure 12).

Although absolute density estimates are generally unknown, a relative indications of population density based on the average archery harvest per 100 square miles of forested habitat (Appendix C) tend to be highest in zones associated with the northern Allegheny Mountains and Shenandoah National Park, areas around the Great Dismal Swamp, and in some areas of the southwestern mountains. The lowest densities are found in most of the Southern Appalachian Piedmont and Middle Atlantic Coastal Plain.

Past research has provided density estimates for a few intensively studied areas. Past densities have been estimated to be >1.5 bears/mi^2 in Shenandoah National Park (1992), about 1 bear/mi^2 in the Great Dismal Swamp (1987), 1.5 bears/mi^2 in the Great Dismal Swamp (2004) and 3.5 bears/mi^2 in western Rockingham County (2001).

Rates of male mortality appear to be higher than rates of female mortality. Higher rates of male mortality have been observed from both reconstruction modeling and recent research at Virginia Tech. The difference in mortality between sexes may reflect the historical intended reduction in female harvests through hunting season changes.

Trends in documented nuisance complaints can reflect bear population changes, but these trends are subject to changes in many other factors including habitat conditions, human tolerance, bear education programs, DGIF response philosophies and reporting rates. Although complaints increased from 1970 through mid 2001 and generally mirrored the associated population growth, (Figure 13), these complaints primarily represented significant problems requiring special attention (e.g., relocation) and did not include more frequent concerns about minor bear issues (e.g., garbage, sightings) that were resolved via telephone calls. The increases in nuisance problems from 1970-2001 included complaints from both established and expanding bear populations. Primarily due to significant changes in VDGIF reporting procedures, the numbers of nuisance complaints have changed considerably since 2001 and now are primarily associated with bears getting into human-made attractants such as birdfeeders and garbage but also include calls about just seeing a bear.

Because of the confounding problems associated with interpreting the landscape-level numbers of nuisance complaints over time, the best use of nuisance complaints as an index to population status is at a local level. Indices of nuisance complaints are especially valuable for those areas that lack quality harvest information.

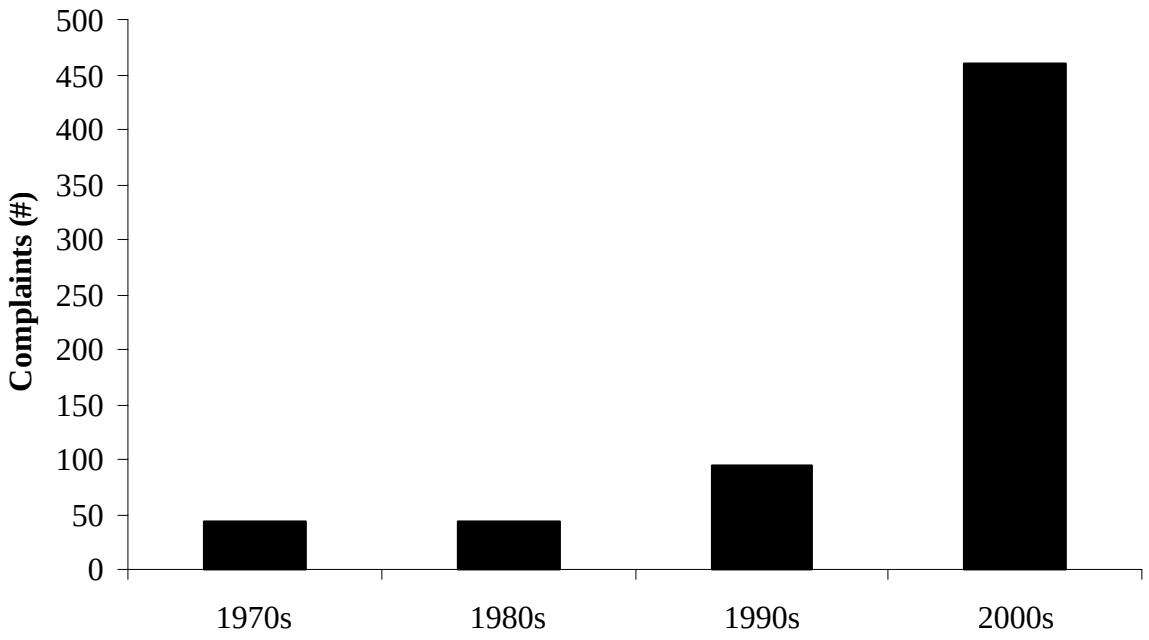

Figure 13. Average number of bear related complaints by decade (1970 - 2009).

By themselves, none of the harvest, nuisance, or age structure (population reconstruction) indices are absolute determinants of bear population status. However, their combined results can make a strong case for determining bear population status across the state. The growing population trends and healthy bear status in Virginia also are substantiated by similar bear population changes found throughout the Appalachians and the eastern United States.

DEMAND

Bear Hunting Demands

Types of bear hunting

In Virginia, hunters generally pursue bears using five different techniques: firearms with dogs, firearms without dogs, archery, muzzleloader hunting, and chasing with dogs without a weapon (during the dog-training season). Since a muzzleloader season was implemented in Virginia during 2003, the firearms, archery season and muzzleloader seasons have accounted for an average of 63.3%, 26.9% and 9.8% of the total harvest through 2011. Averaging 32.7% of the total annual bear harvest, hunters who use hounds also account for a little over half of the firearms harvest (51.6%).

As of 2012, the traditional bear hound training season offers between six to seven weeks (depending on the year) of opportunity, the special archery season offers six weeks of opportunity, and the special muzzleloader season provides hunters one week of opportunity. The open season, allowing hunters to harvest a bear with any legal method (including archery equipment, muzzleloaders, approved firearms, and hounds) varies in length by location from one week to the longest season in southeast Virginia having 14 weeks of opportunity. The traditional bear hunting counties in the western portion of Virginia have approximately six weeks of open season; however, hounds can only be used after the close of firearms deer season in those counties resulting in approximately five weeks of hound hunting opportunities.

While many bear hunters use more than one method, most bear hunters use firearms without dogs sometime during the season. Of hunters that specifically hunted for bears during the 2008-2009 bear

season, 66.8% used firearms without dogs, 43.2% hunted during archery season, 31.1% hunted during the muzzleloader season and 23.7% hunted during firearms season with dogs.

Bear hunters using dogs also utilize a non-harvest chase (dog-training) season during August and September. Approximately 18.7% of Virginia bear hunters (76.7% of the bear hound hunters) are thought to participate in this non-harvest season.

The archery bear harvest varies widely depending upon mast conditions. Years with poor mast conditions typically produce archery harvests that represent a greater proportion of the total harvest compared to years with good mast production. For example, during the 7 worst mast years on record since 1989, the archery harvest averaged 31.7% of the total harvest (range: 23.5 - 44.1%). In the remaining 14 years with better mast production, the archery harvest averaged much less at 18.6% of the total harvest.

Much of the bear harvest was by hunters who were actually hunting for other species, primarily deer. Based on 2008-2009 VDGIF hunter survey data, most successful bear hunters (53.5%) were actually hunting for other species; 44.2% of the successful bear hunters killed their bears while deer hunting and 9.3% were successful while hunting for species other than deer. Although a 1990 survey indicated that the opportunity to harvest bears while deer hunting was relatively unimportant, most deer hunters (70.3%) in 2008 said they would harvest a bear if they had the opportunity. Only 46.5% of the successful bear hunters were specifically hunting for bears. While most bears in Virginia are harvested opportunistically by other hunters, hunting bears with hounds is the traditional method for hunters who exclusively hunt bears.

Hunter effort

Bear hunting for recreation, food, clothing, weapons, and ornaments has had a long tradition in Virginia. During the 2009-2010 hunting seasons in Virginia, approximately 25,000 hunters spent 164,000 hunter-days hunting black bears. Hunter-days are defined as the total sum of all days hunted by all bear hunters (i.e., four sportsmen hunting for two days each generates eight hunter-days of bear hunting effort). On average, bear hunters spent 6.6 days bear hunting with 7.7% annual success during the 2009-2010 seasons. Following the trends of all hunting participation in Virginia, the number of bear hunters has generally declined since the 1970s. However, since the mid-1990s, declines in bear-hunter participation appeared to have stopped, with increases in both numbers of hunters (Figure 14) and total hunter-days of effort (Figure 15) in recent years. In 2008, 37.9% of the hunter effort was by bear hunters who used dogs while 62.1% of the effort was bear hunters who did not use dogs. An average of 7.4 days was spent by all bear hunters with 8.2 average days spent by hunters using dogs and 6.1 average days spent by hunters who did not use dogs to hunt bears. This resulted in a total of 57,843 dog hunter-days and 94,777 non-dog hunter-days.

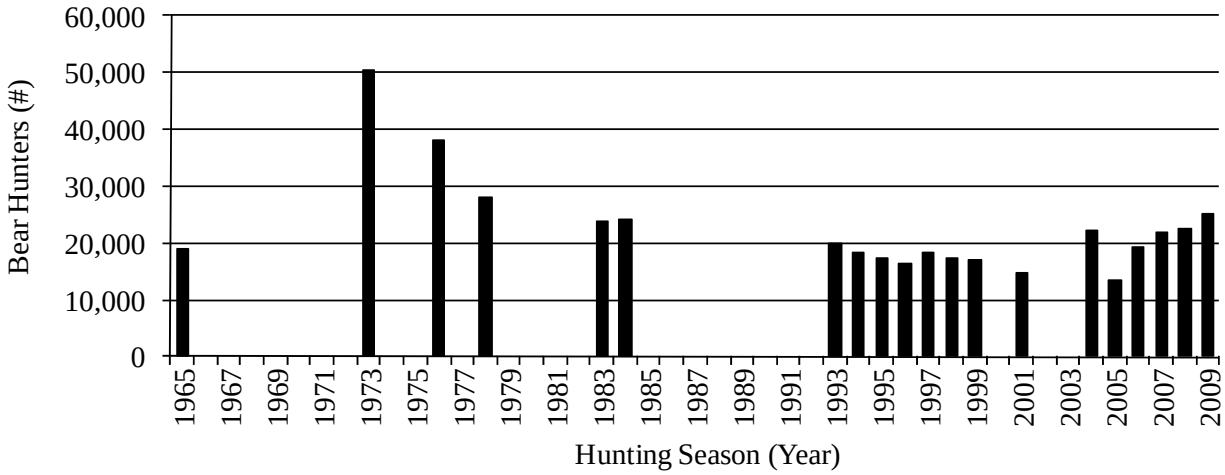

Figure 14. Number of black bear hunters in Virginia between 1965 and 2009. Hunter numbers are based on hunter surveys , which are run opportunistically, and not necessarily on an annual basis.

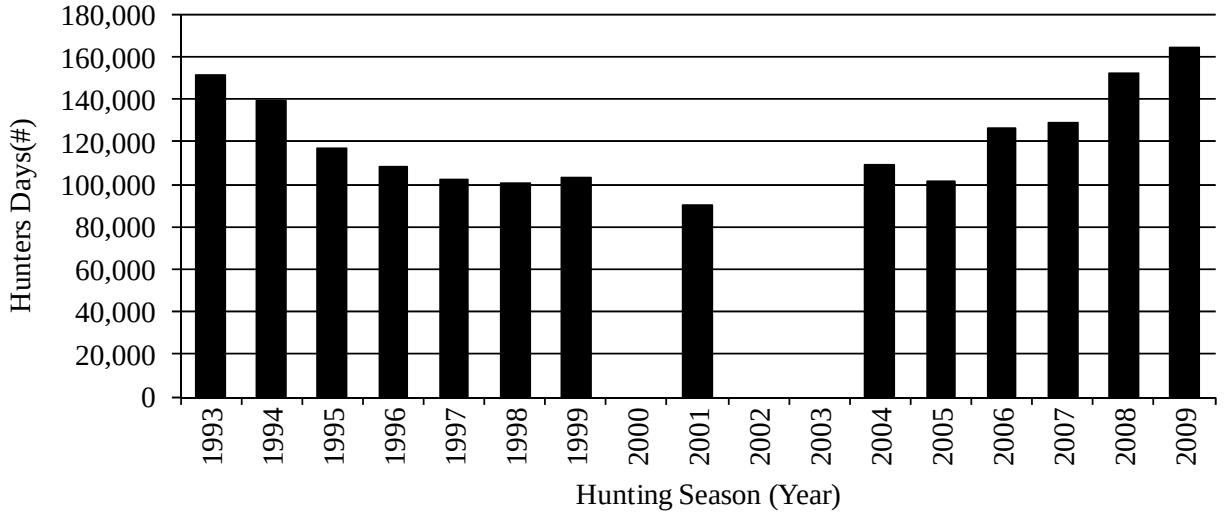

Figure 15. Black bear hunting effort (hunter-days) in Virginia between 1993 and 2009. Hunter days are based on hunter surveys , which are run opportunistically, and not necessarily on an annual basis.

Hunter satisfactions

Individuals hunt for many reasons (e.g., companionship, being close to nature, skill and challenge, meat). Specific information on bear hunter satisfactions is limited. Input from focus groups participants suggests that family customs and camaraderie are important satisfactions for Virginia dog hunters. Family and community traditions are important reasons for participation in bear hunting as well as the value of spending time with hunting companions and hearing the dogs.

In the 2009-2010 VDGIF hunter survey, 25.1% of all hunters ranked bear hunting as more than moderately important. Deer hunting was the most important kind of hunting with 87.5% of hunters who considered it more than moderately important. Bear hunting also ranked in importance behind hunting spring turkeys, fall turkeys, squirrels, and rabbits, but still ranked higher than hunting for many other species (e.g., waterfowl, quail, fox, raccoons).

In the 2010 VDGIF Deer, Bear and Turkey hunter survey, hunters who had ever harvested a bear were asked what they did with that bear. Among those hunters who answered the question the most common use of the bear was meat consumption (76%). Over 42% of those who had ever harvested a bear in Virginia said that they had it mounted, 31% tanned the hide, nearly 26% preserved the skull, and 22% donated the meat. Only 4% said they used the bear for ornamentation or clothing.

In a 1995 survey, Virginia bear hunters rated the gun bear season without dogs (and overlapping the deer season) as the most important segment of the bear season and the bear dog training season as least important.

The archery season and the gun-hunting season (with dogs) were ranked second and third, respectively. These rankings were probably heavily influenced by bear hunters who did not use dogs (and were primarily deer hunters). The VDGIF receives frequent requests from bear hound hunters for changes to harvest and chase opportunities (e.g., longer and earlier seasons).

Hunter Perceptions and Desires for Bear Populations

All 2008-09 hunter survey respondents were asked, *"What advice would you give the Department regarding how to manage bear populations?"* Statewide, 28% of hunters advised to increase

bear populations, 30% advised to stabilize the populations and only 6% advised to decrease the bear population size; 36% offered no opinion. The greatest demand for increasing bear populations came from VDGIF Administrative Region 3 (35.0% of hunters in Region 3) and the greatest demand for decreasing the bear population was in Region 4 (12.0% of hunters in Region 4, Table 2, Figure 16). When asked of only bear hunters the greatest demand for increasing bear populations came from VDGIF Administrative Region 5 (48% of hunters in Region 5) and the greatest demand for decreasing the bear population was in Region 4 (20.7% of hunters in Region 4, Table 3).

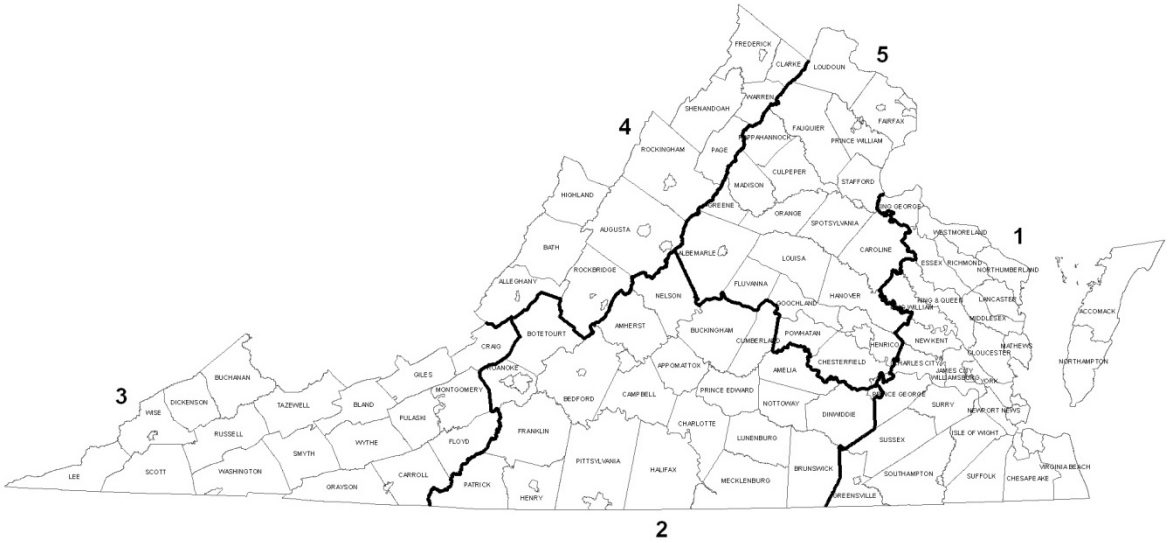

Figure 16. VDGIF Administrative Regions (at time of surveys, Administrative Regional boundaries changed in 2010)

Table 2. All hunter opinions (n=1872) from the 2008-2009 hunter survey when asked the question *"What advice would you give the Department regarding how to manage bear populations?"*

All Hunters Opinion	**State (%)**	**Region 1 (%)**	**Region 2 (%)**	**Region 3 (%)**	**Region 4 (%)**	**Region 5 (%)**
Increased	28.3	22.9	33.7	35.0	21.8	28.3
Remain the same	29.8	23.6	32.2	33.5	37.6	26.9
Decreased	5.9	5.9	4.4	7.7	12.0	3.2
Don't know/neutral	36.1	47.6	29.7	23.8	28.6	41.7
Number of respondents	**1872**	**288**	**407**	**260**	**234**	**283**

Table 3. Bear hunter opinions (n=205) from the 2008-2009 hunter survey when asked the question *"What advice would you give the Department regarding how to manage bear populations?"*

Bear Hunters Opinion*	**State (%)**	**Region 1 (%)**	**Region 2 (%)**	**Region 3 (%)**	**Region 4 (%)**	**Region 5 (%)**
Increased	36.6	25.0	46.3	37.7	22.4	48.0
Remain the same	35.6	50.0	26.8	39.6	36.2	32.0
Decreased	11.7	12.5	9.8	9.4	20.7	4.0
Don't know/neutral	16.1	12.5	17.1	13.2	20.7	16.0
Number of respondents	**205**	**8**	**41**	**53**	**58**	**25**

Concerns about bear hunting

Surveys of the public across the country have generally indicated approval for hunting and to a lesser extent bear hunting in particular. A recent survey (Responsive Management 2010) found that a large majority (81%) of Virginian citizens supported legal, regulated hunting in general with only 12% opposed. Although with lower approval than for other hunting, there still tended to be support for bear hunting among Virginia residents; 51% of Virginians supported the hunting of bears compared to 36% who opposed bear hunting (12% were neutral or didn't know). Virginians opposed to bear hunting were primarily opposed because they had a general opposition to all hunting, thought hunting would reduce bear populations that were already too low or felt that killing bears was cruel and inhumane.

Although there has been general approval across the United States for black bear hunting, bear hunting has also created controversies. Citizen initiatives to restrict black bear hunting or bear management options have produced varied results in many states including California, Colorado, Florida, Idaho, Maine, Maryland, Massachusetts, Michigan, New Jersey, Oregon, Utah, Washington, and Wyoming. Black bear hunting controversies have primarily focused on how, when and whether black bears should be hunted.

Different methods of bear hunting generate varied opinions among the public and hunters. Of the different methods of bear hunting surveyed in Virginia during 2010 (Responsive Management 2010), Virginia citizens had the most support for bear hunting with firearms without the use of hounds (57%), followed by archery bear hunting (46% support). Only 24% of Virginians supported firearms hunting with hounds or a hound-training season where bears are not harvested. Even among other Virginia hunters, there was much less support for firearms bear hunting with hounds (48%) or a chase-only season (47%) than for firearms hunting without hounds (91%) and archery hunting (79%). Other research in Virginia targeting specific stakeholder groups (Lafon et. al 2003) has also showed varying levels of support for hunting of bears and specifically hunting bears with the use of archery equipment or hounds.

Past surveys in Virginia have shown similar concerns from other hunters about hound hunting for bears. In 1993, 49% of hunters were neutral about the bear chase season, with 32% opposing and 19% favoring. Among bear hunters, 54% of the non-hound bear hunters did not favor the chase season. As would be expected, a large majority (82%) of the hound bear hunters favored the training season in Virginia. During the mid-1970s in Virginia, 74% of the opportunistic bear hunters (i.e., those hunters who were primarily hunting deer, but would harvest a bear if they had the opportunity) were opposed to hunting bears with hounds.

The use of hounds for bear hunting has been controversial in many states. Hunting with hounds for bears was banned by public ballot initiatives during the 1990s in Colorado, Massachusetts, Oregon, and Washington. Similar voter initiatives in Maine, Michigan, and Idaho failed, and hound hunting for bears continues in these states.

This attention on bear-hound hunting generally has not been anti-hunting in nature, but has focused more on specific practices that may be unacceptable for some publics. Based on research and surveys from around the country, the primary reasons given by the public and hunters opposed to bear hunting with hounds are that it is perceived to be inhumane and unethical, which leads to an unfair advantage for the hunter. The use of advanced technology (e.g., two-way radios, tracking collars, four-wheel-drive vehicles) and road access contributes to the perception of an unfair advantage for bear hunters using hounds. To some people, chasing is inhumane or abusive to bears, while others think that bear hounds chase all wildlife. Because bear hounds may be killed or injured while hunting, animal welfare concerns sometimes are extended to the hounds themselves. Other concerns for bears are based on presumed impacts on reproduction and movement, behavioral changes and physiological stress. Bear chases sometimes infringe on posted properties.

Public concern about bear hunting is not the only source of controversy. Even among bear hunters, there are sometimes issues about hunting seasons that may be viewed as too liberal with concerns about overexploitation. Hunter disagreements also often focus on the allocation of the bear harvest and hunting opportunities among hunter groups (e.g., archery hunters, firearms hunters with hounds, firearms hunters without hounds).

Bear Damage Demands

Bear management demands are not only related to hunter recreation. Concurrent with the growing bear populations, problems associated with bears also have been increasing (Figure 13). While most Virginia residents (68%, Responsive Management 2010) believed that people and black bears can live in the same locality without conflict, diverse bear-related problems can impact both residential and agricultural areas. From 2001-2011 most bear calls the VDGIF received (63%), including calls just to report a bear sighting, have been for non-agricultural/residential concerns, followed by other (22 %), and agricultural (16%) issues. In developed or residential areas, problems often center on damage to bird feeders, scavenging garbage cans, feeding on pet food, foraging at garbage dumps, automobile accidents, and simple public sightings. Agricultural problems include destruction of beehives, eating or destroying crops (corn, fruit trees), feeding on grain at livestock feeders, damage to trees, and killing of livestock. Although public perceptions may differ, many of these problems are not necessarily serious. With its combination of rural and urban environments in close proximity to bear habitat, any of these problems can occur almost anywhere in Virginia.

Male bears typically are involved in most of the human-bear problems. Prior to 2001 when bears were more commonly translocated by VDGIF, 73% of the bears captured for relocation were male. Because males travel greater distances than females, especially around the breeding season, they may also be more likely to cause nuisance problems. Adult males displace females and younger bears at prime feeding sites (including human-related food sources). Dispersing subadult males are also prime contributors to human-bear problems.

Residential bear concerns

High populations of both bears and humans commonly coexist together in many parts of North America, including in Virginia. However, concerns about bears around residences have become more prevalent with increasing bear and human populations. Problems involving black bears in residential areas are especially complex. Diverse residential/urban problems range from issues like a simple sighting that is perceived as a threat to relatively serious issues such as a bear in the city center being harassed by humans and disrupting traffic. Misinformation about black bears often results in uncertainties and unrealistic and unfounded fears.

Residents who live in rural or semi-rural areas represent about 33% of all Virginians. While these residents are more likely to interact with bears than the more urban or suburban human population, bears visiting urban areas have become more common. Approximately 11% of Virginia citizens stated that bears were a problem in their neighborhood, with 4% feeling they were a major problem and another 7% believing bears were a minor problem (Responsive Management 2010). Most residents (89%) indicated that bears were not a problem at all. Over the last two years, only 2% of Virginia residents had actually experienced a problem associated with a bear.

The most common problems Virginians reported were bears getting into garbage (31%), damaging birdfeeders (29%), and getting into the garden (21%, Responsive Management 2010). Similarly, from 2001 through 2011 the two most common bear complaints received by the VDGIF have concerned bears getting into trash and bird feeders.

Vehicle-bear collisions

Vehicle-bear collisions become more of a concern with expanding bear populations and increased traffic volumes. A minimum average of 30 vehicle-bear collisions occurs annually statewide, but an unknown number remain unreported. Although road-killed bears are difficult to document accurately, the incidence may be increasing. Since the 1970's, there have been over 600 reports of bears killed as a result of vehicle strikes; over a third of these occurred within the last 10 years. In 2001, VDGIF documented a human fatality associated with a bear-vehicle collision in eastern Rockingham County. VDGIF continues to work with VDOT and auto insurance companies to improve methods for collecting and reporting animal-vehicle collisions (e.g., police and motorist reports, carcass pick ups, insurance claims)

Agricultural bear damage

The VDGIF has documented agricultural damage by black bears for over 60 years. Agricultural concerns include damage to field and sweet corn, peanuts, beehives, orchards (peach, apple, cherry) and the occasional killing of livestock (goats, sheep, cattle, chickens, hogs). Agricultural producers often request assistance from the VDGIF for problems associated with bears. Assistance is provided in the form of education, assistance with exclusion devices, or issuance of kill permits as per Virginia Code§ 29.1-529. Since 2004, there has been an upward trend of bears killed on kill permits, with 156 killed by agricultural producers in 2011 (Figure 17).

While there can be a great deal of annual fluctuations, from 2001 through 2011, requesters of kill permits cited damage to corn by bears as the most common agricultural problem (45% of agricultural complaints), followed by orchards (13%), livestock/livestock feed (10%), damage to apiaries (9%), poultry (5%), and peanuts (5%).

Bee damage is most prevalent from April through June, but also may be common in October and November. Fruit trees may be damaged from the end of June through October. Damage to corn occurs primarily during the short period of the milk stage of development which begins about mid-July in most years. Grape vineyards (ripening time through August), wheat (sprouting time through maturity), oats, soybeans and peanuts (September - November) are other crops that may experience bear damage. Bear predation on livestock usually involves adult sheep and lambs (mostly in the spring).

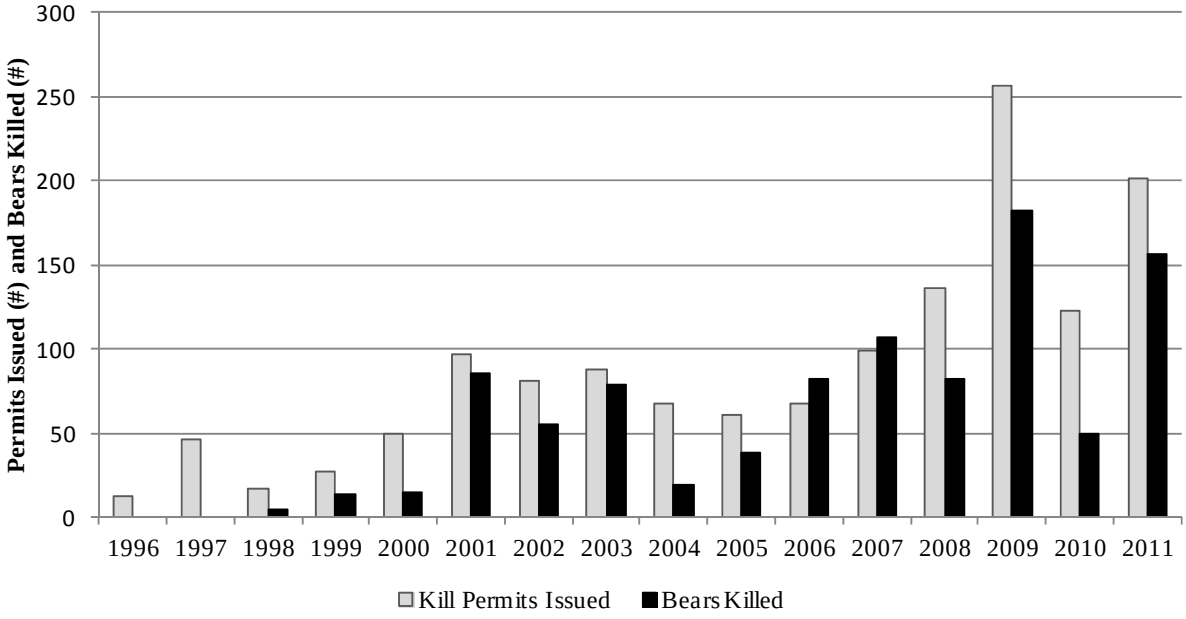

Figure 17. Number of VDGIF issued black bear kill permits issued and number of bears killed (2001-2011).

Human safety concerns and bear attacks

Black bears are usually nonaggressive, shy, elusive, and harmless to people. Despite many human-bear encounters, black bears pose little physical danger to humans. In 2011, valuable research was published on the location and characteristics of fatal attacks on bears (Herrero et. al. 2011). According to this research, there have been 63 documented human fatalities in 59 incidents due to black bears in North America since 1900. Of the fatal attacks, 49 were in Alaska or Canada and only 14 occurred in the lower 48 states. In most incidences (88%), these fatalities were attributed to predatory attacks in remote areas by bears having little prior contact with people. Although rare, fatal attacks have also involved bears that have lost their wariness of people. No bear-inflicted human fatality or unprovoked attack has ever been documented in Virginia.

Public opinions regarding damage management options

A variety of approaches are generally available to mitigate concerns with problem bears. Often without regard for their efficacy or feasibility, damage management options also elicit varied public opinions about their acceptability.

Most Virginians (58%) felt that the VDGIF should have the primary responsibility for addressing problems caused by neighbors attracting bears to the neighborhood; only 30% felt the primary responsibility resided with the person attracting the bear (Responsive Management 2010). Even so, the public supported requirements imposed on residents who attract bears. There was a majority of support (57%) for requiring residents to take down bird feeders that were actually attracting bears, but support was split (42% support, 48% oppose) for generally prohibiting residents in high bear density areas from using birdfeeders or feeding other wildlife. The majority of Virginians (57%) also supported fines for people who attract problem bears to their property, either intentionally or unintentionally.

There was overwhelming public support (85%), most of it strong support, for requiring people to use bear-proof garbage containers in areas frequented by bears; 66% of Virginians would also be willing to pay for a bear-proof container (e.g., $10 per month for 12 months). A large majority (84%) of Virginia residents also felt that counties with bear populations should also be required to make open dumpsters bear-resistant.

In general, the public prefers non-lethal options for managing bears. The majority of Virginia residents opposed the destruction of a bear that causes property damage to a home or building (71%), causes damage to agricultural crops or livestock (61%) or harms a pet (53%). On the other hand, most people would support destroying a black bear that was aggressive toward humans (76%) or made an unprovoked attack on a human (79%).

If local bear populations in areas of high human density (e.g., urban areas) or frequent human use (e.g., around highways) needed to be reduced, the most preferred strategy by the public was to use capture and relocation (88%). Other strategies included regulated hunting (31%), kill permits (16%), sharpshooters (7%) and capture and destroy (5%). Hunters also felt that capture and relocate (73%) was the best option, followed by regulated hunting (49%), and the use of kill permits (22%).

If it was necessary to destroy a bear, the majority (66%) of Virginia residents preferred the VDGIF capture and destroy it. Other lethal options included the use of VDGIF sharpshooters (with 36% acceptance), special hunting programs (33%) and the use of VDGIF-issued kill permits (31%). However, hunters most preferred the use of special hunting programs (49%), followed by VDGIF issued kill permits (38%), VDGIF capturing and destroying the bear (32%), and VDGIF sharpshooters (28%).

Most Virginia residents (53%) disagree that people should be compensated for bear damage to their property (34% agree). However, there was some support to compensate farmers for agricultural damage by black bears (41% disagree, 47% agree), with the greatest support for compensating property owners for bear damage to livestock (37% disagree, 53% agree).

Illegal and Market Bear Demands

The steady decline of the Asiatic black bear (*Ursus thibetanus*) and continued demand for bear gall bladders and other bear-related products by the Asian market has made the American black bear a natural target for wildlife commerce. Bile from gall bladders of black bears is a prized medicine in Asia with traditional unsubstantiated uses for liver disease, impotence, blood disorders, hemorrhoids and digestive ailments. Bear gall bladders sell for $250 to $10,000 each in some Asian countries. Although bear farming for bile production has gained momentum in the Orient, bile from wild bears is preferred due to the belief that it is more potent. Bear paws sell for $24-$254 per meal in some Asian restaurants. As a highly revered animal, consumption of bear parts by some Asians has a mystical value. Pet bear cubs sell for as much as $5,000 each in parts of the Orient. The acceptance and use of eastern medicine in North America is also on the rise and has created a domestic demand for some bear products.

In 1999, Virginia's Operation SOUP uncovered a supply of illegal gall bladders and bear paws. Fueling suspicions that bears may be the targets of international poaching rings, investigations conducted

over the past 16 years have yielded approximately 400 cases related to the illegal trafficking of Virginia black bears. Although the full extent of the trade remains unknown, research in Virginia suggests only minor bear losses due to illegal harvest or poaching activities, it is doubtful that poaching is currently having a significant impact on the statewide bear population.

Wildlife Watching Bear Demands

Wildlife watching activities (e.g., observing, feeding, photographing) are important to Virginians. Wildlife watching participants made up 81% of all wildlife-associated recreation in Virginia followed by fishing (30%) and hunting (14%). Over 2,126,000 Virginia residents participated in some type of wildlife watching activity in Virginia in 2006 with related expenditures of over $531,000,000 (USFWS-National Survey -Virginia 2006). A 2010 survey (Responsive Management 2010) found that 73% of Virginians have participated in wildlife watching activities within a mile of their homes, including 57% of residents who feed birds on their property.

A 1999 telephone survey indicated that black bears (74%) were second only to eagles and hawks (81%) as the animals Virginians were most interested in taking a trip to see. When asked in 2010 to rate the importance of seeing a black bear in their wildlife viewing experience, 68% of Virginia residents felt it was important. Approximately 13% of Virginia residents have specifically taken a trip to see a black bear in the last two years and 12% of residents say it is very likely that they will take a trip to see a bear in the next two years. Visitors in Great Smoky Mountains National Park wanted to see a bear more than any other wildlife species.

Other Public Bear Values and Demands

Black bears capture human admiration and interest like few other wildlife species. As a reflection of strength, bears often are used as icons for countries and athletic teams. With their resemblance to humans, intelligence and ingenuity, bears are perceived to have emotional qualities and were the fourth most commonly mentioned animal in titles of children's books in the United States during the 1970s (following horses, dogs and cats).

As a symbol of the American wilderness, bears are valuable to many citizens simply because they exist in their native ecosystems. The majority of Virginia residents in 2010 (Responsive Management 2010) believed it was important to have black bears in Virginia (81%) and that bears were an important part of Virginia's ecosystem (85%). The majority of residents (64%) who have seen a black bear rated the experience as positive with relatively few people (4%) having a negative experience.

Black bears also are used as an indicator of ecological health. In the southern Appalachian forests, the United States Forest Service uses the black bear as an indicator species to monitor habitat diversity and the presence of disturbance-free areas.

Bear Population Demands

<u>Public opinions about bear population status</u>

Virginians had mixed opinions about bear population growth over the last 10 years, although the largest group felt bear populations had increased (39%, Table 4, Responsive Management 2010). Residents from areas with the higher bear densities (Survey Regions 2B, 3A and 3B, Figure 18) were much more likely to think populations had increased compared to citizens in eastern Virginia. Hunters also were more likely (69%) to believe that the bear population had been increasing than non-hunters (37%). Interestingly, 11% of citizens (5% of the hunters) also think that Virginia's bears are endangered.

Table 4. Virginia residents opinion when asked *"Do you think black bear populations in Virginia have increased, stayed about the same, or decreased over the past 10 years?"*

All Residents Opinion	State	Survey Region 1	Survey Region 2A	Survey Region 2B	Survey Region 3A	Survey Region 3B
Increased	39	31	36	62	64	52
Stayed the same	18	19	21	13	13	16
Decreased	28	33	30	11	12	19
Don't know/neutral	15	17	13	13	10	13
Number of respondents	1546	305	308	305	313	315

In a 2008 survey of Virginia hunters, most hunters (56%) did not know or have an opinion about the status of bears on National Forest lands. Of those that did have an opinion, hunters considered bear populations to be slightly better than adequate with a mean score of 4.2 (where 1 = poor, 4 = adequate, 7 = excellent).

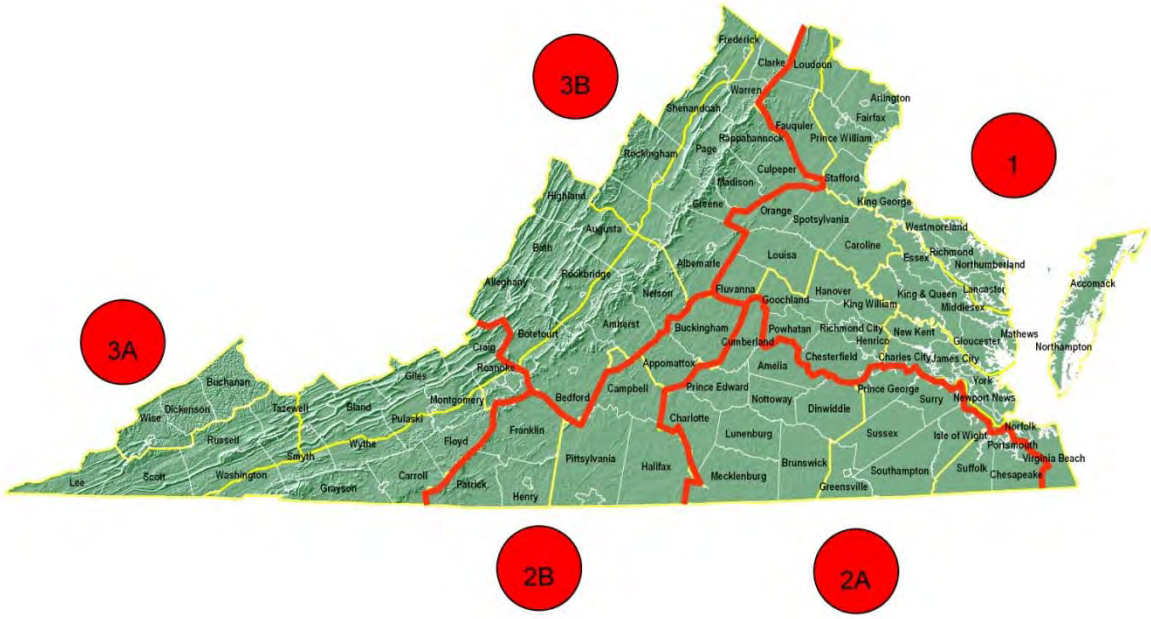

Figure 18. Survey regions for *Virginia Residents' Opinions on Black Bears and Black Bear Management* (Responsive Management 2010) public survey.

<u>Statewide population objectives</u>

The majority of Virginians (61%, Responsive Management 2010), felt that the statewide bear population should remain the same, with 22% desiring a population increase, and 9% wanting a population decrease (Table 5). Hunters expressed more desire to increase bear populations (34% support) than non-hunters (21% support), but also showed more support (12% support) for decreasing the population compared to non-hunters (8% support). Those who wanted the bear population to decrease (over increase or stay the same) also were more likely to say they know little about the management of

wildlife and natural resources, had personally experienced on problem with bears in the last two years, believe it is not at all important to have native species exist in Virginia, and moderately disagree that black bears are an important and essential part of Virginia's ecosystem.

Table 5. Virginia residents opinion when asked *"In your opinion, should the black bear population be increased, remain the same, or be decreased in the (state, county)"*

	In the State?	**In Your County?**					
Opinion from respondents:	**Statewide**	**Statewide**	**Survey Region 1**	**Survey Region 2A**	**Survey Region 2B**	**Survey Region 3A**	**Survey Region 3B**
Increased	22	9	7	10	12	12	12
Remain the same	61	68	68	72	63	67	69
Decreased	9	15	16	8	20	18	11
Don't know	9	8	9	9	4	4	8
Number of respondents	1546	1546	305	308	305	313	315

Similar to hunter opinions in the 2010 general population survey, a 2008 hunter survey indicated that 28.3% of hunters wanted to see bear populations increased. However only 29.8% wanted the population to remain the same and 5.9% wanted decreases; in comparison, hunters in the 2010 public survey were more likely to want stabilization (52%) or decreases (12%). The 2008 hunter survey had many more "no opinions" (36.1%) compared to the 2010 survey where only 2% of hunters "did not know".

Local population objectives

Although the majority of the public (68%) still wanted the bear populations to remain the same in their county, citizen opinions about population objectives changed when they were specifically asked about the county where they live compared to their statewide objectives (Table 5, Responsive Management 2010). Residents were much less likely to want bear population increases in their specific county (9%) than they generally desired for the state (where 22% wanted to increase populations). Likewise, more residents (15%) felt that the objectives in their county should be to decrease bear populations than were generally indicated for the state (9%). On a regional level, residents in the southwest mountains (Survey Region 3A) and the southwestern Piedmont (Survey Region 2B) had the most interest in reducing their local bear populations with 18% and 20% support, respectively. Citizens in the northwest mountains (Survey Region 3B) and the southeastern Piedmont (Survey Region 2A) showed the least interest in decreasing bear populations in their county of residence (8% and 11%, respectively).

Similar to the statewide opinions, hunters were much more likely to want bear population increases in their county (27%) than non-hunters (7%). Even so, the majority of both hunters (52%) and non-hunters (69%) felt that the bear populations should be stabilized in their counties of residence.

Other 2010 survey questions also provided additional insight into the "not in my backyard" attitudes about local bear populations. Although most people (66%) were comfortable having bears somewhere in their county, only 17% wanted to have bears in their neighborhood or yard. About a third of the residents (31%) felt uncomfortable even having bears in their county.

Residents in the northwest mountains (Survey Region 3B) showed the most tolerance for local bear populations with 37% wanting to have bears in their neighborhood or yard; only 8% were uncomfortable having bears in their county. The lowest tolerance for local bear populations came from eastern Virginia (Survey Region 1) where only 11% of the public wanted bears in their neighborhood or

yard and 38% did not even want bears in their county. Desires for bears in their counties and neighborhoods were also much greater for hunters (87%) than non-hunters (64%).

Reinforcing concerns about bears in too close a proximity to homes, most people (53%) disagreed that the presence of black bears near their homes improved their overall quality of life (compared to 27% agreeing that it would improve their quality of life). Again, the northwestern mountain residents (Survey Region 3B), who live near the highest bear densities in the state, expressed a higher tolerance and value for local bear populations than other regions. Only 35% of Survey Region 3B residents disagreed that bears near their homes improved their quality of life (44% agreed). Eastern Virginia residents (Survey Region 1) most strongly disagreed (57%) that bears improved the quality of their life (only 24% agreed).

The higher tolerances of residents from the northwestern mountains compared to eastern Virginia are supported by 1978 research in New York State that generally found more positive attitudes about bears from people who had experience with bears than from people who had no experience. Education has often been the key to increasing knowledge, awareness, and tolerance of bears.

Cultural Carrying Capacity

The joint impact of all the demands for bears (both negative and positive demands) results in the cultural carrying capacity (CCC). Sometimes called the wildlife stakeholder acceptance capacity, the cultural carrying capacity is the maximum number of bears in an area that is acceptable to the human population. The CCC is a function of the human tolerance of bears and the benefits derived from bears by people. It is different for each constituency, location, and point in time. The actual CCC is subjective and involves a combination of social, economic, political, and biological perspectives. For example, a farmer experiencing crop damage from bears may have exceeded his tolerance and desire fewer bears. However, for the park visitor hoping to see a black bear, the current population level may be too low to provide sufficient viewing opportunities. The CCC is ultimately a balance of and trade-off among the variety of public demands.

Especially in areas with higher human populations, the CCC is probably well below the BCC because the public tolerance for bears will be exceeded before the habitat or other factors become limiting. In general, the abundance and distribution of black bears will hinge on public values and tolerance that will often result in population levels well below biological carrying capacity.

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BLACK BEAR MANAGEMENT

Adapted from the NEBBTC technical publication

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.

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 and minimum 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.

Developing acceptable responses to specific problems often is the primary objective for managing human-bear problems. Acceptable responses to human-bear problems are determined by public concerns, extent of damage, type of problem/damage, black bear biology, public safety, animal welfare, and available control methods. While nonlethal and lethal control measures have been used to resolve problems, wildlife management agencies and the public generally have preferred nonlethal over lethal control (Baptiste et al. 1979, McIvor and Conover 1994, Warburton and Maddrey 1994). Lethal control, such as kill permits or trap and kill, typically has been used only as a last resort.

BLACK BEAR MANAGEMENT OPTIONS

Concurrently 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. Interactions 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 for bears and serve to attract bears into close proximity. Common activities, such as feeding birds and other wildlife, cooking food outdoors, feeding domestic animals in outdoor locations, and improperly storing refuse set the stage for human-bear conflicts.

Mitigation of human-bear conflicts routinely accounts for substantial allocation of staff and fiscal resources from state and provincial wildlife agencies and imposes 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 other management options and techniques also applicable.

Black bear management options are designed to satisfy bear population and/or human-bear problem objectives. Some options primarily target population management objectives or human-bear problem management objectives, while other options may have dual implications by affecting both population levels and human-bear problems. The following options with related case studies as published by the Northeast Wildlife Administrators Association will be available in 2012

BLACK BEAR MANAGEMENT OBJECTIVES

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 Problem Management.

Although human-bear problems are greatly influenced by natural food abundance, population management in a given area can influence the occurrence of human-bear problems. Generally, as black bear populations increase, human-bear problems increase as bears encounter humans more frequently. Conversely, as black bear populations decrease, human-bear problems generally decrease. In addition to general population management for bears, other management options can more specifically target human-bear problems.

BLACK BEAR POPULATION MANAGEMENT

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 (Hygnstrom and Hauge 1989). Similarly, a season extension in Pennsylvania to allow concurrent bear and deer hunting seasons resulted in increased harvest rates of bears involved in human-bear conflicts (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.

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 Problem Management: Regulated bear harvest may reduce human-bear problems 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. For protected populations, roads offer no barrier to bear movement and habitat use (Carr and Pelton 1984), but bears cross roads less as vehicle traffic increases, thereby causing bear populations to become genetically isolated (Brody and Pelton 1989, McCown et al. 2004). However, food availability may cause bears to use areas adjacent to roads or drive bears to cross highways regardless of habitat or traffic density.

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 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 may be 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 Problem Management: Except for potentially preventing a few bear-vehicle collisions, controlling non-hunting mortality does not reduce human-bear problems 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 two-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 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 problems may generate additional landowner costs.

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 Problem Management: Maintenance of diverse, productive black bear habitat can serve to reduce human-bear problems. Additionally, removing protective cover or locating commodities or property away from protective cover may reduce site-specific human-bear problems.

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 techniques 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).

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 Problem 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 should not be considered a viable option to manage human-bear problems.

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

HUMAN-BEAR CONFLICT MANAGMENT

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. 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.

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 Problem Management: Because bears exploiting human-related food resources are responsible for most human-bear problems, 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, bear poles and bear-resistant containers, can eliminate individual, site-specific human-bear problems.

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 wariness) to humans. Food conditioned and habituated bears are typically responsible for increased nuisance problems. Eliminating bear access to human-related foods in areas of high human use (e.g., parks, campgrounds) helps reduce human-bear problems. In such areas, management plans and strategies for mitigating human-bear problems 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 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 problems 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, construction 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 problems, 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 the cultural carrying capacity by reducing some human-bear conflicts.

Implications for Human-Bear Problem 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 bear calls. Exclusion devices secure food and waste and are effective at reducing human-bear problems.

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 technique for wildlife management agencies to address human-bear problems. 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 bear-specific 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 perceived effectiveness of aversive conditioning for reducing human-bear problems has mixed results. 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 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 most likely to be 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.

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 conduct.

Implications for Population Management: Aversive conditioning is not effective at managing bear population size.

Implications for Human-Bear Problem Management: Aversive conditioning may alter some specific black bear behavior, temporarily reducing human-bear problems.
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 do 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 problems.

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).

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

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 problems, particularly damage to agricultural commodities. While kill permits are used to alleviate human-bear problems, wildlife agencies have not used kill permits to manage black bear population levels. Kill permit programs for human-bear problems 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 problems. 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).

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 Problem Management: Kill permits can effectively alleviate human-bear problems 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 problems, 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 problems. Use of non-lethal techniques (e.g., translocation, aversive conditioning, etc.) as alternatives to killing may provide a short-term solution to a problem.

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 bear 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. Additionally, catching the right bear becomes a complicating factor.

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 Problem 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 problems, 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 more than two 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 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 human-bear conflicts (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 problems (Warburton and Maddrey 1994). However, translocation fails to address the situation which led to the problem, and translocated 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.

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 Problem Management: Translocation may reduce local nuisance activity. However, translocation does not address the behavior causing the human-bear problem 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 control of human-bear conflicts 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 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 Problem Management: Reimbursement funds have been successful at mitigating the impacts of human-bear problems. Unless compensation programs emphasize measures to reduce damage, the incidence of human-bear problems 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 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 problems that arise from the program and any negative impacts the program would have on other wildlife populations (e.g., disease concerns or habitat destruction).

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.

Implications for Human-Bear Problem Management: Bears that exploit human-related food resources are responsible for most human-bear problems. Supplemental feeding by the public has increased human-bear problems 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 problems, 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.

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ACCOMPLISHMENTS OF THE 2001 BLACK BEAR MANAGEMENT PLAN

The 2001-2010 Black Bear Management Plan (BBMP) contained 24 objectives that were prioritized by the Stakeholder Advisory Committee (SAC) and VDGIF Black Bear Technical Committee (BBTC, see Appendix V. pages 102 and 103 in the 2001-2010 BBMP). Each member of the SAC and BBTC independently chose the eight most important, eight least important, and eight moderately-important objectives in the bear management plan. An importance rank of 1 meant the most important objective, 2 meant the second most important objective, and so on until 24, which meant the least important objective. Some ranks were tied. The following table provides a summary of progress toward meeting each objective since plan implementation in 2001.

Objective by Goal Area		2001 Priority Rank (out of 24)		Objective Met?
		SAC	VDGIF	
Goal 1 - Population Viability				
1. To determine status of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations by 12/31/03.		5	2	Generally Yes (with exceptions)
Explanation	Within these broad regions, Bear Management Zones with sufficient harvest data were used for population trend analyses and population reconstructions (see Figure 12, Table 1). Although boundaries of the 22 Bear Management Zones do not correspond exactly with the larger regions, status analyses in these Zones provide a good foundation for assessments of the larger regions. Many Zones (1, 2, 3, 4, 5, 8, 12) within the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, and southern Piedmont had growing bear populations. Other Bear Management Zones (6, 7, 10, 20) located within the southern Piedmont, southern Blue Ridge, northern Blue Ridge, and southeastern Tidewater regions had bear populations that were stable. The majority of the Bear Management Zones with insufficient data came from the northern Piedmont and northern Tidewater regions that were not included in this objective.			
2. To establish minimum population and habitat criteria required for achievement of long-term viability of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations by 12/31/05.		3	4	No
Explanation	Minimum population and habitat criteria for population viability were not specifically assessed; however, bear population trends by Bear Management Zones were assessed. Leaving little doubt about population viability, bear populations in the long-term viability areas were found to be increasing or stable.			
3. To determine the most important risk factors that may prevent attainment and/or maintenance of the long-term viability of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations by 12/31/04		9	12	No
Explanation	This objective was not explored specifically. Although risks are probably not immediately critical, trends in increasing human populations, development, subsequent loss of habitat, and disease or pests of hard mast producing forests have the potential to negatively affect bear populations.			
4. To implement management programs that achieve or maintain the long-term viability of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations by 12/31/06.		1	8	Yes
Explanation	Population impacts of hunting seasons are evaluated annually and specific hunting regulations are examined every two years. To meet recreation and population objectives, hunting seasons in long-term Viability Regions have been conservatively approached. As a result, there have not been any decreases in bear populations in the long-term Viability Regions over the last 10 years.			

Goal 2 - Desirable Population Levels				
5. To meet bear cultural carrying capacity population objectives that are consistent with population viability objectives in each Zone by 12/31/10.		9	8	Limited and In Progress
Explanation	In 2003, staff made hunting season recommendations to meet stabilization objectives in Bear Management Zones with increasing populations (specifically Zones 4, 5, and 9). As a result of the regulation process, only Zone 9 had significant changes implemented (where a 4-day muzzleloader season was added). Zone 9 bear populations have stabilized, while Zone 4 and 5 populations have continued to grow (Figure 12). Primarily targeting still unmet population objectives in Zones 4 and 5, hunting seasons were liberalized in 2009 to reduce populations to the 2001 levels. Zones with objectives for increasing populations have generally seen growth (Figure 12)			
6. To determine the relationships between population viability and CCC by 12/31/09.		15	17	Limited
Explanation	Although this objective was not specifically met, results from a statewide survey of Virginia Residents' Opinions on Black Bears and Black Bear Management imply that bear population viability may be consistent with the CCC. A very large majority of Virginian's felt that bears were important to have in Virginia and were an important part of the ecosystem. However, some regional differences in acceptable population levels might have viability implications (e.g., northern Piedmont, northern Tidewater).			
7. To determine updated CCC objectives in each Zone by 12/31/10.		20	14	In Progress
Explanation	Information from a statewide survey of *Virginia Residents' Opinions on Black Bears and Black Bear Management* (Responsive Management 2010) will be incorporated into the current Black Bear Management Plan revision. The planning process will help provide informed designs about CCC objective for the revised plan.			
Goal 3 - Habitat Conservation and Management				
8. To ensure habitat requirements meet minimum population viability criteria (200,000 acres of connected forested areas or 80,000 acres of connected forested wetlands) in each of the 6 population areas and cultural carrying capacity objectives for black bear populations by 12/31/05.		15	12	No
Explanation	Habitat studies were not completed during the 2001-2010 timeframe because higher priority objectives were being addressed.			
9. To refine specific bear habitat quality and associated habitat needs (e.g., amount, composition, linkages, diversity) that meet minimum population viability criteria and cultural carrying capacity objectives for black bear populations by 12/31/06.		8	19	No
Explanation	Habitat studies were not completed during the 2001-2010 timeframe because higher priority objectives were being addressed.			
10. To determine the relationships between population dynamics of bears in Virginia and the dynamics of suitable habitat by 12/31/09.		15	14	No
Explanation	Habitat studies were not completed during the 2001-2010 timeframe because higher priority objectives were being addressed.			
Goal 4 - Hunting Seasons And Demands				
11. Consistent with black bear population objectives, to maintain an annual average of at least 32,500 hunter-days for archery, 32,500 hunter-days for firearms hunters who do not use dogs, 60,000 hunter-days for hunters who do use dogs, and 40,000 hunter-days of bear-dog training through 12/31/10.		9	17	Generally Yes (with many uncertainties)

Explanation	During the 2008-2009 hunting seasons in Virginia, hunters spent about 152,620 hunter-days hunting black bears (Figure 15). The overall objective of 165,000 hunter-days is within the error bounds of the 2008-09 estimate. If 37.9% of the hunter effort was by bear hunters who used dogs, then 57,843 hunter-days came from dog hunting vs. 94,777 from non-dog methods (archery, muzzleloading, firearms). The relative split between the non-dog methods is unknown as is the number of hunter-days for dog training. Current surveys are not precise enough for accurate estimates among all the hunting methods. The objective is also based on vague target information from old surveys.		
12. Consistent with black bear population objectives, to open new areas for additional recreational black bear hunting opportunities during the biennial regulation considerations.	19	6	Yes
Explanation	Since 2001, many new hunting opportunities have been provided. The new opportunities include: statewide archery hunting, extension of archery season length, new muzzleloader season (everywhere except southwest and southeast), statewide firearms seasons (except for the Eastern Shore), additional hound-hunting opportunities (legal in all but six firearms counties), lengthening of bear-dog training season (including hunting hours), and new areas open for bear-dog training. Some additional details can be found in the section, "Recent Hunting Regulation Changes".		
13. To determine black bear hunter satisfactions and constraints to participation in Virginia by 12/31/09.	23	20	No
Explanation	This objective was not addressed during the 2001-2010 timeframe because higher priority objectives were being addressed.		
Goal 5 - Ethics of Bear Hunting Methods			
14. To describe fair and sportsman-like black bear hunting methods that also preserves the value of hunting as source of recreation and a population management tool by 12/31/03.	5	8	Limited
Explanation	Although the 2010 survey (Responsive Management 2010) of Virginia citizens provided information on the acceptability of bear hunting and bear hunting methods, budgetary constraints and limited staff time have prohibited the development of publicly acceptable methods of fair and sportsman-like bear hunting.		
15. Implement programs that ensure bear hunter compliance with fair and sportsman-like behavior criteria and protect hunting activities that conform to these standards by 12/31/04.	9	14	Yes
Explanation	Primarily concerned about fair chase and sportsman-like hunter behavior, the Board of Game & Inland Fisheries passed regulations in 2003 that addressed chasing game animals multiple times (4 VAC 15-40-284), using telemetry equipment to aid in a chase (4 VAC 15-40-284), and chasing animals from any baited site (4 VAC 15-40-283). To resolve issues about hound hunting, a comprehensive study on hound hunting in Virginia was completed in 2008. This study was a proactive approach to preserve hound hunting in Virginia, but efforts to address recommendations have been limited. The goal of the study was *"To provide diverse opportunities for hunting with hounds in Virginia in a manner that is fair, sportsmanlike, and consistent with the rights of property owners and other citizens."*		
Goal 6 - Landowner and Citizen Conflicts with Bear Hunting			
16. To identify and describe bear hunting activities (e.g., when, where, type of hunting) that result in conflicts with landowners and other Virginia citizens by 12/31/04.	14	6	Yes, but limited
Explanation	Beginning in 2003, VDGIF facilitated a collaborative process between local bear hound hunters and landowners in Roanoke County that identified conflicts. Bear hunter - citizen conflicts were identified in the *Hunting with Hounds in Virginia: A Way Forward* technical report.		
17. Implement programs to reduce conflicts between bear hunting activities and other Virginia citizens (especially landowners) by 25% by 12/31/06.	2	8	Limited
Explanation	The VDGIF-facilitated process between bear hound hunters and landowners in Roanoke County attempted to resolve conflicts and developed mutually agreeable guidelines for all		

	parties. A reduction in bear hunter/citizen conflicts of 25% could not be determined because no baseline conflict data exist.			
Goal 7 - Non-Hunting Recreation				
18. To determine non-hunting demands and satisfactions for bear recreation by 12/31/09.		21	21	Limited
Explanation	Some additional insight for non-hunting recreation came from a statewide survey of *Virginia Residents' Opinions on Black Bears and Black Bear Management* (Responsive Management 2010). Seeing a black bear as part of their wildlife viewing experience was important to 68% of Virginia residents and 13% have specifically taken a trip to see a black bear in the last two years. The majority of residents (64%) who have seen a black bear rated the experience as positive.			
19. Provide non-hunting recreational opportunities for Virginia citizens by 12/31/10.		21	22	Limited
Explanation	Although specific non-hunting recreational opportunities were not developed, on-line educational materials ("Bear Facts", "Living With Black Bears in Virginia", "Bears on the Move", "Things to Remember in Bear Country") and other links have been made available to the public to enhance their appreciation of and knowledge about bears in Virginia. Numerous talks about bears have been presented all across Virginia.			
20. To determine the effectiveness of exhibition permit holders as a source of bear-related recreation and public education tool for black bears by 12/31/10.		24	24	No
Explanation	This objective was not addressed during the 2001-2010 timeframe because higher priority objectives were being addressed.			
Goal 8 - Human-Bear Problems				
21. To implement explicit and cost-effective response protocols that utilize both non-lethal and lethal options for managing nuisance bear complaints by 4/30/02.		9	1	Yes
Explanation	A finalized version of the Nuisance Bear Guidelines for VDGIF response was implemented in 2005. These guidelines serve as a template for human-bear conflict management strategies used statewide. The guidelines describe general approaches to handling most all potential problems caused by bears and serves as a guiding document for the level of response required by VDGIF staff. Depending on the situation, the guidelines provide a number of lethal and non-lethal options for staff to use. The Nuisance Bear Guideline document is currently undergoing updates to reflect a shift in Departmental responsibilities and new issues relating to bear management.			
22. To evaluate the effectiveness of different nuisance bear management options by 12/31/06.		5	2	Yes
Explanation	Virginia has co-edited a publication through the Northeastern Black Bear Technical Committee. This publication, Black Bear Management Options Booklet, is a comprehensive, scientifically based review of lethal and non-lethal management options that bear managers may use. The publication contains case studies and expert opinions from bear professionals around North America (e.g., state agency biologists, National Park Service biologists, and Provincial biologists. However, in many cases, empirical data from field studies are still lacking.			
23. To achieve a 25% reduction in bear damage by 12/31/08.		15	22	Limited and In Progress
Explanation	With a growing human and growing bear population, proportionally there has been progress made towards reducing human bear conflicts. To increase the tolerances of Virginia citizens and educate people about proper bear response, significant revisions have been done on educational and outreach materials. In addition, a DVD, *Living with Black Bears in Virginia*, has been produced. This DVD has greatly expanded VDGIF's capability to disseminate educational material to more residents around the state.			
24. To identify and develop site-specific management options for unique bear management units through 4/30/02.		4	5	Yes
Explanation	There are a number of areas around the state that have special circumstances surrounding			

	bear issues. To help mitigate bear problems, the Code of Virginia (29.1-529) authorizes kill permits for commercial operations experiencing agricultural damage. For added local flexibility, non-lethal options have recently been added to 29.1-529. VDGIF also provides Bear Population Control Permits (BPOP permits) for site-specific assistance in controlling crop depredation by bears through expanded hunting seasons. For an enhanced educational approach, VDGIF helped facilitate a citizen-initiated Bear Smart program that resulted in significant reductions in bear issues in a resort community in Virginia. VDGIF staff has worked with non-profit groups to acquire grants for bear-proof dumpsters in various areas (e.g., recreation areas, neighborhoods, county governments) to define and prevent future problems.

BEAR PLAN GOALS, OBJECTIVES AND STRATEGIES

This section outlines and describes the goals for managing bears in Virginia through 2021. The Stakeholder Advisory Committee Members (Appendix A), with technical assistance and feedback from VDGIF staff (Appendix B), drafted six goals addressing bear populations, habitat, bear-related recreation, and human-bear problems. These goals reflect the values of a diverse public and are broad statements of principles and ideals about what should be accomplished with bear management in Virginia. As the underpinning for bear management direction, these guiding public values should be relatively stable for the period of the plan.

Specific objectives follow each goal statement. Based on the goals identified by the Stakeholder Advisory Committee, the Black Bear Technical Committee established specific objectives to help guide the successful attainment of each goal. Objectives are the technical expression of the public vision expressed as goals. Objectives are generally more specific, quantifiable, and have milestones for achievement.

Potential strategies clarify how each objective should be achieved. As with objectives, technical decisions about specific strategies are largely the realm of wildlife professionals and will be based on the best available science, anticipated efficacy, and expected costs. The more technical bear management decisions about how to achieve public values (i.e., goals) through strategies that meet specific objectives will primarily be provided via the expertise of VDGIF staff. While this is not an operational plan detailing all specific steps, actions, or costs to achieve objectives, these strategies represent some approaches, techniques, and programs that will be considered to accomplish objectives. However, overarching public expectations for sound strategies to accomplish objectives will include comprehensive education, the best available science technical science, research, management, and law enforcement programs. Other strategy options will also consider public acceptability and compatibility with other goal-based visions.

BEAR POPULATIONS

Goal 1 - Population Viability

Ensure the long-term viability of bear populations in each of the eight Viability Regions in Virginia through comprehensive research, monitoring, management, education, and protection programs.

Bears as a public resource, like other native wildlife, are managed in trust by VDGIF for all citizens. The VDGIF mission of managing *"wildlife…to maintain optimum populations…"* depends on ensuring the viability and sustainability of suitable ecosystems across Virginia. Although bear populations have been expanding across the Commonwealth, the long-term population viability of bears in Virginia should continue to be guaranteed. In simple terms, a minimally viable population is the smallest isolated number of individuals that are able to reproduce and maintain the population from one generation to another. Approximating general physiographic province boundaries (or portions thereof), eight broad Viability Regions were considered for population viability objectives (Figure19). Minimum viability standards will be established to maintain a viable black bear population somewhere in each of the eight Viability Regions of Virginia. Biologically sound ecosystem management approaches should be the basis of maintaining viable bear populations. Because ecosystems (and bears) do not recognize artificial administrative boundaries, coordinated monitoring and management approaches among Virginia's Viability Regions and neighboring states will be necessary.

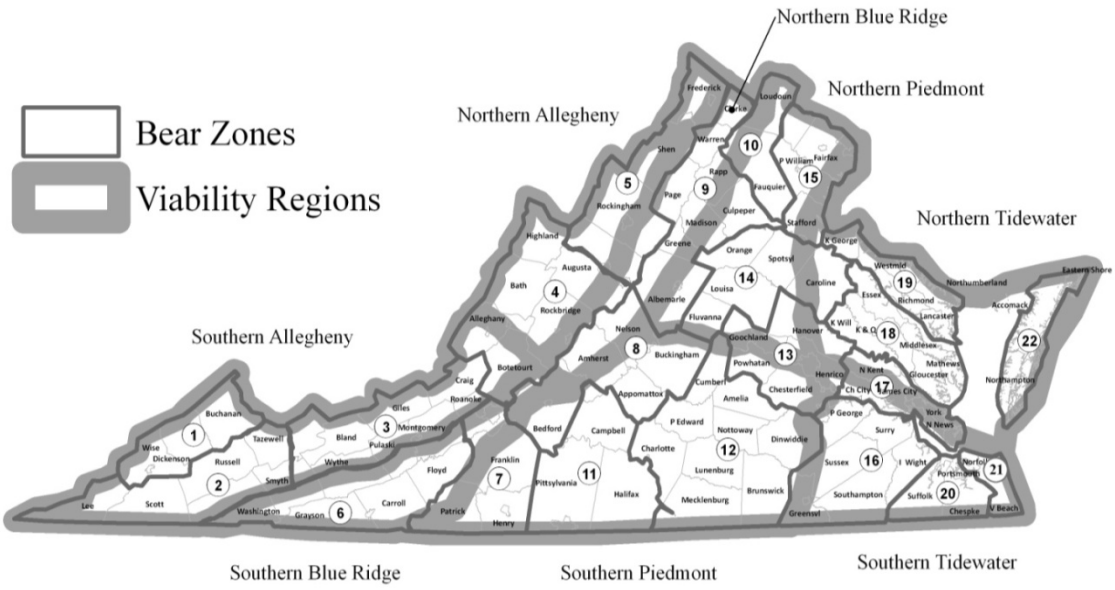


Figure 19**.** Regions for population viability considerations.

<u>Objective 1.</u> To determine the viability status of the northern Piedmont and northern Tidewater black bear populations by 1/1/2017.

Viable bear populations currently exist in the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southern Tidewater Viability Regions. In the 2001 Black Bear Management Plan, both the northern Piedmont and northern Tidewater Viability Regions were designated as "No Viability". The statewide (i.e., all Viability Regions) viability goal for the 2012 Black Bear Management Plan, bear population viability status needs to be determined for the two Regions (northern Piedmont and northern Tidewater) that formerly had no population viability requirement for black bear populations. The process of establishing population viability starts by specifically delineating the management units and describing the bear population status within each unit. Information should be collected regarding population size, historical changes in populations, population trends, and demographic characteristics (birth rates, death rates) within each unit. Because accurate estimates of these data are difficult and expensive to obtain across all areas, bear population status information will rely heavily on indices and other site-specific research results. Accurate interpretation of these indices will hinge on a practical understanding of their relationships to population characteristics.

<u>Potential Strategies</u>

a. Identify boundaries that define the geographic scale of black bear populations in each Viability Region.

b. Describe the status of black bear populations in terms of population size, distribution, population trends, and demographic characteristics (e.g., birth rates, mortality rates) in the northern Piedmont and northern Tidewater black bear populations.

c. Because unbiased estimates of population size, distribution, population trends, and demographic characteristics will usually be unavailable, develop indices of these parameters from hunter harvests, field observations, nuisance complaints, and other field monitoring. Bear populations with limited harvests and harvest data will require

implementation of monitoring indices that are not based on harvests in some areas (e.g., archery deer hunter observations, nuisance trends).

d. Assess the relationships between the population monitoring indices and the actual population size, distribution, population trends, and demographic characteristics. Research may involve investigating the relationship between harvest and population viability.

e. To help interpret variations in population monitoring indices, monitoring also will include additional environmental, habitat, and sociological factors (e.g., mast production, habitat and land-use changes, hunting effort).

f. Recognizing the large-scale monitoring and management needs for black bears through the continued cooperation with regional bear management organizations such as the North East Black Bear Technical Committee, Southern Appalachian Bear Study Group and the Mid-Appalachian Bear Working Group.

Objective 2. To establish minimum population and habitat criteria required for achievement of long-term viability in the northern Piedmont and northern Tidewater black bear populations by 1/1/2017.

Habitat and population requirements need to be established to ensure long-term population viability for black bears in Virginia. The description of these area-specific thresholds should be based on the best information that is cost-effectively obtainable. Because accurate estimates of population size and characteristics are difficult and expensive to obtain across all areas, these minimum criteria will be based heavily on indices of bear habitat and populations

Potential Strategies

a. Use a combination of approaches (including literature review, expert opinion, site-specific information, and population/habitat modeling) to establish minimum viability criteria for black bear populations in the northern Piedmont and northern Tidewater black bear populations.

b. Conduct site-specific research to improve the assessments of minimum viability criteria for black bear populations in the northern Piedmont and northern Tidewater black bear populations.

c. Evaluate the relationship between the population monitoring indices and minimum viability criteria for black bear populations in the northern Piedmont and northern Tidewater black bear populations.

Objective 3. To determine the most important risk factors that may prevent attainment and/or maintenance of the long-term viability of all eight Viability Region black bear populations by 1/1/2017.

In the future, bears across Virginia may be exposed to factors that negatively affect population viability. These potentially limiting risk factors may include changes in population demographics, genetics, environmental influences, human impacts, and habitat concerns. Describing, evaluating, and prioritizing these area-specific risks will be essential to designing management programs that address population viability goals.

Potential Strategies

a. For black bear populations in each Viability Region, evaluate risk factors that might prevent the attainment and/or maintenance of population viability. Potential risk factors should consider population demographics (e.g., changes in births, deaths, and population growth), genetics (e.g., inbreeding concerns), environmental influences (e.g., disease, competitors, pollutants, natural catastrophes), human impacts (e.g., roads, urbanization, poaching, illegal trade), and habitat concerns (e.g., corridors, forest composition, roadless areas).

Objective 4. To implement management programs that achieve or maintain the long-term viability of all eight Viability Region black bear populations by 1/1/2018.

Population status (Objective 1), viability requirements (Objective 2), and risk assessments (Objective 3) should determine the design and implementation of management programs for long-term viability. Implementation might focus on education, coordination among management and resource organizations, habitat connectivity, and other identified limiting factors. Management program effects should be monitored and modified as necessary.

Potential Strategies

a. Programs should have an educational component that informs the public about population viability objectives and management approaches.

b. Programs should place priority on addressing the most important risk factors for the geographic bear populations that fail to meet minimum viability criteria.

c. Addressing the specific limiting factors in each Viability Region, use a combination of appropriate approaches (e.g., interagency coordination, regulations, education, habitat management, establishment of sanctuaries) to implement management programs.

d. Through research and monitoring activities, determine the efficacy of implemented management programs to achieve or maintain the long-term viability of black bear populations in each Viability Region.

e. Modify programs to improve efficacy in achieving and/or maintaining the long-term viability of black bear populations in each Viability Region.

f. As necessary, raise public tolerance (i.e., raise CCC) to establish minimum viable populations.

Goal 2 - Population and Cultural Carrying Capacity (CCC)

Manage and maintain current and projected bear populations at levels adaptable to a changing CCC (e.g. land use, property concerns, economics, recreational opportunities).

- **The goal of maintaining or achieving long-term population viability (per Goal 1) should be of higher priority, even when CCC is exceeded.**
- **Both public attitudes and bear population size should be managed to meet current and projected bear CCC objectives.**
- **Bear management should be local.**
- **Maintain black bear populations while recognizing ecological considerations and balancing the needs of other species.**

The VDGIF mission of managing "*wildlife…to maintain optimum populations…to serve the needs of the Commonwealth*" requires knowledge about public values for Virginia's black bears. The combination of these public values is often considered in terms of cultural carrying capacity (CCC). CCC is the maximum number of bears in an area that is acceptable to the human population. The CCC is a function of the human tolerance to bears and the benefits people derive from bears. It is different for each constituency, location, and point in time. Ultimately, CCC involves a combination of social, economic, political, and biological perspectives. At CCC, the bear population is a balance of positive demands (e.g., recreation) with the negative demands (e.g., damage) for bears. The CCC level for bears generally occurs well below the biological carrying capacity (BCC); BCC is the maximum number of bears that a habitat can sustain over time. Bear populations should be managed to meet both population viability and CCC goals. While traditionally bear populations have been manipulated to meet CCC objectives, public attitudes (i.e., CCC desires) can also be changed to meet bear population levels. Public attitudes and perceptions often determine the success or failure of bear management. In the future, emphasis will need to be placed on effective public education to achieve bear population objectives and/or change public attitudes. For example, public tolerance (CCC) of bears could be increased with additional information and resources on how to coexist with bears.

Objective 1. To meet and maintain bear population objectives at current or potential cultural carrying capacity (CCC) in each Bear Management Zone (Figure 2) through 2021.

Management of black bear populations to achieve current or potential CCC should be done over the smallest area that is practical. In Virginia, 22 Bear Management Zones represent practical management units based on physiography, black bear populations, land use patterns, human population densities, land ownership, black bear biology, and resources available to manage bears.

Public values provide the foundation for determining CCC and the resulting proposed population objectives in each Zone. Bear population management objectives to meet the CCC are based on the balanced, albeit somewhat subjective, combination of public values expressed for bear-related recreation, nuisance concerns, and their role in the ecosystem.

CCC objectives in each Bear Management Zone meet one of three practical population targets. These population targets are to (1) increase the current bear population, (2) stabilize the bear population at the current level, or (3) decrease the current bear population. CCC population objectives are not necessarily related to the current population trends or even the relative population size. Instead, they are intended to simply reflect a balanced assessment of the Zone-wide public values. These public values (public population preferences, hunter population preferences, citizen tolerance for bears) and other available technical information that may influence public values (bear density indices, current nuisance problems, potential for future nuisance problems, human population densities, future development potential) were considered to evaluate CCC (Appendix C). Zones with similar sets of public values and technical characteristics (Appendix D) generally resulted in similar CCC population objectives. The specific CCC population objectives for each Zone in Virginia as of April 1, 2012 are shown in Figure 20. ***However, the Zone 5 population objective is less clear (either decrease or stabilize) and has not been finalized.***

Appropriate options to manage populations will be selected based on CCC objectives, viability status, and current population trends. Due to its efficacy, cost- effectiveness, tradition, and recreational value, regulated hunting will be a primary bear population management option. While regulated hunting is highly effective for controlling and managing bear populations (e.g., stabilizing or decreasing), conservative hunting seasons also are compatible with objectives to increase bear populations. Providing diverse forms of hunting opportunities is also an important bear-related recreational value. Slow growth through natural increases will be the preferred option to increase bear populations. Education and cooperation with large public landowners should be important strategies toward meeting CCC population management objectives.

While the CCC will provide Zone-wide population objective targets, the Zone objective will likely not be uniformly attained across the entire Zone. Site-specific needs for unique management concerns (e.g., nuisance issues around an urban area) might result in locally different hunting seasons and

population objectives compared to the rest of the Zone. However, attainment of the Zone–wide CCC objective will be based on population indices from across the entire Zone and will determine the general population management program and hunting seasons.

INPUT NEEDED: Zone 5 bear population objectives have not been clarified. Public input is needed for all zones, but especially for Zone 5. The current proposal for Zone 5 is either:

- DECREASE the current bear population OR
- STABILIZE at current bear population levels

See text below for zone-specific information

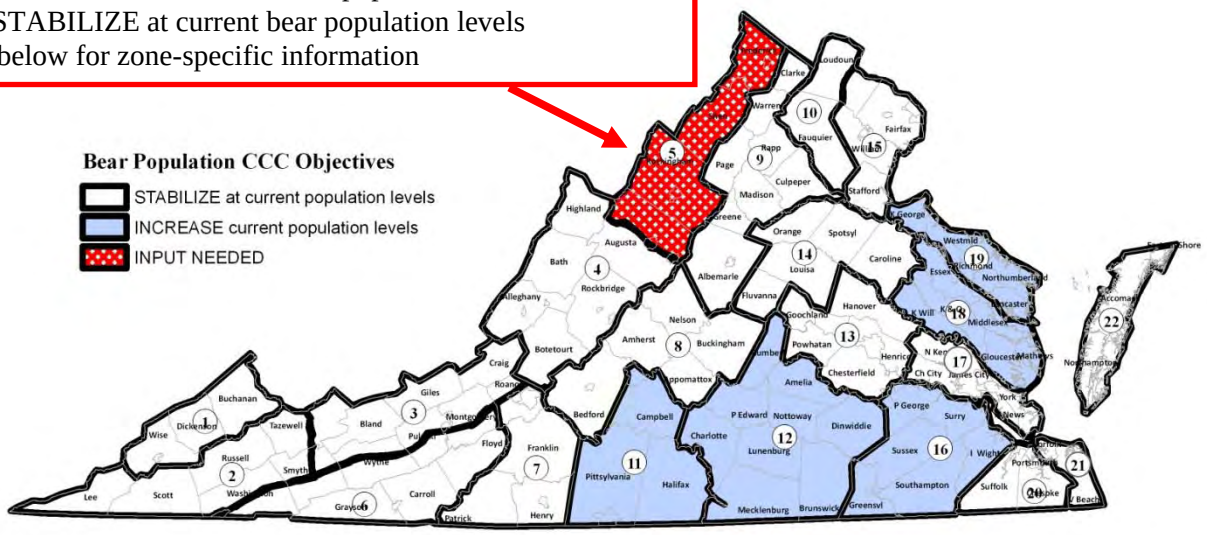


Figure 20. Bear population CCC objectives as of April 1, 2012.

The clear public preference based on surveys was to stabilize the bear population in all Zones (Appendix C). While the CCC represents a balance of the public values for bears, a comprehensive assessment of CCC should be based on more than the opinions of a public that is often unaware of the full spectrum of values and concerns associated with bears. Considering multiple perspectives, the general rationales for the specific population objectives in each Zone are:

<u>Zones 1, 2, 3, and 6 (Stabilize)</u>:

- Bear populations in these heavily forested Zones have generally achieved increasing population objectives over the last 10 years.
- Concurrent with the population growth, nuisance activity has also increased to levels found in the northern mountain Zones.
- The Zones 1, 3, and 6 bear complaint rates are currently among the highest in the state as bear population levels are higher than they have been since the historical population declines
- Human populations are relatively low in these Zones and human populations are not projected to increase, and may decrease over the next 10 years.
- Hunters expressed an equal desire for stabilizing populations and increasing bear populations except for Zone 6 where hunters expressed a stronger tendency for wanting increased populations.
- Human tolerance for bears is relatively high in these Zones, with the most tolerance in Zone 2.
- As humans become more accustomed to the increased bear populations in Zones 1, 2, 3, and 6, CCC is expected to increase.
- Although there is relatively little vulnerable agriculture, agriculture nuisance is relatively higher in Zones 2 and 3.

Zone 4 (Stabilize):

- Bear populations in this Zone have continued to grow over the last 10 years, despite stabilization objectives.
- Bear populations are relatively high compared to other areas of Virginia.
- Despite the population growth, bear densities are moderate and similar to Zone 3.
- Although hunters tend to be equally divided with their preference for stable or increasing populations in almost every Zone, only Zones 4 and 5 among the western Zones exhibited a clear hunter preference to stabilize bear populations. In contrast to Zone 5 hunter opinions, Zone 4 hunters who wanted a change in population size exhibited a tendency for an increase in population size.
- The human tolerance for bears in Zone 4 is one of the relatively highest in the state.
- Residential nuisance concerns are also some of the highest in the state.
- The human population in Zone 4 is relatively low with half the Zone projected to lose human population density in the next 5 years.
- Even with relatively little vulnerable agriculture, agricultural bear nuisance incidences are higher than adjacent Zones 5 and 8.
- Supporting the same stabilization objective, the preference, population, nuisance, and land-use data in Zone 4 are very similar to those found in Zones 2 and 3.

Zone 5 (Decrease or Stabilize INPUT NEEDED):

- Despite objectives to stabilize the population, bear populations in this Zone have continued to grow over the last 10 years.
- Compared to other areas of Virginia, bear populations and residential nuisance activity in this Zone are among the highest in the state.
- Although hunters tend to be equally divided with their preference for stable or increasing populations in almost every Zone, only Zones 4 and 5 among the western Zones exhibited a clear hunter preference to stabilize bear populations. In contrast to Zone 4 hunter opinions, Zone 5 hunters who wanted a change in population size exhibited no difference in the number who wanted an increase versus decrease.
- Human tolerance for bears in Zone 5 is comparable to Zone 4 and is highest in the state.
- Vulnerable agricultural crops (e.g., corn, orchards) are the highest in western Virginia (>4% of the land area) and comparable to Zones in eastern Virginia although the number of agricultural nuisance complaints are relatively low.
- The preference, population, nuisance, and land-use data in Zone 5 are most uniquely different compared to all the other Zones.
- The human population is higher in Zone 5 than Zone 4 and is projected to grow over the next 5 years.
- Among the zones with high bear populations, Zone 5 was the only zone with a public tendency for decreasing the bear population (although as with all Zones, the strongest public preference was still for stabilization). This is in contrast to neighboring Zones 4 and 9 that have no public tendency for either increasing or decreasing the bear population.

Zones 7 (Stabilize):

- Bear populations are currently relatively low compared to other areas of western Virginia.
- Public tolerance is similar to Zone 6, relatively high.
- Bear populations are stable, meeting population objectives over the last 10 years.

- Human population is moderate and agriculture (with row crops) seems to be particularly susceptible to bear damage.
- Residential bear complaints are relatively low.
- Despite hunter preferences for continued population growth, stable bear populations at relatively low levels may be most compatible with existing and projected land use.

Zones 8 (Stabilize):

- Despite objectives to stabilize the population, bear populations in this Zone have continued to grow over the last 10 years.
- Increasing and expanding bear populations in the eastern counties (Buckingham and Appomattox) have generated additional nuisance concerns.
- Nuisance concerns also exist for the urban areas around Lynchburg.
- Both the public (to some degree) and hunters express preferences for higher population and public tolerance is very high.
- Human population is relatively low but expected to increase over the next five years.
- While the bear population is not large, it is greater and has more nuisance issues than its most similar Zone (Zone 12, increase objective)

Zones 9 (Stabilize):

- Influenced by the proximity of Shenandoah National Park, bear populations in Zone 9 are among the highest in the state.
- Although human populations are not very high, there are projected Zone-wide increases over the next five years.
- Although existing row crops and orchards in this Zone experience the greatest rate of damage in the state, the area has a relative low composition of these crops (1.6% of the land area).
- Hunters are split between increasing populations and keeping them at current levels.
- Human tolerance is very high in this Zone and comparable to the adjacent Zones 4, 5, and 8.
- Population objectives to stabilize this population over the last 10 years have been achieved.

Zone 10 and 20 (Stabilize):

- Relatively low Zone-wide bear populations in Zones 10 and 20 are associated with or near high bear population areas of Zone 9 (including Shenandoah National Park) and the Great Dismal Swamp National Wildlife Refuge (GDSNWR), respectively.
- Current human population densities are relatively high with projections for continued strong population growth and development in these areas.
- Especially adjacent to the GDSNWR, significant agricultural damage and other nuisance concerns can occur.
- Stabilizing bear populations will help curb the increasing human-bear problems while providing continued non-hunting and hunting recreation.

Zones 11, 12, and 16 (Increase):

- Bear populations are currently very low compared to other areas of Virginia.
- Natural and cultivated forests provide sufficient habitat for larger bear populations.
- Human populations and development are relatively limited.
- Although there are more abundant crop acres in Zone 16, the relative nuisance and crop damage concerns are limited.
- Although slightly more common in Zone 11, current agricultural problems are very rare.
- Increased bear populations in these Zones may provide a link between the mountains and the Great Dismal Swamp populations.

- Additional non-hunting and hunting recreational demands in these Zones may be realized with an increase in bear populations.
- Within Zone 16, tolerance is lower than Zones 11 and 12 but education would be expected to improve tolerances for bears in the area.

Zones 13, 14, 15, 17, and 21 (Stabilize):

- Bear populations are currently very low (with only infrequent occurrences) compared to other areas of Virginia.
- Human tolerance in Zones 13, 17, and 15 is the lowest in the state. Although tolerance is higher in Zones 14 and 21, these Zones contain areas with very high human densities.
- Human population densities are the highest in the state, especially in Zones 15 and 21.
- Projections are strong for continued future human growth and development in these Zones, especially along the I-95 and I-64 corridors.
- Only infrequent occurrences of bears in these urbanized Zones can be compatible with the limited habitat availability and public tolerances.
- Bear populations should be stabilized at the very low to non-existent populations that currently exist in these Zones

Zones 18 and 19 (Increase):

- Although ample habitat exists, current bear populations are very low with only infrequent occurrences.
- Human population densities are also very low and comparable to the low densities found in the western mountain Zones.
- Ranking just behind the Eastern Shore (Zone 22), these Zones have the highest percent of the landscape in bear-vulnerable cropland (primarily corn); approximately 7% in Zone 18 and 8% in Zone 19. No agricultural nuisance issues currently exist.
- Especially in Zone 19, expected public tolerance for higher bear populations is relatively high and similar to the high-tolerance areas of the western mountain Zones. Education within Zone 18 would be expected to also improve tolerances for bears in the area.
- Higher bear populations in these Zones would provide currently missing non-hunting and hunting recreational opportunities for citizens.
- Higher bear populations would add a missing component to the natural communities of the Northern Neck and Middle Peninsula.
- An increase in bear populations would be expected to occur very slowly because of landscape level barriers to movement; repopulating bears would need to pass through Zones of high human use and major traffic corridors along I-95 and I-64.

Zone 22 (Stabilize):

- Bear populations are non-existent on the Eastern Shore.
- For bears to populate the Eastern Shore naturally, they would need to travel down the Delmarva Peninsula from other source populations (e.g., in New Jersey). A rare wandering bear was trapped in April 2009 on Maryland's Eastern Shore.
- Although human population density is relatively low, there is substantial agriculture (nearly 10% of the land is in corn).
- Until natural restoration prospects improve (which is unlikely), no effort is recommended to increase bear populations in this Zone.

Potential Strategies

a. Where it is necessary to control or reduce bear population numbers, regulated hunting will be the primary population management option.

b. Where hunting is inappropriate, other management options will be used to control bear populations to reach the CCC objective (e.g., trapping and removal)

c. Population growth objectives will be attained through a natural increase in bear populations, in most cases bears will not be moved from one zone to another for the purpose of population increases.

d. Cooperate with Shenandoah National Park, the USFS, and the Great Dismal Swamp National Wildlife Refuge to meet the CCC objectives of adjacent land ownerships through implementation of appropriate population management programs (e.g., habitat management, hunting, other options).

e. Through research and monitoring activities, determine the efficacy of implemented management programs to achieve Zone-specific CCC objectives for increasing, decreasing, or stabilizing bear populations.

f. Identify limiting factors to meeting population objectives (hunting seasons, habitat, agriculture, etc.)

Objective 2. Assess and update bear population CCC objectives in each Zone through 2021.

As bear populations, land use, human populations, and recreational values change, so will the public acceptance of bears. The CCC may be constantly changing over time within any management Zone. Therefore, the CCC objectives need to be updated periodically to ensure that population management programs respond to changes in public demands for bears.

Potential Strategies

a. Based on social, economic, political, and biological perspectives develop methods to determine CCC in all Zones. Use a variety of public involvement techniques (e.g., focus groups, surveys, public meetings, local government coordination) to include input from all segments of Virginia's population.

b. Develop more objective techniques to determine CCC objectives and anticipated future changes.

Objective 3. In areas that have potential for conflict with the Zone objective (e.g., Zones 5, Zone 16, Zone 18, urban areas adjacent to established bear populations), change CCC to be consistent with population objectives through 2021.

Certain Zone population CCC objectives may create local issues. For example, Zone 5 (if determined that the objective will be to decrease) would be the first area in Virginia with a decrease population objective, which may conflict with bear hunter desires. Conversely, Zones 16 and 18 have increase objectives that may ultimately lead to site-specific challenges with agricultural producers or urban/suburban residents. In areas where bear population objectives may exceed current levels of CCC, attainment of bear population objectives may depend on raising the CCC. Increased knowledge and better understanding of black bears could lead to increased public tolerance of bears and raise CCC to match the population objective.

Potential Strategies:

a. In Zones with increase objectives that might meet exceed current CCC desires, foster an understanding of how to coexist with bears and increase acceptance of growing bear populations (raise CCC) through public education. Public education should accompany/precede attainment of population objectives.

b. In any Zones with a decrease objective, educate hunters and the public about the decrease bear objective.

c. Identify and target key stakeholders with large influences on public opinion.

d. Monitor attitude changes over time through surveys that target the public, hunters, public officials, etc.

e. Conduct research that identifies how public tolerance (CCC) interacts with bear population viability criteria. Research considerations should include land use, human density and distribution, bear density and distribution, nuisance management responses, and level of public education.

f. Research may involve field components to understand bear behavior in proximity to humans, assessment of public demands and satisfactions, and surveys of areas with frequent bear/human interactions.

Objective 4. To develop or continue management programs for local bear management areas within the larger management Zones through 2021.

While a Zone-wide CCC will provide Zone-wide population objective targets, it does not mean that the Zone objective will be uniformly attained across the entire Zone. Site-specific management needs for unique concerns (e.g., nuisance issues around an urban area) might result in locally different hunting seasons and population objectives compared to the rest of the Zone. However, attainment of the Zone–wide CCC objective will be based on population indices from across the entire Zone and will determine the general population management program and hunting seasons.

Regulations on bear hunting are designed purposefully to apply to large areas with similar population characteristics (i.e., Bear Management Zones), be as simple and uniform as possible, and avoid confusion. Because habitats, densities, hunter pressures, human-bear problems, and public demands (CCC) are not exactly the same over entire Management Zones, regulations encompassing these broad areas may be either too conservative or too liberal at specific sites within Zones.

To meet the unique management needs and challenges in such areas, alternative site-specific management regulations (e.g., urban vs. rural areas, high human population) and programs must be developed and implemented. Local bear management areas may include refuges; state parks and forests; cities, towns, and developed sections of counties; resorts and planned communities; industrial or utility developments; military installations; government research facilities; airports; agricultural areas; and any other areas that merit bear population management assistance beyond that provided on a Zone-wide basis (e.g., hunting regulations).

Potential Strategies

a. Educate the public about the need for local bear population management.

b. Consider smaller units of management for site-specific management of bear populations through regulated hunting seasons or targeted non-lethal management programs.

c. Encourage the management of and reduce bear-related attractants that unnaturally draw bears into high human density areas by providing technical assistance to communities.

d. Develop and maintain programs for site-specific management of bears (e.g., BPOP, kill permits).

Objective 5. Determine the relationship between bear and deer populations in National Forest and mountainous areas of Virginia by 1/1/2018.

While generally bears do not have significant impacts on other species of flora and fauna, there are some situations where impacts may occur. Especially in marginal habitats, a few studies have suggested that bears may negatively impact ungulate populations. Recent concerns about deer population levels in National Forest areas of Virginia have implicated several potential factors including habitat issues (e.g., lack of timber management) and predator impacts (e.g., coyote, bears).

Potential Strategies

a. Conduct research and develop methods to assess and monitor the impacts of bears on deer populations in high bear density/low deer density areas.

HABITAT

Goal 3 - Habitat Conservation and Management

Manage and conserve black bear habitat in Virginia consistent with long-term bear population objectives, with emphasis on areas of special significance (e.g., areas with source populations and habitat linkages) considering potential habitat changes, and potential human-bear interactions. Conservation may consist of habitat management or protection and the benefit of multiple species.

Because habitat provides the essential requirements for life, availability of suitable habitat is key to managing black bears to meet specific population viability and CCC objectives. Habitat management practices that affect habitat diversity, forest succession, land use, and habitat connectivity will have major influences on bear population levels and human-bear problems. To the extent that habitat management promotes habitat diversity and productivity, in terms of available natural foods, bears should benefit. However, management practices that limit diversity or productivity are generally considered detrimental to bears. A primary component for promotion of beneficial habitat practices, especially on large tracks of public land (USFS), is the need for public education about the importance of active forest management to accomplish habitat goals for bears.

Objective 1. To refine specific bear habitat quality and associated habitat needs (e.g., amount, composition, linkages, diversity) that meet minimum population viability criteria for black bear populations through 2021.

The estimated minimum area needed to support a bear population (about 80,000 acres for forested wetlands or 200,000 acres for forested uplands) is a generalization for the Southeast and only based on

observational information. These estimates may not be representative of habitat conditions across Virginia's diverse physiographic provinces. Therefore, physiographic differences in habitat quality need to be recognized to refine the regional habitat requirements that achieve minimum population viability criteria and CCC objectives.

Potential Strategies

a. Determine geographic differences in habitat across Virginia (related to BCC and minimum population size).

b. Determine when habitat becomes a limiting factor in suburban areas.

c. Determine impact of habitat changes (e.g., loss of corridors, expanding human population) on bear populations.

Objective 2. To ensure habitat requirements meet minimum bear population viability criteria in each of the eight Viability Regions for black bear populations through 2021.

Minimum bear habitat requirements consist of adequate food supplies, forest blocks that meet home range needs, and connectivity to large blocks of forestland that serve as population sources. Studies of viable black bear populations within the Southeast suggest that the minimum area needed to support a bear population is about 80,000 acres for forested wetlands or 200,000 acres for forested uplands. Furthermore, optimal habitat contains important components such as managed forest dominated by hardwoods containing a variety of mast producing tree and shrub species intermixed with early successional habitat types and vegetation. Extensive, rugged terrain with dense thickets, swamps, bays, or rock outcrops, upland or swampland thickets or areas of dense vegetation are important for escape cover and enough area to travel having with minimal human contact. The most important element of escape cover is protection from people, dogs, and off-road vehicles. Conservation of corridors and habitat linkages are important, especially for bear populations where habitat fragmentation is a concern (e.g., Great Dismal Swamp). Monitoring the status of bear habitat, working with a diversity of land ownerships and organizations to manage habitats, and educating the public of the importance of these critical habitat types, will be important to meeting population objectives.

Potential Strategies

a. Modify minimum viability criteria, as minimum habitat needs are refined.

b. Determine where habitats fail to meet minimum population viability criteria and cultural carrying capacity objectives.

c. Monitor changes in bear habitats (size and quality) for the 8 Viability Regions. Monitoring habitat changes may include use of Landsat Imagery, aerial photography, existing GIS information, Continuous Forest Inventory data, forest stand information, and specific field data.

d. Consistent with population viability priorities and CCC objectives, maintain and/or establish connectivity and corridors among forested habitats in all areas of Virginia (with special emphasis around the Dismal Swamp) through acquisitions, easements, municipal planning coordination, etc.

e. Actively promote and implement habitat management practices on all lands (public & private) that are consistent with population viability and CCC objectives.

f. Support public land habitat management that manipulates vegetation to meet bear management objectives. These lands include U.S. Forest Service, Virginia Department of Game & Inland Fisheries, State Parks, State Forests, Shenandoah National Park, Great Dismal Swamp National Wildlife Refuge, and military installations.

g. Work with governmental (e.g., county, state, federal) and non-governmental (e.g., The Nature Conservancy, National Wild Turkey Federation) organizations to preserve forest habitat integrity in areas associated with human population growth/development and in other areas where habitat minimums are not met.

h. Within each Viability Region, evaluate the feasibility, costs, and benefits of establishing sanctuaries, or areas with little to no hunting pressure, especially in areas of Virginia with little public land.

BEAR-RELATED RECREATION

Goal 4 – Recreational Opportunities

Provide and promote a diversity of bear-related recreational opportunities (e.g., hunting for recreation and population management, nonhunting) based on education and information that minimize negative human-bear interactions, encourage outdoor experiences, and promote keeping bears wild. Recreational opportunities should not support activities that prevent attainment of black bear population objectives.

Black bears are popular among wildlife watchers, hunters, and the general public. Wildlife watching activities (e.g., observing, feeding, photographing) provide recreational opportunities to Virginia citizens. Wildlife watching participants during 2010 made up 81% of all wildlife-associated recreation in Virginia followed by fishing (30%) and hunting (14%); 68% of Virginia residents felt seeing a bear was important to their wildlife viewing experience. Over 2,126,000 Virginia residents participated in some type of wildlife watching activity in Virginia in 2006 with related expenditures of over $531,000,000. During 1999, black bears were second only to eagles and hawks as the animals Virginians are most interested in taking a trip to see. Non-hunting recreational opportunities to enjoy bears in their natural habitats, under conditions that foster education about bears, should be available to Virginia citizens.

Carefully managed hunting of black bears provides a variety of recreational experiences, and is compatible with maintaining viable bear populations. During the 2009-10 bear season, more than 25,000 Virginia bear hunters spent 165,000 days afield hunting bears. The impacts of hunting on bear populations are controlled by manipulating the magnitude, sex composition, and age composition of the harvest through the regulation of season length, season timing, and legal methods of take. Popular hunting methods during seasons for archery, muzzleloader, firearms without dogs, firearms with dogs, and bear-dog training (a non-harvest season) provide a diversity of distinct hunting satisfactions and experiences. As the major source of black bear mortality, hunting has also been an important, cost-effective tool for managing bear populations. As a population management tool, regulated hunting may provide recreational benefits under all population management objectives (e.g., increase, stabilize, decrease). Public and hunter awareness of this important dual role of regulated hunting will be critical to successful bear management in the future.

Bear-related recreational opportunities should not foster opportunities for negative human-bear situations (e.g., viewing of bears at garbage dumps, artificial feeding sites). Bear-related recreational activities should also occur outdoors to promote an accurate understanding of bears in natural environments.

Objective 1. To determine non-hunting demands/desires and satisfactions for bear recreation by 1/1/2017.

Non-hunting recreational demands/desires for bears are poorly understood. While the demand to view bears is high, satisfactory approaches to these viewing opportunities are unknown. A better understanding of satisfactions and tailoring opportunities to focus on those satisfactions would enhance non-hunting recreational benefits.

Potential Strategies

a. Survey Virginia citizens regarding non-hunting recreational satisfactions and demands. Considered recreational demands should include watching opportunities, access to information and education, existence values, and photography. Obtain further details about results from existing surveys. For example, determine the type of bear watching opportunities that are preferred by the public.

b. Evaluate constraints to participation in non-hunting recreation.

Objective 2. Inform the public about non-hunting recreational opportunities through 2021.

Information should address the non-hunting recreational demands of Virginia's citizens. Non-hunting recreational opportunities should minimize negative human-bear interactions while concentrating on recreation in natural habitats and educational messages. Surveys to monitor changing levels of satisfactions and awareness about bears will need to be developed.

Potential Strategies

a. Prioritize programs based on demands expressed by Virginia citizens.

b. Develop and/or promote educational programs on black bear biology, management, and human-bear interactions in Virginia. Educational approaches may involve coordination with other organizations, public dissemination of information through brochures, videotapes, slide programs, computer programs, web page devoted to black bears, and school programs consistent with the Standards of Learning.

c. Educate public about non-hunting bear-related recreational opportunities by identifying areas for photographic and bear watching opportunities where people can enjoy bears in their natural habitats. These opportunities should focus on safety and maintaining wild bear behaviors. Programs might focus on information about where to find bears, identification of bear sign, and bear behavior.

d. Utilize surveys to monitor changing levels of non-hunting recreation satisfactions, awareness about black bears, and impact of non-hunting recreational programs.

e. Ensure that bear viewing and photography activities do not facilitate human-bear conflicts.

Objective 3. To determine black bear hunter satisfactions (distinct qualities associated with hunting methods) and constraints to hunting participation in Virginia by 1/1/2016.

Individuals hunt for many reasons which make up a set of distinct satisfactions (e.g., for companionship, seeing bears, being close to nature, to test their skills, for the challenge, to obtain meat, to work with dogs), but specific information on bear hunter satisfactions is limited, especially for Virginia. Recreational benefits would be enhanced by a better understanding of hunter satisfactions and tailoring hunting opportunities to focus on those satisfactions. A better understanding of constraints (e.g., access, free time, cost) could help explain changes in hunter effort. A better understanding would be used to design hunting programs that maximize recreational satisfactions, minimize constraints to hunting participation, and achieve participation objectives.

Potential Strategies

a. Determine desirable attributes of quality bear hunting experiences (e.g., hunter density, specific characteristics of and demand for quality bears, access needs, etc.), and the relative importance and sensitivity of bear hunting satisfactions as they relate to the overall recreational experience.

b. Determine constraints to bear hunting participation and enjoyment. Potential constraints should include considerations for access on public and private land, season frameworks, interference with other hunters, and other sociological and economic factors.

c. Evaluate landowner (public and private) constraints to allowing access to bear hunters on their properties.

d. Implement programs that that maximize recreational satisfactions, minimize constraints to hunting participation, and achieve participation objectives by providing diverse bear hunting experiences and opportunities to satisfy varied demands by bear hunters.

e. Educate public about different hunting opportunities that satisfy different recreational satisfactions.

f. If hunting access is a limiting factor, foster cooperation between hunters and landowners who experience bear damage.

Objective 4. Consistent with black bear population objectives, to maintain diverse recreational bear hunting satisfactions from archery, muzzleloader, firearms without the use of dogs, firearms with the use of dogs, and bear-dog training seasons through 2021.

Following the downward trend of all hunting participation in Virginia, the number of bear hunters and hunting effort has declined since the 1970s although both numbers of bear hunters and the bear hunter effort has been relatively stable since the 1990s. The dynamics in hunter participation is the result of a complex array of factors involving changes in societal values, demographics, economics, leisure time, and other recreational opportunities. The effect that recreational hunting and bear management programs can have on hunter participation is unknown (i.e., sociological conditions may have the greatest influence on hunting trends). Black bears in Virginia have expanded their range well beyond the areas that have been traditionally hunted. This growing bear population provides new opportunities for hunting recreation that are consistent with all population objectives. Bear populations may continue to increase as recreational hunting is carefully implemented. Additional recreational hunting programs in parts of the state with expanding populations will generate more information on population status and may provide some necessary relief to growing nuisance concerns. When population control eventually becomes necessary, established hunting programs will already be in place as a population management option.

Potential Strategies

a. Monitor hunting effort in Virginia by developing and implementing accurate measures of effort by different black bear hunting methods.

b. Maintain hunting recreation quality by preserving diverse types of hunting opportunities.

c. Establish population criteria (based on indices of population size, distribution, population trends, and demographic characteristics) for managing (e.g., initiating, expanding, and shortening) bear hunting seasons to meet black bear population objectives.

d. Ensure that hunting is not impacting the attainment of population objectives by monitoring the harvest and status of black bear populations (e.g., population size, distribution, population trends, demographic characteristics).

e. Consistent with population management objectives, propose to open new bear hunting opportunities in eligible counties based on established population criteria.

Objective 5. Identify and manage for appropriate allocation of hunting opportunities among hunting methods by 1/1/2014.

Allocation of hunting opportunities and harvest is an ongoing issue with constituents including hunter groups and the public. There are diverse and sometimes conflicting interests in values, satisfactions, and seasons associated with different methods of hunting. In order to optimally provide diverse hunting opportunities and satisfactions, identification of the appropriate allocation of seasons and harvests are necessary.

Potential Strategies:

a. Identify stakeholders representing diverse interests in different forms of bear hunting (e.g., archery hunters, hound hunters) and those stakeholders impacted by bear hunting (e.g., landowners).

b. Determine stakeholder issues through surveys, meetings, etc.

c. Reach an agreement among stakeholders as to the appropriate allocation of hunting seasons.

d. Establish hunting regulations to meet allocation goals.

Objective 6. To develop and promote recreational programs and regulations that keep bears from being habituated to humans or human related food sources through 2021.

Bear-related recreation exists in many forms from watching bears perform human-like tricks in a circus (e.g., riding a bicycle) to hunting bears in remote wilderness areas. Promoting recreation that keeps bears wild implies the importance of enjoying bears in a natural setting while minimizing the habituation of bears to humans and human activities. Food-rewarded interactions (from intentional or inadvertent feeding) with humans are a primary factor in changing bear behavior that leads to

habituation. Public education will play an important role in keeping bears wild while enjoying bear-related recreation.

Potential Strategies

a. Provide directed education and technical assistance about techniques for bear-related recreation in natural environments that reduce negative human bear interactions. Educational programs should include information about avoiding interactions that lead to habituation of bears to people and how to interpret bear behavior.

b. Maintain and enforce current regulations that prohibit the intentional or inadvertent feeding of bears.

c. Regulate the feeding of other wildlife food substances that attract bears.

d. Maintain and enforce current laws prohibiting the private ownership of bears in Virginia

Goal 5 - Ethics of Bear-Related Recreation

Ensure that black bear-related recreation (hunting and non-hunting) methods in Virginia are fair, safe, sportsmanlike, humane, ethical, and legal and that those methods are consistent with and respect the rights of private property owners and other Virginia citizens. Harvested bears should be utilized.

Under some circumstances, bear hunting or non-hunting bear-related recreational activities may create conflicts with landowners, other hunters, other outdoor recreationists, motorists, and other citizens. Black bear hunting (especially with the use of dogs) is documented as a controversial issue. Perhaps the most contentious issues involve public concerns about fair chase and the ethics of certain hunting methods (e.g., the use of technology, hounds, archery equipment, high-powered rifles). These issues are concerns for both hunters, the non-hunting public, and bear managers. Additional public and landowner concerns may also focus on trespassing, road hunting, the welfare of hunting dogs, and other issues related to hunting bears with dogs have increased in recent decades. Further, certain forms of bear hunting may not be acceptable in or near urban areas due to concerns for human safety and privacy. The future of bear hunting for population management, damage control, and recreational benefits depends on its compatibility with Virginia's citizens. Therefore, it is important that bear hunting activities be conducted in a manner that respects the concerns of landowners and other Virginia citizens.

Objective 1. To identify, describe, and document bear hunting activities (e.g., when, where, type of hunting) that result in conflicts with landowners and other Virginia citizens by 1/1/2015.

A thorough understanding of the bear hunting practices that may infringe on the rights of others is an important first step toward resolving conflicts. Surveys should focus on when, where, and the type of hunting that creates problems. From this information, possible solutions may be identified.

Potential Strategies

a. Use existing hunter and public surveys in addition to new survey instruments to question landowners, outdoor recreationists, resource professionals (e.g., law enforcement officers, biologists), and other potentially affected citizens about negative aspects of bear hunting and bear hunter behaviors.

b. Identify the bear hunting practices that create the greatest infringement on the rights of others. The determination of negative bear hunting practices should be based on the impact to landowners, outdoor recreationists, and other citizens.

c. Identify potential solutions to areas of greatest conflict.

Objective 2. Implement programs to reduce conflicts between bear hunting activities and other Virginia citizens (especially landowners) by at least 25% by 2021.

Bear hunting activities may create conflicts with landowners, other hunters, other outdoor recreationists, motorists, and other citizens. Although the potential for trespass exists for all forms of bear-related recreation, most incidents that are reported involve the use of dogs in hunting bears. Programs should be designed to educate bear hunters and concerned citizens about conflict resolutions. Potential solutions should consider both bear hunter recreation satisfactions and other citizen issues. Solutions should foster communication among bear hunters and concerned citizens as well as proffer appropriate regulations. A monitoring program for bear hunting conflicts will need to be developed.

Potential Strategies

a. Using a variety of techniques (e.g., workshops, brochures, popular articles, videos) inform and educate bear hunters, landowners, and other affected citizens about solutions to the most significant conflicts (e.g., what causes conflicts, where they occur, how to avoid them) .

b. Foster communication about concerns and solutions between bear hunters, landowners, and other affected citizens through conflict resolution strategies (e.g., workshops, focus groups). These strategies could be implemented at local, regional, and statewide levels.

c. As necessary, make regulation changes and enforce laws to ensure bear hunting does not infringe on the rights of landowners, and other affected citizens.

d. Implement a system to monitor changes in bear hunter conflicts with landowners and other affected citizens (possibly through landowner/citizen surveys).

Objective 3. To describe fair, sportsmanlike, humane, and ethical bear hunting methods (including utilization) and implement programs that ensure compliance with these methods by 1/1/2015.

The future of bear hunting will be affected significantly by public perception of bear hunters and bear hunting activities. Therefore, guidelines, regulations, and education pertaining to bear hunting should address concerns for ethics and fair chase. Based on a variety of input, fair and sportsmanlike hunting methods need to be clearly described. Management that addresses fair and sportsmanlike hunting methods should not unnecessarily limit the value of regulated hunting as a source of recreation and a population management tool. Programs should be designed to educate bear hunters and concerned citizens about fair and sportsmanlike bear hunting standards. Efforts should be made to ensure hunter compliance with these standards and to protect the hunting activities that conform to these standards. Utilization of harvested animals is a fundamental component of ethical hunting. Although the percentage of hunters who do not use any part of harvested bears is unknown, survey responses from hunters who had harvested bears have indicated that the most common use was for meat consumption (76%), followed by mounting (42%), tanning the hide (31%) preserving the skull (26%), and donating the meat (26%). A current regulation addresses wanton waste of game animals (4VAC15-40-250).

Potential Strategies

a. Consider a variety of sources to describe fair, sportsmanlike, humane, ethical black bear hunting methods.

b. Develop standards that define specific criteria and guidelines for fair, sportsmanlike, humane, and ethical bear hunting.

c. Evaluate sociological implications of hunting regulations to avoid regulation strategies that generate negative public perceptions jeopardizing the future of bear hunting and/or bear hunters.

d. Using a variety of techniques (e.g., workshops, brochures, popular articles, videos) inform and educate bear hunters, other hunters, and the general public about fair, sportsmanlike, humane, ethical bear hunting standards that ensure bear hunter compliance with behavior criteria and protect hunting activities that conform to these standards.

e. Use a variety of techniques (e.g. focus groups, surveys, task forces, public meetings) to balance fair, sportsmanlike, humane, and ethical values with the population management values associated with bear hunting.

f. Enforce laws that govern bear hunting activities (e.g., trespass, bag limits, methods) and maintain prohibition on the use of bait to hunt bears.

g. As necessary, make regulation and law changes to ensure the future of bear hunting in Virginia that follows fair, sportsmanlike, humane, and ethical methods.

h. Monitor hunter compliance with fair, sportsmanlike, humane, and ethical bear hunting standards using surveys and the incidence of law enforcement citations.

i. Ensure through regulation that weapon types used in bear hunting methods are adequate for dispatching an animal quickly with minimal chance of wounding an animal that can escape without being retrieved (minimize unrecovered crippling loss).

j. Promote the ecological and personal benefits of eating wild game through directed education campaigns.

Objective 4. To identify and manage non-hunting bear-related recreational activities that result in conflict with Virginia citizens by 1/1/2018.

Although there are over two million Virginians that participate in wildlife watching activities, the conflicts that occur as a result of these activities is not well understood or known. Determining the cause and extent of conflicts can determine solutions.

Potential Strategies

a. Use existing and new survey data to determine the type and extent of conflicts resulting from wildlife watching activities.

b. Educate non-hunting bear recreationists about trespassing, feeding of wildlife, and other potential conflicts with landowners and other citizens.

c. Maintain and enforce laws that prohibit feeding of bears and other wildlife that attract bears.

HUMAN-BEAR PROBLEMS

Goal 6 - Human-Bear Problems

Mitigate loss of personal property and income, and promote human safety while:

- **Attaining bear population and recreation objectives.**
- **Minimizing negative interactions by fostering sound, proactive management practices that keep bears wild.**
- **Ensuring consistent, shared public / agency responsibility for human-bear problems.**
- **Using hunting as the preferred method when lethal alternatives are required to manage problem bears.**

Bear management goals are not limited to achieving population objectives or providing hunting and non-hunting recreation for Virginia's citizens. Damage caused by black bears is diverse, including destruction of beehives, killing of livestock, foraging at garbage dumps, destroying crops (sweet corn, fruit trees), feeding on grain at livestock feeders, damage to trees, and harassing campers. In residential areas, problems often center on damage to bird feeders, scavenged garbage cans and pet food, automobile accidents, and concerns over simple public sightings. With the combination of rural and urban environments in close proximity to bear habitat, any of these issues can occur almost anywhere in Virginia. Human-bear conflicts in Virginia have increased with growing populations of both bears and humans and these concerns need to be considered in conjunction with other population and recreation objectives.

Citizens, communities, local governments, VDGIF, and other agencies share responsibility in managing problems associated with bears having access to human associated food sources. While VDGIF has primary responsibility for managing bear populations (and therefore bear impacts) by providing opportunities and programs to control bear populations, the decisions and actions of landowners, community leaders, and other citizens directly influence the type of interactions people have with bears and the effectiveness of programs developed to address concerns and damage by bears. Citizen decisions about planting gardens or crops, maintaining beehives, feeding birds or other wildlife, leaving trash unsecured, hunting bears or allowing bears to be hunted, participating in community planning processes, etc. impact local bear movements and abundance, with consequences for themselves and their neighbors. Community leaders can influence human-bear interactions with policy decisions about bear proofing open dumpsites, enacting ordinances regarding bird feeding or trash management, involving and/or educating citizens, etc. An effective public information effort the influences public attitudes and perceptions will be critical to the future success of Virginia's bear management programs. This educational effort should be consistent especially among VDGIF staff, including biologists and law enforcement, by utilizing the best science and information available to inform individuals about bear biology and how best to prevent conflicts.

The lethal handling of problem black bears is a contentious issue. In Virginia, there is little support for killing bears that are involved in nuisance issues unless the bear is deemed a threat by VDGIF or has attacked a person without having been provoked. As provided by Virginia State Statute *§29.1-529. Killing of deer or bear damaging fruit trees, crops, livestock or personal property or creating a hazard to aircraft*, the VDGIF is authorized to permit owners or lessees of land where bear are causing commercial or personal property damage to kill bears. Frequency of kill permit issuance for agricultural and urban/residential damage has increased over the last decade.

<u>Objective 1.</u> To implement and review explicit and cost-effective response policies/guidelines that utilize both non-lethal and lethal options for managing bear complaints through 2021.

Standard, but flexible, nuisance response policies are necessary to clarify public and agency responsibilities for specific human-bear problems. The public usually prefers non-lethal options for managing bears. Nuisance management options generally should be restricted to managing bears in place (i.e., at the site of conflict). Non-lethal options should be encouraged and lethal solutions used as a last resort. Education should be an important component of human-bear problem management. Currently, VDGIF has standard operating procedures, Black Bear Capture Protocol, and written Nuisance Bear Guidelines. These guidelines are used as a template for human-bear conflict management across Virginia.

<u>Potential Strategies</u>

a. Revise and adopt cost-effective response policies/guidelines to address bear complaints. Revisions of the policy/guidelines should address:
    - A consistent, shared public / agency responsibility,
    - Keeping bears wild,
    - Input from affected individuals, municipalities, and government organizations,
    - Circumstances for lethal and non-lethal management applications,
    - The use of hunting as the preferred lethal management tool.

b. Determine how Nuisance Bear Guidelines apply to unusual/complicated situations like orphan cubs, bears in foxhound training preserves, etc.

c. Bears should be managed at the site where the conflict is occurring. Relocation of bears generally should not be used to manage nuisance situations unless relocation of bears is a desirable management strategy. Relocation of bears should remain an option for some special circumstances (e.g., some urban problems).

d. While non-lethal approaches are preferred (e.g., aversive conditioning, electric fencing, garbage management), both lethal and non-lethal options should be available for managing bear problems. Lethal options may be necessary when non-lethal options are ineffective or impractical.

e. Policies/guidelines should be flexible to allow affected individuals, landowners, and municipalities a range of choices in resolving conflict situations.

f. Policies/guidelines should provide explicit capture, treatment, and disposition guidelines for black bears that need to be handled.

g. Communicate and educate the public, municipalities, and state agencies about these policies/guidelines.

h. Policies/guidelines should identify and correct citizen actions that encourage bear problems (e.g., intentional feeding that habituates bears to people, poor garbage management).

<u>Objective 2.</u> Encourage and support effective nuisance bear management options to reduce negative human bear interactions through 2021.

The options to manage human-bear problems are poorly understood by the public. The significance of bear-related problems is related to the public misconception of danger, human inconveniences

incurred, the monetary value of losses and the public tolerance for these losses. Bear damage has not been quantitatively documented in Virginia, but is measured via specific damage assessments (e.g., field measurements, surveys, nuisance reporting) and the incidence of complaints. A better understanding of bear behavior, a reduction in economic losses due to human-bear problems and/or an increase in the public tolerance for deleterious bear activities would result in fewer concerns about the damage inflicted by bears. Public concerns about bear damage should be reduced primarily via educational and population management approaches. Monitoring changes in human-bear conflicts (e.g., economic losses, public complaints) will help direct management options specific to problem type throughout Virginia. Citizen satisfactions with response protocol outcomes will help assess the practical application of management options.

There is overwhelming support (85%) from Virginia residents for requiring people to use bear-resistant garbage containers in areas frequented by black bears. Additionally, 66% of Virginia residents say that they would be willing to pay about $10 more per month for 12 months for their trash service to defray the cost of being provided bear-resistant containers for their garbage. There is also overwhelming support (84%) among residents for requiring counties that are frequented by bears and that use open dumpsters to use bear-resistant dumpsters instead.

Potential Strategies

a. Provide directed education and technical assistance about techniques for preventing negative human-bear interactions

b. Via surveys, monitor satisfactions and changes in satisfactions with protocol outcomes by affected individuals, landowners, and municipalities.

c. Keep records on bear complaints, recommendations, and outcomes for analyses of methods. Records should be geo-referenced and should include the location of the attractant as well as the bear

d. Communicate with other states for information about successful bear management procedures.

e. Determine public satisfactions with methods used to manage damage concerns.

f. Monitor and evaluate trends in annual bear damage by type.

g. To prevent potential negative human-bear interactions from occurring, develop updated educational materials and outreach programs designed to inform the general public, landowners, and local governments about how to prevent and minimize conflicts.

h. Use recreational hunting to reduce human-bear problems.

i. Maintain and enforce current regulations that prohibit the intentional or inadvertent feeding of bears including the feeding of other wildlife food substances that attract bears.

j. Enforce 4VAC15-40-282 by requiring any entity (defined by *§1-230. Person*) with open dumpsters/ free access to garbage by bears to bear proof the trash attractant.

k. Maintain and enforce current laws prohibiting the private ownership of bears in Virginia

Objective 3. To identify, develop, and implement site-specific management options for unique bear management situations through 2021.

To be as simple and as consistent as possible, bear hunting regulations are uniformly established over large areas. While achieving population management objectives over a large area, area-wide hunting regulations sometimes may be too conservative, too liberal, or ineffective for some specific sites with unique management concerns. These specific sites may still require additional management strategies. Some of these unique situations may include human-bear problems in urban/suburban areas (e.g., Roanoke valley, Suffolk) and agricultural crops associated with large refuges (e.g., Shenandoah National Park, Great Dismal Swamp National Wildlife Refuge). Additional management strategies may include special hunting, kill permit, and education programs. To be successful, these unique management approaches will need additional proactive support (e.g., education, mediation assistance, endorsement) to mitigate other public concerns.

Potential Strategies:

a. Actively support site-specific bear management options through educational programs, conflict resolution techniques, and coordination among affected parties (e.g., neighboring landowners, recreational users).

b. Develop special hunting regulations or programs to address damage concerns for specific bear management concerns.

c. Evaluate the feasibility and desirability of special options that might be utilized for site-specific concerns.

Objective 4. Promote citizen initiatives that prevent negative human-bear interactions though 2021.

In conjunction with Agency-run educational programs and regulations that reinforce keeping bears wild, citizen initiatives (e.g., Wintergreen Bear Smart) have proven to be a success way to curtail existing problems with bears and prevent future problems.

Potential Strategies:

a. Attract and support (through education, supplies, guidelines, etc) communities that would like to start programs for the benefit of coexisting with bears/preventing negative interactions.

b. Survey communities in high bear density areas about the willingness to begin bear friendly communities.

c. Create model ordinances for communities to use as guidelines for reducing human-bear problems (e.g., trash, bird feeding).

Objective 5. To reduce the requests for out-of-season bear kill permits for agricultural bear damage by at least 50%, by 2016.

Virginia currently issues more bear kill permits than any other jurisdiction in the eastern states. However, the majority of Virginia residents (61%) oppose destroying a black bear that causes agricultural damage to crops or livestock and if a bear needed to be destroyed in this situation only 31% of Virginia residents thought it was acceptable for VDGIF to issue kill permits.

Potential Strategies

a. Use regulated hunting as the primary bear population damage management strategy.

b. Provide resources on and support the use of non-lethal alternatives for managing agricultural bear damage such as exclusionary devices, aversive conditioning, and or bear dogs.

c. Foster cooperation between hunters and landowners who experience bear damage.

d. Provide site-specific management programs.

e. Provide technical assistance to communities and landowners implementing bear management programs.

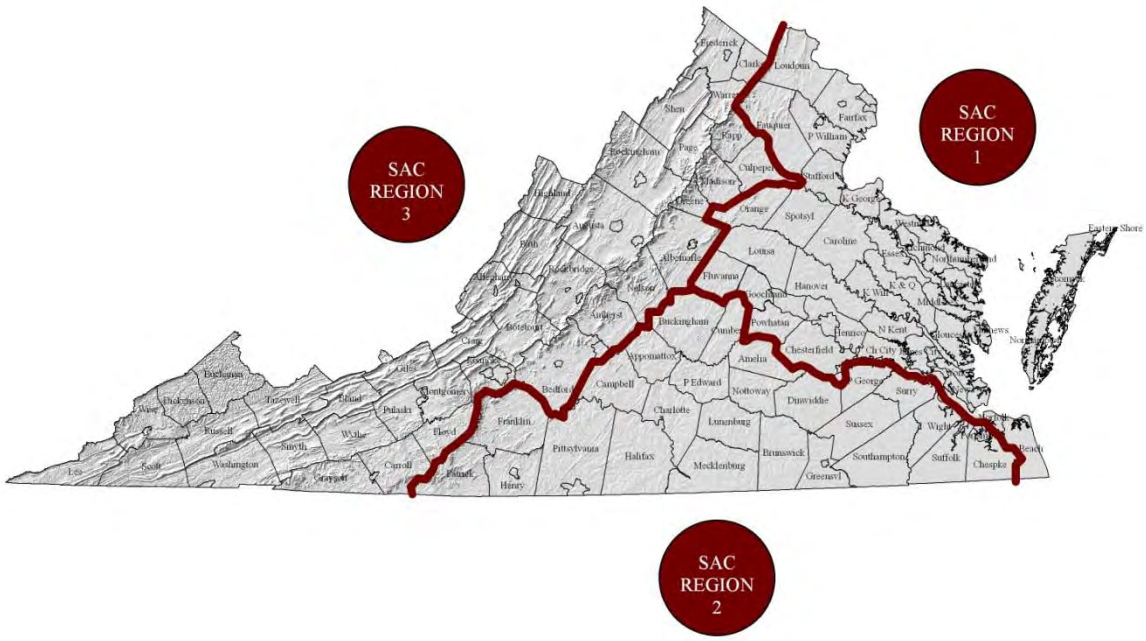
f. Develop educational materials for agricultural producers regarding bear damage abatement programs and techniques.

Appendix A. Members of the 3 Regional Stakeholder Advisory Committees (member / alternate). These individuals contributed significantly to the development of the Black Bear Management Plan. Participation in the Stakeholder Advisory Committees did not always constitute full agreement regarding all issues.

Name	**Interest/Organization**	**SAC Region**
Adele MacLean	Sierra Club/Falls of the James	1
Brian Gallagher	Central Virginia Beekeepers Association	1
Dave Burpee / Steve Richards	Virginia Bowhunters Association	1
Dave McCarthy / Ron Circe	Virginia Master Naturalist, Banshee Reeks Nature Preserve	1
Doug Graham	Department of Conservation and Recreation	1
Fred Kallmeyer*	Bull Run Mountain Civic Association	1
Herb Distefano	Virginia Association for Parks	1
Ken and Dale Pickin	Virginia Peninsula Sportsmen's Association	1
Kim Winter	Piedmont Environmental Council	1
Lt. Shawn Sears	Henrico Police Animal Protection Unit	1
Mary Arginteanu*	Richmond Audubon Society	1
Sheryl Winkler	Homeowner Human/Bear Problems	1
Tim Kidwell	Landowner	1
Tom Wood	Piedmont Biodiversity Stewardship Council	1
Bill Sgrinia	Virginia Recreation and Parks Society	2
Curtis Crump	Landowner/Hunter Trespass	2
David Hayes	Orchard Damage/Landowner	2
David Martin	Hunter	2
Don Schwab / Chris Lowie	USFWS Great Dismal Swamp National Wildlife Refuge	2
Este Fisher	Virginia Bear Hunters Association	2
Gary Heiser	Appomattox-Buckingham State Forest	2
Helen Warriner-Burke	Southside SPCA	2
Ralph Reynolds	Landowner	2
Stuart Bayne	Non- hound hunter/NRCS	2
Stuart Ward	Hunter	2
Annie Downing / Ken Landgraf	U.S. Forest Service	3
Bob Scott / Jim Kneas	Wintergreen Bear Smart	3
Buck Kline	Bow hunter / Virginia Department of Forestry	3
Dave McRuer / Miranda Sadar	The Wildlife Center of Virginia	3
Dave Mumaw	Isaac Walton League	3
David Shelor*	Landowner	3
David Steger	Virginia Bear Hunters Association	3
Eric Hubble	Roanoke County Animal Control	3
Jeb Wofford	Shenandoah National Park	3
Joe Parrish	Appalachian Trail Conservancy	3
Marshall Jones / Pam Owen	Rappahannock League for Environmental Protection	3
Matthew O'Quinn	Breaks Interstate Park	3
Richard Thompson	Farm Bureau/ Farmer	3

* SAC member/contributed and participated in 2001 BBMP process

Stakeholder Advisory Committee (SAC) Regions



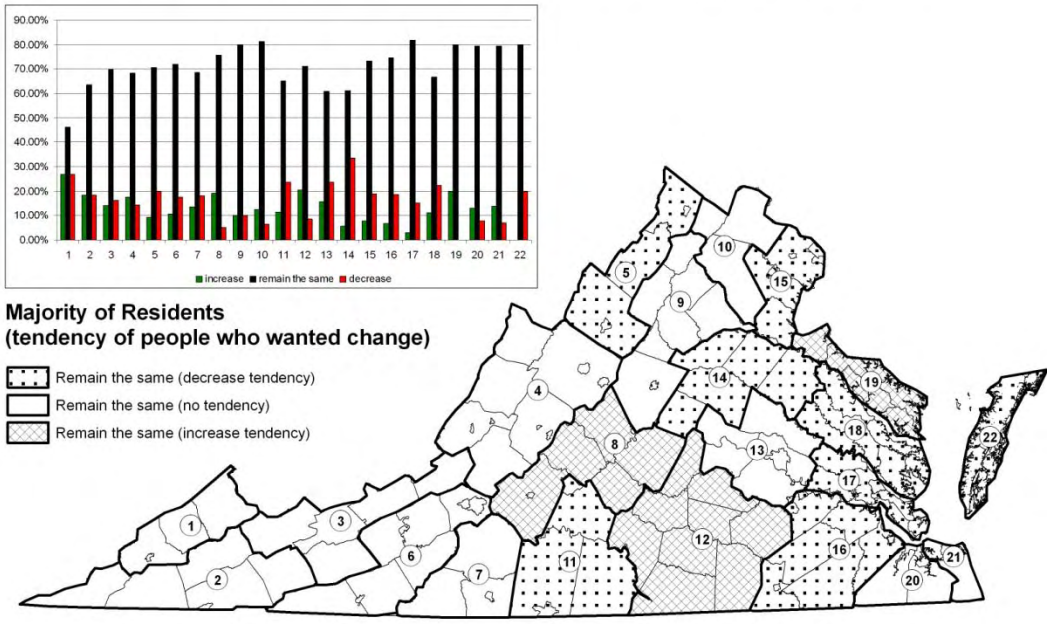
Appendix B. Members of the Black Bear Technical Committee, VDGIF staff that provided assistance during the planning process.

Name	Position
Aaron Proctor	Region 1District Biologist
Allen Boynton	Region 3 Terrestrial Wildlife Manager
Betsy Stinson	Region 3 District Biologist
Bob Ellis	Deputy director of the Bureau of Wildlife Resources
Cale Godfrey	Assistant Director of the Bureau of Wildlife Resources
David Kocka	Region 4 District Biologist
David Steffen	Forest Wildlife Program Manager/Science Team Leader
Glen Askins	Region 1 Terrestrial Wildlife Manager
Jaime Sajecki	Bear Project Leader
Jim Bowman	Region 2 Terrestrial Wildlife Manager
Nelson Lafon	Deer Project Leader
Todd Engelmeyer	Region 1District Biologist

Appendix C. CCC Indices for Determination of Population Objectives

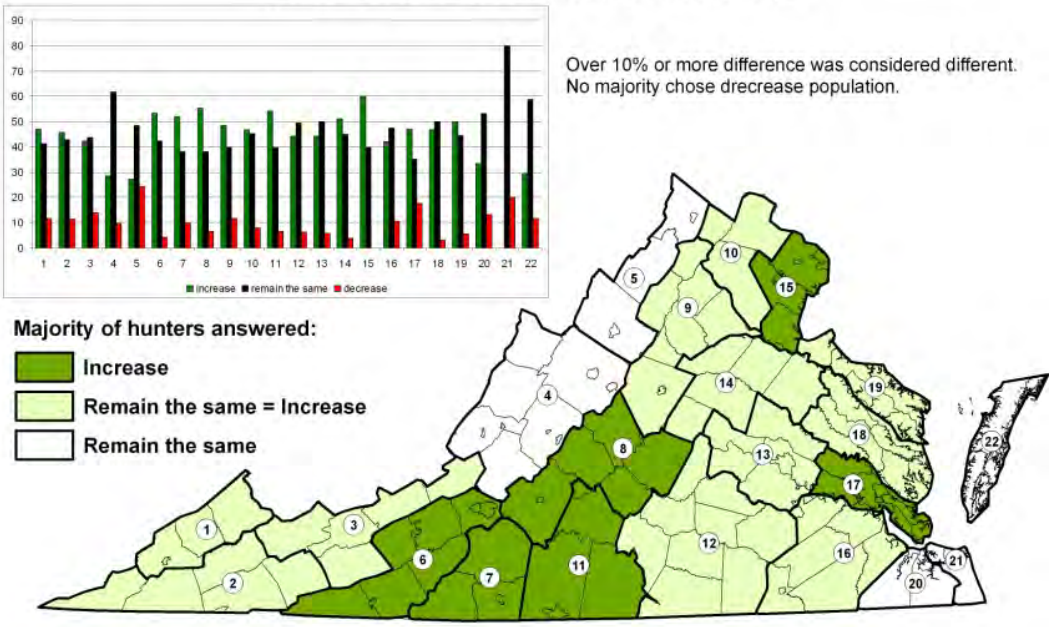
Public Preference

In your opinion, should the current black bear population in your county be increased, remain the same, or be decreased?



Hunter Preference

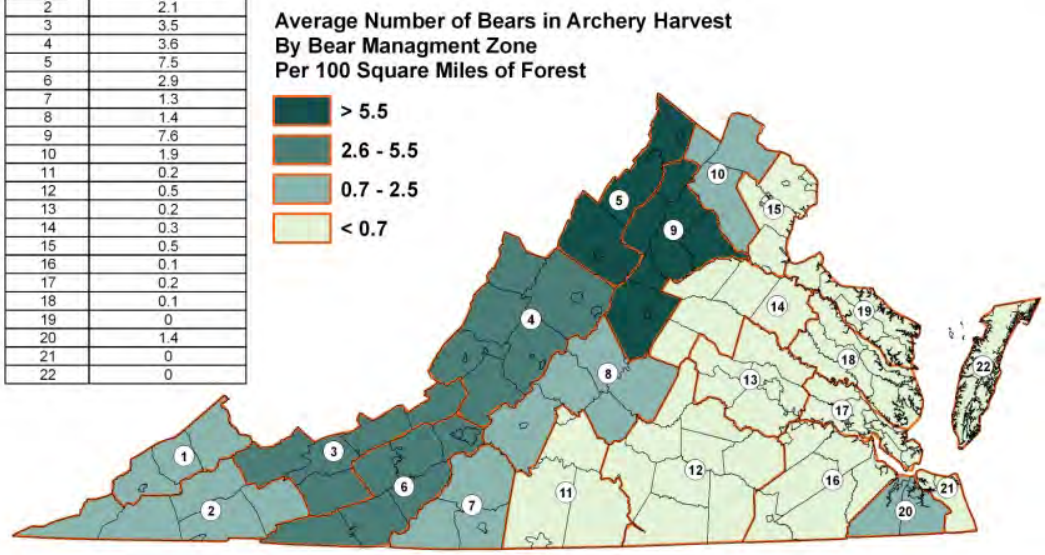
Even if you are not a bear hunter, what advice would you give to VDGIF regarding how to manage bear populations (increase, remain the same, or decrease)?



Bear Population Index

Relative Black Bear Abundance Based on Mean Archery Harvest

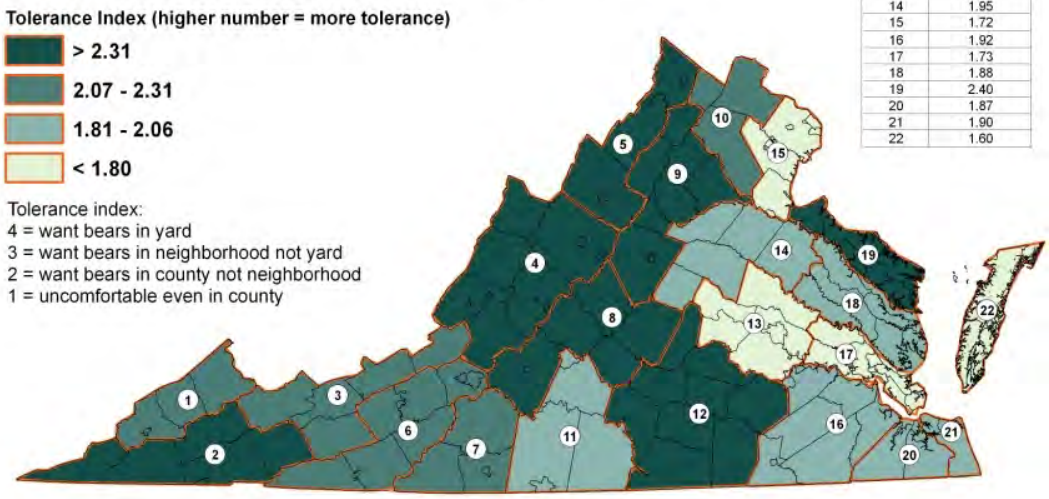
Bear Zone	Ave Kill / 100 sq mi
1	0.8
2	2.1
3	3.5
4	3.6
5	7.5
6	2.9
7	1.3
8	1.4
9	7.6
10	1.9
11	0.2
12	0.5
13	0.2
14	0.3
15	0.5
16	0.1
17	0.2
18	0.1
19	0
20	1.4
21	0
22	0



Average Human Tolerance of Black Bears

Bear Zone	Tolerance index
1	2.19
2	2.37
3	2.26
4	2.44
5	2.47
6	2.16
7	2.22
8	2.46
9	2.61
10	2.22
11	1.93
12	2.40
13	1.71
14	1.95
15	1.72
16	1.92
17	1.73
18	1.88
19	2.40
20	1.87
21	1.90
22	1.60

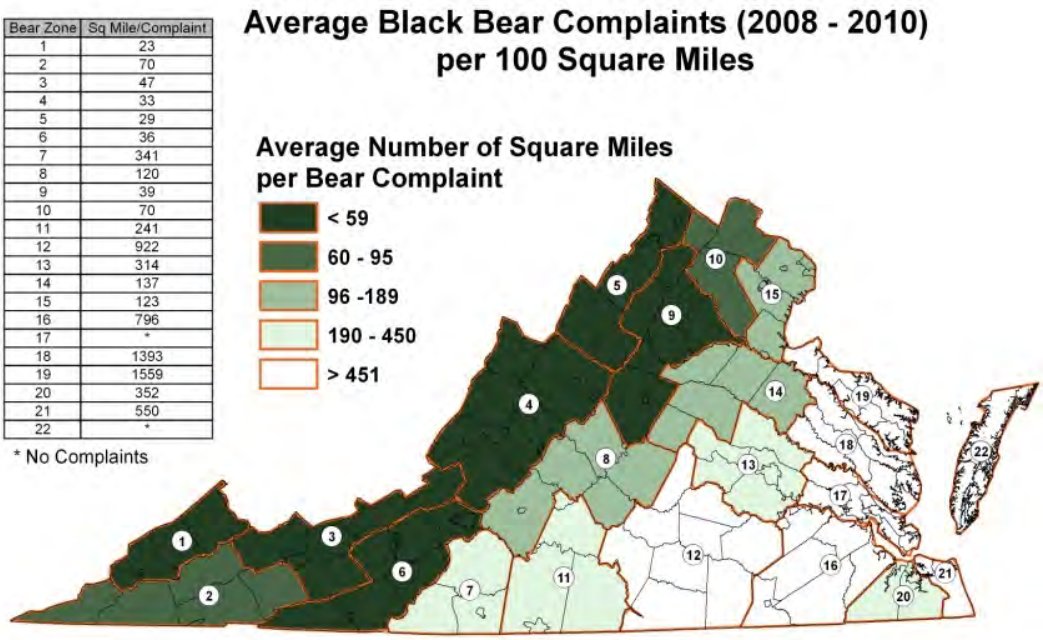
Which describes your feelings about black bears around your primary home and in your yard



Overall Nuisance Index

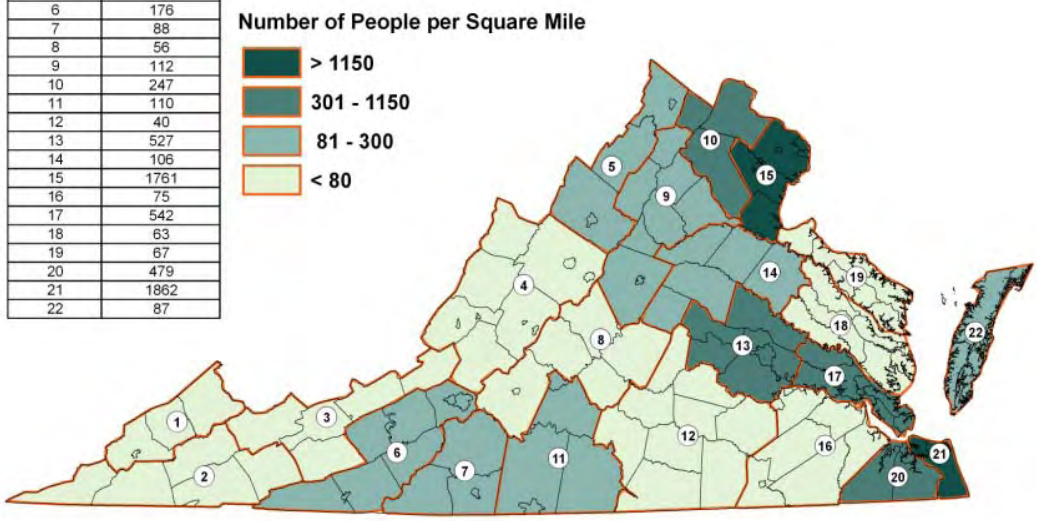
Bear Zone	Sq Mile/Complaint
1	23
2	70
3	47
4	33
5	29
6	36
7	341
8	120
9	39
10	70
11	241
12	922
13	314
14	137
15	123
16	796
17	*
18	1393
19	1559
20	352
21	550
22	*

* No Complaints



Human Population Density By Bear Managment Zone (from 2005 projected census)

Bear Zone	People/sq mile
1	70
2	73
3	50
4	59
5	135
6	176
7	88
8	56
9	112
10	247
11	110
12	40
13	527
14	106
15	1761
16	75
17	542
18	63
19	67
20	479
21	1862
22	87

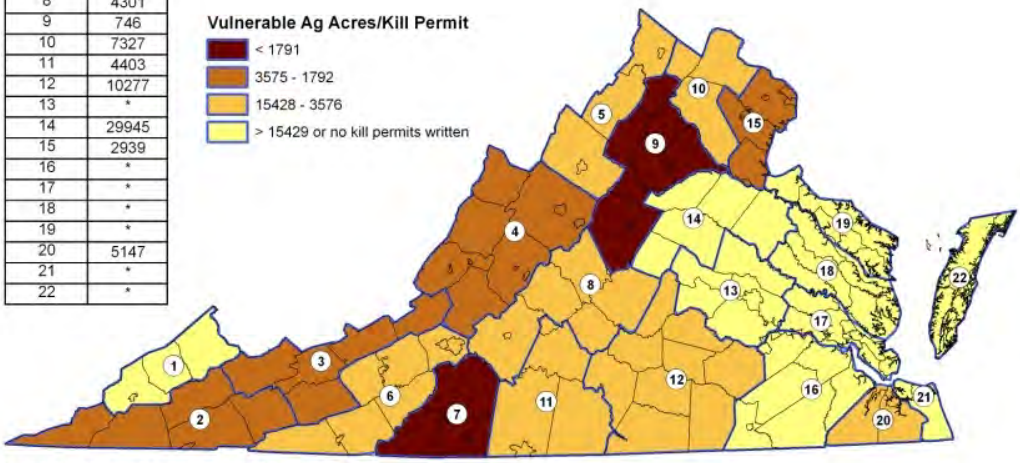


Agriculture Nuisance Index

Agricultural Crop Acres (Corn Acres + Peanut Acres + Orchard Acres) for Every 1 Bear Kill Permit Written

Crop Acres From USDA Census of Agriculture (2005-2007)

Bear Zone	Acres/KP
1	*
2	3017
3	2244
4	2093
5	6842
6	4134
7	1491
8	4301
9	746
10	7327
11	4403
12	10277
13	*
14	29945
15	2939
16	*
17	*
18	*
19	*
20	5147
21	*
22	*

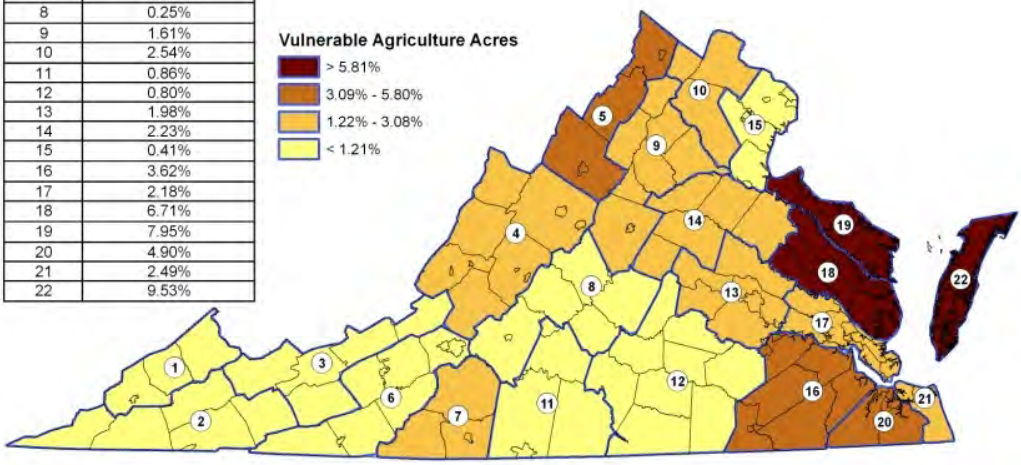


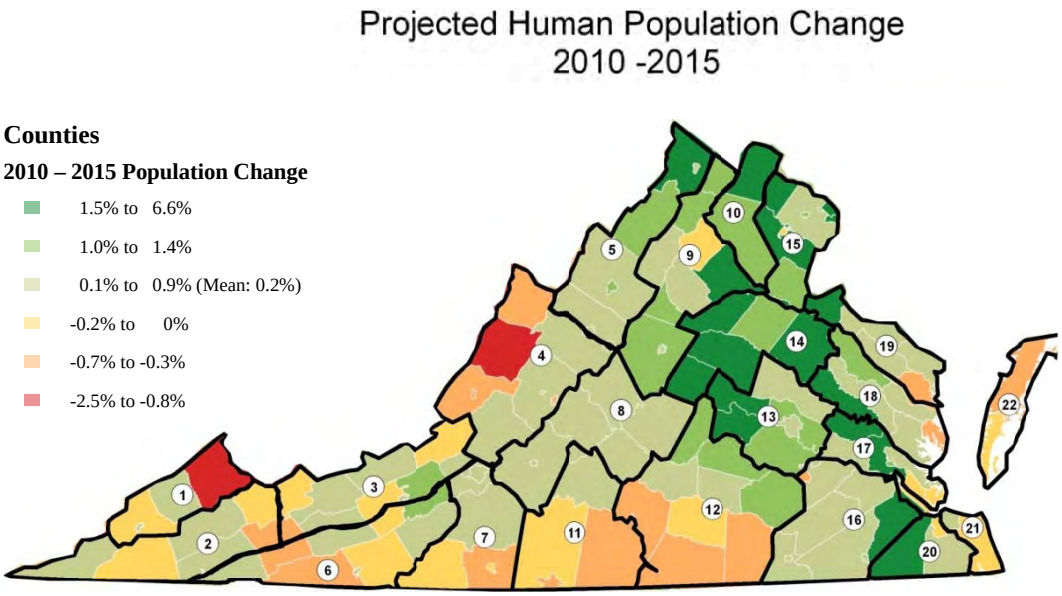
Legend Key: For every X acres there was 1 kill permit written.
*No kill permits written

Percent of Landscape in Vulnerable Agricultural Crop Acres (Corn Acres+ Peanut Acres + Orchard Acres / Total Zone Acres)

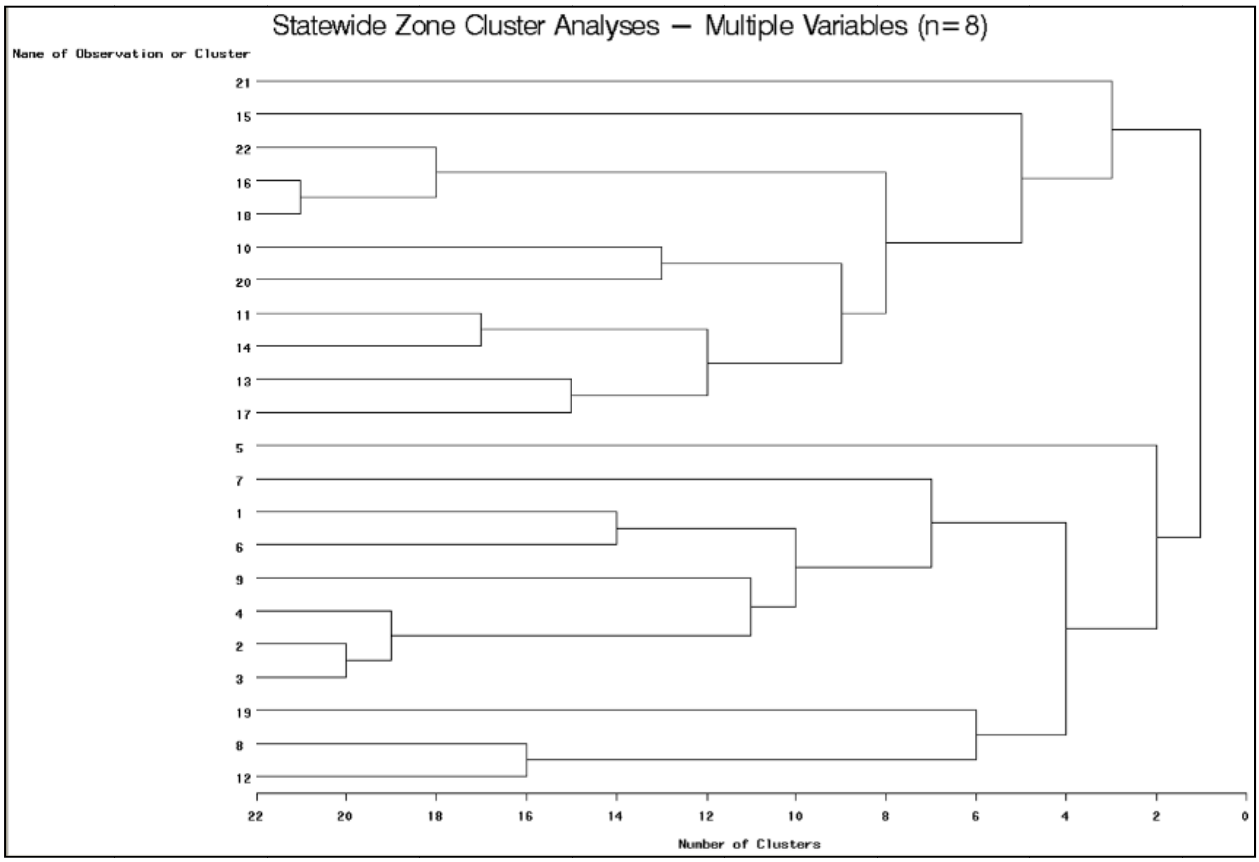
Crop Acres From USDA Census of Agriculture (2005-2007)

Bear Zone	%Vulnerable Ag Acres
1	0.00%
2	0.38%
3	0.52%
4	1.56%
5	4.14%
6	0.55%
7	1.61%
8	0.25%
9	1.61%
10	2.54%
11	0.86%
12	0.80%
13	1.98%
14	2.23%
15	0.41%
16	3.62%
17	2.18%
18	6.71%
19	7.95%
20	4.90%
21	2.49%
22	9.53%





Appendix D**.** Multivariate Cluster Analysis of 8 Indices: Public preference for population (CCC survey), Hunter preference for population (DGIF hunter survey), Bear relative density (archery harvest), Local tolerance of bears (CCC survey), Overall nuisance activity of bears (DGIF reports), Human population density (2005 projected census), Agriculture nuisance activity (USDA ag. census and DGIF kill permits), Future potential agriculture nuisance activity (USDA ag. census)



Appendix E. Glossary of select terms.

Bear Population Reduction Program (BPOP): BPOP is a site-specific bear management tool that allows public and private landowners experiencing bear damage to use recreational bear hunters to kill bears outside of traditional seasons.

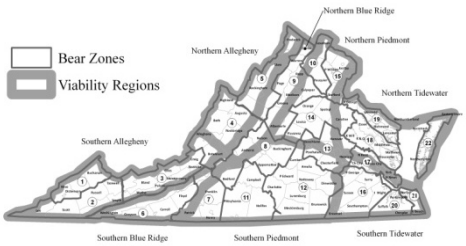
Biological Carrying Capacity (BCC) Biological carrying capacity is the maximum number of individuals of a species that can exist in a habitat indefinitely. Factors such as available food, water, cover, prey, and predator species will affect biological carrying capacity.

Cultural Carrying Capacity (CCC) Cultural carrying capacity is the maximum number of individuals of a species that the human population will tolerate. The number may or may not be the same as the species' biological carrying capacity. Cultural carrying capacity depends on human attitudes towards a species.

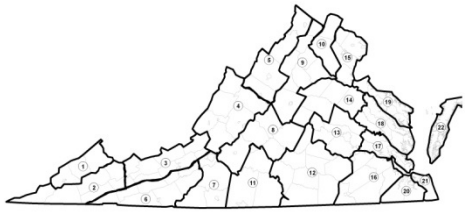
Kill Permit As provided by Virginia State Statue §29.1-529, VDGIF Conservation Police Officers may issue permits any time of year to landowners who suffer agricultural damage from bears. The permit may authorize lethal or non-lethal control methods to manage bears.

Viable Population A viable bear population is a population of bears that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes. Typically, viability is defined as the probability of persistence relative to some time frame and some set of conditions. A minimally viable black bear population is the smallest isolated number of individuals that are able to reproduce and maintain the population from one generation to another.

Viability Region(s) Virginia is divided into eight broad areas based on general physiographic boundaries. These boundaries designate broad bear population viability objectives (viable population, no viable population). These areas, called Viability Regions, include the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, northern Piedmont, southern Piedmont, northern Tidewater, and southern Tidewater. If a Viability Region objective is for a "viable" bear population, the requirement is for a viable population somewhere and not necessarily everywhere, within the Viability Region. See Figure 19.



Bear Management Zone or Zone Within each Viability Region, there are multiple Bear Management Zones or portions of Zones. There are 22 Bear Management Zones (also referred to in the text by "Zone") in Virginia that are smaller units with specific population objectives (increase, decrease or stabilize). Zone objectives may differ from one another and within Viability Regions. However, the overall Viability Region objectives will have to be met in addition to the Zone Objectives within the Viability Regions. See Figure 20.



Local/Site Specific In terms of bear management, *local* or *site-specific* management can be looked as a smaller area of scale within a Bear Management Zone. Whereas bear management is most effectively accomplished at the scale of Zone, there are some instances where smaller units within a Zone need to be handled separately due to unique circumstances. For example, County X is located in a high bear density area and has open dumpster sites throughout the county that attract bears. Management and specific actions that occur in County X would be on a local scale within the Bear Management Zone.