
Virginia Black Bear Management Plan

(2001 – 2010)



Virginia Department of Game and Inland Fisheries

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EXECUTIVE SUMMARY

Black bear management throughout the United States has become increasingly complex with the profusion of contentious issues surrounding bear hunting, human-bear problems, bear habitat conservation, and trade in bear parts. Many Virginians are interested in observing, photographing, hunting, or just knowing bears exist in the Commonwealth. Unfortunately, bears sometimes damage agricultural crops or residential property. Highway accidents involving black bears have increased in recent years. Diverse values and opinions associated with black bears provide unique management challenges for the Virginia Department of Game and Inland Fisheries (VDGIF).

In July 1999, the VDGIF started the process to develop the first statewide black bear plan to help manage black bears in Virginia. The bear plan describes the history, status, and future management direction of bears in Virginia. It also identifies a framework for what needs to be done and how to do it. By clarifying goals and directions of black bear management, this plan will assist the VDGIF Board of Directors, VDGIF administrators and staff, and the public in addressing bear issues.

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 public values (e.g., economic, sociological, and political) and biological considerations.

This plan embodies the interests of all Virginians. Black bear stakeholders focused on making value choices about bear management, while wildlife professionals focused on the technical aspects. Diverse stakeholders representing homeowners, sportsmen, nonconsumptive interests, agricultural producers, commercial timber industry, and resource management agencies participated in the plan development process.

A 17-member Stakeholder Advisory Committee (SAC), representing a cross section of Virginians, was responsible for identifying the values and goals that should drive bear management. A technical committee, comprised of VDGIF staff with technical expertise in bear management, designed objectives and strategies based on values identified by the SAC.

Additional public values were considered via focus group interviews, regional meetings, and stakeholder surveys. A draft of the bear management plan was extensively advertised to solicit even broader public input. The final draft was presented to and approved by the VDGIF Board of Directors on March 28, 2002.

The final Virginia Black Bear Management Plan serves as a blueprint for black bear management across the Commonwealth through 2010. The Plan includes sections on black bear life history, program history in Virginia, program status (supply and demand), management options, and program goals and objectives. Guided by the VDGIF mission statement, the Virginia Black Bear Management Plan includes 8 *goals* which specify the general directions for: (1) bear population viability, (2) desirable population levels, (3) habitat conservation and management, (4) hunting seasons and demands, (5) ethics of bear hunting methods, (6) landowner and citizen conflicts with bear hunting, (7) nonhunting recreation, and (8) human-bear problems. Specific *objectives* help guide the attainment of each goal. Preferred *strategies* then clarify how each objective should be achieved.

INTRODUCTION

THE PLAN

Many 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 highway accidents involving black bears have increased in recent years. Black bear management throughout the United States is becoming increasingly complex with the profusion of contentious issues surrounding bear hunting, human-bear problems, bear habitat conservation, and trade in bear parts. Diverse values and opinions associated with black bears provide unique management challenges for the Virginia Department of Game and Inland Fisheries (VDGIF).

The Virginia General Assembly has given the VDGIF specific responsibilities to manage the Commonwealth's wildlife, under the direction of a Governor-appointed Board of Directors. 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 regulation (§29.1-501). In 1990, the Board of Directors adopted mission statements to help clarify and interpret the role of VDGIF in managing wildlife in Virginia. The mission statements are:

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 promote safety for persons and property in connection with boating, hunting and fishing.

In July 1999, the VDGIF began developing the first statewide black bear management plan to fulfill its mandate to manage black bears in Virginia. The 10-year bear plan describes the history, status, and future of bears and their management. Setting the future course for bear management through December 31, 2010, the plan also identifies a framework for *what* needs to be done and *when* and *how* to do it. By clarifying goals and directions of black bear management, this plan will assist Board members, VDGIF administrators and staff, and the public in addressing bear issues.

DEVELOPMENT OF THE PLAN

The Planning Perspective

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 public values (e.g., economic, sociological, and political) and biological considerations.

This plan is intended to represent the interests of *all* Virginians (including both hunters and nonhunters). Diverse stakeholders representing homeowners, agricultural producers, naturalists, and recreationists contributed unselfishly toward this end. As with the process used to develop the Virginia Deer

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Management Plan (1996-1998), black bear stakeholders focused on making value choices about their resource, while wildlife professionals focused on the technical aspects of resource management.

The 17-member Stakeholder Advisory Committee (SAC) represented public values and was the workhorse in developing the plan. Providing technical information about black bears, staff from the VDGIF formed the Black Bear Technical Committee (BBTC) to work closely with the Stakeholder Advisory Committee. Expanded public values were solicited from other Virginia stakeholders through focus group interviews, regional meetings, and stakeholder surveys. While considering all the other forms of public input, the joint efforts of the Stakeholder Advisory Committee and the Black Bear Technical Committee resulted in a draft plan for public review. Dr. Steve McMullin, Associate Professor, and Nelson Lafon, Graduate Research Assistant, both of the Department of Fisheries and of Wildlife Sciences at Virginia Tech, provided guidance for stakeholder involvement and helped facilitate focus groups, Stakeholder Advisory Committee meetings, stakeholder surveys, and regional input meetings.

Stakeholder Advisory Committee (SAC)

The Stakeholder Advisory Committee, met 6 times between May 2000 and June 2001. The SAC embodied a cross section of Virginia citizens from across the state with diverse interests in bear management issues. The 17 members of this committee (see Appendix I) represented homeowners, sportsmen, nonconsumptive interests, animal welfare concerns, agricultural producers, commercial timber industry, and resource management agencies. Only 3 of the members formally represented bear hunters. The primary responsibilities for this committee were to identify the important values to consider for bear management; formulate plan goals; review public comments; and amend, approve, and prioritize management objectives designed by the VDGIF Black Bear Technical Committee. Although several members of the Black Bear Technical Committee were always present at Stakeholder Advisory Committee meetings, they did not actively participate in the discussions except to provide feedback and alert the SAC about crucial management issues and constraints (e.g. biological, administrative, and legal constraints).

Black Bear Technical Committee (BBTC)

This committee was comprised of VDGIF staff with responsibilities and expertise in bear management (Appendix II). Staff examined scientific literature and the work of other agencies and exchanged ideas with bear managers and scientists in other states and institutions. The BBTC informed the Stakeholder Advisory Committee about the biological and administrative realities of bear management, designed management objectives and strategies based upon the values identified by the stakeholder advisory committee, and compiled the bear management plan.

Focus Groups

Facilitators conducted 5 focus group interviews during December 1999 and January 2000 with stakeholders who (1) hunted bears with dogs, (2) hunted bears without dogs, (3) experienced agricultural or property damage from bears, (4) had nonconsumptive interests in bears, and (5) worked for agencies besides VDGIF with interests in bear management. Focus groups were comprised of 7-16 individuals sharing a common interest (Appendix III). A facilitator directed questions to the group and fostered discussion among group members. Focus groups were instrumental in providing in-depth information about issues important to Virginia stakeholders early in the planning process. The Stakeholder Advisory Committee used focus group input during their first meeting to articulate key issues and concerns for bear management in Virginia.

Regional Input Meetings

Between July 27 and August 2, 2000, VDGIF and Virginia Tech personnel conducted 5 regional input meetings across Virginia. The 71 stakeholder participants (Appendix III) at these meetings represented a diversity of views. Regional meeting participants had the opportunity to view a slide presentation about black bears and their management, offer opinions about regional bear populations, actively discuss draft plan goals and associated local bear management issues, and provide anonymous input. The Stakeholder Advisory Committee reviewed, discussed, and incorporated regional input during development of goals, objectives, and strategies for the plan.

Stakeholder Surveys

Expanded input on key management issues was solicited from selected constituent groups. VDGIF and Virginia Tech designed and administered mail surveys to a sample of all hunters (through the statewide hunter survey) and to members of 3 constituent groups represented on the Stakeholder Advisory Committee. Information about management preferences and population objectives was summarized from the hunter survey (2,600 respondents), Virginia Bear Hunters Association (261 respondents), Virginia State Beekeepers Association (326 respondents), and the Virginia Chapter of The Nature Conservancy (302 respondents). These constituent group surveys were not intended to represent a cross section of all Virginians and data from each survey were never compiled into an overall response. The surveys were only used to provide some insight into the attitudes a few representative constituent groups (e.g., general hunters, bear hunters, agricultural producers, environmental interests).

Public Review

During April and May 2001, the draft plan was extensively advertised to solicit additional public comments. Written comment options were provided through the VDGIF web site, an e-mail address, or regular mailings.

Some 63,000 copies of a 4-page newspaper version of the draft bear management plan were distributed throughout Virginia to reach a broad spectrum of stakeholders. Multiple copies of the newspaper version of the plan were provided to all 1,294 big game check stations, 907 hunter safety coordinators, 613 Deer Management Assistance Program cooperators, 146 city/county Boards of Supervisors, 110 county extension agents, 98 outdoor publications/writers, 4,228 successful bear hunters (from past years), 45 bear biologists in the eastern U.S., and 183 county Game Wardens. Newspapers were available at all 12 VDGIF Regional and Field Offices around Virginia. Individual newspapers were also mailed to a sample of Virginia State Beekeepers Association members (n=163), and a sample of The Nature Conservancy (Virginia Chapter) members (n=151). Newspapers were mailed to anyone requesting a copy.

Unabridged copies of the entire draft plan (with multiple newspapers) also were sent to the 17 SAC members (Appendix I) and 161 invitees to focus groups and regional meetings (Appendix III plus some 65 other absentees). The full plan and the newspaper version also were available on the VDGIF web site. There were 1,540 visits to the draft plan on the VDGIF web site.

To stimulate additional public input, news releases and media interviews also were made available to newspapers throughout the state. Numerous articles on the bear management plan were published in large market and local newspapers.

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By the end of the public comment period at the end of May 2001, 108 individual written comments were received (83 e-mail/web site comments and 25 regular letters). A summary of respondent interests, a listing of individual respondents, and a digest of the individual comments are provided in Appendix IV.

Draft Plan Revisions and the Final Plan

After the public review period, the SAC reviewed comments and made recommendations for final revisions to the draft plan. Both the SAC and BBTC prioritized objectives (Appendix V). These priorities will provide the basis for budget and personnel allocation decisions related to the bear program in Virginia. The final draft was presented to and approved by the VDGIF Board of Directors on March 28, 2002.

PLAN FORMAT

The Virginia Black Bear Management Plan includes 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 bear program goals and objectives. Within the context of the VDGIF mission statement, the Stakeholder Advisory Committee developed 8 *goals* addressing bear population viability, desirable population levels, habitat conservation and management, hunting seasons and demands, ethics of bear hunting methods, landowner and citizen conflicts with bear hunting, nonhunting recreation, and human-bear problems. For each goal, specific *objectives* have been identified to help guide attainment of the goal. Preferred *strategies* then clarify how each objective should be achieved.

INTERIM CHANGES IN THE PLAN

The Virginia Black Bear Management Plan is designed to provide guidance and priorities to help manage Virginia's bear population through 2010. However, the plan should be a dynamic and flexible tool which remains responsive to potential shifts in bear management needs, even prior to 2010. Considering the substantial and thoughtful public investment already expended to produce the final Virginia Black Bear Management Plan (e.g., focus groups, SAC meetings, regional meetings, public review & comments), consideration of interim changes to the plan should be subjected to significant scrutiny. Similar to the procedures adopted for interim changes to the Virginia Deer Management Plan, the following steps shall be followed to make amendments to the Black Bear Management Plan prior to 2010.

1. For a change to the Virginia Black Bear Management Plan to be considered, it must be recommended and justified to the VDGIF in writing by one of the following:
 - a. any governmental entity (e.g., city, county, U.S. Forest Service).
 - b. any non-governmental organization (e.g., Virginia Bear Hunters Association, Virginia Wildlife Federation).
 - c. VDGIF.
2. If, in the opinion of the VDGIF, the recommendation represents a new issue or change of circumstances that may not have been adequately addressed in the final Virginia Black Bear Management Plan, the VDGIF will inform the SAC about the request and justification.
3. The VDGIF will survey SAC member opinions about the recommended change. Depending on the necessity, SAC members may be surveyed via letter, e-mail, phone, or special meeting.

4. If the SAC wishes to consider the recommendation further, the public shall be informed via a stakeholder meeting and/or a news release in the affected area.
5. A 30-day public input period shall be provided.
6. Summarize and review public input with the appropriate VDGIF Regional staff and Richmond administration.
7. VDGIF staff makes recommendation to SAC (via letter, e-mail, phone, or special meeting) for appropriate action (i.e., to make a specific plan change or to keep the plan unchanged).
8. If the SAC supports a change to the Virginia Black Bear Management Plan, a recommendation will be made to the Director for consideration by the VDGIF Board of Directors.

ACKNOWLEDGMENTS

As a plan representing the bear-related interests and public values of all Virginians, success hinged on the meaningful involvement of stakeholders from throughout the Commonwealth. The commitment of time, unselfish dedication, and enthusiasm provided by the Stakeholder Advisory Committee (Appendix I) not only made a substantial difference in the quality of the final plan, but enriched the process throughout; we greatly appreciate their efforts. Other stakeholder input provided by participants at the focus group / regional input meetings (Appendix III) and reviewers of the draft plan (Appendix IV) ensured that the plan addressed public concerns and needs.

Public input was most useful when comments were based on accurate technical knowledge about bears and their management. Appreciation is extended for the work of the Black Bear Technical Committee (Appendix II) for summarizing and presenting a great deal of life history and management information. The VDGIF also appreciates other valuable technical input and reviews that were provided by Dr. Michael Pelton (University of Tennessee, retired), Dr. Michael Vaughan (Virginia Tech), Dr. David Maehr (University of Kentucky), the Mid-Appalachian Bear Study Group, and the Southern Appalachian Bear Study Group.

Thanks are also extended to Dr. Steve McMullin and Nelson Lafon, both of the Department of Fisheries and of Wildlife Sciences at Virginia Tech, for shepherding everybody through the planning processes. Their process guidance and technical reviews kept everyone on track, ensured the efficient use of time, and integrated technical concerns with public values. Sarah Mott and Dr. Brett Wright, both with George Mason University, were instrumental in producing the 4-page newspaper version of the draft bear management plan for public review. Technical research and writing for the Virginia Black Bear Management Plan primarily was provided by David Steffen, Cale Godfrey, Dennis Martin, and Kim Needham Echols.

HISTORY

LIFE HISTORY OF BLACK BEARS

Black bears are the most common and widespread of the 3 bear species in North America. Although their historical distribution was larger, black bears are still found in at least 35 states and all Canadian provinces. 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 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, which walk on their toes, bears walk on the soles of their feet. 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. Bears see colors, but only blues and yellows. Relying primarily on their nose, bears have a keen sense of smell, detecting 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 5 to 6 feet long, 2 to 3 feet tall, and weigh 100 - 400 pounds. Some males, however, may weigh in excess of 500 pounds. Adult females generally weigh between 100 and 175 pounds and rarely weigh more than 200 to 250 pounds.

Bear size and weight vary widely depending on differences in habitat quality. Male bears in Pennsylvania commonly weigh more than 500 pounds. 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 1887-1888. 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. Bears consume a wide variety of foods including berries and fruits (soft mast), nuts and acorns (hard mast), grasses and forbs, insects and beetles, agricultural crops, animals, and carrion. Although bears can kill livestock, rabbits, mice, squirrels, groundhogs, 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. As spring progresses, bears find insects and larvae in snags and 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, especially when mast crops are poor, bears may focus more heavily on agricultural crops (e.g., corn, orchards, peanuts) and other foods associated with humans (e.g., birdseed, dog food, garbage).

High-energy foods become essential for bears in the fall when their diet consists mostly of soft and hard mast (nuts and acorns). Preferred foods that are high in protein, carbohydrates, or fat promote weight gain prior to denning. These foods include acorns, hickory nuts, beechnuts, hazelnuts, grapes, and black gum fruit. Bears feed heavily in the fall and can gain as much as 1-2 pounds per day. During good mast years, bears may more than double their body weights between August and December. 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 their 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. In northern forests, home range overlap is minimal due to limited habitat productivity. In contrast, black bears exhibit extensive home range overlap in the productive Southern Appalachians. 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 between 1 and 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 a year or two before their mother (and other adult males) force them to disperse. As a result, these young males often exhibit large movements in search of new home ranges.

Black bears are generally most active at dawn and dusk, but significant movements may occur during daylight hours. When food is scarce, bears may travel extensive distances. In poor mast years, bears ranged 2-4 times further than during good mast years in Tennessee. In years of mast crop failure, bears may move from forested areas in search of more abundant foods such as agricultural crops. 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 and make use of a variety of forest habitat types to meet all their seasonal needs. In spite of expanding human populations and land-use changes, bears have persisted because of their ability to utilize 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. Agricultural crops and other human-related foods associated with bear habitats can enhance suitability for bears.

Despite their adaptable food habits, black bears require extensive areas of diverse habitat types. Often considered a wilderness species, black bears also thrive in areas where forested habitats are interspersed among other land uses. Although black bears are often found in large, contiguous tracts of forested lands, smaller blocks of forested habitat that are linked by forested corridors also will satisfy daily and seasonal needs. Based on known, 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 6 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 1 degree 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 other hibernating mammals, bears may be easily aroused from their winter dens.

Bears often den in confined spaces, reducing heat loss and conserving 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. Despite an apparent abundance of large trees, the majority of dens are on the ground in eastern Virginia. Den reuse in Virginia is less than 10%. 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 conserves accumulated resources. When mast crops are good, bears typically enter dens later taking advantage of additional opportunity to feed and gain weight. During particularly mild winters, some bears (especially males and females with yearling cubs) 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 October 31 or as late as January 4. 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 during and immediately after denning. Even after den emergence, bears may continue to lose weight while they search for scarce early spring foods, some of

which may be of low nutritional value. Lactating female bears raising cubs are particularly stressed after leaving their dens.

Reproduction

Black bears in Virginia breed between June 20 and August 21, with a peak in mid-late July. Postponing any fetal growth, the fertilized eggs do not actually implant on the uterine wall until early December. This delayed implantation ensures that cubs are born in the security of the winter den when females are in the best nutritional condition.

In Virginia, cubs are born in mid-late January (with a range between January 1 and March 2) after a 6-week gestation period. Cubs are born helpless, hairless, with their eyes closed, and weigh only about 8 ounces. Common litter sizes are usually 1, 2, or 3 cubs; but 4 cubs are not uncommon. Litters generally have equal numbers of male and female cubs.

Females usually become sexually mature in Virginia at age 3 or 4. Females may breed as early as 2½ years old and give birth at age 3, or may delay reproduction until age 7 or older. Although rare, 1½-year-old females have been found to breed at times in Virginia, but none are known to have 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 2 years. Cubs remain with their mother through their first summer and the following den season. Females rarely breed while they are still raising cubs. If a female prematurely loses her entire litter prior to the regular breeding season, she may breed again. Inexperienced 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

Preliminary information in Virginia indicates that annual rates of cub mortality in the first year are about 20%. Cub losses are primarily due to predation (e.g., birds of prey, foxes, bobcats, coyotes, other bears) or abandonment by the female.

With no natural predators (except, infrequently, other adult bears), adult bears have very low natural mortality rates (<2% per year). Black bear survival also is relatively unaffected by parasites and diseases. Consequently, bears in un hunted populations may live up to 30 years.

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.

Reducing the impact of direct human mortality factors (primarily from hunting), refuges can help improve black bear survival. Bear sanctuaries have been used effectively to protect core populations of breeding females and provide surplus bears for hunters to harvest.

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 limited food. Bow hunter success also increases in Virginia with poorer 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.

Population Dynamics

Bears have the second lowest reproductive rate of any North American land mammal (muskoen have the lowest). Although this low reproductive potential is offset by low natural mortality rates, population growth rates for bears still are relatively low. When densities are low and resources abundant, un hunted black bear populations have a maximum growth potential of 25% per year. Even so, an un hunted black bear population in good habitat of the Catskill Mountains of New York was observed to almost double within a 2-year time frame. 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 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 losses remove less than the annual recruitment. Low population growth capability and limited reproductive potential result in relatively slow population recovery from over harvest or low population levels.

In some situations, hunting may not always be an additive mortality factor. The removal of adult males from a previously un hunted 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 (e.g., competition among males) 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 per square mile in Alberta, Canada. Recent research indicates that even higher densities (3.5 bears/mi²) may occur in some areas of Virginia.

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 over exploitation. By 1739, bears reportedly were only found in the western mountains and swamp areas of Virginia. By 1836, bears seemed to be extirpated 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, offered since the American Revolution, provided added incentive for the demise of bear populations in Virginia. By 1900, bears were practically extinct in Virginia with 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, beginning the reversion back to forest. These reverting farmlands enabled bears to reoccupy newly forested habitats.

Making it possible to purchase and protect deforested land in Virginia, forest reformation was secured with Congressional approval of the Weeks Act in 1911. Totaling 13,450 acres, the first land purchase for National Forests in Virginia occurred in the Mt. Rogers area 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. Later renamed the George Washington National Forest, Shenandoah National Forest was created in 1917. Ensuring large forested areas for bear habitat, some 1.7 million acres of National Forest currently occur in Virginia.

The creation of Shenandoah National Park in 1936 provided additional protection for bears and habitat. Nearly 200,000 acres occur in Shenandoah National Park.

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

To help control harvests, the black bear was first 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 still be

VIRGINIA BEAR MANAGEMENT PLAN

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. Lower 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 100 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 1-4 reflect published reports of past bear distributions in Virginia since 1950. These figures clearly show the impact of management actions that have fostered expanding distributions of bears in Virginia.

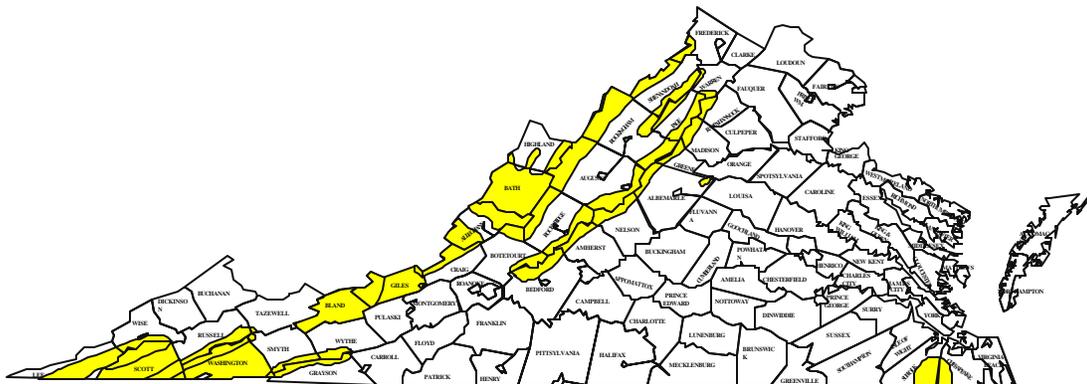


Figure 1. Distribution of black bears in Virginia in 1950.

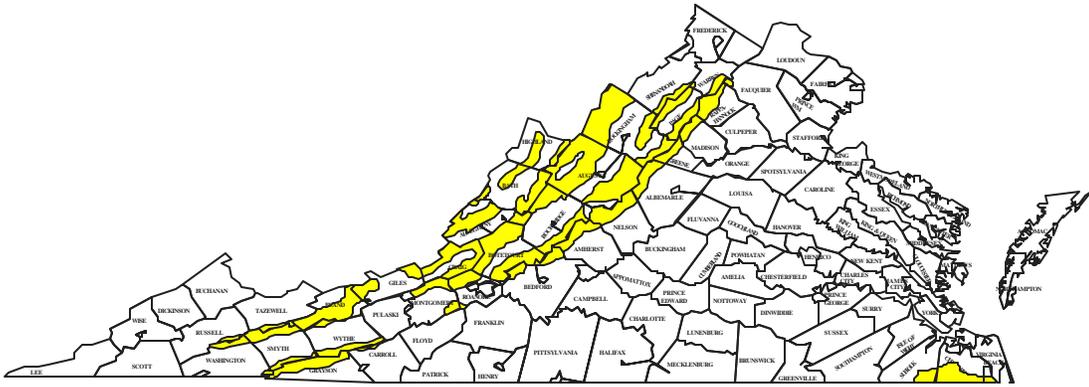


Figure 2. Distribution of black bears in Virginia in 1974.

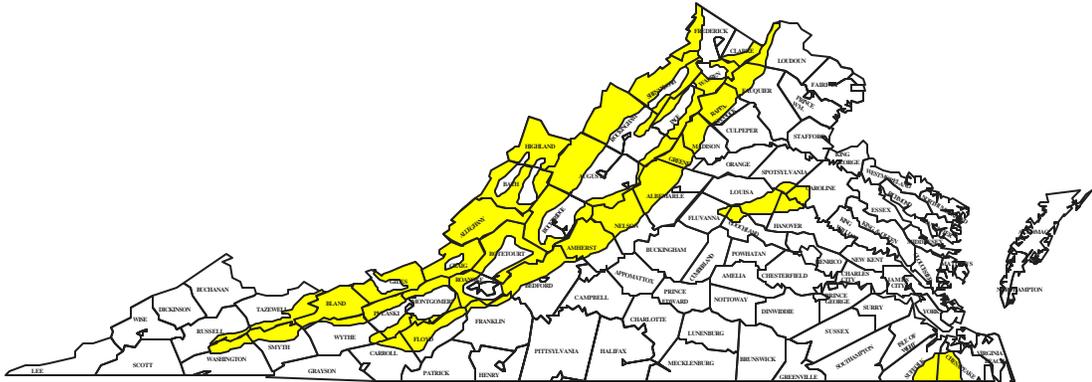


Figure 3. Distribution of black bears in Virginia in 1983.

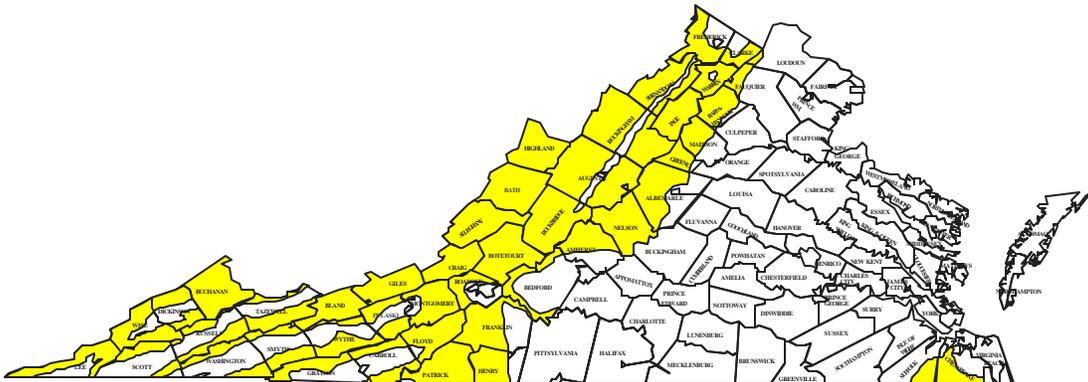


Figure 4. Distribution of black bears in Virginia in 1999.

Hunting Regulation Changes

Since the establishment of the first hunting season in 1930, Virginia bear hunting regulations have changed frequently. Regulation changes usually were designed to enhance 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 dressed). 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 1956-57 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 4 years. Beginning with the 1960-1961 season, the bear and deer seasons again ran concurrently, but bear hounds weren't allowed during the first week.

Season length & timing. Starting with the 1967-68 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 2 weeks of the bear season (i.e., the week prior to deer season and the opening week of deer season). These 2 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 1962-73 was 46.4%, while the average since that time has been 38.1%.

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, hunting occurs in 29 western counties and 2 cities around the Dismal Swamp.

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, Norfolk, and Princess Anne.

Bear-dog training season. A September bear-dog-training season was initiated in 1992 for 21 counties. This 4-week season, expanded to 5 weeks in 1998, affords hound hunters additional recreation and the opportunity to train and condition dogs before the harvest season in December. Harvesting bears is not permitted during the bear-dog-training season.

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 4th 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 1st 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.

Supplemental feeding. While not specifically a hunting regulation change, supplemental feeding of bears on VDGIF-owned lands and national forest lands was banned in 1999. Concerns associated with supplemental feeding included: 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.

Other Bear Management & Research Programs

Nuisance Bear 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 \$50 bounties hadn't 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 nuisance bears to other 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. Since 1980, an average of more than 50 bears have been moved annually.

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 to immediately 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 stipulate that only commercial operations experiencing damage are eligible to receive a kill permit. The annual number of nuisance bears killed under kill permits averages about 13 bears, but may vary from only a couple per year to as many as 40.

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 are required to purchase "Damage Stamps". Mostly concerned with deer damage, interest in this program peaked in the late 1970s with 18 counties participating. Today, only Floyd and Highland counties continue to participate in the damage stamp program.

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Restoration in southwest Virginia. To bolster populations in the Mt. Rogers area, nuisance bears have been 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.

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, 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. More than 1,500 check stations statewide provide annual harvest information on black bear, 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), approximately 60 volunteer bear check stations also: (1) determine presence of ear tags or lip tattoos, (2) record whether bear hounds were used, (3) extract a small premolar tooth for age determination, and (4) attach a special harvest seal to the carcass.

Because of its 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.

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 nationally recognized studies have resulted from collaborative efforts among the Virginia Department of Game & Inland Fisheries, the Department of Fisheries & Wildlife Sciences at Virginia Tech, the Cooperative Wildlife Research Unit at Virginia Tech, the Shenandoah National Park, the Great Dismal Swamp National Wildlife Refuge, the U.S. Forest Service, 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-present: Using captive bears at Virginia Tech, the goal of this research is to develop an understanding of the role of nutrition in bear reproduction and the role of females in regulating populations.
- (7) 1990-92: 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-present: The Cooperative Alleghany Bear Study (CABS) is designed to document the demographics of Virginia's hunted bear population. An evaluation of reproductive, survival, and population characteristics is designed to produce long-term population monitoring and management recommendations for hunted bear populations.
- (9) 1999-2001: A 2-year study of black bear denning ecology on the industrial forest lands of the Westvaco Corporation has involved trapping and monitoring bears in Botetourt County in Virginia and Hardy, Hampshire, Pendleton, Randolph, and Greenbriar Counties in West Virginia.
- (10) 2000-present: Focusing on the Great Dismal Swamp National Wildlife Refuge, a multiple-year study is designed to evaluate the impact of roads on bear movements, document the incidence of bear-vehicle collisions, and estimate bear population size.

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BLACK BEAR PROGRAM SUPPLY AND DEMAND

SUPPLY

Bear Habitat Supply

There are 5 physiographic provinces (Coastal Plain, Piedmont Plateau, Blue Ridge, Ridge and Valley, and Appalachian Plateaus) representing 2 major landscape units (Atlantic Coastal Plain and Appalachian Highlands) in Virginia (Figure 5). 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.

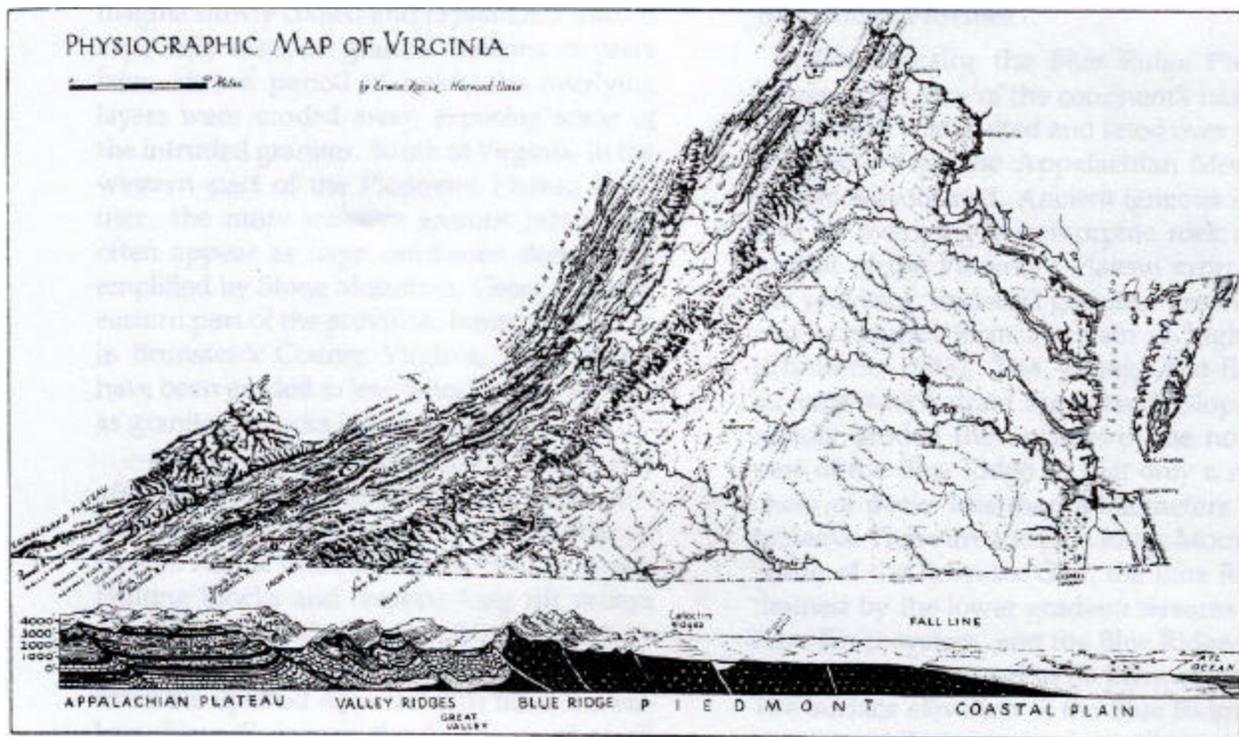


Figure 5. Virginia's physiographic regions. (Terwilliger 1991)

Soils along narrow ridges and steep slopes in the Appalachian Plateau 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 Appalachian Plateau 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 (24,137 square miles) represent 60.8% of Virginia's land area (39,682 square miles). Most of these forested lands are in private ownership (87.2%) with the remainder being publicly owned (12.8%). Agricultural lands constitute 32.4% (12,857 square miles) of the Commonwealth.

With extensive forested areas and a variety of habitat types in all physiographic provinces (e.g., Appalachian Plateau, Ridge & Valley, Blue Ridge, Piedmont, Coastal Plain), 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 (Figure 6). Establishment of viable bear populations would not be feasible in the heavily urbanized counties/cities of Virginia Beach, Henrico, York, Fairfax, and Newport News.

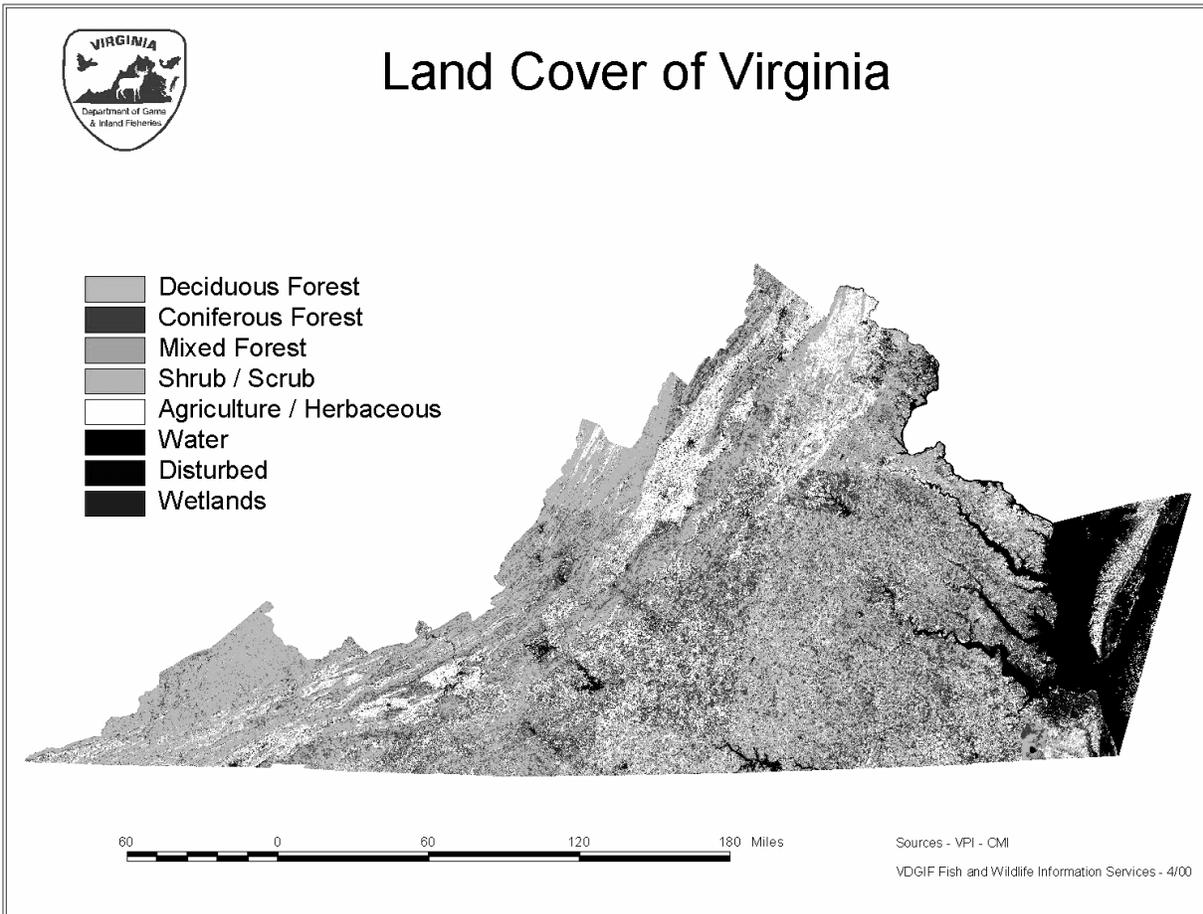


Figure 6. Land cover map of Virginia during 1997.

Despite significant land-use changes (e.g., decreases in agricultural acreages, expansions of human populations), the forested area of Virginia has remained relatively stable since 1947 (declining <1%). However, changes in forest composition and interspersions may impact future bear populations in some areas. For instance, forest habitat diversity for bears probably has been reduced on public lands due to decreased timber harvesting during the last 20 years on National Forest lands in western Virginia.

Concerns about habitat fragmentation are due to recent conversions of forested wetlands to agriculture in the coastal plain. 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 (Figure 7). The bears in Virginia’s western mountains belong to the largest contiguous bear population in the southeast. Virginia’s current 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 (Figure 8). Although Virginia’s highest bear populations are found in the 31 counties with legal bear hunting, bears may occur in most any region of the state. During the last 4 years, bears have been observed or have created a nuisance in 85 counties/cities (out of 98) throughout Virginia. Only the middle peninsula, lower peninsula, and eastern shore counties of Virginia do not have recent bear observations (Figure 8).

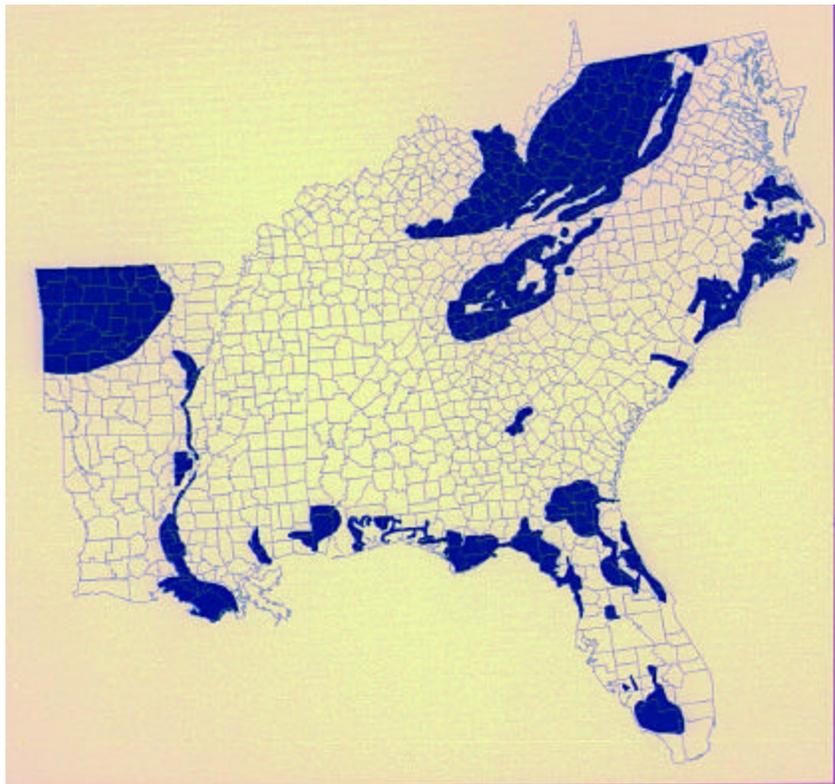


Figure 7. Distribution of black bears in the southeastern United States (Pelton and Van Manen 1994).

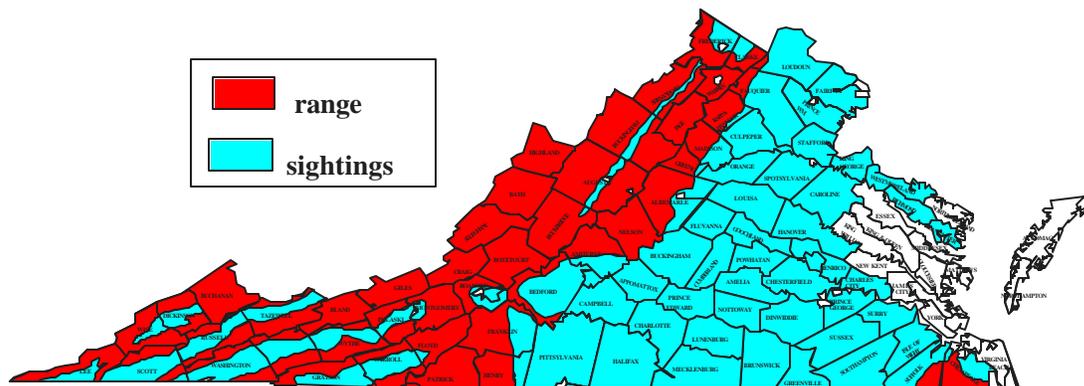


Figure 8. Current black bear distribution in Virginia with counties experiencing occasional sightings.

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 practical methods exist to accurately estimate black bear population size in Virginia. Fortunately, assessments of bear population status are obtained by monitoring indices derived from harvest, nuisance activity, and age structure. Although monitoring indices do not provide accurate estimates of bear population size, they reflect population trends and densities.

Harvest data are a principal source of information for monitoring black bear population status in the hunted areas of Virginia. For black bears in Virginia, harvest trends may correspond to general population trends. Despite decreased participation in bear hunting (see the section on demand), harvest trends indicate significant increases since 1974 when hunting regulations were changed to reduce the hunting mortality on adult females (Figure 9). The absence of hunting information from the unhunted areas of Virginia (e.g., southwest mountains, piedmont) makes the assessment of population status in those areas more uncertain and speculative.

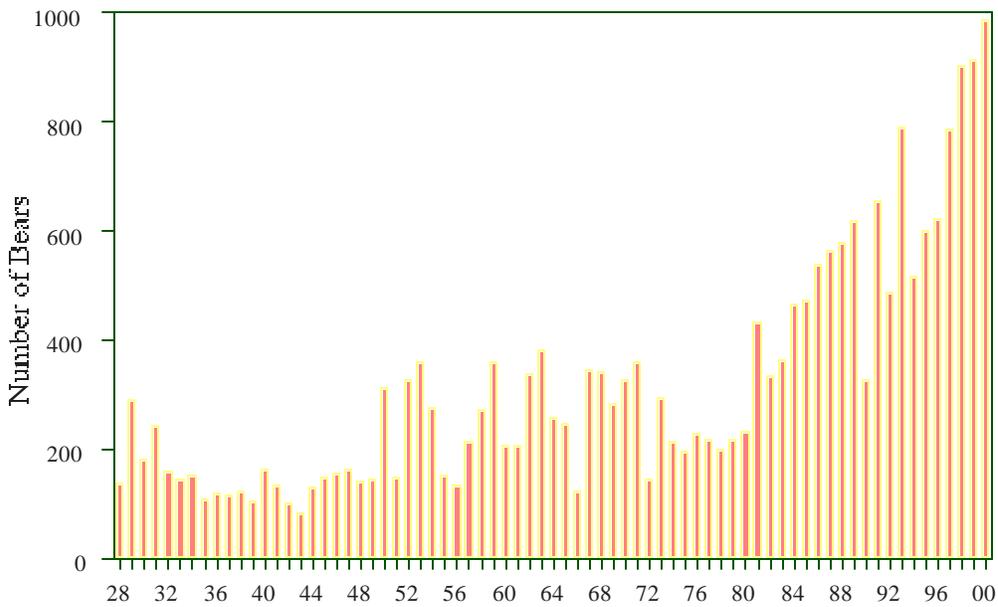


Figure 9. Virginia's annual black bear harvest (1928-2000).

During the last 10 years (1991-2000), the bear harvest has been significantly increasing at an average annual rate of 6.3% per year. However, this increase has not been uniform across Virginia's hunted bear range. Most of the increase has come from the Allegheny Mountain and Dismal Swamp bear populations. Bear harvests around the Blue Ridge Mountains and Shenandoah National Park have remained relatively stable (Figure 10).

While actual population densities are generally unknown throughout Virginia, research provides density estimates for a few intensively studied areas. Estimated densities were >1.5 bears/mi² in Shenandoah National Park (1992) and about 1 bear/ mi² in the Great Dismal Swamp (1987). Preliminary results from ongoing research in a high-density area of western Rockingham County suggest that densities may be as high as 3.5 bears/mi².

Population reconstruction models use age information from harvested bears to generate indices of population size and other population parameters (e.g., population growth rates, sex-specific mortality rates, age -specific mortality rates, recruitment rates). Population reconstruction in Virginia suggests that the female population in hunted areas grew at an average rate of 3.4% annually between 1986-95.

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 intended reduction in female harvests through hunting season changes.

Since 1980, nuisance complaints also have increased (Figure 12). These complaints primarily represent significant problems requiring special attention (e.g., relocation) and do not include more frequent concerns about minor bear issues (e.g., garbage, sightings) that were resolved via telephone calls. The increases in nuisance problems includes complaints from both established and expanding bear populations (Figure 12).

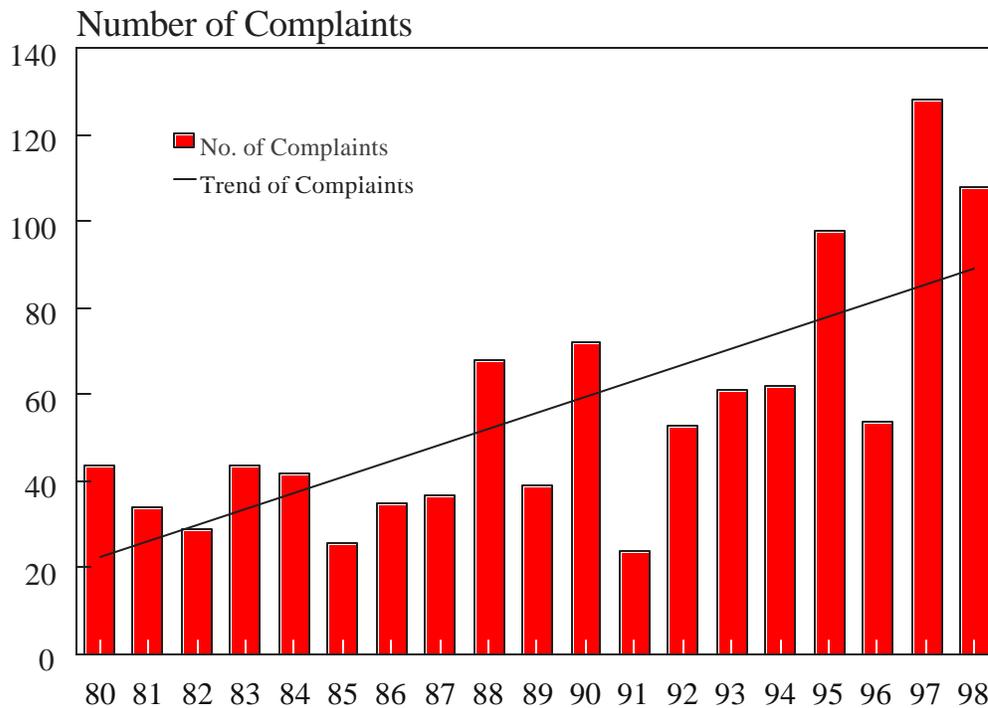


Figure 12. Nuisance black bear complaints in Virginia (1980-1998).

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

Lower female mortality rates have probably stimulated the population growth evident by the trends in harvest, age structure, reconstructed populations, and nuisance activity. Bear populations may have the highest densities around Shenandoah National Park, but bears can be found almost anywhere across the state (even if they are not part of a locally established population).

DEMAND

Bear Hunting Demands

Bear hunter effort. Bear hunting for recreation, food, clothing, weapons, and ornaments has had a long tradition in Virginia. Today, bear hunting effort in Virginia continues to result in some \$17.3 million being spent on food, lodging, equipment, and transportation. Nationwide, over \$184 million may be spent by bear hunters.¹

During the 1999-2000 hunting seasons in Virginia, some 17,157 hunters spent 102,687 hunter-days hunting black bears. Hunter-days are defined as the total sum of all days hunted by all bear hunters (i.e., 4 sportsmen hunting for 2 days each or 8 sportsmen hunting for 1 day generates 16 hunter-days of bear hunting effort). Following the trends of all hunting participation in Virginia, the number of bear hunters (Figure 13) and hunting effort (Figure 14) has declined since the 1970s.

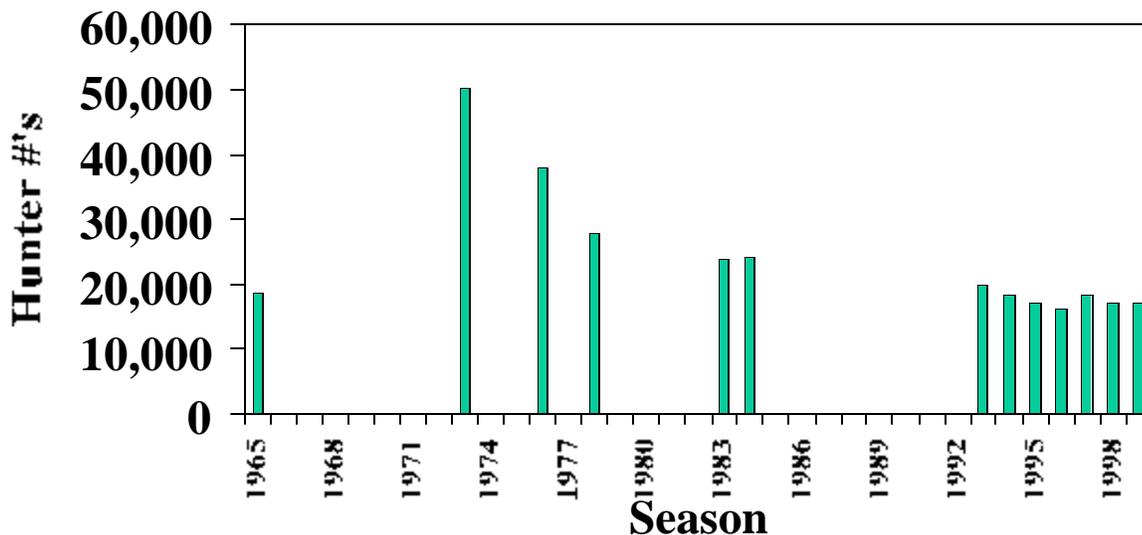


Figure 13. Number of black bear hunters in Virginia between 1965 and 1999.

¹ Derived from the 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Because specific bear hunting data were not provided, it was assumed that bear hunting expenditures would approximately be equal to the total big game expenditures x the proportion of big game hunting effort utilized by bear hunters (e.g, VA = \$376,230,000 * 0.046, US = \$9,712,735,000 * 0.019).

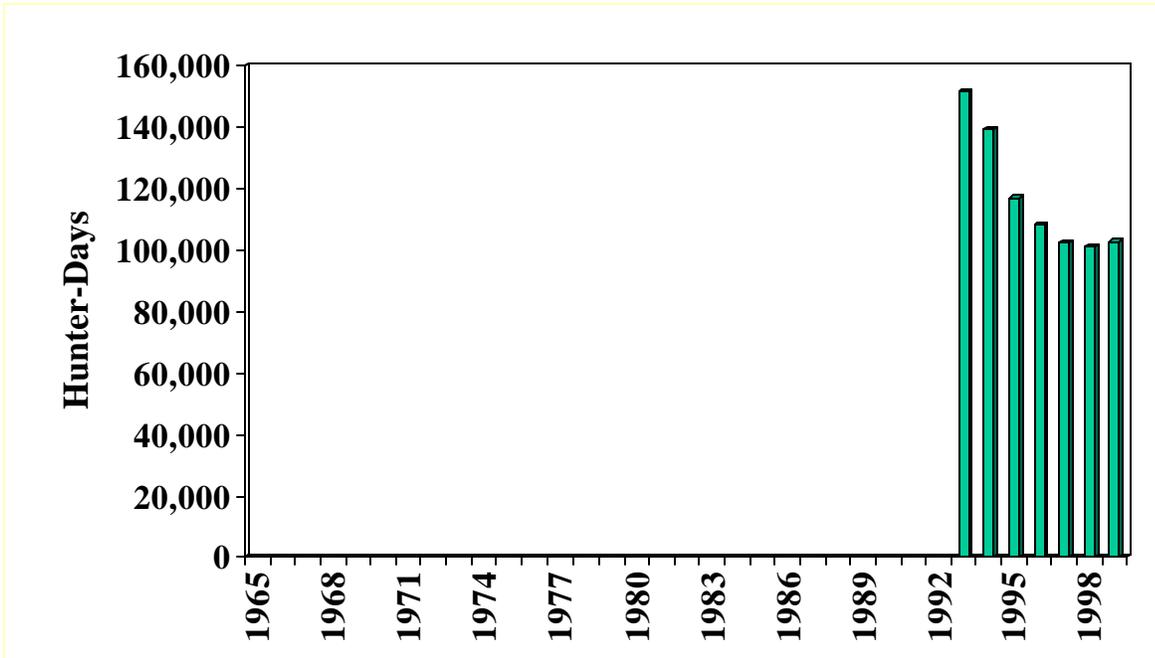


Figure 14. Black bear hunting effort (hunter-days) in Virginia between 1993 and 1999.

Participation trends during the 1990s reflect a continued decrease in the number of bear hunters (21,000 hunters in 1993-1994 to 17,157 hunters in 1999-2000) and hunter effort (151,227 hunter-days in 1993-1994 to 102,687 hunter-days in 1999-2000).

Types of bear hunting. In Virginia, hunters generally pursue bears using 3 different techniques. While most bear hunters (84%) use firearms without dogs sometime during the season, many bear hunters use more than one method. On average, 31% and 45% of all bear hunters also use archery equipment and firearms with dogs, respectively. Since 1995, archery hunters, gun hunters without dogs, and gun hunters with dogs have accounted for 17%, 44%, and 39% of the annual bear harvest, respectively. The archery bear harvest varies widely depending upon mast conditions. When mast conditions are poor, the archery harvest increases to about 32% of the total bear harvest. Undoubtedly, much of the gun hunting effort without dogs occurs by deer hunters during the overlapping portion of the bear and deer seasons. Bear hunters using dogs also utilize a nonharvest chase season during September.

Bear hunter demands & satisfactions. Individuals hunt for many reasons (e.g., companionship, being close to nature, skill & challenge, meat). Specific information on bear hunter satisfactions is limited. Input from focus groups participants suggest that family customs and camaraderie are important satisfactions for Virginia dog hunters. In Colorado, family and community traditions are important reasons for participation in bear hunting. In Michigan, bear hunter preference for still hunting or dog hunting was related to the reasons for hunting. Spending time with hunting companions and hearing the dogs were much more important for dog hunters than for still hunters. Harvesting a bear was more important for still hunters. Many hound hunters in Virginia have shifted their emphasis from harvesting bears to sport chasing. As an indication of the dog hunting value, Michigan dog hunters were more likely than still hunters to consider bear hunting as their most important recreational pursuit.

In a 1995 survey, Virginia bear hunters rated the gun bear season (without dogs and overlapping the deer season) as most important 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. Bear hunters who did not

use dogs (and were primarily deer hunters) probably heavily influenced these rankings. In a 1990 survey, Virginia gun deer hunters indicated that the opportunity to harvest bears during the concurrent portions of the deer and bear hunting seasons was relatively unimportant.

A recent Virginia survey indicated that more than 20% of bear hunters were dissatisfied with their hunting experience during the 1998-1999 season. The VDGIF receives frequent requests for a longer chase season and to open more counties for chase.

Concerns about bear hunting. Black bear hunting is controversial across the United States. Recent citizen initiatives to restrict black bear hunting or management options in California, Colorado, Florida, Idaho, Massachusetts, Michigan, New Jersey, Oregon, Utah, Washington, and Wyoming have produced varied results. Black bear hunting controversies have primarily focused on how, when, and whether black bears should be hunted.

Perhaps the most contentious issues involve ethics and fair chase of certain harvest methods, especially hunting bears with dogs. In Idaho, only 12 % of nonhunters approved of hunting black bears with dogs. Although 62% of Colorado's citizens approved of bear hunting, 73% opposed the use of dogs. Many people oppose hunting bears with dogs because they perceive: (1) that bears have little chance to escape, (2) that technology used by bear hunters is unfair (e.g., radio-collars on dogs, CB radios, vehicles), (3) that chasing is cruel or abusive to bears, or (4) that bear chases sometimes infringe on posted properties.

Bear hunting issues are as contentious among bear hunters and other hunters as they are with the general public. In Idaho, only 28% of other hunters favored bear hunting with dogs. 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 dogs. Similarly in 1993, 54% of the non-dog bear hunters did not favor the bear-dog training season in Virginia. On the other hand, 82% of dog bear hunters favored the bear-dog training season; only 14% of the dog bear hunters opposed the training season with 5% remaining neutral. Of the other hunters who did not hunt bears, most were neutral (49%); another 32% opposed the bear-dog training season with 19% favoring it.

Issues related to dog hunting are not the only controversies among bear hunters. Other bear hunters sometimes become concerned about overexploitation and allocation of the harvest when archery kills increase during poor mast years (i.e., compared to an average of 17%, >30% of the total bear kill during poor mast years comes from archery hunting). Bow hunter harvests also result in higher percent females in the harvest than other hunting methods.

Bear Damage Demands

Bear management demands are not only related to hunter recreation. Damage caused by black bears is diverse including destruction of beehives, foraging at garbage dumps, destroying crops (sweet corn, fruit trees), feeding on grain at livestock feeders, damage to trees, harassing campers, and killing of livestock. In developed areas, problems often center on damage to wooden structures and bird feeders, scavenging garbage cans and pet food, automobile accidents, and simple public sightings. Although public perceptions may differ, many of these problems may not be 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 cause most of the human-bear problems. In Virginia, 73% of the nuisance bears captured for relocation have been male. Because males travel greater distances than females, especially around the breeding season, they may also be more likely to cause nuisance problems and be more vulnerable to trapping. Adult males displace females and younger bears at prime feeding sites (which may be a human-

related food source). Dispersing subadult males during late summer and fall also are prime contributors to human-bear problems.

Agricultural bear damage. The Virginia Department of Game and Inland Fisheries has documented agricultural damage by black bears for over 60 years. Agricultural damage has increased substantially since 1980. Over the past decade, the number of bear complaints requiring VDGIF response has increased 44% (Figure 12). The full extent of bear damage experienced by the residents of Virginia is not known.

Agricultural concerns include damage to field and sweet corn, peanuts, bee hives, orchards (peach, apple, cherry, apple), and killing of livestock (goats, sheep, cattle, chickens, hogs). Damage to corn and orchards are the most common agricultural complaints.

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 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. Relatively rare bear predation on livestock usually involves adult sheep and lambs (mostly in the spring).

Agricultural producers often request assistance from the VDGIF for nuisance bear problems. Assistance is provided in the form of education, live-trapping and removal, or issuance of kill permits.

Bear vehicle collisions. Bear-vehicle collisions become more of a concern with expanding bear populations and increased traffic volumes. A minimum average of 17 bear-vehicle collisions occurs annually statewide, but an unknown number remain unreported. Although road-killed bears are difficult to document accurately, the incidence may be increasing. Between 1980 and 1989 (10 years), 109 bears were reportedly killed by vehicles, increasing to 205 between 1990 and 1997 (8 years). A human fatality occurred during March 2001 because of a bear-vehicle collision in the northern Shenandoah Valley.

Residential / Urban bear concerns. High populations of both bears and humans commonly coexist together in many parts of North America (e.g., Pocono Mountains in Pennsylvania). Concerns about urban bears are becoming more prevalent with increasing bear and human populations. Problems involving nuisance black bears in residential areas are especially complex. Diverse residential/urban problems range from perceived threats (e.g., a simple sighting on the edge of the suburbs) to relatively serious issues (e.g., a bear in the city center being harassed by humans and disrupting traffic). Misinformation often results in uncertainties and unrealistic fears about wild animals, especially black bears.

Human safety concerns and bear attacks. Black bears are usually nonaggressive, shy, elusive, and harmless to people. Despite great many bear-human encounters, black bears pose little physical danger to humans. Even so, some 45 human fatalities due to black bears have been documented in North America since 1900. In most cases, these fatalities were predatory attacks in remote areas by bears having little prior contact with people. Although rare, fatal attacks have also involved nuisance bears that have lost their fear of people. No bear-inflicted human fatality has ever been documented in Virginia.

Illegal and Market Bear Demands

The steady decline of the Asiatic black bear (*Selenarctos thibetanus*) and continued demand for bear gall bladders and other bear-related products by the Asian market make 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 uses for liver disease, blood disorders, hemorrhoids, and digestive ailments. Bear gall bladders sell for \$800 to \$2,500 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 may create 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 projects suggest only minor bear losses due to illegal harvest; it is doubtful that poaching is having a significant impact on the statewide bear population.

Augmenting the recreational value of black bear hunting in rural America, several states permit the sale of bear parts. To avoid waste, some scientists, resource managers, and hunters support broader legalization of bear parts trade for legitimate medical uses. However, an Idaho survey of bear hunters found that only 34% would approve the legal sale of bear parts. The Vermont Department of Fish and Wildlife's proposal to implement mandatory tagging of bear parts before sale was met with 59% approval and 28% disapproval by the public.

Nonconsumptive Bear Demands

Bears capture human admiration and interest like few other wildlife species. As a reflection of strength, bears often are used as icons for countries (e.g., Russia) and athletic teams. With their resemblance to humans, bears are perceived to have emotional qualities and were the 4th most commonly mentioned animal in titles of children's books in the United States during the 1970s (following horses, dogs, and cats).

Wildlife watching activities (e.g., observing, feeding, photographing) are important to Virginians. Over 2,600,000 people participated in some type of wildlife watching activity in Virginia during 1996 (USFWS-National Survey -Virginia 1996). A recent 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. Visitors in Great Smoky Mountains National Park wanted to see a bear more than any other wildlife species. Supplemental feeding of bears may provide additional recreation for many bear hunters during the off-season and a sense of contribution to increased growth, reproduction, and survival of local bear populations. Hunters also may derive nonconsumptive benefits from viewing bears at bait sites.

Other Bear Demands

To many people, the black bear is a symbol of the American wilderness. As such, bears are valuable to many citizens simply because they exist in their native ecosystems.

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.

Cultural Carrying Capacity

The joint impact of all the demands for bears (both negative and positive demands) results in the cultural carrying capacity (CCC). 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 by people from bears. It is different for each constituency, location, and point in time. Development of bear management objectives to meet the CCC are subjective and involve a combination of social, economic, political, and biological perspectives. For example, a farmer experiencing crop damage from bears may have exceeded his CCC and desire fewer black bears. However, for the suburban resident traveling to a park hoping to see a black bear, the current population level may be too low to provide sufficient viewing opportunities.

In areas with higher human populations, the CCC is probably well below the BCC because people's tolerance for bears will limit bear populations before the habitat becomes a limiting factor. Landowners have generally exhibited a great deal of tolerance for black bear nuisance problems. A 1978 survey of landowners and camp managers in New York State revealed that those who had experience with bears generally had more positive attitudes about bears than those who had no experience. Ultimately, the abundance and distribution of black bears will hinge on public tolerance and result in population levels well below biological carrying capacity.

A 1999 survey of Virginia hunters found that 66% of the bear hunters expressing an opinion and 68% of the other hunters wanted bear populations to increase. Only 2% and 4% of the bear hunters and other hunters, respectively, desired a decreased bear population. Most (55%) of the other hunters had no opinion compared to only 9% of the bear hunters. The population objectives for landowners and other nonhunting stakeholders are unknown.

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BLACK BEAR MANAGEMENT OPTIONS

Several management strategies are potential options to achieve cultural carrying capacities that meet specific human objectives for black bears. These strategies involve many aspects of black bear management, including 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. While public demands regarding black bear management objectives may be divergent, the specific management strategies or options to achieve these objectives can be equally diverse and controversial. A thorough understanding of the implications of the various bear management options will be important to the success of bear management programs.

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. Population management in a given area will impact 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.

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 euthanization, typically has been used only as a last resort.

BLACK BEAR MANAGEMENT OPTIONS

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 list groups management options according to the objectives they primarily address:

Options Primarily For Population Management

1. Allow nature to take its course
2. Control nonhunting mortality
3. Fertility control

Options For Both Population & Human-Bear Problem Management

4. Habitat management
5. Kill permits
6. Regulated hunting
7. Supplemental feeding

8. Translocation
9. Trap and euthanize

Options Primarily For Human-Bear Problem Management

10. Aversive conditioning
11. Exclusion devices
12. Repellents
13. Reimbursement fund

Option 1 – Allow Nature to Take Its Course

Allowing nature to take its course, black bear populations would increase until reaching BCC. The point at which black bear populations achieve BCC is not known but varies regionally and annually with habitat quality and food availability. It is highly probable that BCC for black bear populations exceeds CCC, as human-bear problems occur at low bear population densities.

To increase population levels, allowing nature to take its course is best suited for low-density black bear populations where the incidence of human-bear problems is limited. In the absence of population control measures, rates of population growth will be maximized. At low densities, these population growth rates may be 25% per year.

Biologists speculate that adult male black bears will regulate populations approaching BCC (Kemp 1976, Bunnell and Tate 1981, Taylor 1994). However, such density-dependent effects on black bear populations are not well understood (Miller 1990). Habitat degradation is a serious biological consequence of white-tailed deer overabundance. While black bears will cause damage to forest stands (Poelker and Parsons 1980, Warburton and Maddrey 1994), the extent of habitat degradation caused by high bear population levels is uncertain, but is probably of limited consequence.

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. Adopting a “hands off” policy will not 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, and vehicle collisions can be substantial. Wisconsin awarded over \$2.2 million in payments to landowners due to damage resulting from black bears in 1992 (Warburton and Maddrey 1994).

Implications for Population Management: Allowing nature to take its course increases population levels at maximum rates until BCC is reached.

Implications for Human-Bear Problem Management: Allowing nature to take its course has no site-specific impacts on human-bear problems. Generally as populations increase, human-bear problems also will increase.

Option 2 – Control Non-Hunting Mortality

In black bear populations, nonhunting mortality results from a variety of causes including vehicle collisions, poaching, intra-specific aggression, flooding of natal dens, and disease (Jonkel and Cowan 1971, Alt 1984, Higgins 1997, Ryan 1997). Controlling nonhunting mortality of black bears would be most promising for human-induced mortality (i.e., vehicle collisions, poaching). Control of behavioral, disease, and environmental factors affecting black bear populations is not practical.

The impact of vehicle collisions on established black bear populations in Virginia is limited. From 1982 – 1997, research in Shenandoah National Park, Great Dismal Swamp, and George Washington and Jefferson National Forests reported only 8 of 574 (1.4 %) captured black bears were involved in vehicle collisions (Hellgren 1988, Kasbohm 1994, Schrage 1994, Higgins 1997, Ryan 1997). Maehr et al. (2000) noted several black bear populations inhabiting areas close to human development and highways that lacked vehicle collisions as a source of mortality. These populations were found in Washington state (Poelker and Hartwell 1973), Idaho (Beecham and Rohlman 1994), Apalachicola National Forest (Seibert 1993), and coastal North Carolina (Martorello 1998). Most states in the eastern United States indicated that bear-vehicle collisions were a relatively minor problem (Wooding and Maddrey 1994).

However, vehicle collisions can be an important source of mortality for black bears under certain conditions. Comly (1993) reported 13 of 168 (7.7%) black bears translocated to Mount Rogers National Recreation Area in southwestern Virginia died as a result of vehicle collisions. Vehicle collisions also were an important source of mortality for isolated black bear populations near Eglin Air Force Base (FL) and Camp LeJeune Marine Corps Base (NC). Almost 10% of black bears captured at Eglin died because of vehicle collisions (Kasbohm and Bentzien 1998) and 72% of all bear mortality at Camp LeJeune was from highway accidents (Wooding and Maddrey 1994). At another central Florida cite, 83% of all bear mortality was attributed to vehicle collisions (Wooding and Maddrey 1994).

Evidence that highway fencing and underpasses reduce black bear mortality is limited and speculative. Foster and Humphrey (1995) suggested that the construction of highway underpasses reduced mortality for some wildlife species, particularly Florida panthers and bobcats. However, Foster and Humphrey (1995) reported black bears were observed on only 2 of 672 photographs showing wildlife using underpasses. Lotz et al. (1997) reported black bear use of underpasses in south Florida was much lower than that exhibited by the Florida panther, but considering the relative population density of these 2 species, black bear use of highway underpasses should have been an order of magnitude greater. Along the Trans-Canada Highway, Waters (1988 as cited by Foster and Humphreys 1995) reported that black bears often crossed fenced sections of the highway but used underpasses when they were convenient. While underpasses may benefit some wildlife species, no conclusive evidence is available to suggest that highway fencing or underpasses reduce the nonhunting mortality of black bears.

Adequate assessments of the impact of poaching within black bear populations are difficult to obtain (Ryan 1997). Activities of poachers are secretive, complicating quantification of their effects. In Virginia, research from Shenandoah National Park, Great Dismal Swamp, and George Washington and Jefferson National Forests reported 9 of 574 (1.6%) captured black bears were illegally killed (Hellgren 1988, Kasbohm 1994, Schrage 1994, Higgins 1997, Ryan 1997). Additionally, black bear populations throughout most of their range are stable or increasing (Garshelis 1990) suggesting that poaching is not having serious negative impacts on established black bear populations. However, poaching losses may impact population growth rates and expansion for localities where the objective is to increase bear populations.

The costs associated with controlling nonhunting mortality can be great. In Florida, the estimated cost of an underpass varies from \$750,000 for underpasses incorporated into the proposed construction of a 2-

lane highway to \$1.7 million dollars for underpasses incorporated into an existing 4-lane highway (J. Hartley, Florida Dept. of Transportation pers. commun.). These estimates include costs associated with project design, right-of-way acquisition, construction, fencing, and wetland mitigation. Increased levels of law enforcement to control poaching also are costly. Enforcement costs are associated with increased staffing levels, additional equipment needs, and other tasks that are foregone due to time constraints. Unless black bear populations are small, isolated, and significantly impacted by nonhunting mortality, the cost of controlling nonhunting mortality may be prohibitive.

Implications for Population Management: In general, controlling nonhunting mortality increases population levels. However, the minimal population impact of both poaching and vehicle collisions in Virginia would minimize the effectiveness of this option.

Implications for Human-Bear Problem Management: Except for a few potential vehicle collisions, controlling nonhunting mortality has no site-specific impacts on human-bear problems. Generally as populations increase, human-bear problems also will increase.

Option 3 – Fertility Control

Chemical contraception by steroids, estrogens, and progestins has been studied since the 1960s. Although studies have identified successful methods of inhibiting reproduction, they have not led to the development of a viable wildlife management technique. Therefore, chemical contraception currently is impractical for broad-scale population control (Miller et al. 1998). 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 a viable wildlife management technique. However, Miller et al. (1998) reported that current immunocontraceptive technology is practical only for laboratory studies, pen studies, and limited field applications.

The effectiveness of fertility control agents in managing wildlife populations is unclear. Garrott (1991) reported that, in most situations, fertility control agents may only slow population growth or stabilize the population at current levels. 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 can reduce recruitment into the population, it does not reduce the current population size, which is usually the major objective of population control.

Most of the fertility control research and applications have been directed at the management of deer populations. Insufficient research exists with respect to the use and effectiveness of fertility control agents on black bears. Until the efficacy, health impacts, behavioral changes, method of administration, and costs are determined, fertility control will not be a viable option for black bear population management.

Implications for Population Management: Fertility control techniques have not been developed for the management of bear populations. However should the technology be developed, fertility control should stop population growth and maintain a stable population size.

Implications for Human-Bear Problem Management: Fertility control has no site-specific impacts on human-bear problems.

Option 4 – Habitat management

Black bears require extensive blocks of habitat, and are adapted to a wide variety of forest types. Based on known, apparently viable black bear populations within the Southeast, the minimum area observed to

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support a bear population was 79,000 acres for forested wetlands and 198,000 acres for forested uplands (Rudis and Tansey 1995 citing M. R. Pelton pers. comm.). Greater diversity and productivity associated with forested wetlands reduced the minimum acreage required for this habitat type. Based on observational information, these minimum areas for viable bear populations can only be considered as very general estimates and subject to improvements.

A diversity of habitats and habitat conditions is important for satisfying black bear habitat requirements. Therefore, a forest managed to provide a variety of successional stages would likely provide better black bear habitat potential than an unmanaged forest (Weaver 2000). Forest management practices designed to benefit black bears ensure a sustained and abundant food supply throughout the year (e.g., hard mast, soft mast, herbaceous foods, invertebrates), denning sites, and escape cover. Because oak mast abundance can be an important habitat factor for bears, management strategies should encourage the sustained availability of mature, acorn-producing trees. Integration of silvicultural treatments, prescribed burning, and management of woodland openings affords the greatest potential for improving, maintaining, and establishing black bear habitat (Weaver 2000).

Habitat quality, through its influence on food abundance, affects reproduction and survival of cubs. Poor nutrition can delay the onset of the breeding season, increase the age of sexual maturity, and lengthen the normal 2-year interval between litters (Jonkel and Cowan 1971, Rogers 1976, Eiler et al. 1989, McLaughlin et al. 1994, Noyce and Garshelis 1994). Rogers (1976) stated that cub mortality was nutrition-related. In Tennessee, limited fall food supplies increased cub mortality the following spring (Wathen 1983).

Habitat fragmentation and subsequent isolation of black bear populations is a concern in the Southeast (including Virginia) where black bears occupy only 5 – 10% of their former range (Pelton 1986). Corridors connecting isolated black bear populations have been recommended to ensure the long-term persistence of bears in this region (Rudis and Tansey 1995). However, human activities such as urbanization, intensive agriculture, and construction of high-traffic volume roads can impact corridors and linkages among populations. Brody and Pelton (1989) reported that black bears crossed roads less frequently as traffic volume increased and were reluctant to cross roads with high traffic volumes (e.g., interstate highways).

In general, the current need for developing corridors in Virginia appears minimal. Recent sightings in Virginia suggest that black bears are likely to occur most anywhere in the Commonwealth, indicating that sufficient corridors to source populations may currently exist. Where habitats are more fragmented (e.g., areas around the Great Dismal Swamp), population viability may be a concern. With encroaching human population growth, corridor protection and/or development may become necessary to ensure habitat availability and 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.

Habitat management has some potential to influence human-bear problems. Maintaining a diversity of habitat types and conditions should minimize human-bear problems associated with limited food resources. In Minnesota, nuisance activity increased during late summer and fall during years of low natural food availability (Rogers 1976, Garshelis 1989). Samson et al. (1994) noted that bears are strongly attracted to early successional habitats during late summer and fall in Canada; establishment and maintenance of these areas may minimize some seasonal needs for bears to search elsewhere for food. Nuisance and damage activities of bears also are influenced by acorn availability in the mature oak forests of the southern Appalachians.

At the site of human-bear problems, some preventative measures associated with habitat management activities are possible (Hygnstrom 1994), but little information is available on their effectiveness.

Preventative measures for human-bear problems involve careful planning and development of human-related structures and activities away from areas frequented by bears. Habitat management techniques that eliminate protective cover near human-related property may moderate nuisance problems. Gilbert and Roy (1977) reported that beehives located > 100 yards away from protective cover were visited much less frequently by bears than beehives located closer to protective cover.

Although habitat has important consequences for black bears, the ability to effectively manage habitat is limited. Management of public lands using conventional silvicultural techniques has been hindered by increased public resentment to timber harvesting, increased environmental regulation, and decreased budgets (Weaver 2000). Prescribed burning also meets resistance due to traditional public values about fire suppression. Further, wildlife managers do not have a direct control on private and corporate land management. These private lands comprise approximately 87% of Virginia's forestland ownership.

Costs associated with habitat management for black bears depend upon the management activities conducted. Most silvicultural 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 by raising the BCC. 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 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 can reduce site-specific human-bear problems.

Option 5 – Kill Permits

Conover and Decker (1991) reported that 86% of states had implemented shooting-permit programs. Generally, these programs were 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.

Kill permits can effectively target and remove specific 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 could lead to public safety concerns. 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. Animal welfare groups often support nonlethal means for managing wildlife populations. Perceiving a loss in recreational

opportunities, some hunters would likely object to bear removal from the population via kill permits. However, Horton and Craven (1997) reported that the controversy surrounding Wisconsin's kill permit program appeared to come from a vocal minority, and hunters and farmers accepted the use of kill permits for reducing crop damage.

The kill permit option generally would involve administrative costs to distribute permits and monitor permit use. Persons issued kill permits would incur expenses in the time and equipment needed to remove bears. Additional costs would result from the loss of some recreational opportunities, as animals killed with permits would not be available for hunting or viewing.

Implications for Population Management: The population impacts of kill permit use generally would be minimal. If extensively used, kill permits could stabilize or decrease black bear population levels. The 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. Typically, kill permits often have been used as a last resort in situations where substantial damage has occurred or human life and safety are threatened.

Option 6 – Regulated Hunting

Regulated hunting has been the method of choice for managing wildlife populations since 1910 (Strickland et al. 1994). With regulated hunting, specific population levels are achieved by adjusting season length, season timing, and legal methods of take to manipulate the magnitude, sex composition, and age composition of the harvest. Information from hunting harvests provides wildlife managers with important data to assess bear population status.

Usually as an additive (and often significant) form of mortality, hunting is the major limiting factor in most black bear populations (Cowan 1972, Bunnell and Tait 1981). Depending on harvest levels, black bear populations can increase, decrease, or remain the same in the presence of hunting. Demonstrating the population growth potential associated with bear hunting seasons, a survey of 23 bear-hunting states indicated that 57% had increasing populations; all the remaining states had stable populations (Kocka et al. 2001).

Bear populations have been observed to decrease due to heavy hunting pressure (McIlroy et al. 1972, McCaffrey et al. 1976, Lindzey et al. 1983). Unless population reduction is the objective, black bear hunting seasons should be conservative because depleted populations are slow to recover due to low reproductive potential (Miller 1990). Population growth will be realized when hunting harvests remove less than the annual recruitment of bears. Populations are stabilized when the harvest equals the annual recruitment.

The selected harvest of adult males in Alberta seemed to result in bear population growth in a previously unharvested population (Kemp 1976). Stimulating population growth, the reduction in numbers of older male bears might decrease dispersal by subadult bears (largely males) and increase subadult survival rates.

Bear sanctuaries have been used effectively to protect core populations of breeding females from human disturbances. As refuges, sanctuaries provide surplus bears that may be available for harvest (Beringer et al. 1998). Because sanctuaries provide surplus bears to the population, they are most practical for areas wishing to increase or maintain population levels.

Regulated hunting has potential to reduce human-bear problems. In Washington, hunting to control black bear population levels has been used to reduce bear damage to commercial forest stands (Poelker and Parsons 1980). However, liberalized hunting regulations failed to reduce bear population levels and crop damage in agricultural areas of Minnesota's black bear range; more liberal hunting regulations would be required to have a population and damage impact (Kontio et al. 1998).

Bear hunting seasons that do not coincide with damage periods (as occurs in Virginia) keep hunters from targeting the specific bears involved in problems at other times of the year. The establishment of a September bear hunting season in Wisconsin increased the recreational harvest of bears that were causing damage problems and decreased the average number of nuisance bears destroyed per year using kill permits from 110 to 19 (Hygnstrom and Hauge 1989). Adjusting the hunting season structure to coincide with bear damage periods may afford greater opportunities to remove problem bears from the population.

Regulated hunting of black bear populations has become a controversial social issue. Perhaps the most contentious issues involve fair chase and the ethics of certain methods of harvest, especially hunting bears over bait, hunting with dogs, or hunting in the spring (Loker and Decker 1995). Physical effects of hunting on bears (Beck et al. 1994, Loker and Decker 1995), possible environmental side-effects of providing access to hunters, and the expense of regulating various hunting methods (Beck et al. 1994) also have been questioned by critics of bear hunting. Additionally, regulated hunting may not be acceptable or feasible near urban areas due to concerns for human safety. Hunting may be ineffective at controlling bear populations and human-bear problems near large sanctuaries (e.g., Shenandoah National Park).

Regulated hunting provides economic benefits in the form of hunting-related expenditures (food, lodging, equipment, and transportation). Annually, bear hunters may spend over \$184 million in the U.S. and \$17.3 million in Virginia (U. S. Department of the Interior 1996). Because the specific data were not provided, it was assumed that bear hunting expenditures would approximately be equal to the total big game expenditures x the proportion of big game hunting effort utilized by bear hunters. 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.

Implications for Population Management: Regulated hunting is compatible with increasing, decreasing, or stable population management objectives. Because hunting is usually an additive source of mortality for black bears, maximum population growth can not be obtained by implementing this option. However, the additive nature of hunting mortality in black bears offers wildlife managers the potential to effectively control black bear population levels. Increasing population levels are achieved through conservative hunting seasons designed to protect certain segments of the black bear population (e.g., mature females). Stable or decreasing population levels can be achieved through more liberal hunting seasons that do not offer as much protection to the black bear population.

Implications for Human-Bear Problem Management: Regulated hunting may reduce human-bear problems by controlling population levels. Some potential also exists for targeting bears involved in problems by adjusting hunting season timing and methods of take.

Option 7 – Supplemental Feeding

Supplemental feeding augments natural food supplies by providing additional food sources to wildlife populations through cultivated wildlife plantings or strategically located wildlife feeding stations.

Research suggests that black bears utilizing high-energy, human foods grow faster and mature earlier than bears that utilize only natural foods (Rogers 1976, 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 (Rogers 1976, Tate 1983, Rogers 1987, McLean and Pelton 1990).

Estimates of survival rates for bears with supplemented diets are limited. McLean and Pelton (1990) reported that lower survival rates likely contributed to the young age structure of panhandling bears in the Great Smoky Mountains. For grizzly bears, Glenn et al. (1976) suggested that mortality rates of juvenile bears might be elevated in areas where bears aggregate to feed. 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 ultimate impact of supplemental feeding on black bear populations is unknown.

Proponents suggest that supplemental feeding may reduce competition for human-related food resources and minimize other human-bear problems. Bear damage to coniferous trees in Washington was reduced through a supplemental feeding program (Ziegeltrum and Nolte 2000).

Most human-bear problems arise from bears exploiting human-related food resources. These supplementally fed bears (although often not intentionally fed) often are responsible for increased nuisance problems (Will 1980, Warburton and Maddrey 1994). 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 access to human-related food sources (Follmann 1989, McCrory et al. 1989, Smith and Lindsey 1989, Smith et al 1989). In Denali National Park, Dalle-Molle and Van Horn (1989) reported that human-bear problems decreased in back country camping areas after hikers were supplied bear-proof containers for food storage. Human-bear problems also decreased in areas of Yosemite National Park where access to human-related food sources was eliminated (Keay and Webb 1989). Little information is available on the effect of supplemental feeding in areas receiving minimal human use.

Research has shown that bears possess adaptable behavioral mechanisms that allow them to interact advantageously with their environment (Eagar and Pelton 1979). These mechanisms easily allow bears to become food conditioned and habituated (i.e., lose of fear) to humans (McCullough 1982). Bears lacking fear of humans are dangerous and close encounters between habituated bears and humans are more likely (McCullough 1982).

Because of the satisfaction gained from the sense of benefiting wildlife populations, the public often supports supplemental feeding. However, depending on the methods used, supplemental feeding has generated concerns from associated littering (especially on public lands in Virginia). Supplemental feeding as a black bear population management technique produces some ethical and philosophical issues/concerns. The black bear is a symbol of the American wilderness (Rolston 1987), representing those things that are natural, wild, and free. To what extent can, or should, a black bear (or any wildlife) population be manipulated using supplemental feeding and still be considered “wildlife” management?

The economic costs and benefits of supplemental feeding are not well defined or understood. In Virginia, Gray (2001) reported that bear hunters from July 1, 1998 to June 30, 1999 spent an average of \$162.64 on supplemental feeding of black bears. While this estimate likely reflects costs associated with acquiring supplemental foods and some feeding equipment, detailed analyses of all the costs and the efficacy of supplemental feeding have not been conducted. It is likely that supplemental feeding, as a wide-scale program, would 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). Benefits might include increased opportunities for wildlife viewing, especially black bears. Some 74% of Virginians indicated they were interested in taking a trip to see black bears (McMullin et al. 2000).

Implications for Population Management: Supplemental feeding is intended to increase BCC and improve the health of the black bear population. The overall impact of supplemental feeding on black bear populations is unknown.

Implications for Human-Bear Problem Management: Bears exploiting human-related food resources are responsible for most human-bear problems. Supplemental feeding has increased human-bear problems in areas of high human use. The effects of supplemental feeding in areas of minimal human use are unknown. In some situations, supplemental feeding might reduce some types of bear damage.

Option 8 – Translocation (Trap and Transfer)

Translocation is the introduction of wildlife into new or previously occupied habitats to establish, reestablish, or augment wildlife populations (Griffith et al. 1989). Translocation has been used to restore black bear populations in areas where native bear populations have been extirpated (Shull et al. 1994). A sizeable black bear population currently exists in Arkansas due to translocation of bears from Minnesota and Canada (Smith et al. 1991). Nuisance bears translocated to the Mt. Rogers National Recreation Area of southwestern Virginia have enhanced population recovery (Comly 1993).

Translocation has numerous effects on black bears. At the release site, translocation appears to increase human-induced mortality (i.e., vehicle collisions, regulated hunting) through increased movements during the first few months following translocation (Massopust and Anderson 1984, Stiver 1991, Comly 1993). In Virginia during the past 20 years, hunters have harvested 30.0% of the translocated nuisance bears while at least another 6.1% have been hit on the highways (VDGIF, unpublished data). Rogers (1986) reported natural mortality rates of black bears ≥ 2 years old did not increase following translocation. Translocation appears to have some short-term effects on reproduction. Comly (1993) and Godfrey (1996) reported females failed to reproduce the winter following translocation, but reproduced normally in subsequent years.

Beyond population enhancements, translocations of nuisance bears have implications for human-bear problems. Translocated nuisance bears tend to be male and intra-specific aggression between male bears can be considerable. While the effect of translocation on individual bear behavior is unknown, it appears likely that translocated bears may experience considerable intra-specific aggression when released into new territories. Translocated bears also may introduce “harmful” genes or diseases into existing bear populations (Shields 1982). These potential, detrimental impacts of translocation are probably limited for closely associated bear populations where dispersal among populations probably occurs anyhow (McCollum 1974, Alt et al. 1977, McLaughlin et al. 1981). However, the affect of these impacts is largely unknown for distant bear populations where dispersal among populations does not normally occur.

Per unit of effort, bear trapping may be more efficient than regulated hunting (as it is currently practiced) for removal of bears. During the 1998–99 bear hunting seasons, Virginia bear hunters harvested 914 bears using 100,858 man-days of hunting (1 bear per 110 man-days of hunting) (Wright et al. 2000). During the summer of 1999, research personnel trapping black bears in western Virginia captured 176 bears during 3,894 nights of effort (1 bear per 22 nights of effort) (Vaughan et al. 1999). Some bear hunters, especially dog hunters, do not harvest every bear for which they have the opportunity.

In eastern North America, 24 of 28 states/provinces use translocation to manage human-bear problems (Warburton and Maddrey 1994). Translocation has been effective at reducing nuisance activity (McArthur 1981, McLaughlin et al 1981, Fies et al. 1987). However, McArthur (1981) suggested that translocation fails to address the situation which led to the nuisance behavior, and Massopust and Anderson (1984) reported translocated nuisance bears caused problems while attempting to return home or after returning. During the last 20 years in Virginia, 4.7% of translocated nuisance bears continued nuisance activity (VDGIF, unpublished data).

Age of the bear and distance moved affects the success of translocation. Several studies indicate that translocation of subadults is more successful than adults (Sauer and Free 1969, Alt et al. 1977, Rogers 1986). Subadults returned home less often and remained near the release site more often than adults. Distance moved appears to affect a bear's ability or desire to return home following translocation. It is unlikely that bears moved > 40 miles will return home (Sauer and Free 1969, Alt et al. 1977, Rogers 1986, Shull et al. 1994).

Translocation appears to receive wide public acceptance as a wildlife damage control technique, but selection of suitable release sites for black bears may be problematic. 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 habitat 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 can not 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

The need to chemically immobilize bears with some capture methods (e.g., snares) limits the applicability of translocation during certain times of year (e.g., prior to and throughout the hunting seasons). Following immobilization, the Food and Drug Administration requires a 45-day waiting period before a bear is considered fit for human consumption. This policy therefore restricts the use of immobilizing drugs on bears released in hunted areas within 45 days of the bear hunting season. Unless bears can be captured and released without the need for immobilization, other management options may be required.

Translocation has proven to be labor intensive and expensive. In 1991, the cost of translocating a bear from northwestern Virginia to southwestern Virginia was \$349 per individual (Comly 1993). This is a conservative estimate based on variable costs. Fixed costs such as administrative expenses, capture and handling equipment (i.e., traps, carrying cages, immobilization equipment), purchase of specialized vehicles, and various overhead expenses were not included. In New Jersey, the current cost of translocating a black bear is estimated to be \$750 per individual (B. Eriksen pers. comm.).

Implications for Population Management: Translocation usually is considered a means of increasing black bear population levels at the release site. While less practical, translocation may also be an option for stabilizing or decreasing bear populations at the capture site. The magnitude

of these effects depends upon the number, sex, and age of bears translocated as well as the size of the area from which bears are captured or released. Effective, long-term population control would require continual translocation efforts; 1-time removals will only achieve short-term control benefits.

Implications for Human-Bear Problem Management: Translocation can reduce nuisance activity. However, translocation does not address the behavior causing the human-bear problem, thus, bears need to be relocated to areas where they cannot exhibit the same problem behavior. Effective, long-term nuisance control would probably require continual translocation efforts; other bears in the area are likely to learn the same nuisance behavior.

Option 9 – Trap and Euthanize

Applications of black bear captures and euthanizations to manage population levels probably have been exceedingly rare. Other than for mitigating unique human-bear problems, the published literature provides no references to capture and euthanization as a black bear population management option.

Capture and euthanization can effectively target and remove specific bears involved in human-bear problems, eliminating future problems with that individual. In practice, euthanization generally only occurs in situations where the bear is an immediate threat to human safety or has repeatedly been involved in human-bear problems (Warburton and Maddrey 1994). Research suggests that the use of non-lethal techniques (e.g., translocation) in favor of euthanization may cause an increase in future human-bear problems in some situations. Problem female bears have been shown to produce cubs that exhibit similar behavior (Meagher and Fowler 1989). Euthanization of problem females would help stop the cycle of nuisance behaviors ultimately learned by her cubs.

Especially in unhunted areas where information may be lacking, capture and euthanization would provide the opportunity to collect baseline data on bear populations and assist wildlife management agencies in monitoring bear population health and growth. Bears euthanized by gunshot could be consumed (supporting programs like Hunters for the Hungry), while bears euthanized by chemical means are generally not safe for human consumption. However, chemical euthanization may be viewed as more humane.

As a lethal control measure, capture and euthanization may be less socially acceptable than non-lethal options. Even when human-bear problems arise, wildlife management agencies have only used capture and euthanization as a last resort (Warburton and Maddrey 1994).

Capture and euthanization would be expensive and labor intensive. Cost estimates for capture and euthanization are not available, but it is reasonable to expect the cost of capture and euthanization to be similar to that of capture and translocation. Time and labor costs would be nearly equal, and the cost of moving a bear to a new site would be replaced by the cost of removing and disposing of the euthanized bear.

Implications for Population Management: Capture and euthanization could be used to stabilize or decrease black bear population levels. The efficacy of capture and euthanization would depend upon the number, sex, and age of bears removed from the population.

Implications for Human-Bear Problem Management: Capture and euthanization would effectively remove problem bears from the population and eliminate the possibility of future problems with specific offending bears.

Option 10 – Aversive Conditioning

Aversive conditioning is the process where bears learn to alter certain problem behaviors through negative reinforcement of that behavior. While aversive conditioning has been used for many years, it is becoming an increasingly important technique used by many wildlife management agencies for human-bear problems (McCullough 1982, Rogers 1984, Leonard 1989). It is designed to alleviate problems by altering behavior of the bear rather than removing the individual from the area or the population.

Aversive conditioning techniques include the use of pepper spray (Capsaicin), emetic compounds, electric shocks (e.g. cattle prods), rubber bullets, or live-trapping/handling/release at the capture site. Capsaicin can repel black bears, but is effective only at distances less than 30 ft. (Hygnstrom 1994). Emetic compounds are used to condition bears to avoid food items (Colvin 1975). Ternent and Garshelis (1999) reported emetic compounds successfully conditioned bears to avoid meals-ready-to-eat (MRE's) at Camp Ripley Military Reservation in Minnesota, but Dorrance and Roy (1978) reported emetic compounds did not reduce bear damage at apiaries in Alberta. Consumption by nontarget species is a problem with emetic compounds. While literature on the use of rubber bullets to manage human-bear problems is limited, Schirokauer and Boyd (1998) reported that 8 of 11 bears aversively conditioned with rubber bullets in Denali National Park did not cause further problems during the season in which the conditioning occurred.

In practice, the perceived effectiveness of aversive conditioning for reducing human-bear problems has mixed results. Survey responses from 33 state agencies and 3 National Parks indicated that there was no clear consensus about the effectiveness and use of aversive conditioning methods (Kocka et al. 2001). Most respondents felt aversive conditioning was only sometimes effective. However, state wildlife managers in New Jersey (Bob Eriksen, pers. comm.) and West Virginia (Bill Igo, pers. comm.) felt aversive conditioning was effective at managing human-bear problems in those states.

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. McCullough (1982) suggested that it is unlikely that sufficient negative reinforcement could be directed at bears that already have learned behaviors leading to human-bear problems. Even infrequent rewards serve to perpetuate such behavior. Thus, aversive conditioning is most likely to be successful for young bears and first-time offenders.

The acceptability of aversive conditioning may be controversial. Strong negative reinforcement is often used to alter bear behavior. These negative reinforcement techniques are sometimes viewed as cruel because they cause pain, discomfort, or illness.

Because trapping is often required before conditioning can occur, aversive conditioning may be expensive. It also requires specialized equipment, professional training, and time to conduct. In New Jersey, the cost of aversive conditioning is approximately \$950 per bear (B. Eriksen, pers. comm.).

Implications for Population Management: Aversive conditioning does not affect the broad-scale population management of black bears.

Implications for Human-Bear Problem Management: Aversive conditioning can alter bear behavior, reducing human-bear problems. However, aversive conditioning will not alter every bear's problem behavior, requiring other techniques to mitigate human-bear problems.

Option 11 – Exclusion Devices

Exclusion devices are physical barriers that prevent access of bears to human property, food, or commodities. Exclusion devices include electric fencing, bear poles, and bear-resistant containers.

Electric fencing around apiaries is extremely effective in preventing hive destruction (Gilbert and Roy 1977, Brady and Maehr 1982). Electric fencing also can be used around other agricultural commodities, but the high cost of fencing limits the practical use to small areas. Bear poles and bear-resistant containers are effective at keeping bears out of garbage and stored foods. Incidences of bears obtaining human-related food in Denali National Park, Alaska decreased 96% following implementation of a program providing hikers with bear-resistant containers for food storage (Schirokauer and Boyd 1998). 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).

Exclusion devices can eliminate individual, site-specific problems and appears to be socially acceptable as a nonlethal management technique. 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 (Hygnstrom 1994). Bear-resistant containers and bear poles are likely cost effective for camping, backpacking, and other recreational activities in bear habitat.

Costs associated with broad-scale solid waste management can be highly variable depending upon the specific needs of each area. However for industrial development sites in Alaska, adequate advanced planning and facilities can significantly reduce the costs associated managing human-bear problems, property damage, and work stoppages (Follmann 1989). Mandatory animal-resistant garbage containers have reduced bear problems in the city of Gatlinburg, TN adjacent to Great Smoky Mountains National Park (Delozier and Stiver 2001).

Implications for Population Management: Exclusion devices do not affect broad-scale population management of black bears.

Implications for Human-Bear Problem Management: Exclusion devices are effective at reducing human-bear problems for apiaries, relatively small crop fields, backpackers, campers, industrial development sites, and residential areas.

Option 12 – Repellents

Repellents are nonphysical deterrents that keep bears from entering certain areas or prevent the close approach by bears. They can be chemical compounds, loud noises, or guard animals. When sprayed directly in a bear's eyes, Hunt (1984) and Rogers (1984) reported that Capsaicin was effective at repelling captive and free-ranging black bears. However, Smith (1998) reported that objects or sites sprayed with Capsaicin did not repel bears but attracted bears to the object or site. Additionally, Capsaicin is effective only at distances less than 30 ft (Hygnstrom 1994). 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 problem. Certain chemical compounds may prevent the close approach of bears. Hunt (1984) reported that male human urine or ammonia mixed with bait were both effective at keeping bears from bait sites about 67% of the time. Ammonia applied around bait sites, but not mixed with the bait, also appeared effective at keeping bears away (Hunt 1984). 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, Anonymous 1998).

As a nonlethal form of control, repellents appear to be socially acceptable. Repellents also are relatively cost effective. Capsaicin is sold commercially and often recommended for individuals hiking in bear habitat. Ammonia is also widely available. While maintaining guard animals can be costly, they may be very cost effective for protecting wide-ranging livestock and large fields of agricultural commodities.

Implications for Population Management: Repellents do not affect the broad scale population management of black bears.

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

Option 13 – Reimbursement Fund

Damage compensation funds receive little use for managing human-bear problems. Only 5 states and no provinces in eastern North America offered compensation for damage attributed to black bears in 1992 (Warburton and Maddrey 1994). As of 1997, only 12 states and provinces in North America had bear damage compensation programs (Wagner et al. 1997).

Damage compensation programs for black bears have been effective in some states. Based upon management experiences in Wisconsin, Hygnstrom and Hauge (1989) recommended that damage compensation programs should be used for problem bear management. Additionally, wildlife managers in Maryland (Steve Bittner, pers. comm.) and West Virginia (Bill Igo, pers. comm.) felt reimbursement programs in those states were effective at mitigating many of the human-bear problems.

While damage compensation programs may satisfy those receiving damage, they do not address the problem causing the damage (Wagner et al. 1997). Without addressing the causal factors, damage is likely to persist; 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. Wagner et al. (1997) stated that private organizations (e.g., Great Bear Foundation, Defenders of Wildlife) 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 (Kellert 1979, Arthur 1981, McIvor and Conover 1994). Surveys of the Virginia Chapter of The Nature Conservancy (TNC), Virginia State Beekeepers Association (VSBA), and Virginia Bear Hunters Association (VBHA) reported that 47.4% of TNC members, 66.5% of VSBA members, and 60.7% of VBHA members somewhat agreed or strongly agreed that agricultural producers should be compensated for damage caused by black bears (Lafon et al. 2001).

Costs associated with damage compensation programs would vary according to program guidelines. Costs associated with small-scale programs restricted to only reimbursements for the most significant

damage may be affordable. However, large-scale programs aimed at reimbursing individuals for any damage incurred are likely very cost prohibitive.

Implications for Population Management: Reimbursement funds would not affect the broad scale population management of black bears.

Implications for Human-Bear Problem Management: Reimbursement funds have been successful at mitigating the impacts of human-bear problems. Unless compensation programs emphasize damage abatement measures, the incidence of human-bear problems would not be reduced.

CONCLUSION

No single management option is best for managing black bear population levels or human-bear problems in every circumstance. Selection of the appropriate population management options must be consistent with CCC and will vary with population objectives, recreational desires, and habitat requirements. For human-bear problems, appropriate management options are determined by public concerns, extent of damage, type of problem/damage, black bear biology, public safety, animal welfare, and available control methods.

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BEAR PLAN GOALS, OBJECTIVES, AND STRATEGIES

The Stakeholder Advisory Committee drafted eight goals addressing bear populations and habitats, bear-related recreation, and human-bear problems. Based on the values identified by the Stakeholder Advisory Committee, the Black Bear Technical Committee established specific objectives to help guide the successful attainment of each goal. Preferred strategies clarify how each objective should be achieved. Specific timeframes for objective completion were based on priorities recommended by the Stakeholder Advisory Committee, the Black Bear Technical Committee, and operational practicality.

Fulfillment of all the goals and objectives outlined in the Black Bear Management Plan will depend on adequate funding and allocation of additional resources to the bear program. The guidance and objective priorities (Appendix V) found in the Black Bear Management Plan will direct bear program budget submissions, spending, and effort, but complete implementation ultimately will be contingent on other VDGIF program needs and priorities related to the Agency mission.

BEAR POPULATIONS AND HABITAT

Goal 1 - Population Viability:

Ensure the long-term viability of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations in Virginia through a comprehensive research, monitoring, management, education, and protection program.

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 are expanding across the Commonwealth today (especially in the western parts of the state), 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), 8 broad regions were considered for population viability objectives (Figure 15). Primarily based on human population levels and land use (both current conditions and anticipated future development), the northern Piedmont and northern Tidewater regions were deemed unsuitable areas for viable bear populations. Minimum viability standards will be established in the remaining 6 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.

Regions for Population Viability Considerations

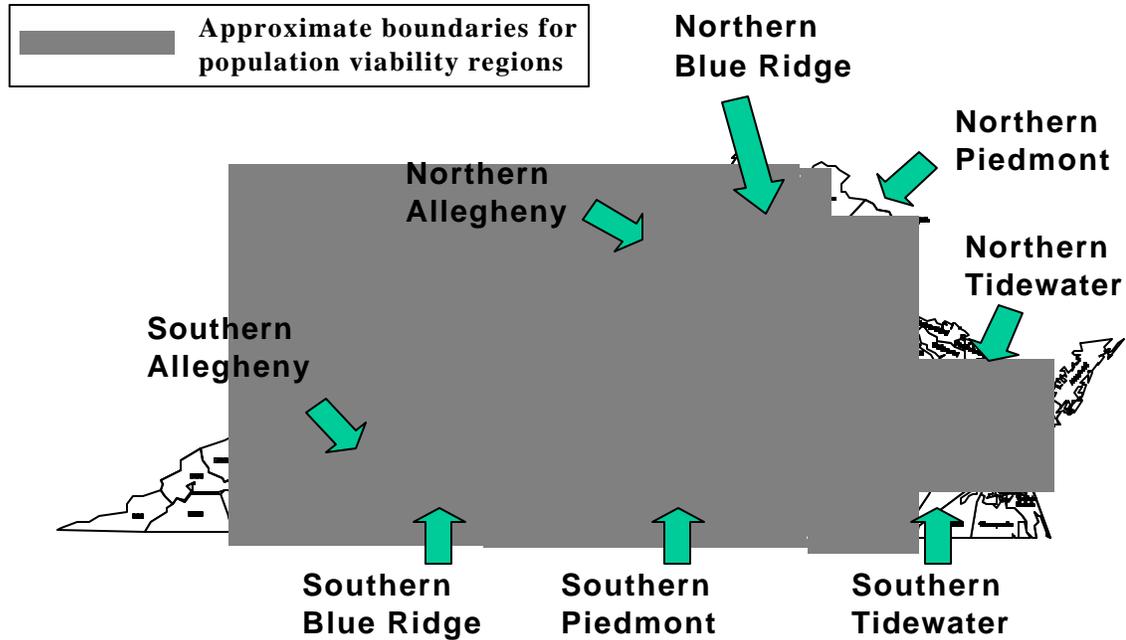


Figure 15. Regions for population viability considerations.

Objectives:

- a. 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.

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.

Strategy #1: Identify boundaries that define the geographic scale of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations

Strategy #2: Describe the status of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black

bear populations in terms of population size, distribution, population trends, and demographic characteristics (e.g., birth rates, mortality rates).

Strategy #3: 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.

Strategy #4: Unhunted bear populations will require implementation of monitoring indices that are not based on harvests in some areas (e.g., sardine station surveys, archery deer hunter observations, nuisance trends).

Strategy #5: 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 associated sustained yields.

Strategy #6: To help interpret variations in population monitoring indices, monitoring also will include monitoring additional environmental, habitat, and sociological factors (e.g., mast production, habitat and land-use changes, hunting effort).

Strategy #7: Recognizing the large-scale monitoring and management needs for black bears through the continued cooperation with regional bear management organizations such as the Southern Appalachian Bear Study Group and the Mid-Appalachian Bear Study Group.

- b. 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.**

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

Strategy #1: Use a combination of approaches (including literature review, expert opinion, site-specific information, and population/habitat modeling) to establish minimum viability criteria for the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations.

Strategy #2: Conduct site-specific research to improve the assessments of minimum viability criteria for the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations.

Strategy #3: Evaluate the relationship between the population monitoring indices and minimum viability criteria for the northern Allegheny, southern Allegheny, northern Blue

Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations.

- c. **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.**

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.

Strategy #1: For each of the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations, 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).

- d. **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.**

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.

Strategy #1: Programs should place priority on addressing the most important risk factors for the geographic bear populations that fail to meet minimum viability criteria.

Strategy #2: Programs should have an educational component that informs the public about population viability objectives and management approaches.

Strategy #3: 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.

Strategy #4: Through research and monitoring activities, determine the efficacy of implemented management programs to 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.

Strategy #5: Modify programs to improve efficacy in achieving and/or maintaining the long-term viability of the northern Allegheny, southern Allegheny, northern Blue Ridge,

southern Blue Ridge, southern Piedmont, and southeastern Tidewater black bear populations.

Goal 2 - Desirable Population Levels:

Maintain black bear populations throughout Virginia at levels compatible with land use, property concerns, and recreational opportunities; i.e., at cultural carrying capacity. The goal of maintaining or achieving long-term population viability in the northern Alleghenies, southern Alleghenies, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater should be of higher priority even when cultural carrying capacity is exceeded.

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. These public values are usually expressed 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. Development of bear population management objectives to meet the CCC are subjective and involve a combination of social, economic, political, and biological perspectives. Bear populations should be managed to meet both population viability and CCC goals. However, a viable population should be present somewhere in each of the following 6 units: northern Alleghenies, southern Alleghenies, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater.

Objectives:

- a. To meet bear cultural carrying capacity population objectives that are consistent with population viability objectives in each zone (Figure 16) by 12/31/10. As of June 1, 2001, the specific cultural carrying capacity population objective for each zone in Virginia is:

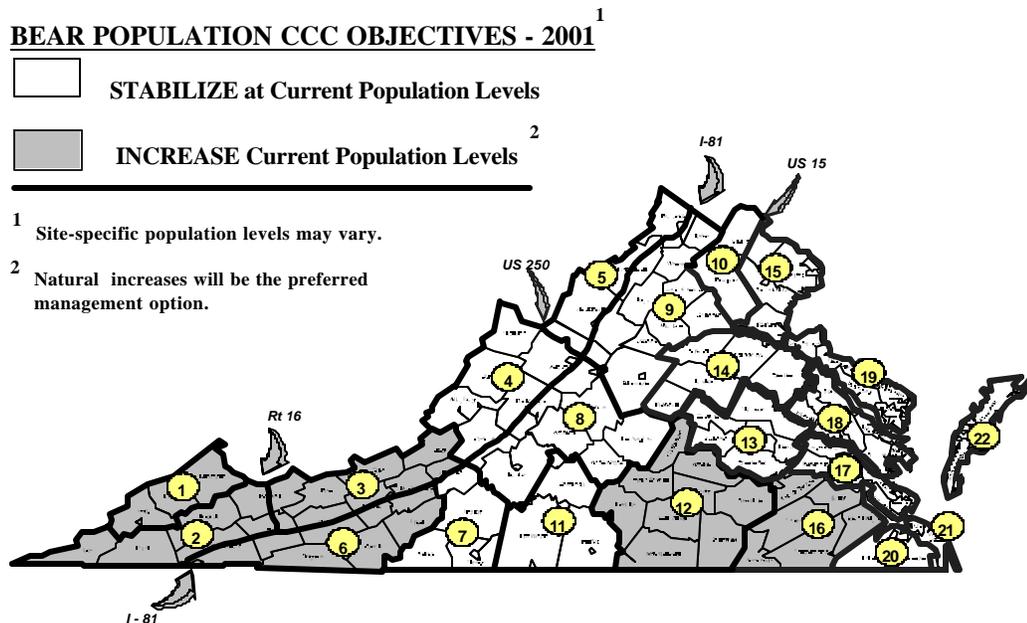


Figure 16. Bear population CCC objectives.

Management of black bear populations to achieve CCC should be done over the smallest area that is practical. Although it may be, in theory, desirable to manage black bears differently in every county (and in some cases within counties), wildlife managers must balance that desire with practical considerations based on black bear biology and resources available to manage bears. After considering such factors as physiography, current black bear populations, land use patterns, human population densities and land ownership, the Department of Game and Inland Fisheries established 22 black bear management zones.

To achieve the CCC for bears, population objectives in each management zone should meet 1 of 3 practical options. These options are to (1) increase the current bear population, (2) stabilize the bear population at the current level, or (3) decrease the current bear population. These objective options are not necessarily related to the current population trends (which may already have an increasing, decreasing, or stable population growth). For example a CCC objective for increasing bear populations in a zone might mean: (1) continuing the increase in a population that is already increasing, (2) promoting an increase in a population that has been stable, or (3) reversing a declining population trend to the point that it is increasing.

Population management objectives to achieve CCC in each zone were based on input from a cross-section of bear stakeholders. Population management objectives were based on input received from various constituent surveys (e.g., all hunters, Virginia Bear Hunter Association, The Nature Conservancy, Virginia State Beekeepers Association), regional meetings attended by a wide variety of stakeholders, other public input (written and oral comments to the advertised plan), and the statewide Stakeholder Advisory Committee discussions.

By zone, the general rationale for the specific population objectives are:

Zones 1, 2, 3, and 6 (Increase):

- *Bear populations in these heavily forested zones are relatively low compared to other areas of Virginia and can accommodate higher population levels.*
- *A significant proportion of the forested lands is in public ownership (USFS).*
- *Significant restoration (trap & transfer) has already occurred in Zone 6.*
- *Human population, development, and agriculture are relatively limited.*
- *Additional non-hunting and hunting recreational demands in these zones may be realized with an increase in bear populations.*

Zones 4 and 5 (Stabilize):

- *Bear populations in these heavily forested zones are already relatively high compared to other areas of Virginia – among the highest in the state.*
- *While human population and development are relatively limited, agriculture damage concerns have increased with the growing bear population.*
- *Non-hunting and hunting recreational demands in these zones may continue to be satisfactory with the current bear population.*

Zones 8 and 9 (Stabilize):

- *Bear populations in these zones are already relatively high compared to other areas of Virginia – probably the highest in the state (especially in and around Shenandoah National Park).*

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- *While the human population is not large, the majority of agricultural bear damage in the state occurs in these zones.*
- *Non-hunting and hunting recreational demands in these zones may continue to be satisfactory with the current bear population.*

Zones 7 and 11 (Stabilize):

- *Bear populations are currently relatively low compared to other areas of Virginia.*
- *Human population is moderate, agriculture (with row crops) may be particularly susceptible to bear damage, and developmental growth increase the likelihood of bear problems (e.g., urban, agricultural).*
- *Stable bear populations at relatively low levels may be most compatible with existing and projected land use.*

Zones 15 and 21 (Stabilize):

- *Only an occasional animal represents bear populations in these zones.*
- *Intense development and high human populations have already occurred in these zones.*
- *Human tolerance in these urban zones is near zero.*
- *Only infrequent occurrences of bears in these urbanized zones can be compatible with the limited habitat availability and public tolerances.*

Zones 10, 13, 14, and 17 (Stabilize):

- *Bear populations are currently very low (with only infrequent occurrences) compared to other areas of Virginia.*
- *Human population is moderate to high with the prospect for rapid future growth.*
- *No growth of the very low bear population may be most compatible with the current human population levels and projected development in these zones.*

Zones 18 and 19 (Stabilize):

- *Bear populations are currently negligible.*
- *Human population is low to moderate with substantial agricultural and forested areas.*
- *For bears to populate these zones naturally, they would need to pass through zones where human development pressures are greatest.*
- *Until natural restoration prospects improve, no effort is recommended to increase bear populations in these zones.*

Zones 12 and 16 (Increase):

- *Bear populations are currently relatively low compared to other areas of Virginia.*
- *Natural and cultivated forests provide sufficient habitat for larger bear populations.*
- *Human population, development, and agriculture are relatively limited.*
- *Increasing 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.*

Zone 20 (Stabilize):

- *Bear populations associated with the Great Dismal Swamp National Wildlife Refuge (GDSNWR) are currently moderate to high compared to other areas of Virginia.*
- *Human population is moderate to high and development around the GDSNWR is increasing.*

- *Significant agricultural damage occurs in the area with increasing urban/vehicle collision problems.*
- *Stabilizing bear populations will help curb the increasing human-bear problems while providing continued non-hunting and hunting recreation.*

Zone 22 (Stabilize- remain unoccupied by bears):

- *Bear populations are currently non-existent on the unoccupied Virginia’s Eastern Shore.*
- *Human population is low to moderate, but there is substantial agriculture.*
- *For bears to populate the Eastern Shore naturally, they would need to travel from the mainland in Maryland and travel down the Delmarva Peninsula.*
- *Until natural restoration prospects improve (which is unlikely), no effort is recommended to increase bear populations in this zone.*

Appropriate population management options will be selected based on the CCC objectives and current population trends (Figure 10). Hunting, where appropriate, will be the primary population control option for bears due to its efficacy, cost- effectiveness, tradition, and recreational value. While regulated hunting is highly effective for controlling bear populations (e.g., stabilizing or decreasing), conservative hunting seasons also are compatible with increasing population management objectives. As an example, Virginia’s hunted bear populations have increased due to regulation changes that reduced harvest impacts.

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.

Attainment of zone-wide CCC objectives will be based on population indices from across the entire zone. This does not necessarily mean that the zone objective will be uniformly met in all areas of the zone. For example, implementation of site-specific management options for unique damage management concerns (see Goal 8, Objective d) might result in a locally different population level/trend compared to the rest of the zone. However, attainment of the zone-wide objective will still determine the general population management program.

Strategy #1: Where it is necessary to control or reduce bear population numbers, regulated hunting will be the primary population management option.

Strategy #2: Where hunting is inappropriate, other management options will be used to control bear populations (e.g., trapping and removal, euthanasia) and/or raise CCC (e.g., education, nuisance management).

Strategy #3: To foster an understanding of how to coexist with bears and foster acceptance of growing bear populations, public education should accompany/precede attainment of population growth objectives.

Strategy #4: Population growth objectives will be attained through a natural increase in bear populations. Trap and transfer of bears for population enhancement should only be considered for mountainous areas of SW Virginia and with the endorsement of local officials.

Strategy #5: Cooperate with Shenandoah National Park 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).

Strategy #6: 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.

Strategy #7: Where CCC objectives conflict with minimum population viability objectives, implement programs that raise CCC objectives for the public (e.g., educational programs, increase nuisance management assistance).

b. To determine the relationships between population viability and CCC by 12/31/09.

Minimum viable bear population levels may exceed CCC objectives, especially in areas with high human densities. In these situations, long-term viability of bears may depend on recognizing potential human-bear problems. Increased knowledge and better understanding of black bears could lead to increased public tolerance of bears (i.e., raise CCC nearer to the minimum viable population level).

Strategy #1: Conduct research that identifies how public tolerance (CCC) conflicts and 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.

Strategy #2: 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.

c. To determine updated CCC objectives in each zone by 12/31/10.

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.

Strategy #1: 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, task forces, public meetings, local government coordination) to include input from all segments of Virginia's population.

Goal 3 - Habitat Conservation and Management:

Conserve black bear habitat in Virginia, consistent with bear population objectives and with emphasis on areas of special significance (e.g., areas with source populations and habitat linkages). Conservation may consist of habitat management or protection.

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, bears should benefit. However, management practices that limit diversity or productivity are generally considered detrimental to bears.

Objectives:

- a. 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.**

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. Conservation of corridors and habitat linkages may be important for some bear populations where fragmentation is a concern (e.g., Great Dismal Swamp). Monitoring the status of bear habitat and working with a diversity of land ownerships and organizations to manage habitats will be important to meeting population objectives.

Strategy #1: Modify minimum viability criteria as minimum habitat needs are refined.

Strategy #2: Determine where habitats fail to meet minimum population viability criteria and cultural carrying capacity objectives.

Strategy #3: Monitor changes in bear habitats (size and quality) for the northern Allegheny, southern Allegheny, northern Blue Ridge, southern Blue Ridge, southern Piedmont, and southeastern Tidewater geographic areas. 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.

Strategy #4: 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.

Strategy #5: Actively promote and implement habitat management practices on all lands (public & private) that are consistent with population viability and CCC objectives.

Strategy #6: 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.

Strategy #7: 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.

Strategy #8: Within each viability region, evaluate the feasibility, costs, and benefits of establishing sanctuaries, especially in areas of Virginia with little public land.

- b. 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.**

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.

Strategy #1: Determine geographic differences in habitat across Virginia (related to BCC and minimum population size).

Strategy #2: Determine when habitat becomes a limiting factor in suburban areas.

Strategy #3: Determine impact of habitat changes (e.g., loss of corridors, expanding human population) on bear populations. Are linkages needed?

- c. To determine the relationships between population dynamics of bears in Virginia and the dynamics of suitable habitat by 12/31/09.**

Beyond the minimum habitat requirements to meet population management objectives, habitat features will have important impacts on bear population dynamics and human-bear problems. A better understanding of these habitat considerations (e.g., land ownership, corridor values, roads and other barriers, human density) on bear population dynamics will improve management capabilities to meet public demands.

Strategy #1: Determine the importance of source populations (in particular the public-land habitats in National Forests, Shenandoah National Park, Great Dismal Swamp National Wildlife Refuge) to viable bear populations and CCC objectives.

Strategy #2: Determine if habitat found within large public land ownerships (e.g., Shenandoah National Park, National Forests, and the Great Dismal Swamp National Wildlife Refuge) provides an adequate resources to support viable bear populations.

Strategy #3: Determine corridor characteristics (e.g., cover types, length, width) that facilitate bear movements among populations.

Strategy #4: Evaluate impact of barriers (e.g., roads, lack of corridors) to bear movements and habitat utilization.

BEAR-RELATED RECREATION

Goal 4 - Hunting Seasons And Demands:

Provide a diversity of black bear hunting opportunities in Virginia as a management tool and recreational experience, while discouraging or prohibiting activities that prevent attainment of black bear population objectives.

Carefully managed hunting of black bears provides a variety of recreational experiences, maintains time-honored traditions, and is compatible with maintaining viable bear populations. Popular hunting approaches involve seasons for archery equipment, firearms without dogs, firearms with dogs, and bear-dog training (a non-harvest season). As a major source of black bear mortality, hunting can be a limiting factor for black bear populations. Even so, regulated hunting may provide recreational benefits under all population management objectives (e.g., increase, stabilize, decrease). 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.

Objectives:

- a. 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.**

Following the downward trend of all hunting participation in Virginia, the number of bear hunters and hunting effort has declined since the 1970s. Declining 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 this trend is unknown (i.e., sociological conditions may have the greatest influence on hunting trends). Even so, the objective is to stop this decline and maintain the 1994-95 levels of bear hunter recreation as benchmarks for the future. According to the 1994-95 hunter survey, the only recent information about user-specific bear hunting effort, bear hunters spent about 32,500 hunter-days for archery, 32,500 hunter-days for firearms hunters who do not use dogs, and 60,000 hunter-days for hunters who do use dogs. Hunter-days are defined as the total sum of all days hunted by all bear hunters (i.e., 4 sportsmen hunting for 2 days each and 8 sportsmen hunting for 1 day generates 16 hunter-days of bear hunting effort). No information is available for bear-dog training effort. The objective also defines some minimum participation levels for the diverse approaches to hunting recreation. Since 1995, archery hunters, gun hunters without dogs, and gun hunters with dogs have accounted for 17%, 44%, and 39% of the annual bear harvest, respectively.

Strategy #1: Monitor hunting effort in Virginia by developing and implementing accurate measures of effort by different black bear hunting methods.

Strategy #2: If the average annual number of hunter-days falls below desired levels, implement programs designed to overcome constraints and promote black bear hunting opportunities.

- b. Consistent with black bear population objectives, to open new areas for additional recreational black bear hunting opportunities during the biennial regulation considerations.**

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.

Strategy #1: Establish population criteria (based on indices of population size, distribution, population trends, and demographic characteristics) for initiating bear hunting seasons that will be consistent with black bear population objectives.

Strategy #2: 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).

Strategy #3: Implement black bear monitoring systems, in counties currently closed to bear hunting, designed to collect population criteria required for initiating recreational hunting opportunities.

Strategy #4: Consistent with population management objectives, propose to open new bear hunting opportunities during the wildlife regulation process in eligible counties based on established population criteria.

c. To determine black bear hunter satisfactions and constraints to participation in Virginia by 12/31/09.

Individuals hunt for many reasons (e.g., for companionship, 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. A recent Virginia survey indicated that more than 20% of bear hunters were dissatisfied with their hunting experience. 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 explain declines in hunter effort. Surveys results would be used to design hunting programs that maximize recreational satisfactions, minimize constraints to hunting participation, and achieve participation objectives.

Strategy #1: Conduct a survey bear hunters regarding bear hunting satisfactions for recreational values.

Strategy #2: Survey bear hunters regarding 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.

Strategy #3: Evaluate landowner (public and private) constraints to allowing access to bear hunters on their properties.

Strategy #4: Based on survey results, implement programs that that maximize recreational satisfactions, minimize constraints to hunting participation, and achieve participation objectives.

Goal 5 - Ethics of Bear Hunting Methods:

Ensure that black bear hunting methods in Virginia, including chase and take, are fair and sportsmanlike.

Hunting of black bears has become a controversial issue. Perhaps the most contentious issues involve public concerns about fair chase and the ethics of certain methods (e.g., the use of technology, hounds, archery equipment, high-powered rifles). These issues are concerns for both hunters (non-bear hunters) and the non-hunting public alike. The future of bear hunting will be affected significantly by public perception of bear hunters. Therefore, guidelines and regulations of bear hunting should address concerns for ethics and fair chase.

Objectives:

- a. To describe fair and sportsmanlike black bear hunting methods that also preserves the value of hunting as source of recreation and a population management tool by 12/31/03.**

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.

Strategy #1: Consider a variety of sources about the assessment of fair and sportsmanlike bear hunting methods.

Strategy #2: Use a variety of techniques (e.g. focus groups, surveys, task forces, public meetings) to balance fair and sportsmanlike values with the population management values associated with bear hunting.

Strategy #3: Develop standards that define specific criteria and guidelines for fair and sportsmanlike bear hunting.

- b. Implement programs that ensure bear hunter compliance with fair and sportsmanlike behavior criteria and protect hunting activities that conform to these standards by 12/31/04.**

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.

Strategy #1: 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 and sportsmanlike bear hunting standards.

Strategy #2: Develop programs that encourage voluntary compliance by hunters to behave according to fair and sportsmanlike standards. Programs may involve incentives through special recognition as “master” sportsmen and memberships with sportsmen groups.

Strategy #3: As necessary, make regulation and law changes to ensure the future of bear hunting in Virginia that follows fair and sportsmanlike methods.

Strategy #4: Enforce laws that govern bear hunting activities (e.g., trespass, bag limits, methods).

Strategy #5: Monitor hunter compliance with fair and sportsmanlike bear hunting standards using surveys and the incidence of law enforcement citations.

Goal 6 - Landowner and Citizen Conflicts with Bear Hunting:

Ensure that bear hunting activities are consistent with and respect the rights of private property owners and other Virginia citizens.

Under some circumstances, recreational bear hunting activities (especially those involving the use of dogs) may create conflicts with landowners, other hunters, and other outdoor recreationists. Further, regulated hunting may not be acceptable near urban areas due to concerns for human safety. 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 values and concerns of landowners and other Virginia citizens.

Objectives:

- a. 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.**

A thorough understanding of the bear hunting practices that 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.

Strategy #1: Survey 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.

Strategy #2: Identify the bear hunting practices that create the greatest infringement on the rights of others. Negative bear hunting practices should be based on the impact to landowners, outdoor recreationists, and other citizens.

Strategy #3: Identify potential solutions to areas of greatest conflict.

- b. Implement programs to reduce conflicts between bear hunting activities and other Virginia citizens (especially landowners) by 25% by 12/31/06.**

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.

Strategy #1: 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).

Strategy #2: 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.

Strategy #3: As necessary, make regulation changes and enforce laws to ensure bear hunting does not infringe on the rights of landowners, and other affected citizens.

Strategy #4: Monitor changes in bear hunter conflicts with landowners and other affected citizens through landowner/citizen surveys.

Goal 7 - Non-Hunting Recreation:

Provide opportunities for non-hunting recreation associated with black bears in Virginia with a focus on information and education designed to minimize negative human-bear interactions.

Bears capture human interest like few other wildlife species. Wildlife watching activities (e.g., observing, feeding, photographing) provide recreational opportunities to Virginia citizens. Over 2,600,000 people participated in some type of wildlife watching activity in Virginia during 1996. Black bears are second only to eagles and hawks as the animals Virginians are most interested in taking a trip to see. Visitors in the Great Smoky Mountains National Park wanted to see a bear more than any other wildlife species. Non-hunting recreational opportunities to enjoy bears in their natural habitats, under conditions that foster education about bears, should be available to all of Virginia’s citizens. Recreational opportunities should not create negative human-bear situations (e.g., viewing of bears at garbage dumps).

Objectives:

- a. To determine non-hunting demands and satisfactions for bear recreation by 12/31/09.**

Non-hunting recreational demands for bears are poorly understood. While the demand to view bear 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.

Strategy #1: 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.

Strategy #2: Evaluate constraints to participation in nonhunting recreation.

- b. Provide non-hunting recreational opportunities for Virginia citizens by 12/31/10.**

Programs should address the non-hunting recreational demands of Virginia’s citizens. These programs should minimize negative human-bear interactions while concentrating on bear

recreation in natural habitats and educational messages. Surveys to monitor changing levels of satisfactions and awareness about bears will need to be developed.

Strategy #1: Prioritize programs based on demands expressed by Virginia citizens.

Strategy #2: 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.

Strategy #3: Identify 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.

Strategy #4: Utilize surveys to monitor changing levels of nonhunting recreation satisfactions, awareness about black bears, and impact of nonhunting recreational programs.

- c. 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.**

Numerous exhibition permit holders throughout Virginia (from roadside zoos to large zoological parks) have captive bears, ostensibly to promote public education about bears. These facilities probably vary in their success at providing “opportunities for non-hunting recreation ... with a focus on information and education”. An understanding of the effectiveness of these facilities will help promote their mission and VDGIF permit considerations.

Strategy #1: Conduct research on the effectiveness of exhibition permits with respect to the quality of education and recreation provided by different exhibition settings.

Strategy #2: Effect regulation changes to ensure exhibition permit holders promote a high quality recreational and educational experience.

HUMAN-BEAR PROBLEMS

Goal 8 - Human-Bear Problems:

Promote human safety and protect personal income and property in attaining black bear population and recreation objectives in Virginia.

Bear management goals are not limited to 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 developed areas, problems often center on damage to wooden structures and 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 problems can occur almost anywhere in Virginia. Human-bear

problems in Virginia have increased with growing populations of both bears and humans. In conjunction with objectives to increase populations, even more human-bear problems can be expected in the future. Nuisance concerns need to be considered in conjunction with other population and recreation objectives.

Objectives:

- a. 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.**

Standard, but flexible, nuisance response protocols are necessary to clarify public and agency responsibilities for specific human-bear problems. The public usually prefers non-lethal options for managing nuisance bears. However, relocation of most nuisance bears has become an impractical management option with expanding bear populations throughout the state. Not only is relocation a costly approach, citizens in other localities are not interested in somebody else's nuisance bears. Therefore, nuisance management options generally should be restricted to managing bears in place (i.e., at the nuisance site). Non-lethal options should be encouraged, but lethal solutions may be necessary as well. Education should be an important component of human-bear problem management.

Strategy #1: Develop, revise and adopt cost-effective response protocols to address nuisance bear complaints. Development should include input from affected individuals, municipalities, and government organizations. Protocol should define circumstances for lethal and non-lethal management applications.

Strategy #2: Nuisance bears should be managed at the nuisance site. Except to support circumstances where relocation of bears is a desirable management strategy for population enhancement, relocation of bears generally should not be used to manage nuisance situations. However, relocation of bears should remain an option for some special circumstances (e.g., some urban problems).

Strategy #3: 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 nuisance bear problems. Lethal options may be necessary when non-lethal options are ineffective or impractical.

Strategy #4: Protocols should be flexible to allow affected individuals, landowners, and municipalities a range of choices in resolving nuisance situations.

Strategy #5: Protocols should provide explicit capture, treatment, and disposition guidelines for black bears that need to be handled.

Strategy #6: Communicate and educate the public, municipalities, and state agencies about these protocols.

Strategy #7: Protocols should identify and correct citizen actions that encourage nuisance bear problems (e.g., intentional feeding that habituates bears to people, poor garbage management).

- b. To evaluate the effectiveness of different nuisance bear management options by 12/31/06.**

The efficacy of the options to manage human-bear problems is poorly understood. Only limited research has been conducted to evaluate the effectiveness of various nuisance management

options under a variety of conditions. Citizen satisfactions with nuisance response protocol outcomes will help assess the practical application of management options.

Strategy #1: Conduct specific research on the efficacy of different nuisance management options in different nuisance situations.

Strategy #2: Via surveys, monitor satisfactions and changes in satisfactions with protocol outcomes by affected individuals, landowners, and municipalities.

Strategy #3: Keep records on nuisance bear complaints, recommendations, and outcomes for analyses of methods.

Strategy #4: Communicate with other states for information about successful nuisance bear management procedures.

Strategy #5: Determine public satisfactions with methods used to manage damage concerns.

c. To achieve a 25% reduction in bear damage by 12/31/08.

The significance of bear-related damage is related to the monetary value of losses and the public tolerance for these losses. Bear damage has not been quantitatively documented in Virginia, but may be measured via specific damage assessments (e.g., field measurements, surveys) and the incidence of complaints. 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 nuisance activity (e.g., economic losses, public complaints) will require the development of reliable estimates of nuisance problems by type of complaint throughout Virginia.

Strategy #1: Develop and implement methods to determine bear damage (or indices of bear damage) by type of damage.

Strategy #2: Monitor and evaluate trends in annual bear damage by type.

Strategy #3: To prevent potential nuisance situations from occurring, develop educational materials and outreach programs designed to inform the general public, landowners, and local governments about how to prevent and minimize negative human-bear interactions.

Strategy #4: Use recreational hunting to reduce human-bear problems.

d. To identify, develop, and implement site-specific management options for unique bear management units through 4/30/02.

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, compensation, 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.

Strategy #1: Develop special hunting regulations or programs to address damage concerns for specific bear management concerns.

Strategy #2: Evaluate the feasibility and desirability of other options such as compensation programs, education, and kill permits that might be utilized for site-specific concerns.

Strategy #3: Actively support site-specific bear management options through educational programs, conflict resolution techniques, and coordination among affected parties (e.g., neighboring landowners, recreational users).

VIRGINIA BEAR MANAGEMENT PLAN

Appendix I. Members of the Stakeholder Advisory Committee. These individuals contributed significantly to the development of the black bear management plan. Participation in the stakeholder advisory committee did not always constitute full agreement regarding all issues.

Name	Interest/Organization	City/County
Mary Arginteanu	Richmond Audubon Society	Richmond
Jim Atkinson	Shenandoah National Park	Page
Ronnie Bennett	Crop damage	Alleghany
Lloyd Culp	Great Dismal Swamp National Wildlife Refuge	Suffolk
Judy Duncsomb	The Nature Conservancy	Charlottesville
- Gwynn Crichton (alternate)		
- Brian Van Eerden (alternate)		
- Sam Lindblom (alternate)		
Skip Griep	George Washington / Jefferson National Forests	Roanoke
Anne Hocker	Loudoun Wildlife Conservancy	Loudoun
Fred Kallmeyer	Bull Run Mountain Civic Association	Prince William
Pat Keyser	Westvaco	Rupert, WV
Mike Lane	Izaak Walton League of America	Suffolk
Gene Parker	Hound hunter; Blue Ridge Parkway	Bedford
Dave Proctor	Virginia Bowhunters Association	Harrisonburg
- Owen Shifflett (alternate)		
Gene Riddle	Virginia State Beekeepers Association	Halifax
Ken Shaver	Orchard damage	Madison
David Shelor	Hunter trespass	Roanoke
Wilmer Stoneman	Virginia Farm Bureau Federation	Richmond
Danny Thorn	Virginia Bear Hunters Association	Montgomery
- Cecil Boggs (alternate)		

Appendix II. Members of the Black Bear Technical Committee. These staff members of the Virginia Department of Game & Inland Fisheries provided technical support and information through all phases of the plan development.

Name	Position	Work Area
Glen Askins	Regional Manager	Region 1
John Baker	District Biologist	Region 3
Al Bourgeois	District Biologist	Region 4
Thad Cherry	District Biologist	Region 1
Bob Duncan	Wildlife Division Director	Statewide
Kim Needham Echols	Bear Project Wildlife Biologist Assistant	Statewide
Bob Ellis	Wildlife Division Assistant Director	Statewide
Cale Godfrey	District Biologist	Region 2
Jay Jeffreys	District Biologist	Region 2
David Kocka	District Biologist	Region 4
Dan Lovelace	District Biologist	Region 5
Dennis Martin	Bear Project Leader	Statewide
Jerry Sims	Regional Manager	Region 5
David Steffen	Forest Wildlife Program Manager	Statewide

Regions of Virginia Department of Game and Inland Fisheries

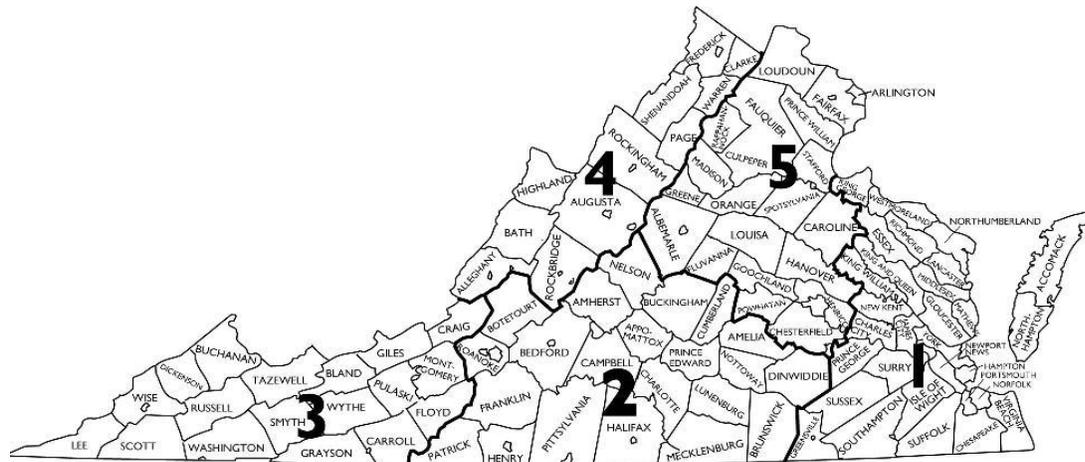


Figure 17. Administrative regions of the Virginia Department of Game & Inland Fisheries.

VIRGINIA BEAR MANAGEMENT PLAN

Appendix III. Participants at focus groups and regional input meetings. Approximately 65 more individuals were invited but did not attend.

Participant	Interest/Organization	City/County
Beth Armstrong	Livestock producer	Highland
William E. Babb	Hunt club	Suffolk
Ronnie Bennett	Crop producer	Alleghany
Dave Bierlein	Bear conservation	Fauquier
Cecil Boggs	Bear hunter (hounds)	Waynesboro
Chris Bolgiano	Sierra Club	Rockingham
Wayne Bowman	VA Dept. of Forestry	Appomattox
Joseph Byrum	Bear hunter (rifle/bow)	Suffolk
Glenn Clayton, Jr.	Beekeeper	Nelson
Glenn Clayton, Sr.	Beekeeper	Nelson
Richard Collins	Bear hunter (hounds)	Harrisonburg
Pat Cuffee	Bear conservation	Chesapeake
Lloyd Culp	Great Dismal Swamp National Wildlife Refuge	Suffolk
Tom Davenport	Bear conservation	Washington
Tom Davis	Resource Management Specialist	Floyd
Doug Davis	Bear conservation	Virginia Beach
Theresa Duffey	Dept. of Conservation & Recreation	Richmond
Dalton Edge	Crop producer	Chesapeake
Jeff Elder	Beekeeper	Appomattox
Larry Faust	Lynchburg Police	Lynchburg
David Foltz	Crop producer	Page
Mark Gall	Blue Ridge Parkway	Rockbridge
Ned Gentz	Wildlife Center of Virginia	Waynesboro
Skip Griep	U. S. Forest Service	Roanoke
Rolf Gubler	Shenandoah National Park	Page
Richard Guild	Bear hunter (black powder)	Appomattox
Ed Haverlack	U.S. Forest Service	Covington
Jennifer Hensley	Bear conservation and hunting concerns	Rockingham
W. T. Hensley	Bear hunter (bow)	Rockingham
Tony Hinkle	Bear hunter (hounds)	Harrisonburg
Clint Hinkle	Bear hunter (hounds)	Rockingham
Marc Hite	Bear hunter (rifle/bow)	Waynesboro
Anne Hocker	Loudoun Wildlife Conservancy	Loudoun
Earl Hower	Izaak Walton League	Loudoun
Edwin Hunter	Bear damage	Suffolk
James Jarrell	Bear hunter (hounds)	Greene
J. W. Jenkins	General	Culpeper
Rachel Johnson	Bear conservation and hunting concerns	Covington
Birt Kidwell	Izaak Walton League	Fairfax
Steve King	Bear hunter (hounds)	Wythe
Chip King	Orchardist	Roanoke
Roy Kiser	Agriculture and Nat. Resources, Crop and Soil Science	Craig
Dave Kiser	Livestock producer	Highland
Everette Kline	VA Department of Forestry	Madison

Participant	Interest/Organization	City/County
Virginia Klump	Horse farmer	Charlottesville
Jim Kneas	Wintergreen Resort	Nelson
Steve Krichbaum	Land/wildlife preservation	Staunton
Mike Lane	Izaak Walton League	Suffolk
Merritt Liptrap	Beekeeper	Augusta
Cecil Liptrap	Beekeeper	Augusta
John L. Marocchi	Beekeeper	Rappahannock
Steven Martin	US Army Corps of Engineers, Norfolk District	Norfolk
Darwin Mason	Crop producer	Campbell
Jack McCambridge	VA Dept. of Transportation	Suffolk
Charles Montgomery	Bear hunter (hounds)	Botetourt
David Mumaw	Bear hunter (rifle/bow)	Harrisonburg
Fred Murray	Bear hunter (rifle/bow)	Richmond
Larry Mustard	Bear hunter (hounds)	Tazewell
Albert Newberry	Town of Wytheville, Public Safety	Wythe
Gene Parker	Bear hunter (hounds)	Bedford
Don Patterson	U.S. Fish and Wildlife Service	Richmond
Bill Price	Bear hunter (bow)	Madison
Mike Quesenberry	Roanoke City Police Department	Roanoke
Harry Racey	General	Culpeper
David Rawls	Bear hunter	Suffolk
Herbert Reynolds	Bear hunter (with and w/o hounds)	Madison
John Rice	Bear hunter (bow)	Culpeper
Gene Riddle	Beekeeper	Halifax
Mike Roberts	Wildlife photography and conservation	Campbell
William Saunders	Beekeeper	Chesapeake
Ken Shaver	Orchardist	Madison
David Shelor	Private property concerns	Roanoke
Owen Shifflett	Bear hunter (bow)	Rockingham
Marion Sims	Bear hunter (hounds)	Greene
Jerry Snyder	Bear hunter (hounds)	Rockingham
Rex Sours	Crop producer	Page
Gary Sprifke	Prince William County Animal Control Bureau	Manassas
Estill Stillwell	Bear hunter (hounds)	Tazewell
Hugh Taylor	Beekeeper	Isle of Wight
Robert Taylor	Bear conservation	Greensville
Ed Temple	Bear hunter (hounds)	Chesapeake
Doug Temple	Bear hunter (hounds)	Elizabeth City, NC
John Temple	Bear hunter (hounds)	Chesapeake
Jason Terry	Bear hunter (hounds)	Wythe
Cecil Thomas	U.S. Forest Service	Smyth
Leri Thomas	Bear hunter (hounds)	Greene
Adrienne Thompson	U. S. Navy Security Group - NW	Chesapeake
Danny Thorn	Bear hunter (hounds)	Montgomery
Ty Tyler	Wintergreen Resort	Nelson
John Victor	Beekeeper	Rappahannock
Bob Weaver	Bear hunter (hounds)	Greene

VIRGINIA BEAR MANAGEMENT PLAN

Participant	Interest/Organization	City/County
Don Wells	Virginia Federation of the Humane Society	Prince George
Dalton Williams	Bear hunter (hounds)	Chesapeake
Steven Williams	Private property concerns	Salem
Charles B. Wolfe	Wolfe Environmental and Engineering Consultants	Chesapeake
John Wright	Bear hunter (rifle/bow)	Highland

Appendix IV. Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Respondent Primary Interest:

Hound bear hunters: 17
 Non-hound bear hunters: 11
 Bear hunters (type not known; or both): 7
 Non-bear hunters: 6
 Sportsmen Groups: 2
 Unknown: 14
 Hiker: 1
 Environmental interests: 27
 Rural resident / Homeowner: 10
 Farmer: 4
 Nuisance management: 1
 Government agency: 2

Respondent Names / Location / Organization (if known):

Ashley Adams, Crozet
 Jennifer Allen, Silver Spring, MD (**The Fund for Animals**)
 John Ax
 Russell A. Bach, Salem
 James Baker, Jr.
 Sherman Bamford, Roanoke
 William E. Banks, Farnham
 Egbert C. Beck, Tionesta, PA
 L. L. Beeson, Jr., Winston-Salem, NC (**Jack Mt. Hunt Club, Inc.**)
 Gerald T. Blank, Sr., Harrisonburg
 Chris Bolgiano, Fulks Run (**VA Chapter of the Sierra Club**)
 Leslie Booher, Halifax
 Gregory K. Bowman, Natural Bridge Station
 Steve Bridge, Lyndhurst (**Back Creek Sportsman's Association**)
 Troy L. Brumfield, Gretna
 Edward Burch, Lexington
 Jeanne Callaway, Norton
 David W. Carr, Jr. / Blaine T. Phillips, Charlottesville (**Southern Environmental Law Center**)
 Mike Carter
 Abram CR Charlton, Charlotte Court House
 John E. Claunch, Eagle Rock
 Gloria Jean Coan, Roanoke
 John R Combs, Coeburn
 Mark C. Cotterman, Delaplane
 Laura G. Cotterman, Delaplane
 Joan Crookshanks
 Brian E. Crotts, Cana
 Pat Cuffee, Chesapeake
 Sharon Daniels, Big Stone Gap
 Tom R Davenport, Damascus
 Pete Davis, Lexington
 Angie DeBord

VIRGINIA BEAR MANAGEMENT PLAN

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

David Demarest, Luray
Ervin L. Duncan, Patrick Springs
Robert L. Faison, III, Battery Park, VA
Clay P. Ferguson, Narrows
Jerry L. Ferguson, Jarratt
Mark L. Ferguson, Lynchburg
Barry Forrest
Jerry L. Fraley, Bog Stone Gap
James C. Graves, Madison County
Margaret D. Gray, Gladstone
Lee H. Haupt
Aloysius Heil, Culpeper
Dwayne N. Hickman, Lexington
Peggy Hinson
James W. Jarrell
Rachel B. Johnson, Covington
Michael Johnston, Bristol
Milton L. Johnston, Chesapeake
Barry A. Jones, New Castle
Vickie Justice
Jay Kirwan
Tony D. Knott, Weyers Cave
Steven Krichbaum, Staunton
Bob Ladd
Sean J. Lancaster, Winchester
Arthur B. Layne, Cullen
Roger Dale Lee, Jr., Bluefield
David E. Martin, Vinton
Timothy D. McCray, Narrows
Susan McSwain
David B. Meeks, Phenix
Rodney Metheny, Vinton
Oliver Platts-Mills, Middletown, CT (native of VA)
Douglas K. Morris, Luray (**Shenandoah National Park**)
J. J. Murray, Charlottesville (**Virginia Wilderness Committee**)
Brian D. Musick, Castlewood
Ernest C. Musser III, Rural Retreat
Ernie C. Musser IV, Rural Retreat
Hunter Musser, Rural Retreat
Temple S. Musser, Rural Retreat
Ian Newport, Arlington
Teresa Osborne, Wise County
John B. Rice, Jr., Madison
Patricia Soriano, Alexandria
John E. Sheridan, Crozet
Diane C Siburt, Hermitage, TN
Mark Slade, Chatham

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Terry Slater
 Don W. Sledd, Hardy
 John Speight, Carrsville
 J. C. Spraker, Vinton
 Clarence R. Sprinkle II, Buchanan
 Herb Stahl, Charlottesville
 William D. Tatham, Broadway
 Pat Therrien, Floyd
 Jerry S. Tickle, Bland
 William B. Tolley, Christiansburg
 Winona Tunnell, Lee County
 Robert F. Vaughan, Jr., Montabello
 Frits and Jacqueline van der Leeden, Lexington
 Johnsey A. Viars, Salem
 Larry Vollmer, Crozet
 Anthony D. Walker, Stuart
 John M Wandless, Staunton
 Otis Ward
 Mary White, Springfield
 Mark C. Williams, Alexandria
 Christina Wulf, Charlottesville (**Virginia Forest Watch**)
 Harold E. Young, Jr., Barboursville

COMMENTS:

General

General endorsements:

- Generally, a good plan with much to commend (thorough, comprehensive, well-written, etc.) (23).
- I'm glad to see VA taking more of an interest in bear management (3).
- A management plan for the black bear is a valuable tool that is well worthwhile. (1)
- The draft plan represents a major step in the right direction. (1)
- Encouraging that there is an attempt to balance conflicting issues in protecting black bears (7).
- I generally support and endorse the goals, objectives, and strategies of the draft Black Bear Management Plan. Most recommendations are sensible and feasible. (4)
- Not being native to a rural area, we found your plan very educational (1).
- I am glad that there is a plan to protect black bears (1).
- Willing to help with bear management (3).
- Thanks for giving the public a chance for comment (6).
- The VDGIF has established a good relationship with hound bear hunters and has been a big asset to bear management (1).
- Good luck, I hope it works! (1)
- In most cases, successfully balanced interests of disparate stakeholders. (1)
- Virginia must be doing something right. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Think the plan will be very successful for the future of bears and bear hunting. (1)
- Shenandoah National Park will continue to work with VDGIF to meet bear management goals and objectives – the plan sets the stage for revisiting and revising the Memorandum of Understanding. (1)
- An important first step toward bringing some sanity to our relationship with bears in Virginia (1).

Technical:

- “We support total non-intervention in the life cycle of bears...leave 'em alone, way off by themselves, in a vast uninterrupted range” (1).
- Keep educating the public and the children. (e.g., den visits, CCC aspects) (5).
- Attributes recent growth in bear populations to maturation of oak forests rather than population management programs. (1)
- There are no base-line maps of the original bear range. (1)
- Extent of illegal and market hunting is overstated in Supply & Demand – Operation SOUP statistics are inflated for political benefits. Very little is really known. (1)
- The plan understates the true extent of poaching. Growing human populations only increase the demand for bear parts. “This dereliction is a severe taint upon the entire document”. (1)
- Bear distribution maps (Figures 4 and 8) are overly optimistic – there is less viable bear habitat in the Shenandoah Valley than shown. Also believes that there is less potential bear habitat than portrayed. (2)
- Distribution maps should show what are “sources” and “sinks”. (1)
- Need a narrative and graphic describing the “age-structure indices” referred to. (1)

Process:

- There is also a need for independent non-dog hunters to be heard. (1)
- If you are really interested in public input you need to send the flyers out earlier, otherwise it appears like you are going through the motions. – need more time to comment. (4)
- Needs to be more widely distributed and publicized so all citizens can comment. (1)
- Was the plan influenced by the skewed surveys of the public (ten times as many hunters as non-hunters) for input into the draft plan? (2)
- There wasn't adequate representation of viewpoints on the SAC – (among representation missed were non-lethal interests, opposition to bear hunting, concerns about increasing roads, technology concerns with bear hunting, concerns about “extractive uses” of public lands, wildlife corridors, old growth, road-kills, poaching, Asian market for bears, CITES issues) (stacked with hunting interests vs. animal advocacy interests). (People for the Ethical Treatment of Animals, The Humane Society of the United States, American Society for the Prevention of Cruelty to Animals, Fund For Animals, Sierra Club, and The Wilderness Society) (3)
- Process seemed designed to maintain status quo. SAC is also loaded with members who also have a vested interest in killing bears. (1)
- The make-up of the so-called non-consumptive focal group is evidence of the skewed nature of this process : this group included not only hunters, but even Bear hunters. (1)
- The biased process means that a major rewrite and re-engagement with the citizens of Virginia is in order. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Other:

- The language of the plan is in direct and seems indecisive (1).
- The plan is unlawful and unwise since it concentrates on hunting; I will ask my legislators to prevent its adoption (1)
- Use science to manage bears, and don't let "politicians, anti hunters, or...other fanatics" or emotions dictate bear management (2).
- Have a regular black bear article or update in your monthly magazine. (1)
- Misappropriation of funds and ignorance of the real issues concerning bears are the biggest problems. (1)
- "Who came up with all the fancy words?" (1)
- Has heard that bear hound-hunting groups are attempting to oppose the efforts proposed in the plan. (1)
- Wonder if the DGIF really has the management plan in mind, when the DGIF seems to favor taking care of the "wheel" that squeaks the loudest. (1)
- How can plan items be funded when DGIF is already short of funds? (1)
- DGIF staff don't seem to know much about the planning effort, perhaps the Department needs to be better informed on this important topic. (1)
- After experiences with "unethical game wardens", doesn't trust the VDGIF's bear plan. (1)
- I feel the present draft is deeply flawed. (1)

Population Viability

General:

- Do everything you can to maintain and ensure a viable bear population (3).
- Poaching is a serious issue, and it need to be curtailed, especially around Shenandoah National Park (11).
- We need much harsher punishment for those poaching bears. (1)
- Work on making better bear crossing signs on highways (1).
- Isn't the Cooperative Alleghany Bear Study addressing objective 1? (1)
- Although "ecosystem management" is never mentioned, the approach indicates some thinking along those lines. (1)
- Endorses the concept that minimum viable populations need to be maintained even if this number is greater than humans are willing to tolerate. (1)
- Standardize the field methods among states to assess regional bear populations (via collaboration with the Southern Appalachian Black Bear Study Group – which is not mentioned). (1)
- Concerned about inbreeding in the Dismal Swamp due to loss of woodland. (1)
- Current population assessment is not well studied enough to determine status. Not convinced that current indices accurately portray population status. Still don't know how many bears there are in Virginia. (3)
- Effectively addresses issues and options to meet viability goals and objectives. (1)
- Needs more detail of bear management on public versus private land (e.g., landowner objectives, hunting pressure, harvest statistics). The differentiation helps explain why the management options on public land might need to be different than those on private land. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Needs to think in terms of the most important issues impacting bears – not just smaller, easy issues. These include: increasing roads, technology with bear hunting, “extractive uses” of public lands, development, wildlife corridors, old growth, road-kills, poaching, Asian market for bears, CITES issues). (1)
- Recovery efforts need to focus on restoring bears to a greater proportion of their original range. (1)
- Restore bears to extirpated portions of Lee, Scott, Washington, and Albemarle Counties. (1)
- The plan states that 40 bears was considered a viable population in Florida (BBMP-12). What is the literature citation for this extremely low number? (1)
- Need a map for the 6 viability zones. (1)
- Allowing nature to take its course is the best option. (1)
- Discontinuing program of moving nuisance bears will alter the protection and availability of the resource. (1)

Hunting:

- Closely regulate harvest of bears so that their populations never drop below a safe level again; i.e., keep seasons conservative (9).
- Efforts at nurturing bear populations to their current state will be defeated if you allow hunting as a solution (1).
- There are too few bears to warrant trophy hunting (1).
- Are current, increasing hunting harvests sustainable for viable populations? (3)
- We believe that the viability of bear populations is at stake and that all bear hunting should be prohibited (2).
- Without a clear understanding of hunting impacts, hunting bears under their current stage of come-back is repugnant (2)
- If bears are in trouble, it is not the hunters’ fault; we try to preserve them (1).
- Bear hunting with hounds is harmful to bears (heat & physiological stress, behavioral changes, reproductive & denning success). (1)
- Risk factors are not known yet, but the plan is still advocating habitat manipulation, an increase in current hunter-days, and opening new areas to hunting. The risks of these factors need to be determined before allowing new practices. (2)
- Viability shouldn’t be a method to increase hunting opportunities nor should hunting be involved along the way. (1)

Sanctuaries:

- Establish bear sanctuaries to protect breeding females (11).
- Establish sanctuaries in all 6 viability zones and include areas with a lot of public land. (1)
- Sanctuaries are especially important in parts of the state with little public land, heavy development pressure, and heavy hunting pressure. (2)
- I don’t think that current public hunting areas should be used for bear sanctuaries. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Desirable Populations

General:

- The idea of “cultural carrying capacity” worries me much, because a lot of people have no tolerance for bears (1).
- Bear populations are good for the economy of the state: tourism and hunting (2).
- The problem is not too many bears, but too many people (3).
- Education and tolerance should be emphasized. (1)
- Increase bear populations so they can prey on deer where deer are overpopulated (1).
- There are many areas in National Forest and on private land in zones 4, 5, 8, and 9 that have few bears but suitable habitat (1).
- The increase in bear populations in the state has been good. (1)

Disagree w/CCC objectives:

- Increase bear populations statewide (6).
- Increase the bear populations in Botetourt County (1).
- Increase bear populations in Lexington area; VDGIF is doing a good job so far (1).
- Encourage the increase we are seeing in Patrick County (2).
- Don’t do anything drastic to stop population growth (1).
- Have the property owners been asked about a population increase for Lee County? Has there been a well-publicized public hearing for Lee County? (1)
- What is being done to protect the people from bears? “What happened to government FOR the people” (1)
- Do not increase bear populations in SW Virginia – they are dangerous. (1)
- Do not increase bear populations in the Wise County; there are already problems (1).

Agree w/CCC objectives:

- Increase bear populations in western mountains (1).
- Increase bear populations in Southside, especially Halifax County (1).
- Increase the bear populations in Sussex and surrounding counties west of the Great Dismal Swamp (1).
- Increase bear populations in Southwest Virginia, particularly the Mt. Rogers area (1).
- Increase bear populations around Big Stone Gap. (1)
- Endorses the objective to increase bears in Bland (1).
- Do not take away the bear population from Fauquier County now that they are back (1).
- The coalfield counties of VA can support many bears. (1)
- I support the proposed population objective to increase populations in zone 6. (1)
- Don’t stock bears in Lee County. (1)
- Want an increase in Greensville County to a huntable population. (1)
- Do not allow bear populations to increase in Botetourt County, where they are already beyond managing (1)
- There are too many bears in western Albemarle County based on the damage we have seen (1).

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- We have enough bears. If there were more, we would be afraid to take walks in the woods near our home (1).
- Stabilize bear populations at their current levels around Jack Mt. (1).

Population control or recovery methods:

- Use regulated hunting to control bear populations (3).
- Hunting season is a way to control numbers but we are close to the Shenandoah Park. (1)
- Open an early muzzleloader season in overpopulated areas (2).
- Do not try contraception to control populations (2).
- Focus on chemical reproductive controls and away from hunting (1).
- Habitat loss will control the bear population sufficiently without hunting; “we don't need or want bear hunting” (comments from Loudoun and Fauquier counties) (1).
- Control bear populations humanely (e.g., non-lethal primarily), not by hunting (2).
- Hunting with dogs is not effective for managing bear populations, and no scientific basis for believing that hunting bears with hounds is needed for effective bear management. (1)
- Relocate bears from overpopulated areas to underpopulated areas (5).
- Don't restrict trap and transfer to only SW Virginia; relocation is the reason we have many bears in other areas of western Virginia (1).
- Mark female bears to help hunters avoid their harvest (1).
- Set quotas as the surest way to avoid overhunting. (1)
- If a \$25 bear tag was adopted, many "deer" hunters would not buy this license, and it could have a negative effect on any objective of stabilizing a population. (1)
- Lethal control only as a last resort & then by euthanasia (not sport hunting). (1)
- Don't manage bears liberally like deer are being managed on National Forests (1).

Habitat Conservation And Management

No roads, no vegetation management, only wilderness:

- Have concerns with some of the strategies that advocate specific management actions under Goal 3: *Habitat Conservation and Management*. Understanding that bears need a variety of habitat types, I would like to see that strategies 5, 6, and 7 under Objective a, under Goal 3 be modified to remove the advocacy statements, substituting monitoring and reporting language. (1)
- Too much emphasis on manipulation of vegetation for bear habitat – large, unmanipulated forest is the best way to provide reservoirs for bear reproduction. Will provide excuse to exploit the last wild places (6)
- Existing road network, forest openings, natural processes already provide enough early successional habitats on National Forests and especially private land. (2)
- Too much emphasis on manipulation without acknowledging an equal or greater need for large areas of undisturbed mature forest. (1)
- Need unmanipulated, old growth for den trees and mast. (3)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Assess value of areas in the National Wilderness Preservation System (within Shenandoah National Park and Jefferson/George Washington National Forests) as secure sites for reproduction. Need more of these sites. (1)
- Bears need pristine areas, so limit logging, making clearings, or roads in bear habitat (13).
- Protect large, undeveloped areas, as bears need a lot of room to roam (2).
- There are enough roads on VDGIF land to allow for game management; some places need to be without roads (1).
- Human access associated with vegetation management (e.g., roads) is bad for bears and needs to be analyzed. (3)
- Research shows bears may begin to avoid areas with road densities $> 0.5 \text{ km/km}^2$ of forest. (1)
- What scientific evidence proves logging and vegetation manipulation is good for bears? The cumulative impacts of forest management practices have not been adequately considered and analyzed by the planners. (1)
- If logging is done, many places can be expected to regenerate in red maple – not mast producing trees. (1)
- Duplicate roadless, old-growth, and wild conditions where bear populations are highest (Shenandoah NP, Shenandoah Mt. in National Forest) – should be the preferred strategy for goal 3. (1)

Corridors, connectivity:

- Forested core and connecting areas should be the theme of the bear plan (13).
- We support habitat corridor protection and establishment as specified in Goal 3, strategy 4 (14).
- Since we are in the early stages of understanding the science of habitat minimums, preservation of connective corridors and habitat linkages should be a top priority. (1)
- Need areas for wildlife to cross highways (underpasses). (1)
- Confused and contradictory approach to corridors. While the draft plan mentions the desirability of corridors in several places (to avoid fragmentation) , it also states that the "need for developing corridors in Virginia appears minimal" (p. 42). An extremely shortsighted statement that seems inappropriate in a document created to take the long view. Corridors will become more important over time as the state succumbs to more destructive sprawl. (2)
- Purchase and preserve land around the Dismal Swamp to preserve corridors and allow population of new areas. (1)
- Key connective corridors include: one area between Buchanan and Natural Bridge, another is in the vicinity of Rural Retreat and Bentonville, and there are others. The VDGIF has an obligation to weigh in on the issue of protecting corridors. (1)
- Since we are in the early stages of understanding the science of habitat minimums, preservation of connective corridors and habitat linkages should be a top priority. (1)
- The schizophrenic response to habitat fragmentation and the need for corridors (such as linkages across the Shenandoah Valley and Interstate Routes) is also highly unreasonable (1).

Other:

- We are moving in to bears' space, not the other way around – society is the problem (2).
- Expand black bear habitat by planting trees and limiting development (1).
- Balanced habitat manipulation for bear is a good idea (2).

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Maintaining good quality habitat is the key to preventing bears moving into areas that do not support their way of life (1).
- Provide the protection and habitat that bears need to thrive. (2)
- Increase the amount of state and federally protected land in Virginia. (1)
- Establish feedplots in the vast areas that have been strip-mined. (1)
- Endorse strategy to work with governmental and non-governmental organizations to preserve forest habitat integrity. (1)
- Need to determine impact of chip mills, clearcutting, logging, roads, ORV's, traffic, disturbance, letter, and sprawl on bears. (1)
- Because the knowledge about habitat minimums is so poorly understood, uncomfortable with using the stated numbers (200,000 acres of forested areas or 80,000 acres of forested wetlands) – too imprecise at this time. (1)
- VDGIF needs to take a sober look at future habitat/development trends and realize expanding bear populations can't go on forever. (1)

Hunting Seasons And Demand

Pro-hunting (general):

- Bear hunting is good recreation and is the best way to manage bears (1).
- We do not hunt, but see hunters as our best ally in protecting wild lands (1).
- I cannot picture my life without this great tradition of hound hunting, which is part our American legacy (1).
- Bears should not be hunted because they are “slow and cumbersome” (1).

Anti-hunting (general):

- The “tradition” of bear hunting was lost, and “our hunters are now largely suburban dwellers with new SUVs and almost no common sense in the woods” (1).
- We believe that VDGIF should not cater to special interests, but respect the wishes of the majority of Virginians who oppose bear hunting (1).
- There is no scientific or biological merit to bear hunting. (1)
- With hunter numbers declining, why is the emphasis to maintain hunting numbers and open new areas? Why use the 94-95 bench-mark levels? (1)
- “Bear hunting as recreation is a narrow-minded idea” (1).

Hound-related comments:

- The plan suggests a decrease in bear hunting, but it seems to me that hound hunting is as popular as ever (a function of supply and demand?). (1)
- Hound hunting in December help non-hound hunters harvest bears because bears are moved around. (1)
- Do not do like other states and push the houndsmen to extinction – preserve dog hunting (3).
- Increase the chase season (4).
- Allow nighttime hunting for chase season – it is cooler for the dogs and bears. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Decrease the kill season (2).
- Extend the hound season (1).
- Reduce, but don't eliminate, bear hunting with hounds (1).
- Extend hunting season without hounds (2).
- Hound hunters already have the longest season but always want more; this infighting is detrimental to all hunters (1).
- Do not establish regulations that will give more control of bear hunting to special interest groups; do something for the majority of hunters (1).
- Without dogs, the bear harvest will plummet in rough country. (1)
- Dog hunter harvests are mostly male and therefore will help nuisance problems. (1)
- Likes Virginia's longer seasons and bag limits (especially compared to PA) – don't change a thing. (1)
- If hunting comes to the south Piedmont, make it no dogs and it should not run concurrent with the dog deer season. (1)
- Want a still hunt area for bears in the mountains. (1)
- Don't sacrifice dog hunting to benefit bird watchers & antihunters. (1)
- Don't focus new hunting regulations just for the benefit of dog hunters. (1)

Other allocation comments:

- Muzzleloader hunters should not have to wait until after dog season to shoot bears (1).
- Keep bear season open during deer season, while those of us who work have time to hunt (2).
- Deer hunters generate a lot of money, and they are getting preferential treatment by keeping the bears season open during deer season (1).
- Give other hunters more opportunity to bear hunt – hound hunters get more than their fair share of season days (seasons are too geared just for dog hunters). (1)

New hunting areas/opportunities:

- Institute limited hunting in areas where bears pass through (1).
- Establish new chase season in or near Charlotte County (1).
- Open bears seasons south of I-81 (1)
- Consider a statewide season when the population becomes large enough (1).
- Hold a bow season only in Patrick County, as firearm hunters would take too many (1)
- I oppose the proposed archery and muzzleloader season for bears in Fauquier County in 2001 due to decreasing bear habitat, additional law enforcement workload, and the importance of the area as a refugia (1).
- Want the Great Dismal Swamp open to public bear hunting? Too little public opportunities in SE Virginia (2)
- Need public bear hunting areas in Warren, Albemarle, Rappahanock, Chesapeake, and Suffolk Counties. (1)
- Don't open new areas to hound hunting. (1)

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Hunter satisfactions:

- Acquire more land for hunters (2).
- Make VDGIF personnel more accessible to sportsmen (1).
- Fines, tickets, and general lack of respect “rangers” (especially around Shenandoah National Park) have for dog hunters makes hunting less enjoyable - this has to change to maintain bear hunters (especially dog hunters). (1)
- Bow bear hunters constantly harassed by “wardens” along the Parkway in Bedford County. (1)
- The sportsmen of the Commonwealth are overburdened with restrictions. (1)
- Hunting bears in a dwindling habitat will equate to “canned hunts” in a few years (1).
- Let hunters sell bear parts to VDGIF who can resell for profit to support programs. Many hides are thrown away. (1)
- Because they have medicinal value, why not utilize bear parts for Asian medicines? (1)

Other restrictions and permits:

- Institute a special bear permit (4).
- I am glad the special bear permit did not pass (1).
- Raise the minimum weight limit (2).
- Allow baiting under strict guidelines for bowhunting (1).
- Do something to help prevent the harvest of underweight bears (that continues to happen). (1)

Ethics Of Bear Hunting Methods

General:

- Bear hunter culture pressures young people to prove themselves by taking up hunting (1).
- We do not support bear baiting or “public bear hunting” (1).
- Agree with Goal 5. (1)
- Main concerns are the fact that so many people are ignorant and biased against bear hunting and especially with dogs. (1)
- Hunting with dogs or high-powered guns is not sporting. (2)
- Any hunting is inhumane and unnecessary. (1)
- Vilification has become a pastime for some people. (1)
- Beyond current laws, the VDGIF should not dictate morality and ethics for hunters – it is beyond their mission. (1)

Hound hunting:

- Your plan needs to show more of the good sides of hound hunting (selectivity, etc.); it is now one-sided (2).

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Emphasizing that people in other states oppose hound hunting makes it look like the plan in preaching that dog hunting is bad (1).
- Tell that tracking collars are used to retrieve valuable dogs (3).
- The technology (electronics)of bear hunting with dogs is unethical; put some ‘fair chase’ guidelines in place (4).
- Hound hunters with their numbers, packs of dogs, and technology are visible to the public, thereby causing image problems for all hunters (2).
- Unless hound hunters police their own activities, the sport will end (1).
- Anyone who wants to hunt bears should do so without dogs (3).
- I am opposed to bear hunting with dogs; it is unethical and not fair chase (13).
- I oppose the chase season, due to the impacts on vulnerable young animals of all species (1).
- I oppose the chase season since it allows hunters to torment bears (1).
- Reduce or eliminate the chase season. (1)
- Eliminate the chase season & the raccoon chase season (it is just another bear chase season (1).
- The public needs to be informed accurately about how little chance a bear has pursued by dogs. (1)
- A harvest decision can be made sometimes (e.g., size, gender) when using dogs. (1)
- Bear hunting with dogs gives all hunters a very bad reputation. (1)
- There are too many dogs per pack - there should be a dog limit (e.g., a 4-dog limit like Maine has). He doesn't feel this is fair chase. (3)
- Bear hunters have taken care of bears by being selective – avoiding females. (3)
- Bear hunting with dogs is the fairest and most humane way to hunt bears (more than bow or rifle). (3)
- Non-hound hunters won't trail a wounded bear. (1)

Bow hunting:

- Bow hunters wound a lot of bears (5).
- Bow hunters are frequently baiting bears (1).
- Hunting with bows is crueler than hunting with dogs (1).

Landowner And Citizen Conflicts With Bear Hunting

General conflicts:

- Hound hunters wear out our forest roads (1).
- Hound hunters have little respect for others on the forest roads (1).
- I already have to watch out for deer hunters – now bear hunters (1).
- Bear hunters using noisy dogs make “enjoying the outdoors a hardship” in the fall and chase season (1).
- My bear-viewing experiences in August through October have been compromised by chase season (1).
- An important goal. (2)
- Dog bear hunters negatively affect other hunters pursuing other species (e.g., deer hunters) – although agree with the right to hunt with dogs. (2)
- Most hound hunters are respected in the community (1).

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

Landowner conflicts:

- Hound hunters trespassing on private lands gives a bad image to all hunters (2).
- I am concerned about fence damage and livestock harassment by bear hunters using hounds trespassing on my farm (1).
- Find out who is really causing problems with landowners before blaming dog hunters. (1)
- Most landowner conflicts are with city people moving to the country and they are not educated about the traditions of dog men. (1)
- Hound hunters always respect landowners, other hunters, and the public. (1)
- Enforce the trespass law and change the dog retrieval law which allows people to trespass (1).

Non-Hunting Recreation

- We support nonhunting recreation and enjoyment from just knowing bears exist (9).
- More facilities like Explore Park are needed for publics which cannot or should not interact with free-roaming bears (1).
- Bear hunters could give bear sighting tours to enhance public enjoyment of bears and public understanding of bear hunting (1).
- Bears should not be killed for the pleasure of a few when so many of us want to see them (1).
- Feel blessed to see a bear. (1)
- Bear watching should be achieved w/o compromising quality of life for bears (including not held in captivity). (1)
- Prohibit supplemental or recreational feeding of bears (8).

Human-Bear Problems

Non-lethal option comments:

- To kill bears to protect a human population that is moving into bear habitat is a perverse idea (1).
- Don't kill nuisance bears; do not issue kill permits for bears (5).
- Relocate nuisance bears to hunted areas or areas needing more bears (2).
- Relocate bears – this may be expensive, but killing bears is not right (3).
- Relocate bears to a wilderness area or some remote location - don't use lethal options on nuisance bears (1).
- Develop a method to decrease crop damage so they won't have to be destroyed - will not be easy, if possible at all (1).

Lethal comments:

- Relocation and kill permits are both appropriate where needed (1).
- We are in favor of kill permits and regulated hunting to address human-bear problems (1).
- Have officers or landowners under supervision of officers dispatch problem bears (1).

Appendix IV (cont.). Respondents and digest of public comments on the draft Virginia Black Bear Management Plan. Numbers in parentheses indicates the number of times a particular comment was noted.

- Use a “3 strikes and the bear is out” protocol (1).
- Give producers permits to allow still hunters only to kill problem bears (1).
- Allow hunters under VDGIF supervision to kill nuisance bears. (1)
- Be aware of abuse associated with kill permits; be tight with their use (1).
- It is better for problem bears to be promptly killed than put in zoos (1).
- We do not support bear trapping (1).
- Change season dates to help with bear damage. (1)
- Have hunting season in October in Chesapeake to help crop damage and highway encounters. Will help public tolerance for bears. (1)
- Don’t use lethal, non-hunting means to control problem bears. (1)
- While shifting away from translocation, protocol needs to have provisions for chronic bear problems that other options (e.g., aversive conditioning) haven’t corrected. (1)
- If lethal action as a last resort is necessary, euthanasia is the only humane option – recreational hunting should not be considered. (1)

Education:

- Education is the best prevention & minimization of bear problems (6).
- Education via the internet (with links to suppliers and designs of materials) and brochures. (1)
- Educational needs for gardens, apiaries, orchards, animal feed, feeders, refuse storage/disposal, and bear country activities (hiking, fishing, and camping). (1)
- Even a very ambitious education program will not decrease human-bear problems by 25% if you are expanding bear populations (1).

General comments:

- To decrease human-bear problems while increasing the bear population is very unlikely (1).
- Extra exposure to humans with a longer chase season would help with nuisance bear problems (1).
- Concerned about livestock damage. (1)
- Large, undisturbed forest habitat will lessen the human-bear problems. (1)
- Do not pay people with cabins in the mountains for frivolous claims; reserve compensation in the strictest sense to verified agricultural losses (1).
- Fence beehives (1).
- Try to get USDA Extension support for fencing demonstration areas (1).
- For reducing bear human conflicts section of the plan, include cleaning up trash, take down bird feeders, and fencing off gardens (2).
- Compensate farmers for damage from bear stamp proceeds. (1)
- Allow dogs to chase problem bears. (1)
- Have an August chase season to move bears away from agricultural crops. (1)
- The chase season chases bears out of their natural home range causing more crop damage & contributes to bear/vehicle collisions. (1)
- Use dogs (e.g., West Siberian Laika, Karelian bear dogs) in a deterrent program. (1)
- VDGIF needs to be more responsive to nuisance complaints. (1)

VIRGINIA BEAR MANAGEMENT PLAN

Appendix V. Priority rankings of the 24 bear plan objectives by the Stakeholder Advisory Committee (SAC) and the Black Bear Technical Committee (BBTC). An importance rank of 1 means the most important objective, 2 means the second most important objective, and so on until 24 which means the least important objective.

Each member of the SAC and BBTC independently chose the 8 most important, 8 least important, and 8 moderately-important objectives in the bear management plan. All 24 objectives were ranked based on these choices. Some ranks are tied.

IMPORTANCE RANK		BEAR PLAN OBJECTIVES
SAC	VDGIF	
(n=14)	(n=12)	
		Goal 1 - Population Viability
5	2	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.
3	4	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.
9	12	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.
1	8	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.
		Goal 2 - Desirable Population Levels
9	8	5. To meet bear cultural carrying capacity population objectives that are consistent with population viability objectives in each zone by 12/31/10. As of June 1, 2001, the specific cultural carrying capacity population objective for each zone in Virginia is: (see CCC map in plan, Figure 16)
15	17	6. To determine the relationships between population viability and CCC by 12/31/09.
20	14	7. To determine updated CCC objectives in each zone by 12/31/10.
		Goal 3 - Habitat Conservation and Management
15	12	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.
8	19	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.
15	14	10. To determine the relationships between population dynamics of bears in Virginia and the dynamics of suitable habitat by 12/31/09.
		Goal 4 - Hunting Seasons And Demands
9	17	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.
19	6	12. Consistent with black bear population objectives, to open new areas for additional recreational black bear hunting opportunities during the biennial regulation considerations.
23	20	13. To determine black bear hunter satisfactions and constraints to participation in Virginia by 12/31/09.
		Goal 5 - Ethics of Bear Hunting Methods
5	8	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.
9	14	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.

VIRGINIA BEAR MANAGEMENT PLAN

SAC	VDGIF	Goal 6 - Landowner and Citizen Conflicts with Bear Hunting
14	6	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.
2	8	17. Implement programs to reduce conflicts between bear hunting activities and other Virginia citizens (especially landowners) by 25% by 12/31/06.
Goal 7 - Non-Hunting Recreation		
21	21	18. To determine non-hunting demands and satisfactions for bear recreation by 12/31/09.
21	22	19. Provide non-hunting recreational opportunities for Virginia citizens by 12/31/10.
24	24	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.
Goal 8 - Human-Bear Problems		
9	1	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.
5	2	22. To evaluate the effectiveness of different nuisance bear management options by 12/31/06.
15	22	23. To achieve a 25% reduction in bear damage by 12/31/08.
4	5	24. To identify and develop site-specific management options for unique bear management units through 4/30/02.