



BIG GAME MANAGEMENT PLAN 2010 - 2020

CREATING A ROAD MAP FOR THE FUTURE

 **VERMONT**
FISH & WILDLIFE DEPARTMENT
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Vermont Fish & Wildlife Department

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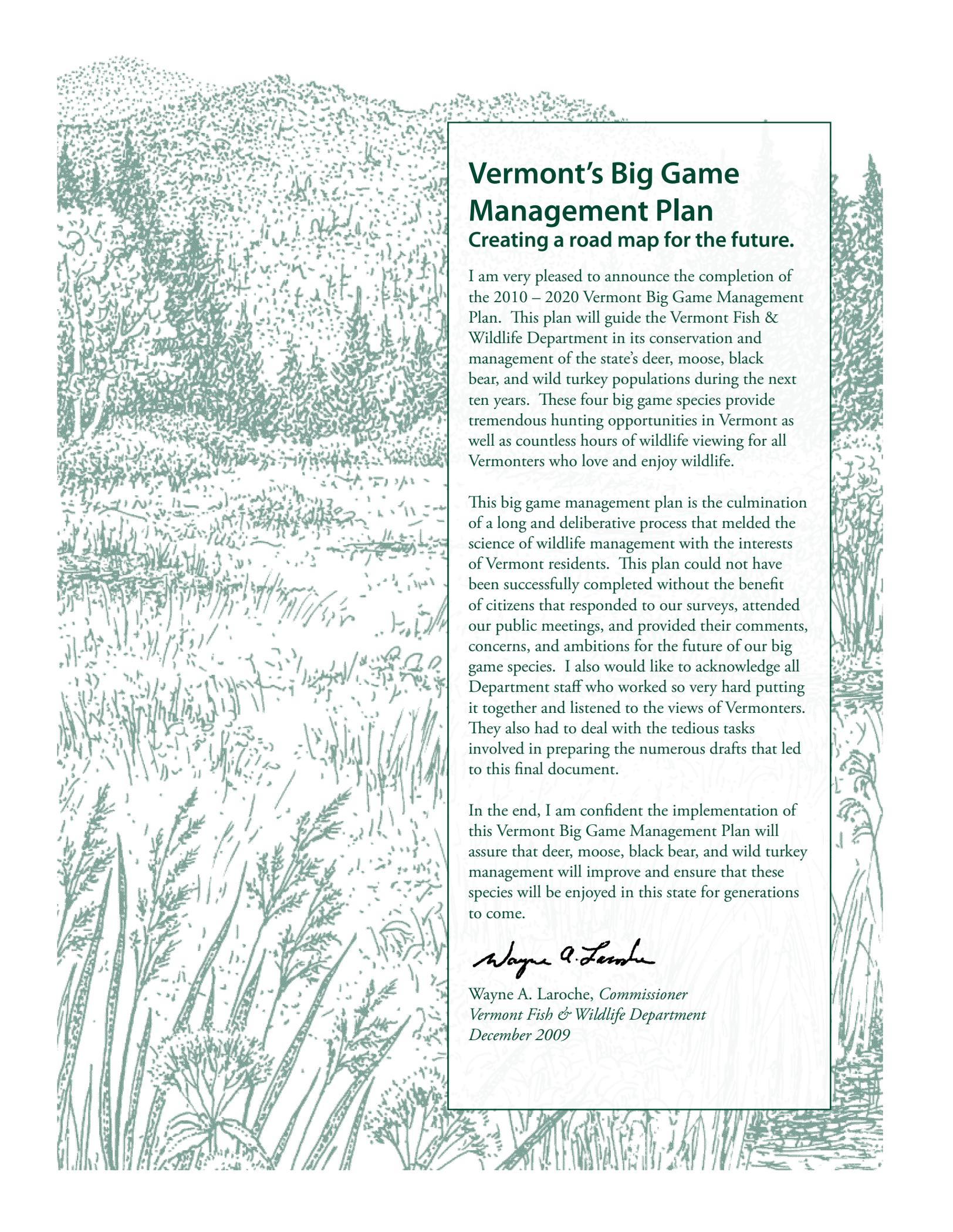
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Vermont's Big Game Management Plan

Creating a road map for the future.

I am very pleased to announce the completion of the 2010 – 2020 Vermont Big Game Management Plan. This plan will guide the Vermont Fish & Wildlife Department in its conservation and management of the state's deer, moose, black bear, and wild turkey populations during the next ten years. These four big game species provide tremendous hunting opportunities in Vermont as well as countless hours of wildlife viewing for all Vermonters who love and enjoy wildlife.

This big game management plan is the culmination of a long and deliberative process that melded the science of wildlife management with the interests of Vermont residents. This plan could not have been successfully completed without the benefit of citizens that responded to our surveys, attended our public meetings, and provided their comments, concerns, and ambitions for the future of our big game species. I also would like to acknowledge all Department staff who worked so very hard putting it together and listened to the views of Vermonters. They also had to deal with the tedious tasks involved in preparing the numerous drafts that led to this final document.

In the end, I am confident the implementation of this Vermont Big Game Management Plan will assure that deer, moose, black bear, and wild turkey management will improve and ensure that these species will be enjoyed in this state for generations to come.

Wayne A. Laroche

Wayne A. Laroche, *Commissioner*
Vermont Fish & Wildlife Department
December 2009



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Wild animals, or wildlife, by Vermont law, belong to the people of Vermont. Conserving and managing Vermont's wildlife resources on behalf of the public are obligations of the Vermont Fish & Wildlife Department. The Department has a long history of managing Vermont's big game species. This long-range management plan will help identify goals, and management objectives to insure that conservation needs of the species and the interests of the public are effectively addressed. Below is an overview of the management issues, goals and strategies for each big game species.

2010-2020 White-tailed Deer Management Issues, Goals, and Strategies

ISSUE 1. Habitat Loss and Assessment

GOAL: To monitor changes in habitat quality and quantity and perform public outreach regarding habitat management techniques, so concerned citizens may help to secure their deer herd's future.

Management Strategies

- 1.1 Update inventory of deer wintering areas for local, regional, and state habitat planning and protection efforts.
- 1.2 Stress the importance of habitat conservation with outreach efforts to various segments of the public such as farmers, educators, hunters, forest managers, and land planners.
- 1.3 Work closely with foresters and entomologists to prevent, manage, and eliminate the threat of the hemlock woolly adelgid.

ISSUE 2. Population Goals

GOALS: 1) Maintain deer densities using regional population objectives.
2) Monitor biological characteristics of habitat and deer that can change in response to deer herd size through time.
3) Adjust antlerless deer harvests to alter population levels as necessary to achieve population objectives.

Management Strategies

- 2.1 Maintain and evaluate regional population goals, established during this planning period, that are based on deer densities that recognize a lower limit that is unsatisfactory to the public and an upper limit that is ecologically unsustainable.
- 2.2 Monitor deer herd health by collecting body condition data from hunter-harvested and road-killed deer.
- 2.3 Consider establishing habitat suitability criteria to define areas of suitable deer habitat within WMUs so that consistent and reliable density estimates can be made while allowing for habitat area estimate updates as new land-cover maps become available.
- 2.4 Evaluate bowhunter surveys to better estimate regional buck:doe and fawn:doe ratios; compare fawn production estimates to autumn fawn:doe ratios to estimate summer fawn survival, and use buck:doe ratios to estimate adult doe population through reference to the unbiased buck population estimate.
- 2.5 Continue remapping and surveying deer wintering areas so that available habitat is quantified and localized winter deer density is better documented.
- 2.6 Work with foresters to develop data-driven methods for assessing localized deer overabundance problems that might lead to development of localized deer management methods. Data must provide measures of forest condition.
- 2.7 Provide outreach to landowners regarding methods that may minimize damage and encourage reduction in locally overabundant deer populations. Investigate feasibility of a formal program to connect hunters with landowners to address locally overabundant deer populations.
- 2.8 Develop strategies to maintain enough big game registration stations to make big game reporting convenient for hunters.
- 2.9 Seek statutory changes to realign boundaries of select WMUs.

ISSUE 3. Hunter Satisfaction and Antler Point Restrictions

GOAL: Employ biologically responsible, socially responsive, and adaptive management of the deer herd.

Management Strategies

- 3.1 Collect adequate yearling buck data (weights, antler beam diameter, and number of points) from the youth hunt to detect and track any changes in the buck population resulting from the current antler-point restriction (two points-on-one-antler minimum), and evaluate biologically acceptable alternatives if needed.
- 3.2 Evaluate a model assessment using genetic data to examine the likelihood of altering the genetic diversity of the buck population via the current antler restriction.
- 3.3 Inform the hunting public about deer management issues and results of antler-point restrictions and gather input concerning deer management and hunter satisfaction.

ISSUE 4. Bag Limits

GOAL: Provide suitable utilization of deer as food and provide opportunity to hunt deer in a way that maximizes potential for effective deer population management but does not overstress the heavily harvested buck population.

Management Strategies

- 4.1 Provide the public with ample opportunity to harvest white-tailed deer for food and other utilitarian purposes.
- 4.2 Advocate for an appropriate deer bag limit that allows maximum hunter opportunity while achieving deer population management strategies.

ISSUE 5. Muzzleloader and Archery Season Modifications

GOAL: Provide suitable opportunity to hunt deer in a way that maximizes the potential for effective deer population management but does not interfere with hunters during youth weekend or rifle and other fall hunting seasons.

Management Strategies

- 5.1 Evaluate feasible options to expand antlerless deer-only hunting opportunities prior to the regular rifle season. These options will include, but are not limited to, an early muzzleloader season, expanded archery season, and increases in archery bag limits.
- 5.2 During the fall and winter of 2009-2010, survey public opinion on the various management options to achieve antlerless harvest objectives prior to the rifle season and develop a proposal of recommended hunting season changes for the Vermont Fish and Wildlife Board in 2010.

ISSUE 6. Captive Deer Hunting/ Deer Farming/ Cervid Importation

GOAL: Implement new captive hunting regulations and work with other state agencies to minimize the chance of introducing and transmitting diseases via captive deer.

Management Strategies

- 6.1 Evaluate the effectiveness of the captive hunting facility regulation.
- 6.2 Work with the Agency of Agriculture, Foods, and Markets and the deer farming industry to promote and enforce disease free importation and husbandry practices.

ISSUE 7. Disease Surveillance and Management

GOAL: Monitor disease issues and respond when necessary to protect the health of wildlife and/or humans.

Management Strategies

- 7.1 Work with associated branches of government (for example, Agency of Agriculture, Department of Health) to monitor and control disease agents and deer populations where and when it is appropriate.
- 7.2 Contribute to the national Chronic Wasting Disease (CWD) surveillance effort.
- 7.3 Monitor the progress of Hemorrhagic Disease as it moves toward the Vermont border.
- 7.4 Work closely with the Agency of Agriculture to ensure dairy farms and domestic deer farms maintain their tuberculosis-free status.
- 7.5 Investigate a prohibition on the use of deer-urine-based scent lures and, if appropriate, implement a public informational effort on the justification.
- 7.6 Inform Vermonters as to the gravity of CWD and repercussions if introduced into our environment through the dissemination of Vermont's CWD Response Plan.

ISSUE 8. Locally Overabundant Deer Populations

GOAL: Promote awareness that hunting is the only practical option to reduce localized overabundant deer populations.

Management Strategies

- 8.1 Demonstrate the effectiveness of archery hunting to reduce locally overabundant deer in Vermont's suburban environments.
- 8.2 Provide communities with up-to-date and comprehensive information on deer overabundance and consider community views when deciding how to best manage deer problems in suburban, agricultural, and forested areas.

- 8.3 Encourage communication and cooperation between antlerless deer hunters and landowners that seek relief from locally overabundant deer.

ISSUE 9. Two-year Regulation Cycle

GOAL: Consider a more efficient two-year regulatory cycle that allows for annual adjustments when environmental factors deem it appropriate.

Management Strategies

- 9.1 Provide outreach to legislators, board members, and hunters to develop an understanding of the rationale behind deer management and proposed actions to improve management.
- 9.2 Evaluate the benefits and deficiencies of implementing a two-year regulation cycle for deer season recommendations.

2010-2020 Moose Management Issues, Goals, and Strategies

ISSUE 1. Regional Population Goals

GOAL: To maintain regional populations of healthy moose at or below cultural carrying capacity.

Management Strategies

- 1.1 Maintain a statewide fall post-hunt population of between 3,000 and 5,000 moose.
- 1.2 Maintain a sex ratio of between 40 to 50 bulls per 100 adults (moose of at least age-class one).
- 1.3 Maintain an adult age-class distribution of at least 25% of at least age-class four.
- 1.4 Maintain an average ovulation rate of more than 1.15 for cows age class of at least three.
- 1.5 Assess relative moose habitat condition of individual WMUs or regions of the state using forest inventory data and a GIS-based Habitat Suitability Index Model.
- 1.6 Reduce and maintain WMU E moose densities to 1.75 moose per square mile (approximately 1,000 moose post-hunt).
- 1.7 Reduce and maintain WMU D2 moose densities to 1.0 moose per square mile (approximately 600 moose post-hunt).

- 1.8 Allow slow population growth in WMUs I, L, P and Q while not exceeding one moose per square mile.
- 1.9 Stabilize moose population in other WMUs at current levels.

ISSUE 2. Moose / Human Conflicts

GOAL: To minimize motor vehicle/moose collisions and other forms of damage caused by moose.

Management Strategies

- 2.1 Develop and implement a policy for Department response to “nuisance” moose.
- 2.2 Continue to cooperate with the Vermont Agency of Transportation (VTRANS) to erect warning signs at traditional moose highway crossings.
- 2.3 Cooperate with VTRANS in implementing roadside brush-clearing projects to improve visibility at the most dangerous moose crossings, when feasible.
- 2.4 Cooperate with VTRANS to investigate the use of new technology that may help reduce moose/vehicle collisions.
- 2.5 Continue with annual press releases to remind motorists of moose hazards during seasons of increased moose movements.

ISSUE 3. Moose Hunting Opportunities

GOAL: To maximize quality moose hunting opportunity.

Management Strategies

- 3.1 Provide quality moose hunting opportunity in all WMUs where feasible.
- 3.2 Coordinate with large property owners to enhance moose hunter access.
- 3.3 Provide information to hunters on how they can share moose meat with needy households throughout Vermont.
- 3.4 Conduct outreach efforts prior to any significant reduction in total permit numbers made in response to moose population changes.
- 3.5 Provide public opportunity to harvest moose for food and other utilitarian purposes.

- 3.6 Maintain and improve hunter satisfaction by managing a preference point lottery system.
- 3.7 Propose to implement a limited special archery-only moose hunting opportunity.

ISSUE 4. Moose Viewing

GOAL: Provide safe and quality moose viewing opportunity.

Management Strategies

- 4.1 Construct at least one moose observation tower with a parking area near a state highway in the Northeast Kingdom region and investigate other locations in other regions.
- 4.2 Include moose in a guide to wildlife viewing sites on the Department’s website.

ISSUE 5. Moose Habitat

GOAL: Maintain necessary habitat to support 3,000 to 5,000 moose on a sustained basis.

Management Strategies

- 5.1 Implement field studies to investigate, measure, and monitor the degree of moose and deer browsing within selected WMUs.
- 5.2 Provide natural resource professionals and landowners with moose habitat management guidelines.

ISSUE 6. Deer-Moose Competition and Forest Impacts

GOAL: Balance the nutritional needs of regional moose and deer populations with the need for adequate forest regeneration.

Management Strategies

- 6.1 Develop a study to assess the carrying capacity for moose and deer on Vermont’s forestland.
- 6.2 Develop a decision making process that assists managers in determining the appropriate mix of moose and deer densities for a given WMU based on cultural and ecological factors.

2010-2020 Black Bear Management Issues, Goals, and Strategies

ISSUE 1. Bear Population Size and Distribution

GOAL: Identify an appropriate bear population objective that ensures the viability of a wild, free-ranging bear population, provides for hunting opportunities, and satisfies human social expectations and tolerances for nuisance bear occurrences.

Management Strategies

- 1.1 Update and re-evaluate Vermont's black bear population model to reflect the most current harvest and biological parameter data available.
- 1.2 Evaluate and develop hunting season structures that align population estimates with biological data, habitat limitations, and public satisfaction data to sustain a bear population between 4,500 and 6,000 animals.

ISSUE 2. Bear Habitat Conservation

GOAL: Maintain a no net loss of function and value of existing bear habitat.

Management Strategies

- 2.1 Maintain and enhance habitat protection efforts through Act 250, wood-to-energy harvest review, work with town and regional planning commissions, land acquisition, and other conservation methods.
- 2.2 Provide technical assistance in managing for critical bear habitat in the Use Value program.
- 2.3 Revise and update "A Landowner's Guide, Wildlife Habitat Management for Vermont Woodlands" to include habitat management recommendations for black bears.

ISSUE 3. Human/Bear Conflicts

GOAL: Minimize the overall number of negative interactions occurring between bears and humans to achieve acceptable levels of human safety and social acceptance.

Management Strategies

- 3.1 Update statewide policy for handling black bear/human conflicts.
- 3.2 Improve and disseminate outreach/education materials and messages for minimizing human/bear conflicts.
- 3.3 Monitor bear/human conflicts and explore new strategies for reducing the number of complaints from the public.
- 3.4 Use permitted houndsmen with trained bear hounds to haze bears and keep them wary of humans.

ISSUE 4. Bear Management Strategies and Season Structure

GOAL: Optimize public hunting opportunity for the utilization of bears for food and other appropriate purposes and ensure hunter satisfaction within biologically sustainable regulations.

Management Strategies

- 4.1 Hunting season management strategies and season structure will be evaluated and adjusted to maintain the population goal of 4,500 to 6,000 bears. Changes in hunting season structure will consider, when necessary, the use of season length, regionalization, or incremental changes to season bag limits to achieve population goals.
- 4.2 Work with partner organizations on issues related to bear management as they are raised throughout the management plan period and develop specific strategies to address them. Such strategies may range from legislative changes to educational efforts.

2010-2020 Turkey Management Issues, Goals, and Strategies

ISSUE 1. Turkey Population

GOAL: To adequately assess Vermont's wild turkey populations and trends.

Management Strategies

- 1.1 Annually collect and assess turkey harvest data to determine trends as well as summer/fall turkey

sighting survey data in order to direct future management decisions.

- 1.2 Conduct the public annual Internet turkey brood survey along with the Department staff summer turkey survey.
- 1.3 Continue the turkey program's investigation into the genetic variability and structure of the statewide population.
- 1.4 Evaluate new wild turkey population estimation methods and models for use in Vermont.
- 1.5 Evaluate the use of a public Internet survey to assess winter flock sightings.

ISSUE 2. Public Satisfaction with Current Population Levels

GOAL: Assess public and hunter satisfaction with current turkey population levels and management program.

Management Strategies

- 2.1 Provide statewide spring bearded-bird-only seasons (including the Youth and regular May season) and limited fall either-sex hunting seasons in WMUs that can sustain a fall harvest so as to provide for population stability.
- 2.2 Prioritize high quality spring hunting over additional fall harvest opportunity.
- 2.3 Manage fall turkey harvests through changes in fall hunting season length within WMUs depending upon stability or growth of three-year average spring harvest densities, except in WMU A Champlain Islands where inadequate forest cover exists to sustain a fall firearm harvest.

ISSUE 3. Fall Turkey Hunting

GOAL: To provide appropriate opportunity for sustainable fall hunting while maintaining current levels of high quality spring turkey hunting.

Management Strategies

- 3.1 Provide public opportunity to harvest wild turkey for food and other utilitarian purposes.
- 3.2 Facilitate healthy, abundant spring turkey populations that are stable using modest, fall hunting seasons/bag limits to control the

population. When the three-year spring average harvest density reaches the specific threshold value, liberalization of fall hunting in a WMU may be called for (initiate shotgun seasons, extend gun seasons).

- 3.3 Consider reducing the current guideline for the threshold as to when fall gun hunting opportunities could be initiated in a new WMU, from the three-year average spring harvest density of one bird per square mile, to an average harvest density of .75 bird per square mile.
- 3.4 Lengthen the current fall seven-day shotgun season to a nine-day season.
- 3.5 Expand the fall shotgun season to include WMUs H1, D1, and B with a nine-day shotgun season.
- 3.6 Expand the fall archery turkey season, coinciding with the opening of the deer archery season, to allow archery hunting statewide.
- 3.7 Investigate establishing a new separate "Fall Gun Season Only" tag.

ISSUE 4. Wild Turkey/Human Conflicts

GOAL: To minimize and manage agricultural damage and nuisance turkey incidents.

Management Strategies

- 4.1 Provide property owners with access to coordinated services of personnel trained to deal with nuisance turkey issues including wildlife biologists, game wardens, and USDA Wildlife Services staff to assist with nuisance complaints via technical guidance/assistance on techniques to minimize/discourage damage.
- 4.2 Conduct follow-up site visits to nuisance complaint sites when necessary and provide hazing equipment to help ameliorate persistent nuisance situations.
- 4.3 Solicit assistance from local volunteers through the Vermont Chapter of the National Wildlife Turkey Federation (NWTf) to help provide on-the-ground assistance to landowners via hazing and behavior modification efforts.
- 4.4 Assist USDA Wildlife Services staff with development of educational materials to inform and educate farmers about techniques for minimizing conflicts.

- 4.5 Compile and evaluate wild turkey damage complaint reports from farmers, state game wardens, biologists and wildlife service personnel to document problems, management approaches and results.
- 4.6 Develop/modify a standard set of protocols/guidelines/solutions to perceived and actual conflicts caused by wild turkeys (nuisance animals, agricultural damage).

ISSUE 5. Turkey Habitat Management and Conservation

GOAL: To encourage conservation and appropriate habitat management practices to support and sustain Vermont's wild turkey population.

Management Strategies

- 5.1 Continue efforts on wildlife management areas and other public lands to provide habitat demonstration areas to promote appropriate commercial and noncommercial vegetation management practices beneficial to turkeys and other wildlife. This includes the use of prescribed fire and other management practices to establish and maintain long-term mast production areas.
- 5.2 Provide technical information and assistance regarding turkey habitat management to private landowners and other land managers, town planning commissions via staff biologists, habitat demonstration projects, LIP and WHIP program lands, etc.
- 5.3 Update the "A Landowner's Guide, Wildlife Habitat Management for Vermont Woodlands" and make this document available on the Internet and in published copy as well.
- 5.4 Work with the NWTF regional biologists and chapter volunteers on development of the North American Wild Turkey Management Plan.
- 5.5 Work with partnering organizations on high priority projects and issues.

ISSUE 6. Perception Regarding the Interaction Between Deer and Wild Turkeys, Ruffed Grouse and Wild Turkeys, and Various Predators and Wild Turkeys

GOAL: To improve the public's knowledge, awareness, and understanding of the role of the wild turkey and its interactions within the ecosystem.

Management Strategies

- 6.1 Promote sound scientific principles regarding inter-species competition and predator-prey relationships through a variety of outreach methods including public speaking events, web-based information and links, and print and broadcast media.

ISSUE 7. Developing and Maintaining an Informed Public is Crucial to the Management Success of the Wild Turkey Project.

GOAL: To ensure continued information exchange and program acceptance by keeping the general public, state and federal agencies informed on the status of the wild turkey resource in Vermont.

Management Strategies

- 7.1 Disseminate wild turkey project information to the public/media professionals via biological reporting stations, teacher workshops, private and public landowner visits/conferences, slide/video presentations, mail correspondence, popular and technical reports, etc.
- 7.2 Use the Department's library to fill all public requests for its video production "The Wild Turkey in Vermont" as well as its wildlife study guide "The Wild Turkey Education Kit."
- 7.3 Continue involvement with standing professional committees, regulatory bodies and cooperative agreements with nongovernmental organizations to assist the Department with meeting the goals and objectives of this plan.

BIG GAME PLAN - INTRODUCTION

Managing Wildlife — A Public Trust

Under federal and state law the management of wildlife falls under the concept of public trust, which means that it is considered a resource that must be preserved and protected for public use. Unlike Europe's feudal system during the Middle Ages, wildlife does not belong to a royal family or a government. Nor can individuals possess wild animals as a commodity as pets or farm animals. The Public Trust Doctrine, based on English Common Law and upheld by the United States Supreme Court, is the principle upon which natural resources, such as wildlife, are conserved in the public interests and for reasonable use by current and future generations. The Vermont Fish & Wildlife Department (the Department) is obligated to conserve and manage Vermont's wildlife resources on behalf of the public. Vermont law entrusts the stewardship and management of wildlife resources to the Department in accordance with the Public Trust Doctrine to ensure this principle is carried out.

The principle of wildlife as a resource that is managed in public trust by state and federal governments is the foundation of what is known as the North American Wildlife Conservation Model. The Model holds that by placing wildlife in the public trust the value that is derived is not merely personal profit. The motive for harvesting wildlife is not one of simple profit as it was in the nineteenth century when market hunting was rampant, but instead, one of broad public benefit and sound and sustainable wildlife and habitat management. This Model has served wildlife and the public well for more than 100 years. As a result, game species such as the four big game species featured in this plan have flourished. Under this Model, the public is involved in the decision-making process, and for this reason, it has been embraced across North America. In keeping with these basic principles of wildlife management and conservation in North America, the mission of the Department is "...the conservation of fish, wildlife, plants, and their habitats for the people of Vermont."

About This Plan

To carry out this mission the Department's long-range management plan identifies issues, goals, and strategies that insure that a balance between the conservation needs of the species and the interests of

the public is effectively addressed. The plan has three major objectives:

- Conserve, enhance and restore Vermont's natural communities, habitats, and plant and wildlife species along with the ecological processes that sustain them.
- Provide a diversity of safe and ethical fish- and wildlife-based activities and opportunities that allow hunting, fishing, trapping, viewing, and the utilization of fish, plants, and wildlife resources consistent with the North American Wildlife Conservation Model.
- Maintain safe fish- and wildlife-based activities while limiting harmful human encounters with fish and wildlife species, and provide general public safety service incidental to our primary fish and wildlife duties.

Management of Vermont's four big game species has been combined into a single, comprehensive big game plan. This will provide the public with easy access to all information related to big game management. It will also help ensure that a more comprehensive assessment of the overlapping and divergent management needs of each big game species are holistically considered and coordinated to improve overall management. In addition, the process of developing a single, comprehensive big game management plan is more cost effective and efficient than four separate planning efforts.

The Process for Developing The "Ten-Year Big Game Management Plan"

This plan is based on currently available and relevant biological and ecological data associated with each of the four big game species and their habitats. A survey of 1,000 randomly selected Vermont residents was also conducted to gather public opinion related to deer, moose, bear and wild turkey management. Respondents were asked their views on many topics such as habitat protection, game species population size preferences, and property damage from wildlife (results of the survey can be found on the Department's website: www.vtfishandwildlife.com/library/)

A series of open house style public meetings were held in five locations around the state during the

summer of 2008 and a web page was developed to allow people to discuss issues and offer opinions to Department staff. This was followed by two public meetings and a month-long public comment period to allow Vermonters to submit opinions regarding draft management plans. Approximately 200 people attended the meetings, wrote letters and e-mails, used the on-line comment option, or made phone calls to express their views. The majority of comments pertained to deer management, with comments varying widely across the topics of season lengths, bag limits, and appropriate antler point restrictions. All of the comments were reviewed and considered by the Department and, as much as possible, assimilated into commonly voiced themes. While biologically responsible wildlife management must come before public opinions, there will always be aspects of wildlife management that can be decided by public sentiment. From the beginning, public feedback steered many aspects of the Department's ten-year planning efforts, and public feedback will continue to help shape our goals and objectives. Provided below are summaries of the issues raised by the public in response to the draft plans for each of the big game species.

WHITE-TAILED DEER

The Department received input on several potential strategies to address the need to harvest more female deer in select parts of the state. First, where female deer are locally overabundant, it may be desirable to encourage bow hunters to fill a second, or even third, archery tag by taking an antlerless deer. This could be achieved by liberalizing the archery bag limit to three deer, with one of these possibly being a buck. All hunters would still be subjected to the annual bag limit that is currently three deer. The option to "tag-out" with three deer during archery season and forfeiting further deer hunting in Vermont in that calendar year would be the choice of the hunter if he or she were successful during this season. It is also noteworthy that additional archery tags may help manage localized deer populations where firearm ordinances restrict the ability to harvest antlerless deer during the Youth Weekend and muzzleloader seasons.

Second, there was considerable interest voiced for an early antlerless-only muzzleloader season that would occur sometime before the regular rifle season. Such a season would only be open to those individuals holding an antlerless-deer permit for muzzleloader hunting. Although the Department is sensitive to the various concerns expressed by hunters, landowners,

and other nature enthusiasts regarding this policy, the Department needs to explore ways to harvest more antlerless deer in some areas when and where consecutive mild winters allow the deer herd to grow beyond our ability to control it with existing antlerless deer hunting seasons. A brief antlerless-only early muzzleloader season is a method to consider with other potential benefits from removing more antlerless deer earlier in the season.

Because of increased interest in an early muzzleloader season and antler-point restrictions, a survey on these topics was circulated at the July public hearings. As recommended by some of the attendees, the survey was also posted on the Department's website. The survey response was substantial, numbering nearly 600 submissions. Additional public surveys that solicit opinions on the use of early muzzleloader season and/or the archery season to achieve female deer harvest objectives will guide the Department's management approaches in the future.

The public provided mixed reviews of a special crossbow season or allowing crossbows during the archery season. Given the consideration of other, more popular antlerless harvest enhancements, such as the early muzzleloader season and a lengthened archery season, the use of crossbows as an additional hunting implement does not appear to be supported by the public at this time.

In preparing the final plan, there were two areas in particular that appeared to require further scientific documentation. Participants requested more information about chronic wasting disease (CWD), how it is transmitted, and what it means for CWD-free and CWD-infected deer populations. Of particular interest was how this might apply to deer-urine-based scent lures. Although widespread live-testing for CWD still remains unfeasible with high probabilities of false-negative results (indications of a disease-free animal when it is actually infected), methods to detect the infectious protein (prion) in animal fluids is advancing. As a result of these advancements, recent studies have found the CWD-causing prion in urine and other excretions and body parts of infected deer. In this final plan we provide additional and current references to pertinent scientific literature and results on this subject.

The other topic needing more supporting documentation was the issue of antler-point restrictions. Again, we provide additional sources of information cited in the text. Many of the studies

cited are available as complete documents on the Internet. Copyrighted studies on the Internet appear as abstracts that may be purchased through the journal in which they are published.

MOOSE

Among the persons commenting on the Department's website, seven made comments related to the draft moose plan. The only issue that drew much attention was the proposed special archery season for moose; six people expressed support for this season, and none were opposed.

The other major issue where public input was specifically solicited in the plan was the proposed management for slow growth of the moose population in the central and southern "mountain" wildlife management units (WMU) of I, L, P, and Q. Only one web comment addressed this issue, and it was in favor of the proposed direction.

Six written moose comment forms were collected from open houses held in July, 2009. Five of these were in support of the special bow season and one was opposed. Similar levels of support (seven in favor, one opposed) were voiced at the May, 2008 open houses. None of the comments addressed population desires for the southern mountains, except for one respondent who desired fewer moose in WMUs H1, H2, D1, D2.

Six respondents commented on the moose lottery. One liked the present system; two thought it was unfair because some families have won multiple times while others have never won. One individual thought bonus points should be earned during the three-year waiting period, one wanted a two-year wait instead of three-years, and one person felt applicants should possess a Vermont hunting license before they could enter the lottery.

BLACK BEAR

Two bear management issues received the most comment from 15-20 respondents. The first was opposition to a regulation requiring minimum registration standards for bear hunting guides or hunting guides in general as a means to address concerns for fee-for-bear hunting. Some felt it would diminish a person's opportunity to earn money or offer a potential mentoring experience for an inexperienced hunter. Others felt a guide registration system did not address the fee-for-bear hunt guiding concerns.

The second most frequent comment concerned nuisance bear situations, especially those involving birdfeeders. Most felt the Department had a good message regarding the removal of feeders but needed to be more aggressive with its advertisement and insistence with compliance. Beehive owners expressed some concern about higher bear populations in the Champlain Valley where apiaries are numerous. The consideration of regional management zones for bear seasons may be an appropriate tool for addressing this concern.

Several respondents wrote to say the bear population was "about the right size," or that it appeared to be growing, and the population goal was appropriate. Others felt the population was too high in parts of the state and suggested managing bear populations by regions to address these differences, while still others felt the bear population was too low.

Comments were received regarding opposition to bear hunting, especially with the aid of dogs. The Department believes it cannot achieve and maintain the proposed bear population objectives without the use of regulated hunting of these animals.

WILD TURKEY

A number of substantive comments were received during the public comment period for the draft wild turkey management plan. These comments ranged from suggestions for a variety of spring and fall hunting season expansion proposals to "maintaining the status quo" to comments on the availability of check stations for reporting harvest. The general focus of comments pertained to the opportunity to expand fall hunting opportunity. One comment of interest suggested a separate fall bird tag to enable hunters to harvest a fall bird who might not otherwise participate in the spring season. A second comment of interest suggested opening the fall season concurrently with archery deer season to permit greater opportunity to hunt turkeys.

Historical Perspective

The following is a brief overview of the historical influences on wildlife in Vermont. It traces some of the most important elements of early land use activity and cultural trends that have affected the state's wildlife and its habitat.

Prior to European colonization in North America in the early 1600s, human activity affected the landscape very little. Native Americans did not

have the technology, other than fire, with which to create landscape-level changes in their environment. Thus, sporadic, naturally occurring events such as hurricanes, earthquakes, and wild fires were the primary forces affecting large geographical areas. Even these major events merely served to set back forest communities to earlier stages of ecological succession. With seed stock and soil still in place the forest communities were always capable of replacing themselves.

Indigenous tribes hunted, fished, trapped, and tended corn fields and small gardens on the banks of major rivers throughout Vermont and New England. Some species of fish and wildlife were very abundant. The passenger pigeon, for example, was so plentiful that it was reported the birds “blacken the sky” with their numbers and broke tree branches when they set down to roost. This single species accounted for 25 to 40% of all birds living in the United States. According to some records, there were 3 billion to 5 billion passenger pigeons at the time Europeans began arriving on the continent. Ducks, geese, deer, moose, and many other species were also plentiful. For native communities wildlife was a primary source of sustenance and socially and culturally important. But just as today, wildlife populations fluctuated through the years and varied with the seasons, and there were times of wildlife scarcity.

The balance between wildlife and human activity, however, changed dramatically in the 1800s with the influx of European settlers. Following establishment of the colonies, the human population increased steadily in Vermont. Just prior to Vermont becoming the fourteenth state, its population was estimated at 85,425. Over the course of the following ten years, the population doubled to 154,465. Just 50 years later, it doubled again (Table 1.1). European settlers changed the wildlife equation in several important ways.

Unregulated market hunting and hunting wildlife for profit rather than for subsistence contributed to a rapid decrease in many species. Another factor was the settlers’ demand for lumber and firewood, as well as land to convert to agricultural use. Throughout Vermont’s early history the landscape has shifted with changes in farming – from sheep to dairy farming, from grass crops to a corn crop. But on a larger scale, farming transformed the land from forests to open pastures. At

one point in our history, the land went from 95% forested to 63% nonforested, eliminating most or nearly all suitable habitat for some species. This, along with the unregulated harvest of wildlife, took a significant toll on many wildlife populations that depended on forestland habitat. By the mid-1800s, many of the species that had been very abundant began to decline or disappear from the landscape. The passenger pigeon, mountain lion, wild turkey, moose, and wolf became extinct, while deer and bear populations were limited to forested remnants of the state.

As early as 1847, famed conservationist and resident of Woodstock, Vermont, George Perkins Marsh remarked on the speed with which this transition to a nonforested landscape occurred. The ecological damage sustained by farming and logging, noted Marsh, was “too striking to have escaped the attention of any observing person.” Governor Urban M. Woodbury angrily proclaimed before the State Legislature in 1894, “Owners of timber lands in our state are pursuing a ruinous policy in the method used in harvesting timber.” The Governor recognized that the deterioration of forestland in Vermont also meant an insecure future for the state’s major industry: lumber and wood products. “There is no more valuable crop produced from the land than timber,” Woodbury commented in the same speech. “Every decade will see timber more valuable and it is of great importance to the state as a whole... that some measure should be adopted to lessen the wanton destruction of our forests.” Although Marsh and Woodbury were early observers of the fact that Vermont’s economy was tied to the resources and aesthetic qualities of its forests, public awareness and concern regarding the effect of certain land practices on the natural environment did not fully emerge until the turn of the twentieth century.

As concern for the loss of species took root among citizens in Vermont and across North America, actions began to be taken to restore the wildlife species that had been lost. Deer were one of the first species to be protected by state laws. In 1865, the hunting of deer in Vermont became illegal and remained so for the next 32 years. During this period,

Table 1.1 Vermont population from US Census Bureau statistics 1790 - 2005.

Year	1790	1800	1850	1900	1950	2005
Population	85,425	154,465	314,120	343,641	377,747	623,050

seventeen white-tailed deer were transplanted from New York into the state, which provided breeding stock that rebuilt the deer herd. The most important change, however, that led ultimately to successful restoration of white-tailed deer and other species was the abandonment of farms that allowed the land to revert back to forests. The combination of improving habitat conditions, legal protection, and lack of significant mortality factors other than winter conditions resulted in a rapid recovery of the deer population. The rapid success of this restoration effort led to the opening of a limited, regulated deer hunting season in October of 1897.

As Vermont entered the era of active wildlife management, the deer population continued to grow as habitat expanded and improved. Throughout the first half of the twentieth century, deer numbers increased and their range expanded. During this time of restoration, a bucks-only harvest regulation was used to maximize the growth rate of the deer population. Because only bucks were harvested for a period of more than fifty years, the buck-only harvest restriction moved from being a population management tool to becoming a Vermont deer hunting tradition.

The white-tailed deer population responded well to the bucks-only regulation and expanded so quickly that in less than 50 years the buck harvest grew from 103 deer in 1897 to more than 4,000 deer in 1940. So rapid was the population growth that by 1946 wildlife biologists had already begun to observe negative impacts on habitat quality caused by large numbers of deer. In this same year, the Department released the publication "The Time is Now" as an attempt to inform the people of the new situation and the problems that the future would hold if growth of the deer population was not limited. Biologists recognized that the harvest of female deer was the only way to control total deer numbers. Unfortunately, Vermont's bucks-only harvest tradition had become well established by this time and the hunting public would not accept harvests of female deer as the solution.

This difference of opinion engendered an infamous period of deer management in Vermont that became known as the "deer wars." Over the next nearly 50 years, public outcries occurred on and off as biologists attempted to implement deer management changes. Although most deer hunters today recognize the importance of harvesting female deer to limit growth of the deer herd and protect deer habitat, deer

management remains an area of great public concern and continued contention.

The other three big game species did not recover as quickly as the deer. Bear populations recovered slowly for several reasons. Livestock owners considered them a nuisance. Not only was bear hunting unregulated, but Vermont state law offered bounties for animals that were killed from 1831 until 1941. The first laws limiting the harvest of bears were not implemented until about 1950. Rapid recovery of forest habitat along with limited harvest of bears proved to be a boon to black bear recovery. Black bears are now distributed throughout most of Vermont.

Moose also may have completely vanished from Vermont at one point. When a young bull was shot in March 1899, at Wenlock (now Ferdinand) in Essex County, the local newspaper reported it as "a strange animal" and "the last moose in Vermont." The shooting was actually illegal because the 1896 Legislature had established a closed hunting season on moose. Moose recovery lagged behind deer and bear due to a lack of suitable forest and wetland habitat. But as the forestlands recovered and wetland habitat expanded with the return of beaver populations, moose habitat also expanded. The Department estimated that in the early 1960s about 25 moose existed in Essex County. The moose population grew steadily over the next 30 years. By the 1990s, moose were abundant enough to support a limited, controlled regulated hunt.

In 1993, the Department issued 30 moose permits in Essex County and conducted the first regulated moose hunt in the state's history. Today, the moose population has fully recovered and has reached a level where regulated hunting is a tool needed to keep the population in balance with its habitat and to protect private property and public safety. The Department's current management aims are to keep the moose population in balance with available habitat and to provide abundant hunter harvest and citizen viewing opportunities.

By the mid-1800s, wild turkey was another species that had disappeared from the Vermont landscape. Thirty-one wild turkeys from New York were stocked into Vermont in 1969 and 1970. From this point on, the turkey population grew so fast that the first modern turkey hunt was established only three years later in 1973. Less than 40 years later, the turkey population has expanded throughout the state and continues to grow in numbers with record

harvests occurring annually. Today these birds can be found in nearly every town of the state with a total population thought to number approximately 50,000 to 55,000 birds. This was an unexpected outcome. Early biologists believed that Vermont's long winters and deep snows would limit the distribution of wild turkeys to the Champlain and Connecticut River Valleys where winters are less severe, acorns are plentiful, and agriculture provides a source of winter food. Wild turkeys proved to be more adaptable than anticipated, however, and today they are found even along the Canadian border in Essex County. In fact, wild turkeys have expanded their range across the border into Quebec, Canada.

The twenty-first century begins with approximately 75% of Vermont's landscape being forestland. A half-century of science-based regulation has restored many wildlife species, including game species. Conservation and management issues, however, still confront our deer, moose, bear, and wild turkey populations. Although these issues more often relate to overabundance than to scarcity and recovery, they are no less daunting. The issues surrounding our wildlife in this century are now focused on maintaining wild and robust populations in balance with their habitats while providing abundant opportunity for the public to use and enjoy. Today the issues we face involve an ever expanding human population and the activities that accompany it (Table 1.1). Bears in backyards, moose in urban areas, turkeys damaging agricultural feed crops, and deer eating the next generation of forests have now replaced the old issues of wildlife scarcity. The loss and fragmentation of habitat associated with development presents new challenges to the conservation and management of deer and other species of Vermont's wildlife. If land ownership in Vermont continues to be divided into ever smaller parcels, available space to hunt and opportunity to access game will become an increasing challenge.

The Benefits of Fish and Wildlife Based Outdoor Opportunities

Hunting, fishing, and trapping are important outdoor activities culturally, socially, economically, and ecologically. These activities conducted under regulated seasons provide for sustainable utilization of fish and wildlife resources statewide. Currently 30% of Vermonters fish or hunt (over 80,000 hunters and 121,000 anglers), a higher participation rate than skiing (19%). Recent surveys report that Vermont is third nationally (behind

Alaska and Maine) in per capita participation by the public in hunting, fishing, trapping, feeding and observing wildlife. Over 600,000 pounds of white-tailed deer, 192,000 pounds of moose, and 15,000 pounds of black bear meat are harvested annually from the forests and wetlands of Vermont. Wildlife related outdoor activities accounted for 5% of Vermont's gross state product in 2001, with nearly \$300 million spent on fishing and hunting alone. These expenditures particularly benefit rural areas of the state and occur when tourism is typically low in Vermont. Within the context of this ten-year plan, the Department examines four of Vermont's big game species with the goal of managing these as assets to perpetuate into the future for the various cultural, social, economic, and ecological values they bring to the state of Vermont.

Management Issues of General Concern

1. Habitat Loss. Loss of critical habitat, such as deer yards and bear feeding areas, can occur as a consequence of development that fragments habitat as well as results in mortality from increased animal movement and motor vehicle collisions. Maintaining an adequate supply of quality, inter-connected habitats in a variety of forms (for example, young forests or wetlands) that sustains viable wildlife populations is one of the most significant conservation challenges given today's issues of sprawl and parcelization of land. For example, it is estimated that a black bear in Vermont requires 10,000 acres of land to successfully meet its annual life needs. Therefore, it is essential that sufficient habitat be maintained, managed and connected through travel corridors in order to sustain a healthy, productive population of black bear.

2. Hunter Demographics. During the last 100 years, regulated hunting has served to effectively provide people with food in terms of a sustainable, renewable wildlife resource and a continuous opportunity to be afield pursuing game. It has also served as a highly effective tool to regulate population size to levels that are compatible with habitat limitations and human expectations. Nationwide, hunters have declined over the past decade while the general population has grown (U.S. Department of Interior 2006). While the national average for annual hunting participation declined to only 5% (U.S. Department of Interior 2006), it was

14% in Vermont (Duda et al., 2007). About 41% of Vermonters have hunted at some time (Duda et al., 2007), indicating that hunting remains an important tradition here. Concern remains that reduced numbers of hunters may make it difficult to harvest enough deer to control the population in the future.

Since 1997, various youth hunting seasons for big game have been established to promote opportunities for youth to participate in hunting under the mentorship of an adult hunter. Youth Weekend seasons now exist for deer and wild turkey. Interest and support among adult hunters for these programs remains high.

3. *Public Access to Land.* Private lands remain very important to most Vermont hunters. One study estimated 30% of Vermonters still travel less than five miles one-way to hunt deer (Duda et al., 2007). Public lands open to hunting are under various ownerships and are distributed widely across Vermont with a total of more than 800,000 acres under state or federal management. The Vermont Agency of Natural Resources manages more than 333,000 acres of this total as wildlife management areas, state forests, and state parks. The Agency also holds easements on over 123,000 acres of conserved commercial forestlands that guarantee public access. The Green Mountain National Forest and Silvio Conte National Wildlife Refuge comprise most of the federally owned public lands in the state.

The value of private lands for hunting and other public access is recognized by laws ranging from Vermont's strict landowner liability laws to statutes granting landowners who own at least 25 acres a preferred status for receiving antlerless deer muzzleloader permits. Because of the latter, the Department is opening up more private land for hunting by offering these landowners first choice in the kind of permits that are issued for hunting on their land. The Department encourages hunters to ask permission and be respectful of private lands even when lands are not posted to ensure that Vermont's heritage of free access to private lands for hunting may continue indefinitely.

4. *Privatization of Wildlife.* Privatization of wildlife resources threatens fair chase hunting

wherever it occurs. When private landowners erect high fencing and charge a fee for the opportunity to hunt, the privatization of a public wildlife resource has occurred. Access for pay or lease hunting systems that restrict land access to those having the money to pay for it is a similar but less direct form of privatization. As demonstrated in much of Texas, lease hunting systems result in reduced hunting pressure and an inability for state wildlife agencies to manage overabundant deer populations (Haskell 2007). In accordance with the founding principles of this nation and the state of Vermont, it is the Department's responsibility to prevent privatization of Vermont's public wildlife resources and ensure the public's right to hunt.

5. *Human-Wildlife Conflicts.* The Department faces increasing conflicts between humans and wildlife. The four big game species present unique cases involving nuisance and other human conflicts. The Department addresses these issues in a consistent fashion for big game species in accordance with the following principles: Protection of human health and safety is first. Second, we must handle the animal involved responsibly when it must be confronted, displaced/removed from the scene, or euthanized. When these two guidelines are met, public acceptance is usually achieved.

6. *Loss of Big Game Check Stations.* These facilities perform a vital data collection service to the Department and provide a convenient means for hunters to legally register their game. The number of check stations has steadily decreased during the last ten years to a point where some hunters now have to drive 30 or more miles to legally report their game. There are a number of reasons for the decline including the time required to record a harvested animal, the small fee received for the effort, and change in ownership of stations. While hunters and others visit the check stations during hunting seasons and make purchases of materials, goods, and products, in some instances the agents believe this ancillary business is insufficient to cover the costs of participating as a reporting station. Big game registration and sale of licenses are a tremendous benefit to the Department and to the hunting public. The Department is examining a variety of strategies to correct this situation.

7. Access to Game. As Vermont's population approaches 650,000, land continues to be developed and subdivided into smaller parcels, resulting in less available habitat for wildlife and fewer opportunities for hunters to access private land. Houses and people now occupy areas that were once open to hunting, posing a safety risk that limits the area where hunters may use their firearms. Posting no trespassing signs on private property also limits the amount of lands available for hunting. To stem the loss of access to game, the Department remains committed to public land acquisition programs (for example, Forest Legacy) that contribute to the acreage available for public hunting. The Department also recognizes the increasing negative impacts of a third-party fee for hunting on private lands. In these cases, individuals or groups of individuals lease hunting privileges to a sought-after hunting location from a landowner and charge clients for the exclusive use of the land. Or the landowner charges a select few directly for use of the land. In either case, access to game is just as restricted as if the land were developed or posted. This reduces hunting opportunity for the hunter without the financial means to buy into the hunting privilege. Examples of this have been readily seen with waterfowl hunting and more recently with bear and deer hunting. As the willingness to pay to hunt increases more and more opportunity will be lost to the general hunting public. Furthermore, the redistribution of hunting pressure due to fee hunting will likely become inconsistent with game species management goals.

Enacting rules against fee for hunting may appear to be a simple solution, but private property rights require that this type of response be carefully weighed before moving in the direction of regulation. It is also important to distinguish the difference between a fee for hunting versus a fee for a guided hunt. The former involves restricting access to hunting land while the latter, as in the case of moose hunting guides, offers a service but does not prevent non-paying hunters access to hunting space. Efforts need to be increased during the next ten years to address the fee-for-exclusive-hunting tide. These efforts must include outreach towards landowners by the Department, organized sporting groups and individual hunters.

8. Wildlife Management Unit (WMU)

Realignment. Wildlife management unit boundaries were established in 1979 to regulate deer harvest on a geographical basis where deer densities mirrored the effects of habitat quality and winter severity. Since that time, WMUs have been applied to the management of moose and wild turkey populations on a regional basis. Bears range across such large areas of land that individual WMU boundaries have lesser value as a management tool. Groups of WMUs, however, can be established that may provide feasible opportunities to manage this species on a regional basis.

Unit boundaries, however, do not in every case align with natural boundaries of population abundance of big game species, particularly deer. To more effectively manage deer populations, it is necessary to periodically reassess and realign unit boundaries. A detailed description of the proposed changes in WMU boundaries is provided in Chapter 2, "Deer Management Plan," Issue 2 Population Goals. It is important to note any realignment of WMU boundaries will apply to all big game species.

Habitat loss and an aging hunter population are significant barriers to meeting the goals of this plan and to wildlife conservation in general. The economic and social forces affecting these changes are diverse and will be part of the Department's focus in addressing these new conservation challenges. The Department will consider a variety of opportunities to address these issues including but not limited to the following:

- ▶ Increase hunter recruitment and participation through a variety of strategies, such as introducing families to safe shooting through workshops sponsored by 4-H.
- ▶ Develop outreach materials for private landowners to introduce them to the wildlife management services offered by the Department, the rules and regulations concerning hunting on private property, and acquaint them with the traditions of Vermont's rural culture associated with hunting.
- ▶ Improve hunter access to land through a variety of strategies including creating

incentives to reduce parcelization of private property.

- ▶ Ensure that Project WILD, Project WET, and Project Learning Tree materials are in the hands of all elementary school teachers.
- ▶ Improve and expand hunter education opportunities through a variety of strategies including creation of a mentored hunting program.
- ▶ Help adjacent landowners form a community-based land access program to expand hunter access to land.
- ▶ Expand habitat management and conservation programs on public and private land to benefit big game and other wildlife species.
- ▶ Continue to raise public awareness of and appreciation for the benefits of sustainable harvest of wildlife for food as a renewable natural resource that is good for people and the environment.

Time line of important dates in Vermont Wildlife Management	
1609	Samuel de Champlain is the first European to see Lake Champlain.
1640-1760	French Canadians slowly begin early European colonization in Champlain Valley.
1761-1791	English colonization of Vermont rapidly expands.
1791	Vermont becomes the 14th state, there are 85,425 people living in the state (1790 Census), landscape is 80% forested. State Constitution gives inhabitants the right to hunt, fish and trap.
1800	US Census reports there are 154,465 people living in Vermont.
1831	First bounties for bear are enacted by State Legislature.
1865	US Civil War ends, over 300,000 people live in Vermont, state is 37% forested, it is illegal to hunt deer.
1887	The last known native catamount is killed in Barnard.
1897	The first modern deer season is held, 103 deer are harvested in a 30-day season.
1904	The forebear of the Vermont Fish & Wildlife Department is created.
1941	Bear bounties repealed.
1946	"The Time is Now" written by Department biologists in response to rapidly growing deer herd.
1950	In 100 years Vermont population has grown very little, 377,747 people reside in the state.
1951	First regulation of bear harvest.
1953	First archery season is held.
1962	First sections of Interstate Highway System completed (Montpelier to Burlington).
1963	Limited antlerless permits issued.
1969	First wild turkeys (17) are reintroduced in Pawlet.
1970	Statewide land-use and development law (Act 250) passed.
1973	First wild turkey hunt held in parts of Addison and Rutland Counties. 579 permitted hunters harvest 23 birds.
1979	Modern deer management era begins, antlerless permits are issued by Wildlife Management Units (WMUs).
1986	First muzzleloader deer season is held in December.
1990	First Deer Management Plan is written.
1993	First regulated moose hunt in Vermont history held in October, 30 permits are issued.
2003	First Youth Day deer season is held the Saturday before regular deer season.
2005	Legal buck definition changes after 108 years from 1, 3-inch antler to 2 points on one side.
2008	Vermont is 75% forested, 625,000 people live in the state, ten-year planning cycle begins for deer, moose, bear, and wild turkey populations.



WHITE-TAILED DEER

I. Management History

Catastrophic conditions in both the deer population and habitat had already developed by the time Vermont's modern-day management program had begun in 1963. Buck-only deer hunting, which had been the tradition since 1897, allowed the deer population to grow rapidly and reach the biological carrying capacity (Seamans 1946, Garland 1978, Miller and Wentworth 2000). In Windham, Windsor and Rutland counties, the deer herd reached an overabundant and unhealthy state during the 1940s. The sporadic and small antlerless harvests between 1963 and 1970 removed less than 5% of the total deer herd (estimated at 250,000 deer). This proved to be insufficient to curtail growth and prevent the herd's impending collapse. As had occurred in other deer populations in other parts of the country earlier in the century, the consecutive harsh winters of 1969 and 1970 severely affected the health and abundance of Vermont's deer herd, which was already compromised by years of chronic overpopulation. In poor physical condition and without a sufficient nutrition base, Vermont's deer population would continue to fluctuate in response to winter conditions throughout the 1970s. Although reduced to only half of its former size through the 1970s, the deer population of about 120,000 animals lacked the vigor and supporting habitats to rebound. Allowing the habitat to recover by holding the deer population at a low or moderate level was the only realistic solution



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to the chronic infirmity within the population created by the long-term over use of deer habitats.

In 1979, the Department began an ambitious deer population recovery effort. This effort occurred in three phases. During the first phase, the deer population was intentionally reduced to a level even below what remained after the winter mortality of the late 1970s. The second phase through the mid-1980s maintained the population at a relatively stable, low-density level to allow habitats to recover their ability to support a larger deer population. The third phase allowed for a gradual increase in the population to sustain annual deer harvests of 15,000 to 20,000 animals, while monitoring measures of herd health. By and large, this plan was successful. The habitats recovered and measurements of deer health such as antler beam diameter, weight, and reproductive rate improved (Table 2.1, Fig. 2.1).

Table 2.1 Reproductive rates of incidentally-killed adult (at least one year-old) female deer examined during winters in Vermont.

Year	# Doe	# Pregnant	Percent Pregnant	# Live Fetuses	# Fetuses per Doe
1963	99	82	83%	121	1.22
1966	115	97	84%	122	1.06
1972	139	121	87%	188	1.35
2001	121	115	95%	199	1.64
2004	78	72	92%	110	1.41
2008	119	108	91%	172	1.45
1963-72*	353	300	85%	431	1.22
2001-08	318	295	93%	481	1.51

*From Garland (1978)

Improvements did not come without a cost, however. The decade of the 1980s saw some of the smallest buck harvests since 1946. Legislation was passed in 1990 that prevented antlerless deer seasons from occurring during the November rifle season. Given this new constraint, the Department set out to make adjustments as to how deer management would be conducted in the years to come. Because the adult females drive the reproductive potential in a deer herd, effective population management means managing the number of does.

Responding to this challenge, the Department moved to involve the public more deeply in deer management decisions than ever before. Based on buck harvest objectives derived from averages of the 1970s and the results of a general public survey, a draft management plan was presented to interested citizens. The plan contained information about historic buck harvests, deer health statistics, and population trends through time on a WMU basis. The first deer management plan concluded with a selection of harvest objectives (within parameters set by the Department) that considered views of the public. With these objectives in hand, the Department proceeded to make annual antlerless harvest recommendations based on regional harvests. With antlerless deer numbers now being controlled using archery, muzzleloading, and youth hunters, the question remains: will the existing season structure and harvest limits be sufficient to take enough does in the future to prevent excessive population growth during mild winters? The answer may be most of the time, as long as multiple consecutive mild winters do not occur. Some of the time, however, it may be necessary to take additional measures to ensure that the deer herd does not become overly abundant.

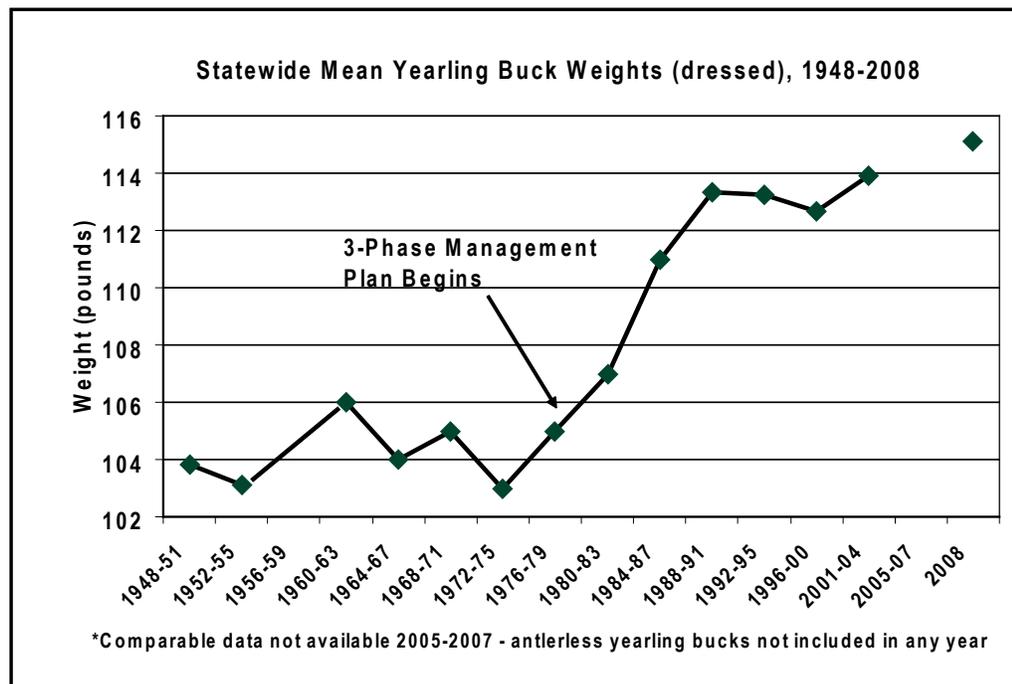


Figure 2.1 Statewide mean-average yearling buck weights (dressed) 1948–2008. In 2008, biological check stations were held during youth weekend, so biologists could again get weight data that were representative of the population, because spike-antlered deer can still be taken during youth weekend.

During the 1990–1995 planning period, buck harvests increased significantly. Light antlerless harvests and mild winters during three of the five years of this planning period were largely responsible for this rapid response. Buck harvests met, or consistently exceeded, the harvest objectives in 15 of the 24 WMUs during this time. On a statewide basis, the statewide harvest objective was exceeded twice, and twice was within 1% of the objective. The overall size of the deer population increased as indicated by the 45% increase in buck harvest. Although the 1996 deer population estimate was between 120,000 and 140,000 animals, the health indices of antler beam diameter and body weight did not decline. Yet, continued growth at the pace experienced during the 1990s would have put the future of the deer herd and its habitats at risk. Indeed, a modest decline in yearling buck weights in the late 1990s (Fig. 2.1) preceded another herd decline resulting from severe winters in 2001 and 2003. The difference this time was that habitat had improved through the 1980s, and the herd was in better overall physical condition to rebound rapidly during this current decade (see data on following page).

1997-2006 Plan Accomplishments

In addition to seeking a balance between human demand for deer and the environmental consequences of too many deer, the Deer Management Plan for the State of Vermont 1997-2006 had five specific tasks to address.

► **Task 1. Protect Deer Yards**

❖ **Action:** Given the importance of deer wintering areas (DWAs) to the state’s deer herd, the Department has vigorously defended against the loss of wintering habitat to human development. This is done through Vermont’s land-use and development law known as Act 250, which requires an evaluation of a project’s impacts on wildlife habitat. As a result, the Department worked with developers to modify development plans to lessen the impact to wintering deer. During this plan period, Department biologists reviewed 971 impacting deer wintering area projects, totaling 25,542 acres, and of these 91% (23,338 acres) were protected as part of the Act 250 regulatory process (Table 2.2).

Because only a small percentage of land development in the state actually requires an Act 250 permit, the majority of development is regulated at the local level or not at all. When

consulted, the Department worked closely with town and regional planning bodies to assure DWA protections were incorporated at the local level.

► **Task 2. Population/Buck Harvest Objectives/ Adequate Antlerless Harvests**

❖ **Action:** Balancing the demands of the people for more deer with the demands of the forest for fewer deer is the continual dilemma every northeastern fish and wildlife management agency faces. During the 1997-2006 planning period, the Department established an annual total buck harvest objective of 11,650. It was estimated that a buck harvest of this size would be generated by a deer population density of 18–20 deer per square mile. Assuming the buck harvest to be directly related to the overall deer population, it would serve as a good indicator of when the deer population increased or decreased. With this goal each year the Department would recommend an antlerless permit allocation distribution by WMU to adjust for population growth or loss resulting primarily from the previous year’s harvest and winter severity index (WSI). Table 2.3 illustrates the relationship between the change in buck harvest (and assumed change in deer population) and

the corresponding change in antlerless permit numbers.

► **Task 3. Antlerless Permit Application Process**

❖ **Action:** A prominent concern expressed by hunters prior to the 1997-2006 plan was the ability of an individual to make multiple applications for an antlerless permit thereby increasing his or her odds of being drawn. Recognizing that this issue of fairness was very important to a majority of hunters, the Department recommended to the Vermont Fish and Wildlife Board a regulation change that limited an individual to one antlerless permit application. This change became effective for the hunting seasons of 1997.

► **Task 4. Promoting Hunting Culture**

❖ **Action:** Although a free youth hunting license had been available since 1993, Vermont’s downward trend in sales continued to follow the national decline. Growing concern for the decrease in the number of hunter served as an impetus to advance a youth hunting opportunity (Fig. 2.2). With the support of the deer hunting community, the Vermont Legislature passed a measure designating the Saturday before the regular deer season as Youth Hunting Day. The first Youth Hunting Day occurred in 1997. Seeking to expand the opportunity for youth, especially considering all of the alternative activities available to them on a Saturday, the Legislature expanded the Youth Season to include Sunday as well. The first youth weekend was held in 2003. Early enthusiasm for youth hunting reached its peak in the year 2000. It was followed by a period of decline mirrored by adult participation. This suggests that factors beyond

Table 2.2 Summary of Act 250 DWA acres with Department involvement (1997-2006).

Year	# Projects involving DWA	Total Wintering Area Acres	Acres Impacted	Acres Conserved or Protected	Pct. Acres Protected per Year
1997	89	3,087	266	2,821	91%
1998	115	3,132	348	2,784	88%
1999	114	3,281	281	3,000	91%
2000	107	2,154	198	1,956	91%
2001	78	1825	205	1620	89
2002	116	3,484	180	3,304	95%
2003	132	2,888	222	2,666	92%
2004	94	2,169	270	1,899	88%
2005	92	2,125	265	1,860	88%
2006	112	3,222	174	3,048	94%

1997-2006 Plan Accomplishments (continued)

Table 2.3 Buck harvest, antlerless harvest, and WSI relationship for the period 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Buck Harvest	12,596	12,641	11,907	12,610	9,409	11,023	9,194	7,648	4,956	7,805
Antlerless Harvest	7,240	7,427	7,876	7,888	5,602	5,609	5,334	4,277	3,590	4,877
Winter Severity	37.3	29.9	35.6	34.0	73.3	23.6	83.9	62.2	44.7	15.2

*New antler point and bag limit regulations in effect

a special hunting season, perhaps the same influences from suburbanization that adult hunters are faced with, are affecting young hunter recruitment and retention (Fig. 2.3). In 2009, the Vermont General Assembly removed the Vermont residency requirement. This now allows any eligible youth to participate in the Youth Hunting Weekend as long as he or she has obtained landowner permission and is accompanied by an adult with a valid Vermont hunting license.

The Department also initiated several other successful programs and activities that encourage hunting, outdoor activities, and appreciation of our forests and wildlife. The "Outdoors Woman" and "Outdoor Family" programs were aimed at educating and exposing women and families to outdoor sports and skills. The Department partnered with the Vermont Outdoor Guides Association to sponsor a yearly "Doe Camp" to introduce women to outdoor hunting skills. A two day retreat, "The Future of Hunting in Vermont" at Castleton State College in 2006, brought together over 80 people from many youth organizations, sporting groups, and academic and government institutions to discuss challenges and solutions associated with barriers to hunting and recruiting new hunters. And finally, the Department created a pilot project called "Working for Wildlife" that establishes partnerships with sporting clubs to work on projects associated with habitat improvement, landowner relations, and conservation education.

► **Task 5. Quality Deer Management (QDM)**

❖ **Action:** Vermont deer hunters with an interest in hunting older-aged bucks (3.5 years or more) with well-developed antlers approached the Department during the development of the 1997-2006 Deer Management Plan. According to the definition used in the management plan, Quality Deer Management (QDM) is described as a management

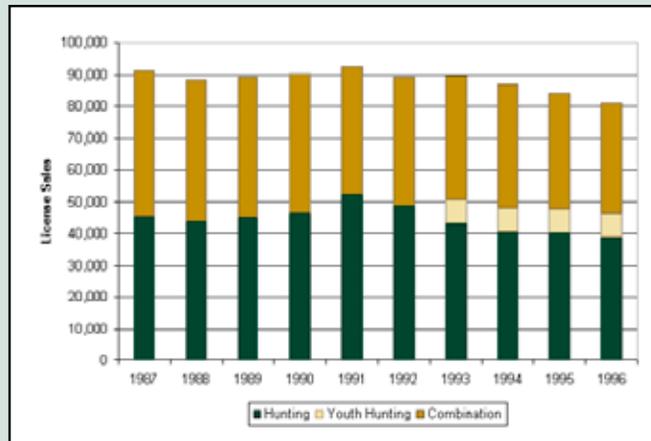


Figure 2.2 Resident hunting license sales, 1987–1996.

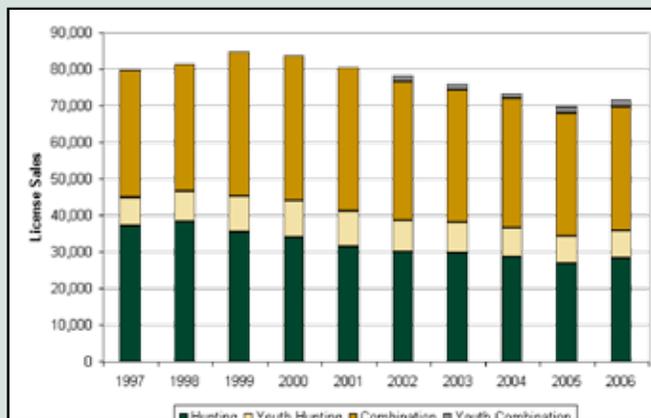


Figure 2.3 Resident hunting license sales during the 1997-2006 deer management plan period.

technique used to shift the age structure of the buck population from one dominated by young (1.5 years old) males to a population with a higher proportion of older-aged (at least 3.5 years old) bucks.

To further assess these components and develop an objective approach for designing a QDM program that was intended to balance deer population and habitat and increase the numbers of older bucks, the Department assembled a nine-member panel of deer hunters in January of 1998. Following their

1997-2006 Plan Accomplishments (continued)

seven months of research and deliberations, the QDM advisory panel identified 14 elements to be included in the QDM program (Table 2.4) and four possible alternatives (Table 2.5).

The panel recognized the implementation challenges and the significant amount of effort required to make institutional changes to a long-standing traditional deer season. To avoid making premature decisions about deer season changes, the panel recommended that strong, broad-based support of hunters and landowners be present before implementing any changes in season format. The panel also recommended that QDM be implemented at the WMU level and not vary in design from one unit to another.

Upon being presented with these recommendations, the Department decided first to assess hunter satisfaction. Results of the 1998 survey indicated most respondents (63%) indicated they were "Very Satisfied" or "Satisfied" with their deer hunting experience in the last five years (Table 2.6). Hunters preferred to retain the then current deer hunting season format (one 3-inch antler minimum) over any QDM restrictions that might be implemented by a 57% to 41% margin, with 2% reported as "Undecided."

Following a review of what the QDM panel produced and the hunter opinion survey, it was decided to table further consideration of any changes to the season format. However, following poor hunting seasons in 2001, 2003, and 2004 related to the severe winters of 2001 and 2003, hunter satisfaction decreased significantly. Another hunter satisfaction survey was

completed in 2003 to assess interest in "QDM," or what was then being labeled as "Comprehensive Deer Management" (CDM).

Results of the 2003 survey indicated that, in general, since 1998 more hunters were still satisfied with their deer hunting in Vermont than those who were not (42% "Satisfied" vs. 31% "Dissatisfied"). However, when compared to the 1998 survey where 63% were "Satisfied" vs. 20% "Dissatisfied", there clearly had been a shift towards greater dissatisfaction. When asked of their support for greater antler restrictions to protect more young bucks, 66% supported and 24% opposed this idea with 10% reporting "neutral" (VFWD 2004).

With the results of the survey showing hunters' support for increasing the proportion of bucks afield, the Department renewed its effort to meet this goal. A series of public hearings were held, and the Fish and Wildlife Board was given authority by the Legislature to set deer hunting regulations, with the exception of the November rifle season, as they do for all other fish and wildlife species.

An antler-point restriction regulation to promote CDM was put into effect by the Board beginning with the 2005 hunting seasons. The new hunting regulation also reduced the

Table 2.4 Elements of QDM , by relative importance, identified by the QDM advisory panel.

1. Hunter participation
2. Ecological integrity
3. Recruitment of young hunters
4. Ease of implementation
5. Endorsement of residents in WMU
6. Quality of hunting experience
7. Balanced Buck:Doe ratio
8. Balanced age structure
9. Maximum sustainable yield
10. Acceptance by the nonhunting population
11. Increased body weight of individual deer
12. Increased antler size on bucks
13. Equal hunting opportunity for all hunters
14. Genetic improvement of the deer herd

Table 2.5 Methods for QDM implementation recommended by the QDM Advisory Panel.

1. Retain the current season structure. The present hunting seasons include the elements of QDM and can be defined by the individual hunter.
2. Restrict the buck harvest by changing the definition of a 'legal buck' from a deer with at least one, 3-inch antler, to a deer with at least 3 antler points.
3. Restrict the annual bag limit from 3 deer of either sex (with appropriate permits) to 3 deer with no more than 1 buck per year.
4. Restrict the annual bag to one deer per year and include antlerless deer, by permit, as part of the 1 deer bag.

Table 2.6 1998 and 2003 survey results for the distribution frequency (%) of hunting satisfaction.

	1998	2003
Very Satisfied	17.3	5.8
Satisfied	46.1	35.7
Neutral	16.9	26.8
Dissatisfied	13.8	23.8
Very Dissatisfied	5.9	7.9

annual bag limit from three deer to two and redefined a legal buck to a deer having at least two points on one side. The points were defined as the terminal point and one other point measuring at least one inch from the main beam.

II. 2010-2020 White-tailed Deer Management Issues, Goals, and Strategies

Many Vermonters would like to have more deer than is advisable under the new deer density objectives, and many others would like to have fewer. The rationale for the deer density objectives are provided in the supporting text that follows. Ultimately, the proper balance maintains ample harvests of deer as well as forest products over the long term. It is apparent that localized deer management issues are mounting in Vermont and methods are needed to support more localized deer management to relieve foresters, gardeners, and farmers from locally overabundant deer populations. The overall goal of deer management in Vermont is to manage Vermont's deer herd to sustain viable populations consistent with biological, social, and economic considerations.

ISSUE 1. Habitat Loss and Assessment

GOAL: To monitor changes in habitat quality and quantity and perform public outreach regarding habitat management techniques, so concerned citizens may help to secure their deer herd's future.

White-tailed deer populations vary widely through time and space in response to varying habitat and landscape conditions as well as weather, hunting intensity, predators, and disease. Changes in any of these factors complicate the ability to track deer populations, but the factors most important in determining population size are habitat conditions and winter severity. Hunting, as a form of predation, can be used as a tool to control the deer population in Vermont as long as enough does can be taken.

Optimum deer habitat has been described as a mosaic of fields and forests (Halls 1984). In areas with high quality habitats, deer can live in an area as small as one square mile. Within this area, the diversity and arrangement of plant species provide a setting for deer to feed, bear young, and find shelter and concealment. The greatest concentrations of deer in Vermont are found in agricultural areas of the state (having the highest carrying capacity for deer) with a mix of field and forest. Reduced numbers of deer occur in remote aging forestlands, especially in large

blocks of forests at high elevations where diversity and quality of food plants are reduced and extreme snow depths frequently occur. For these reasons, Vermont's lower elevation areas tend to have higher densities of deer. The differences in both the habitat quality and the density of deer in different areas of the state are the reason and basis for the state being divided into wildlife management units.

Deer wintering areas, or "DWAs," are habitats that provide shelter for deer in periods of extreme cold and deep snows. These areas are usually comprised of stands of softwood tree species, such as hemlock, spruce, fir, cedar, and pine, and they range in size from less than 100 to more than several thousand acres. Within these critical areas, combinations of vegetative and topographic factors create microclimates that favor survival of deer through the harshest season of the year. These areas are essential to the survival of our deer during severe winters. Wintering areas do not usually change significantly from year to year and may be used by many generations of deer over many decades if appropriate habitat conditions are maintained. Deer exhibit a great deal of fidelity to individual wintering areas. When cover is removed, deer don't always move to another area and are more likely to succumb to harsh weather.

Department wildlife biologists first identified and mapped Vermont's deer wintering areas during the 1960s and updated the maps in the mid-1980s. Since that time, Vermont has lost some of this important habitat to residential development and even more has been affected by winter recreational trails and logging. The Fish & Wildlife Department biologists endeavor to protect and enhance deer wintering areas through negotiations with land developers during the Act 250 land use regulatory process by working with municipal and regional planners to recognize these areas as being sensitive habitats and by coordinating with landowners, foresters, and loggers to maintain and improve conditions within these essential wintering habitats. The Department uses strict guidelines for logging and maintaining DWAs on state-owned Wildlife Management Areas and has recently updated the "A Landowner's Guide, Wildlife Habitat Management for Vermont Woodlands" (VFWD 2009) designed to provide guidance for interested landowners.

In addition to being concerned with the habitat losses caused by people, the Department is also closely monitoring the spread of invasive plant and insect

species that could affect deer habitats. One species that has potential to alter large amounts of deer wintering habitat is the hemlock woolly adelgid. This insect kills eastern hemlock. If this insect becomes established in Vermont, it could have far reaching effects on the state’s hemlock-dominated forests and DWAs. Hemlock trees provide superior cover for wintering deer. Department biologists are closely monitoring the occurrence of this harmful insect with help from state foresters. There is some concern that warmer winters and extended growing seasons may allow the movement and colonization of this tree pest northwards up the Connecticut River valley.

Management Strategies

- 1.1 Update inventory of deer wintering areas for local, regional, and state habitat planning and protection efforts.
- 1.2 Stress the importance of habitat conservation with outreach efforts to various segments of the public such as farmers, educators, hunters, forest managers, and land planners.
- 1.3 Work closely with foresters and entomologists to prevent, manage, and eliminate the threat of the hemlock woolly adelgid.

ISSUE 2. Population Goals

- GOALS:**
- 1) Maintain deer densities using regional population objectives.
 - 2) Monitor biological characteristics of habitat and deer that can change in response to deer herd size through time.
 - 3) Adjust antlerless deer harvests to alter population levels as necessary to achieve population objectives.

DEER DENSITY

Vermont statutory law states that “an abundant, healthy deer herd is a primary goal of fish and wildlife management” (Title 10 V.S.A. §4081(c)). This is the foremost charge of deer population management in Vermont. The deer herd is kept healthy by preventing overabundance with carefully planned antlerless deer harvests.

The population density of a deer herd affects the general health of the animals, the sustainability of its habitat, and the probability of human and animal

conflict. The following discusses the factors that the Department considers when setting management objectives: the sex ratio between bucks and does and biological and cultural carrying capacities. It also discusses how the Department gathers data that is used to determine deer harvests.

Sex Ratio

Adult white-tailed deer females typically produce twin fawns if summer and autumn nutrition are adequate (Ozoga and Verme 1982, DelGiudice, et al. 2007). If successful, the Department’s management strategy should maximize the reproductive potential of does. Sex ratios that are highly skewed in favor of does can result in does remaining barren through the first estrous thus delaying pregnancy for the entire year because there are too few bucks to tend all does (Mysterud et al. 2002). The gregarious nature of female deer and coursing nature of breeding bucks typically allow a sex ratio of one buck to three does to be sufficient to breed all does in a population (Table 2.1; Demarais et al. 2000). Populations that are heavily hunted require more does than bucks in order

Table 2.7 Number of road-killed adult (at least 1 year-old) male and female deer registered by game wardens in Vermont

Year	# Males	# Females	# Females per Male	# Males per 100 Females
1971	274	1,057	3.86	25.9
1972	414	1,394	3.37	29.7
1973	419	1,252	2.99	33.5
1974	381	1,095	2.87	34.8
1975	361	1,208	3.35	29.9
1976	318	1,091	3.43	29.1
2000	434	1,244	2.87	34.9
2001	325	1,225	3.77	26.5
2002	257	974	3.79	26.4
2003	299	1,010	3.38	29.6
2004	255	889	3.49	28.7
2005	299	953	3.19	31.4
2006	357	1,012	2.83	35.3
2007	459	1,149	2.50	39.9
2008	471	1,239	2.63	38.01
1971-76*	2,167	7,097	3.28	30.5
2000-05	1,869	6,295	3.37	29.7
2006-08	1,287	3,400	2.64	37.9

*From Garland (1978) describing a period of buck-only hunting.

to produce the excess of offspring needed to sustain harvests.

Many hunters in Vermont believe that there are too few bucks to completely breed all does. Statewide data from deer road-kills has consistently demonstrated that a sex ratio of a little over three does per buck exists in Vermont (Table 2.7). Sex ratios can also be estimated from survival estimates determined from age data. White-tailed does commonly live many productive years in Vermont (Fig. 2.4) while bucks typically live only a few years (Fig. 2.5). In general, does have about 75–85% annual survival while annual survival of bucks is about 25–40%. Model results confirm the road-kill estimates that before the antler restriction (AR) in 2005, statewide prehunt sex ratios were about 3.25 does per buck.

Increased yearling survival following the AR has changed the buck to doe ratio. Prehunt sex ratios are now estimated to be about 2.75 does per buck state-wide. With more than 50% of legal bucks harvested annually, it is expected that the number of does per buck increases post-harvest. Localized differences are expected to always exist around the state.

Biological and Cultural Carrying Capacities

In determining the optimal size of the deer herd, biologists consider the concept of carrying capacity — biological and cultural. The term biological carrying capacity (BCC) refers to the maximum number of animals that an environment can support without detrimental effects. The quality and quantity of available habitat determines the BCC. The cultural carrying capacity (CCC) is more subjective. It is determined by assessing the values people place on wildlife versus the liabilities created by overabundant wildlife populations. While BCC has only an upper limit, CCC has both an upper and lower limit because most people desire that there not be too few, but not too many deer to cause damage. Hunters and the general public want enough deer to satisfy their

hunting and viewing desire while too many cannot be ecologically sustained and are considered to be a nuisance to humans.

Biological Carrying Capacity and Maximum Sustainable Yield

When deer herds approach or exceed an area's biological carrying capacity, the animals' health is affected. Wildlife managers have determined that deer herds managed at densities below BCC are healthier and in balance with their habitat. This concept of maximum sustainable yield (MSY) is the point

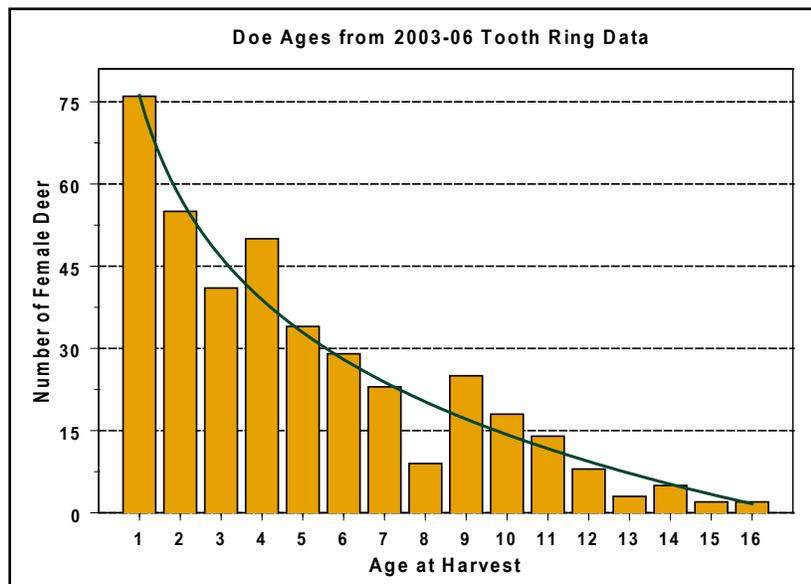


Figure 2.4 Laboratory-determined ages of 427 female white-tailed deer from the 2003–2006 annual Vermont harvests.

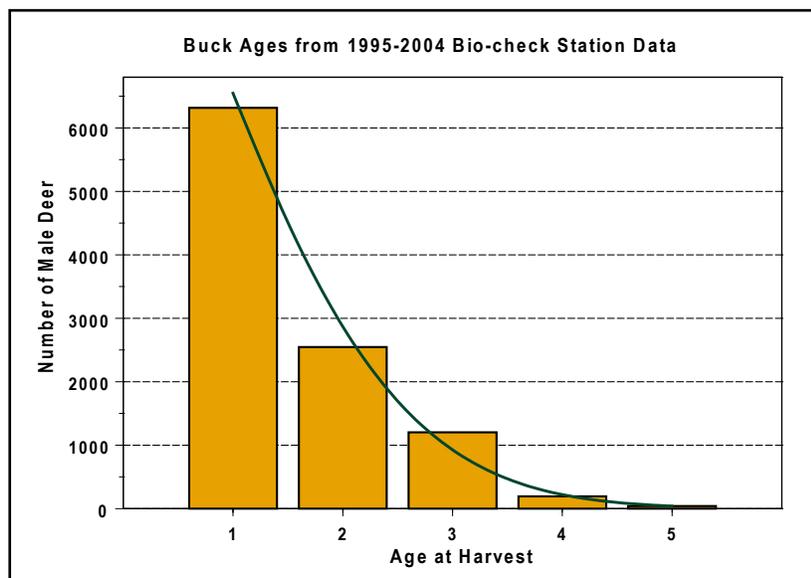


Figure 2.5 Ages of 10,300 male white-tailed deer from 1995–2004 as determined by Vermont biologists at check stations during the opening weekend of rifle season.

within the biological carrying capacity curve when the density of a herd is in balance with its habitat and when fawn recruitment is at its maximum level. A population at BCC recruits as many fawns as it loses adults, so it has no harvestable surplus. At MSY there are fewer deer overall in a population. Does produce more fawns (Table 2.1, pg 10), and fawns have a much better neonatal and overwinter survival.

Deer and their habitats are unhealthy when at a BCC level, but healthy and productive near MSY. This principle is particularly important in northern environments where body condition of deer going into winter can be critical to over-winter survival and where the existence of too many deer can do extensive damage to wintering habitats. Managing near MSY, rather than BCC, helps minimize the boom and bust cycle of the deer herd in Vermont and can be expected to sustain greater deer harvests in the long term (Fig. 2.6). A healthy deer herd with healthy habitats can recover from bad winters or over harvesting much faster than a deer herd and habitat in poor condition.

Cultural Carrying Capacity

Owing to their beauty and athleticism, deer populations are often too low to meet the general public’s desire to view these animals. From a cultural perspective, when deer populations become too large, conflicts such as damage to landscape flowers and shrubs, agricultural and forestry losses, deer-vehicle collisions, and transmission of human pathogens,

such as Lyme disease, can occur. In these cases a deer population may be below its biological carrying capacity (BCC), posing little threat to the long-term sustainability of their habitats, but at the same time above its cultural carrying capacity (CCC) if property losses or disease prevalence are deemed too high. Deer populations can also be below CCC when hunters and other outdoor enthusiasts feel that they see too few deer.

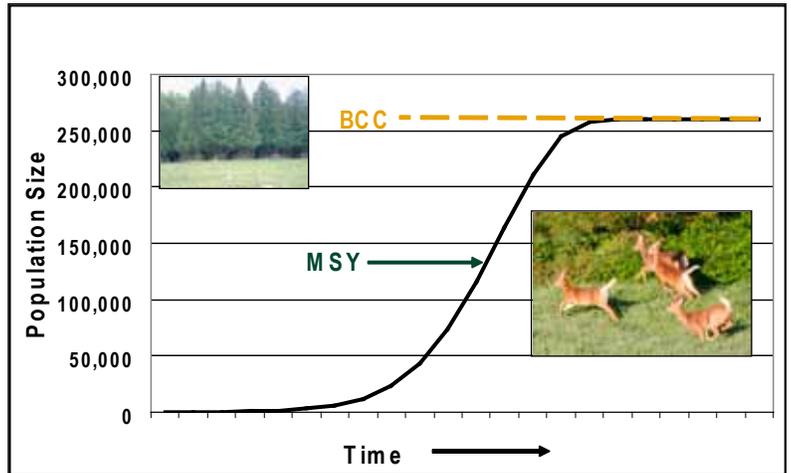


Figure 2.6 Deer population size and growth rate at biological carrying capacity (BCC) versus maximum sustainable yield (MSY)

To find the proper balance between the highs and lows of CCC, the Department conducted a public opinion survey in 2007 to assess the people’s deer abundance preferences (Fig. 2.7). The assessment was analyzed at many different levels including, where one lived, one’s gender, and whether or not one hunted. The results of the survey suggest that nearly half of all Vermonters are generally satisfied with the number

of deer in their county. Thirty-two percent of the respondents felt the deer population should be increased with only 5% of respondents feeling the deer population should be decreased. Fifteen percent either “did not know” or had “no opinion.”

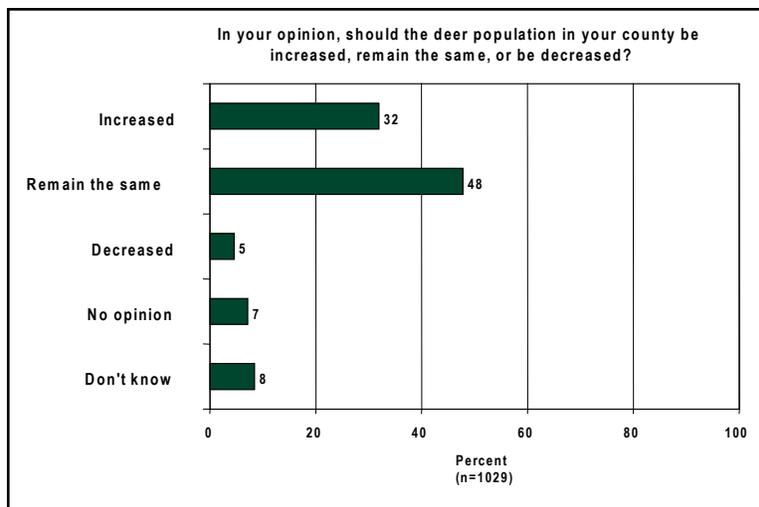


Figure 2.7 Vermont public’s opinion regarding deer population change over the next ten years

When the response to deer population change is analyzed by subgroups, similar interests were found. Of those who said they had hunted in the past five years, 66% felt the deer population should be increased and 27% felt it should remain the same. Of those who did not hunt during the last five years, 22% felt the deer population should be increased and 54% felt it should remain the same. Greater Chittenden County residents were more

likely (58%) to want deer populations to remain the same than their more rural counterparts. This suggests that the deer population may be approaching CCC in Vermont's most populous county. On the other hand, more people (48%) in the Northeast Kingdom (Orleans, Caledonia, and Essex counties) want more deer. This suggests that deer numbers are not near the CCC in that region of the state.

When asked about property damage from wildlife, 14% of the respondents indicated they had suffered a loss to their automobile and 21% had incurred loss of landscape, ornamental or vegetable garden. But when these respondents were compared with those who had not incurred any damage of any kind, responses were remarkably similar for both groups when asked about their opinions of deer population size. Forty-six percent of the respondents incurring damage felt the deer population should remain the same while 48% of respondents that had not incurred any damage felt the same way. These data suggest that, in general, the upper CCC limit, with localized exceptions, is not currently an important issue to the Vermont public.

Responsible deer management dictates that a deer herd's relation to BCC be considered before CCC is considered. In this circumstance, biological measures (for example, birth rates, antler development) inform the Department about the deer population goals. In most of Vermont, deer population goals, as measured by deer per square mile, can currently be achieved through traditional regulated hunting seasons. In cases where deer numbers are below BCC, but CCC demands fewer deer, traditional hunting seasons may not always be effective in satisfying CCC. In some cases, population goals may need to be described in terms other than deer per square mile, for example: motor vehicle collisions, Lyme disease rates, or number of crop damage complaints. These measures may need to be used to set population goals in some local areas if Vermont's deer and human populations continue to grow. Special methods to reduce deer numbers, such as those described in the "Locally Overabundant Deer Populations" section, could be required in the future.

Cultural carrying capacities will likely become increasingly important in the future as a consideration in setting deer density objectives in parts of Vermont where the human population density is growing fastest. In Connecticut where high deer densities (greater than 50 per square mile) are associated with high incidence rates of Lyme disease, CCC may require long-term deer density

objectives to be set as low as 10 deer per square mile (Kilpatrick and LaBonte 2007). This is a situation that may be preventable in Vermont if we are able to maintain densities at or below 20 deer per square mile in regions such as Bennington County that are prone to Lyme disease (see Vermont Health Department statistics for Lyme disease cases in Vermont). Reduction in deer densities may reduce the abundance of Lyme disease-carrying ticks (*Ixodes scapularis*). Very few ticks were found in Maine where deer densities were lower than 18 per square mile (Wilson et al. 1990, Rand et al. 2003, 2004). On the other hand, total elimination of deer can lead ticks to feed more intensively on rodents and result in higher densities of disease-positive nymph-stage ticks (Perkins et al. 2006). Once again, finding the proper balance between too many and too few deer seems to be the best way to ensure that a healthy ecosystem exists with a minimum of human conflicts.

Body Condition and Deer Densities

The number of deer per square mile that Vermont's landscapes can support is a value that shifts across the landscape and through time as habitat quantity and quality change. Often deer themselves are a main cause of this change as they degrade habitat when they become too numerous. Thus, biologists usually rely on biological measures of the deer themselves, such as reproductive rates, weights, and yearling antler beam diameters, to gauge the relationship between the deer herd and their habitat.

Population objectives going forward should be based not only on deer harvest numbers but also on the body condition of deer. Many states and deer management systems monitor deer herd characteristics, such as reproductive rates, yearling antler beam diameter, and fawn weights to track population health (Miller and Wentworth 2000, Williamson 2003) (Fig. 2.8). These data can be used to measure the impacts of and changes in deer populations that follow severe winters (Fig. 2.9). Although tracking changes in the body condition of deer provides a way of recognizing times when there is a need to harvest more deer, it is often after damage to habitat has already occurred. Changes in body condition of deer do not provide a means to determine how many deer should actually be harvested (Fig. 2.10).

In the long-run, if deer harvests are tailored to ensure that deer body condition remains good, deer will weigh more and winterkill will not be as great during severe winters. Deer in good condition will



also produce at an optimal recruitment rate that is just above intermediate levels of abundance relative to BCC (Miller and Wentworth 2000; Fig. 2.6). This management strategy will dampen the boom and bust cycle of deer in Vermont.

It appears that a sustainable harvest of deer having good body condition may be approximately the harvest level that occurred in the mid-1990s, and again in 2008. This is a total deer harvest of approximately 17,000 deer per year (Fig. 2.11). Vermont has never sustained annual harvests of 20,000 deer for very long. Harvest of 20,000 deer per year in Vermont, given current hunting pressure and deer reproductive potential, is probably indicative of an overabundant deer herd. Buck harvests frequently exceeded deer management objectives in the late 1990s following a series of mild winters. Lessons from the 1990s and scientific studies suggest that perhaps 20% of does may need to be harvested during times of mild winter in order to stabilize herd growth when winters fail to do so (Dusek et al. 1989, Giles and Findlay 2004). Historically, less than 10% of adult does have been harvested annually in Vermont. Regional estimates are made using the same method. Adding up these regional estimates results in a total deer population estimate that is very similar to the estimate calculated above for the whole state (Table 2.9 pg 26, Fig. 2.12).

Habitat and Deer Densities

White-tailed deer play a significant role in the ecology of Vermont’s forests. As herbivores (plant eaters), they disperse seeds and as prey, they allow other species to survive. The influence of deer in our forests is considered so significant that researchers and wildlife managers regard them as a “keystone” species in the Northeast. Deer browsing has profound implications for the structure and function of forested ecosystems. If deer were removed from the system, a wide variety of changes would ripple through the forest. However, overabundant deer populations can also be a negative force within the forest ecosystem.

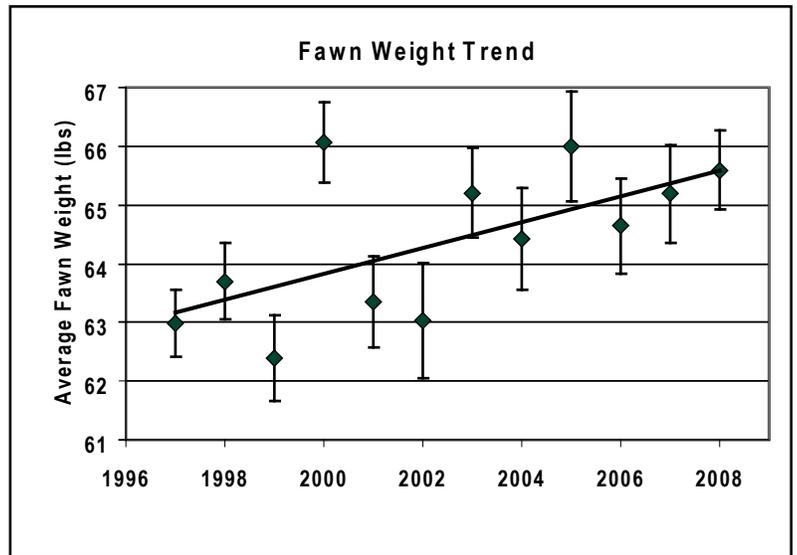


Figure 2.8 Annual average fawn weights (with 95% confidence limits) as reported by hunters to check stations from 1997–2008. All years exclude fawns reported over 99 pounds. The decadal trend-line minimizes the distance between the annual points and the line itself. With bio-check stations now during youth weekend, the Department will investigate the use of fawn weights as a more sensitive indicator of herd health, similar to the use of yearling buck weights.

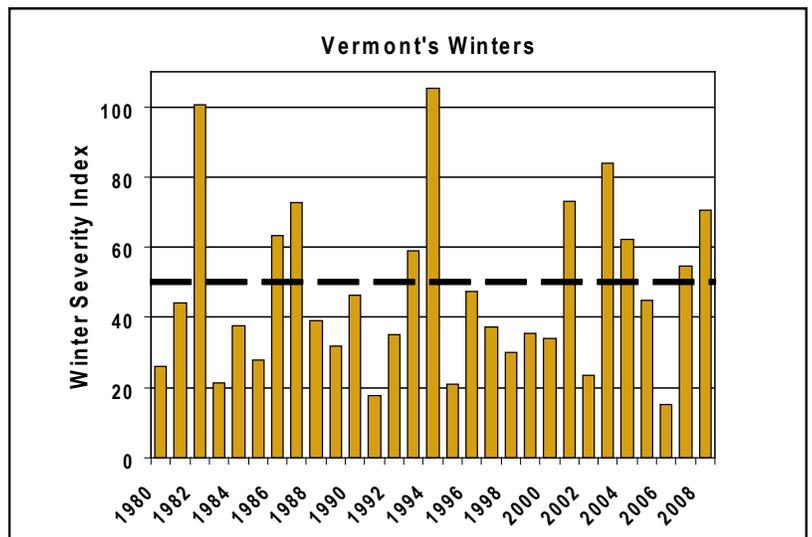


Figure 2.9 Statewide winter severity indices (WSI) in Vermont from 1980–2008. The horizontal dashed line equals a long-term average of about WSI=50. From 1 December through 15 April, one point per day is given when snow depth is at least 18 inches, and a point is given when temperatures drop below 0°F. The Department maintains 38 volunteer weather stations statewide.

Deer densities vary throughout North America as well as within Vermont and are largely in response to habitat and weather conditions that affect reproductive and survival rates and food availability (Halls 1984, Crête 1999). Young forests provide better habitat for white-tailed deer than old-growth forests. A mix of field and forest is more favorable

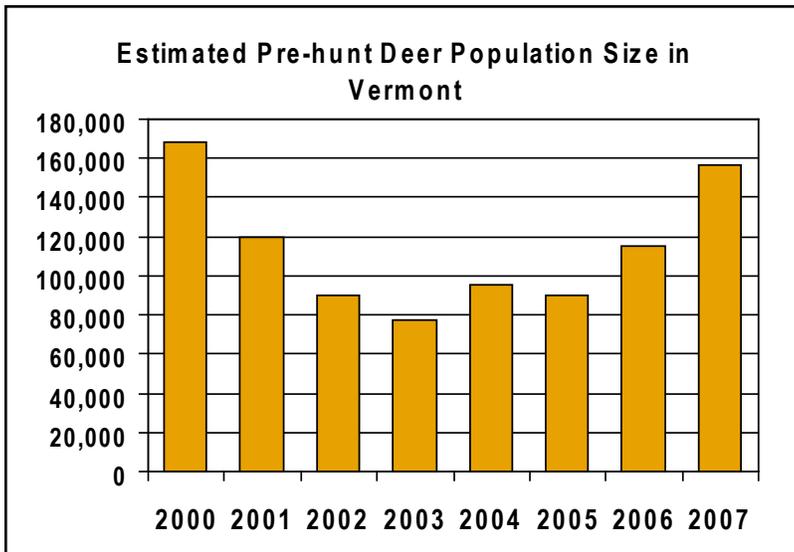


Figure 2.10 Pre-hunt total deer population estimates (+/- 15%) for Vermont from 2000–2007. Rapid population growth from 2005–2007 demonstrates tremendous growth potential of Vermont’s healthy deer herd given a mild winter as in 2006 and restricted antlerless deer harvests.

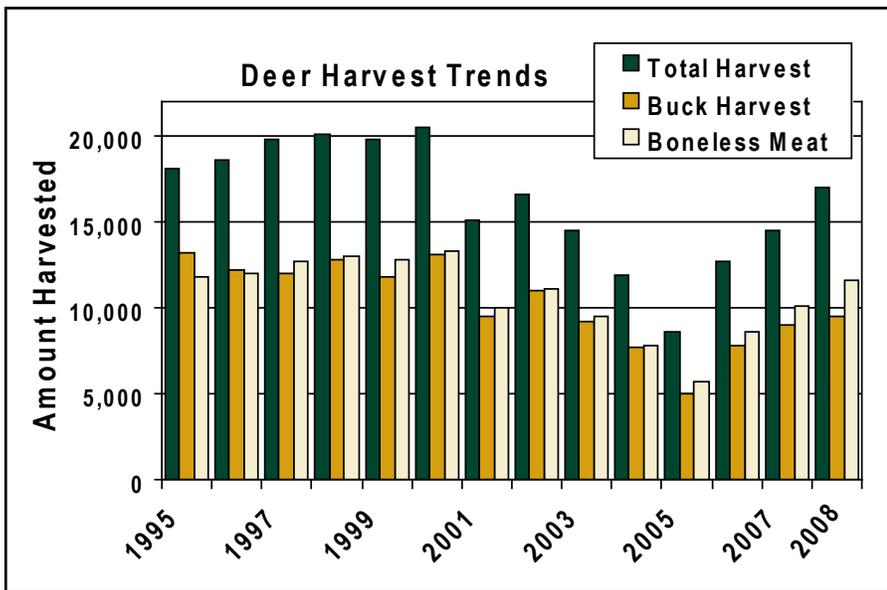


Figure 2.11 Annual total deer and antlered buck harvests in Vermont from 1995–2008. Boneless meat is represented as 100s of pounds, so the ten-thousand-line equals one-million pounds of meat. Pounds of boneless meat assume that hanging weight (skin, head, and feet removed) is 75% of field-dressed weight and edible meat is 75% of hanging weight.

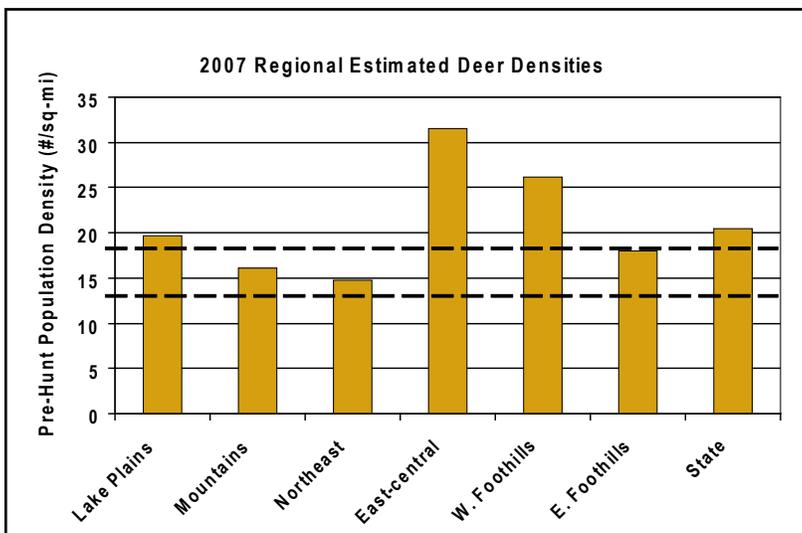


Figure 2.12 Regional pre-hunt deer population density estimates for Vermont in 2007 (see Table 2.9) in relation to statewide upper and lower population density objectives (i.e., horizontal dashed lines near 13 and 18 deer per square mile).

than large unbroken forest tracts. For instance, deer at similar density will have less impact on forest vegetation and habitat condition in areas having some agricultural croplands compared to areas that are entirely forested (Horsley et al. 2003). Areas having greater and more prolonged snow loads during winter can be expected to have greater winter-kill than in areas having less snow. For these and other reasons, sustainable deer densities vary throughout North America and within Vermont. Thus, it is sensible to manage deer to achieve various deer density objectives regionally throughout Vermont in accordance with climate and habitat conditions that are influenced by soil type, topography, weather, and human land-use practices.

Optimal deer density varies across the landscape and through time. Studies from northeastern North America have found that general patterns associated with deer density, however, do exist. Since the mid-1900s, deer density in much of the eastern United States, including southern Vermont, has been high enough to negatively impact forest vegetation. Long-term deer densities exceeding 20 per square mile are capable of altering forest plant communities, threatening endangered plant species, reducing ground-level hiding cover and forage for other wildlife species, and reducing abundance of nesting birds (McShea and Rappole 2000, McGraw and Furedi 2005, Côté et al. 2006). At densities greater than 20.5 deer per square mile, managed forest habitats in northwestern Pennsylvania were altered enough to exclude many songbird species (DeCalesta 1994).

Forest conditions, including deer forage availability, at any point in time are related to past as well as current land and forest management practices. Forest management practices affect the capacity of the forest to accommodate deer. Certain forestry practices may be used to encourage forest regeneration in locations where deer browsing is of concern. For example, one study recommended increasing the size of clear-cuts to larger than two acres as a way to provide for sufficient forest regeneration by producing more than the deer could eat (Akins and Michael 1995). Indeed, more research is needed on forest management practices that are effective in the presence of deer. Researchers have found that northern Pennsylvania hardwood forests were able to successfully regenerate with no shift in tree species composition at deer densities of 13–21 per square mile as long as suitable “deer forage” was at least moderately abundant

(Marquis et al. 1992). On the other hand, when deer food availability was high, successful forest regeneration occurred at deer densities as high as 21–31 deer per square mile (Marquis et al. 1992). Agricultural lands interspersed with forest lands enhance the availability of suitable forage for deer and can increase the density of deer that can be sustained without impacting forest regeneration. A deer density of 18 deer per square mile was suggested to ensure regeneration of desired tree species in the absence of agricultural influences (Tilghman 1989).

Following the end of Vermont’s state-wide deer reduction campaign of the 1980s, deer numbers increased through the 1990s and once again reached high densities in many parts of the state even with increased antlerless harvests. In some parts of the state, deer populations grew to levels that again began to impact forest regeneration. In southeastern Vermont, deer have consumed much of the palatable and merchantable hardwood regeneration of oak, maple, and ash. In addition, the region has experienced a proliferation of invasive species that are not palatable to deer such as buckthorn and barberry. As a result, both the invasive species and deer browsing on the more limited food supply have compounded the impacts on the native forest species. Similar effects, although not as dramatic, may be observed in other parts of the state (Fig. 2.12). For these reasons, the densities of deer that the habitat can support in southeastern Vermont may be more limited than in other parts of the state.

Deer density in any given area typically changes with the seasons. In northern climates, the onset of snow and colder temperatures force deer to vacate their larger summer and fall ranges and concentrate in higher densities in deer wintering areas. Quantity and quality of both winter and nonwinter deer habitat, as well as severity of weather conditions, determine the density of deer that any region can sustain through time. Good summer feeding conditions result in bigger and fatter deer that survive winter better. Good winter habitat minimizes thermal and other stressors that burn energy and result in mortality.

Because optimum deer density varies depending upon regional conditions, any determination of optimal deer density objectives for Vermont should be based upon data that considers both summer and winter habitat while accounting for regional differences in winter severity, winter habitat condition and availability, and the land use considerations of

landowners. Applying all of these factors in managing for a pre-determined prehunt summer and autumn deer density objective is a method that will best provide for optimal body condition as deer go into Vermont's unpredictable winters. This is the best way to minimize boom and bust deer density cycles.

WILDLIFE MANAGEMENT UNIT (WMU) REALIGNMENT

Antlerless deer harvests began being regulated by WMU in 1979 under a permitting system allocating permits to hunt in the 17 newly formed WMUs, which are defined in state statute. Seven of the WMUs were separated by the Legislature into two sub-units in 1983. Changes in deer populations and a reassessment of existing habitat conditions warrant refining the boundaries of select WMUs in order to facilitate more effective management of the deer population in the WMU. Revisions being considered are described below and illustrated in the map (Fig. 2.13).

- a. Adjust the boundaries of the WMUs in southeastern Vermont to more accurately reflect the difference between the Connecticut River Valley habitat and the habitat associated with the physiographic region. This would merge WMUs M1 and O1 to form the Eastern Foothill unit (new WMU M) and WMUs M2 and O2 to form the Connecticut River unit (new WMU O). WMU Q would have I-91 as an easterly boundary in the town of Guilford. East of I-91 would become part of WMU O.
- b. Extend the boundary of J2 northward to US Route 2 to remove an agricultural area from WMU E because habitat in agricultural areas is generally more productive than that found elsewhere in Essex County. Combine the remaining mountainous portion of H2 with H1 to form a new WMU H.
- c. Merge WMUs K1 and K2. The area of K1 is too small to yield harvest numbers large enough to be effectively used in scientific data analyses. These two WMUs closely resemble the habitat types of their respective neighboring WMUs and can be included into a new WMU K.
- d. Move a portion of the boundary between WMU D1 and D2 to the east to put more of the Lake Memphremagog agricultural lands into WMU D1, which is most similar in land use and habitat condition.

DATA GATHERING

In order to allocate permit numbers and direct other management actions at the WMU level, data sources such as hunter sighting rates, antlerless tag fill rates, and local observations are used to fine-tune management actions. For example, some property owners would like the Department to manage overabundant deer at the level of individual properties (for example, extra doe permits for landowners). This could be an option for dealing with localized problem areas having high deer densities. However, any system would need to be scientifically credible, practical, effective, and consistent with the overall deer management strategy. Should such a system be devised it should be based on data measured from vegetation, not by sightings of deer (Mitchell et al. 1997, Augustine and DeCalesta 2003). The Department has found that localized problems of deer overabundance can often be dealt with by getting landowners to provide access to their land and work with hunters to take antlerless deer during archery, muzzleloader, and youth seasons.

Vermont has recently begun using a "mark-recapture" method for deer population estimation. Coupled with new buck:doe ratio data collected from road-killed deer and fawn:doe ratios determined through bow hunter observations, deer biologists are improving their ability to estimate annual deer population composition and density at the state-wide and regional level. Because smaller amounts of data have less predictive power than larger amounts of data, it has now been determined that current data at the WMU level is not sufficient for these techniques to be used to make accurate population estimates at the WMU level. For this reason, WMUs having the most similar deer densities are being grouped into regional units for regional population estimation purposes (for example, Northeastern Highlands, Lake Champlain Valley).

The following provides an example of how the deer population numbers for the state of Vermont can be estimated. Analysis of deer age data (Figs. 2.4 and 2.5) determines that Vermont has a statewide prehunt buck:doe ratio of 1:2.75. Age data reveals that yearling bucks make up about 52% of the antlered buck harvest. Approximately 50% of all yearling bucks have spike antlers as determined by data collected by biologists at check stations prior to 2005 (26% of total buck population has spikes). Thus, a prehunt legal buck population in 2007 of 19,286 indicates a total buck population of about 26,062

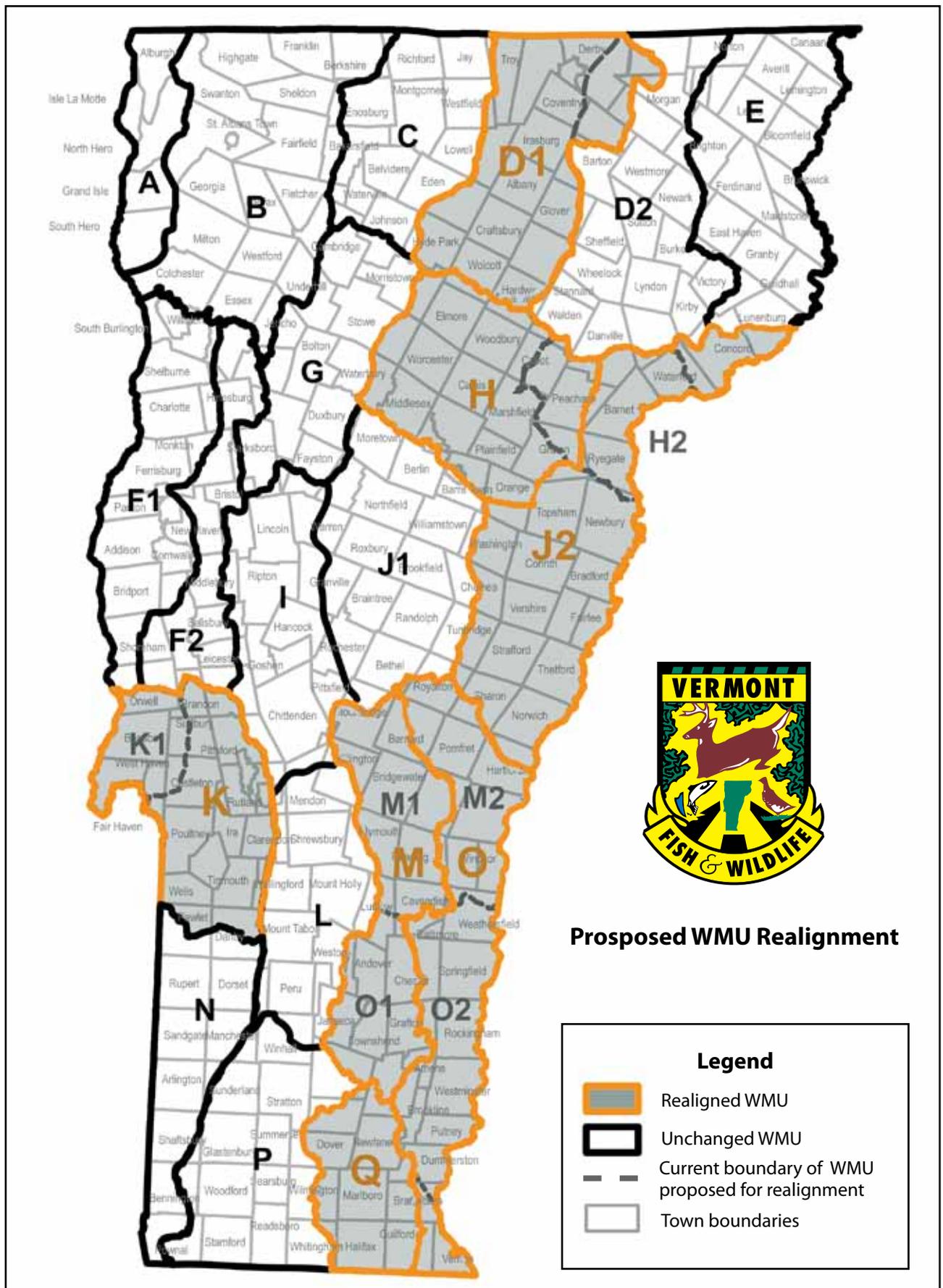


Fig. 2.13 Current and proposed WMU boundaries

if spike-antlered yearlings are included (Table 2.8). Given an estimate of 2.75 does per buck, the adult doe population is estimated to be 71,670 does. In 2007, 4,484 adult does were harvested amounting to 6% of the adult doe population. Assuming 1.5 fawns are produced per does of at least 1 year-old (Table 2.1) and assuming a 55% fawn survival rate through early autumn (Ballard et al. 1999, Haskell et al. 2007), there would have been about 59,130 fawns in the deer herd prior to harvest in 2007. The summer fawn survival estimate is the most uncertain of the estimates used in this model. However, by combining these estimates, it is possible to estimate the total prehunt deer population for 2007 which adds up to about 157,000 ($\pm 20,000$ 90% CI; Fig. 2.10), or 20.5 deer per square mile of deer habitats.

The Department currently also uses the mark-recapture technique to estimate prerifle hunt legal buck population size (results in Tables 2.8 and 2.9). The Department's technique is essentially a removal model where probability of "recapture" is set to zero. The deer are in a sense "marked" when they are registered at the check station during the 16-day rifle season when the hunter reports the WMU and day that the deer was harvested. By combining this data with daily hunter effort estimates gathered from hunter surveys, the mark-recapture model can be used to estimate the daily probability that a deer will be harvested, and ultimately, the number of deer that remained after the annual harvest. Adding the number of deer harvested to number of deer

estimated as not harvested yields a prerifle-hunt population estimate of legal bucks. This application of the mark-recapture method may be uniquely applicable to Vermont for three reasons: 1) mandatory registration of all legally harvested deer ensures that a very complete accounting of actual harvest exists; 2) an adequate return rate of hunter effort surveys exists (demonstrating Vermont hunters' dedication to sound deer management); and 3) the harvest rate of bucks during the rifle season often exceeds 50% of the total buck population (Table 2.8). All three of these conditions must be met for this technique to produce valid results. At this time, Vermont may be the only state that meets all of these conditions.

It is the Department's goal to make deer management in Vermont as scientific and data-driven as possible, but this effort will at times be limited by staff and other resources. Professional judgment provided by Vermont's wildlife biologists will always be necessary to augment the hard science of wildlife management.

DEER DENSITY OBJECTIVES

Based upon the information gathered on the issues presented above, the Department intends to set prehunt deer density objectives for each of the regions in Vermont. These will serve as a baseline from which to work in the future (Table 2.10). In setting these density objectives, it is recognized that they must vary even within a region of the state. For example, the northeastern part of the state may sustain a total deer density of 13 deer per square mile. However,

Table 2.8 Population estimates ("N-hat") of legal bucks in Vermont before the rifle harvest and then corrected for bucks taken in earlier seasons to get pre-hunt estimates. Total harvest rates respond to population size and license sales, and post-hunt buck populations may be important to consider for wintering deer. In all years, post-hunt numbers presented assume no sources of mortality during hunting seasons other than registered harvests.

Year	Pre-rifle Legal Buck N-hat	Rifle harvest	Rifle harvest rate	Early youth and archery bucks	Pre-hunt Legal Buck N-hat	Total buck harvest	Total harvest rate	Post-hunt N-hat	Post-hunt N-hat with spikes
2000	22,428	10,256	0.46	1,816	24,244	13,120	0.54	11,124	11,124
2001	16,102	7,588	0.47	1,123	17,225	9,522	0.55	7,703	7,703
2002	11,619	8,720	0.75	1,428	13,047	10,956	0.84	2,091	2,091
2003	9,575	6,868	0.72	1,623	11,198	9,196	0.82	2,002	2,002
2004	12,283	5,594	0.46	1,420	13,703	7,654	0.56	6,049	6,049
2005*	8,263	3,957	0.48	728	8,991	5,002	0.56	3,989	7,833
2006	11,395	5,964	0.52	1,319	12,714	7,807	0.61	4,907	9,733
2007	17,979	6,839	0.38	1,307	19,286	8,955	0.46	10,331	16,873

*Antler restriction changes definition of a legal buck for 2005–2007, excluding spike-horns from the initial buck population estimate (N-hat) and other estimates until the final post-hunt column.

Table 2.9 Prerifle season legal buck population estimates (N-hat) by region in 2007 and then corrected for bucks taken before the rifle season for pre-hunt estimates. Note variable harvest rates and pre-hunt density estimates among regions. Final pre-hunt estimated population density includes all bucks, does, and fawns as described in the text. Total state “Buck N-hat” estimate (and following population estimates) is the sum of models run for each region separately; it does not exactly match the model for the state as a whole (Table 2.8), but it is close and well within the 95% confidence intervals.

Region	WMUs	Buck N-hat	Rifle harvest	Rifle harvest rate	Mi2	Rifle harvest/ Mi2	Early youth and archery bucks	Pre-hunt bucks	Pre-hunt density (bucks/ mi2)	Total buck harvest	Total buck harvest rate	Estimated population pre-hunt density
Lake Plains	A,B,F1,F2	2,102	1,251	0.595	1,001	1.25	317	2,419	2.42	1,731	0.716	19.6
Mountains	C,G,I, L,P	3,675	1,062	0.289	1,930	0.55	158	3,833	1.99	1,376	0.359	16.1
Northeast	D1,D2,E	2,625	1,037	0.395	1,539	0.67	172	2,797	1.82	1,333	0.477	14.8
East-central	H1,H2, J1,J2	5,668	1,645	0.290	1,542	1.07	316	5,984	3.88	2,131	0.356	31.5
Western Foothills	K1,K2,N	2,005	1,008	0.503	685	1.47	200	2,205	3.22	1,302	0.590	26.2
Eastern Foothills	M1,M2, O1,O2,Q	2,461	828	0.336	1,178	0.70	144	2,605	2.21	1,082	0.415	18.0
State	All	18,536	6,831	0.369	7,874	0.87	1,307	19,843	2.52	8,955	0.451	20.5

WMUs D1, D2, and E may be able to sustain deer densities of 18, 13, and 8 deer per square mile, respectively. Densities will even vary locally within WMUs. The Department recognizes that it cannot manage deer densities directly at any local small scale level. One of the working assumptions underlying small scale deer management in Vermont and other states is that many hunters, especially archers, will congregate in localized areas having higher deer densities within WMUs. This assumption is substantiated by harvest data from Vermont towns.

From previous experiences, the Department can set population goals that include regional deer densities. Statistical advancement in wildlife science made in recent years now allows for accurate estimates of deer density without incurring the high costs. Fine-tuning regional population estimates to small scale WMU-level estimates will be possible using data such as antlerless tag fill rates and hunter sighting rates of

Table 2.10 Deer population density objectives by Vermont regions for the planning period of 2010-2020.

Region	WMUs	Deer Habitats (mi ²)	Density Goal Range (deer/mi ²)		Population Goal Range (deer/mi ²)	
Lake Plains	A,B,F1,F2	1,001	16	21	16,000	21,000
Mountains	C,G,I,L,P	1,930	13	18	25,100	34,750
Northeast	D1,D2,E	1,539	10	15	15,400	23,100
East-central	H1,H2,J1,J2	1,542	15	20	23,100	30,800
W. Foothills	K1,K2,N	685	15	20	10,300	13,700
E. Foothills	M1,M2,O1,O2,Q	1,178	10	15	11,800	17,700
State	All	7,874	13	18	101,700	141,100

deer. The Department will be attempting to track deer densities at the state, regional, and WMU levels using a variety of methods that include the following:

- 1) Population estimation models using harvest and hunter effort data
- 2) Catch-per-unit-effort prehunt population estimation
- 3) Road-kill data for adult sex ratios, reproductive rates, and fawn recruitment through winter to provide necessary data for various analyses
- 4) Bow hunter surveys to determine autumn buck:doe and fawn:doe ratios and sighting rates
- 5) Rifle hunter surveys to gather deer sighting rate data

- 6) Age data to assist in determination of survival estimates and sex ratios
- 7) Change-in-ratio methods using road-kill data

A well established tenet of deer population biology is that altering survival rates of adult females is the most effective way of altering the trajectory of a deer population (Gaillard et al. 2000, Haskell and Ballard 2007). Only by regulating the antlerless deer harvest, 80% of which is typically made up of adult does, will it be possible to meet Vermont’s deer population density objectives.

Maintaining Vermont’s deer population density at ecologically sustainable levels is the only way to ensure the health and vigor of Vermont’s deer herd, native forest, and necessary deer habitats (for example, deer yards). A deer herd in balance with its habitat will have few negative impacts on other wildlife species, the forest and agricultural industries, and will minimize conflicts with people. It will, it is hoped, also prevent periodic boom and bust cycles of deer abundance that have characterized the history of deer in Vermont.

This overall message is not new and cannot be over-emphasized. It has been widely promoted by the Department since at least the mid-1900s (Seamans 1946). Because prehunt population density estimation can only occur after data from the autumn deer seasons and because the impact of the oncoming winter is unpredictable, the task of determining appropriate antlerless harvest objectives for the next fall is a necessarily reactive process. While winter may always be an unpredictable factor, the development of predictive population models is expected to improve through time with additional data and experience. It is hoped the future will provide the tools to make deer management more proactive than reactive.

Management Strategies

- 2.1 Maintain and evaluate regional population goals, established during this planning period, that are based on deer densities that recognize a lower limit that is unsatisfactory to the public and an upper limit that is ecologically unsustainable.
- 2.2 Monitor deer herd health by collecting body condition data from hunter-harvested and road-killed deer.
- 2.3 Consider establishing habitat suitability criteria to define areas of suitable deer habitat within WMUs so that consistent and reliable density

estimates can be made while allowing for habitat area estimate updates as new land-cover maps become available.

- 2.4 Evaluate bowhunter surveys to better estimate regional buck:doe and fawn:doe ratios; compare fawn production estimates to autumn fawn:doe ratios to estimate summer fawn survival, and use buck:doe ratios to estimate adult doe population through reference to the unbiased buck population estimate.
- 2.5 Continue remapping and surveying deer wintering areas so that available habitat is quantified and localized winter deer density is better documented.
- 2.6 Work with foresters to develop data-driven methods for assessing localized deer overabundance problems that might lead to development of localized deer management methods. Data must provide measures of forest condition.
- 2.7 Provide outreach to landowners regarding methods that may minimize damage and encourage reduction in locally overabundant deer populations. Investigate feasibility of a formal program to connect hunters with landowners to address locally overabundant deer populations.
- 2.8 Develop strategies to maintain enough big game registration stations to make big game reporting convenient for hunters.
- 2.9 Seek statutory changes to realign boundaries of select WMUs as proposed above.

ISSUE 3. Hunter Satisfaction and Antler Point Restrictions

GOAL: Employ biologically responsible, socially responsive, and adaptive management of the deer herd.

The Department continually monitors deer hunter opinions. Although opinions will vary widely among hunters, collecting their observations and views is a useful “tool” in managing the deer herd. The Department gains insight into the “will of the people” via five annual public meetings held in the spring as well as through many public outings at reporting stations, sporting shows, game clubs, and various other venues. Daily contacts between state game wardens and the public also provide rapid



feedback from the public to the Department. Since 1999, the Department’s annual hunter effort surveys and periodic opinion polls have provided both general and specific feedback that may be focused on some pressing, current issue. In recognizing the value, and absolute necessity of listening to the people, the Department has made it a goal to continue to improve methods for public input.

HUNTER SATISFACTION

Generally, the effects of winter severity on the deer herd correlate with changes in deer population density. Data since 1970 demonstrate that fluctuations in rifle season buck harvests have fairly predictably paralleled changes in winter severity (Fig. 2.14). This suggests that winter severity has continually influenced deer density in Vermont.

Anecdotal feedback from hunters, as well as increased license sales in 2007 and 2008, suggest hunter satisfaction has improved greatly since 2006. As the deer population rebounded, hunters have seen more deer and harvests have increased (Fig. 2.15). While biologists understand that perhaps the single greatest influence on hunter satisfaction is how many and how often deer are seen, there is a growing interest in the qualitative characteristics of Vermont’s deer population.

ANTLER POINT RESTRICTIONS

In 2005, Vermont established a new antler restriction (AR) designed to “spare” a larger portion of yearling bucks and allow them to mature to an older age. Although this regulation was intended to change the age structure of the buck population by increasing the proportions of bucks in older age classes, it also slightly increased the total number of bucks and ratio of bucks to doe.

Prior to establishment of Vermont’s antler restriction regulation, about 50% of each year’s crop of yearling bucks in Vermont were spike-horns. This regulation protected these yearlings and resulted in a surge of two-year-old bucks and smaller increases in other age classes (Fig. 2.16).

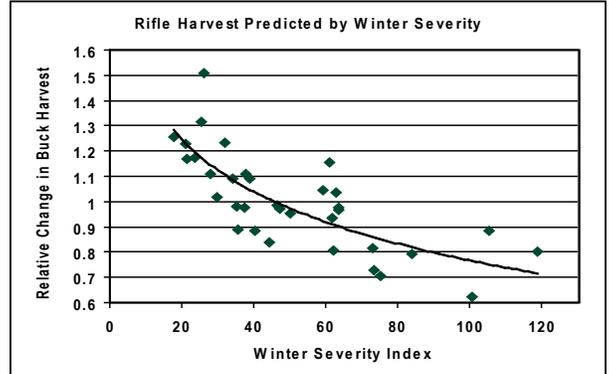


Figure 2.14 Relative annual change in rifle season harvest from one year to the next predicted by winter severity in Vermont from 1970–2004.

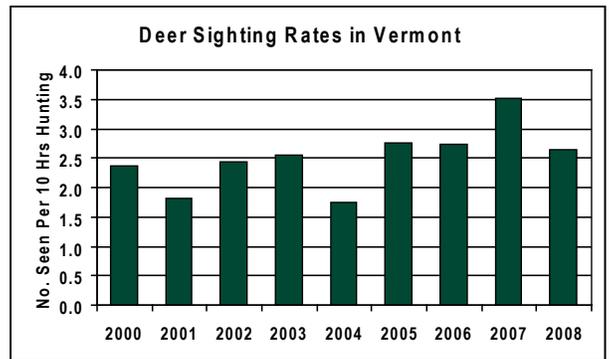


Figure 2.15 Number of white-tailed deer seen per 10 hours of hunting time as reported by Vermont hunters from 2000–2008.

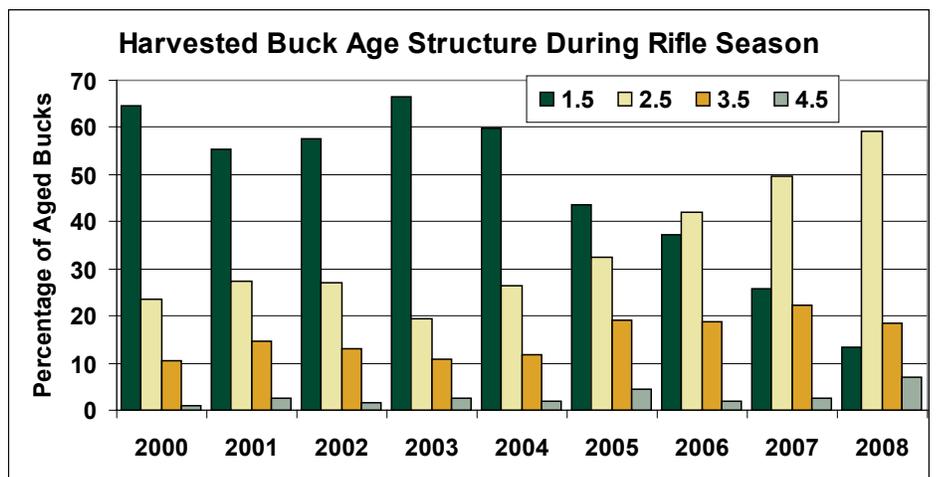


Figure 2.16 Age structure of bucks sampled by Department biologists during opening weekend of rifle seasons 2000–2007 as determined by tooth wear and replacement. Buck sample (n=248) for 2008 taken from buck heads submitted by cooperating meat-cutters during rifle season for disease testing.

Not only have older buck populations increased under the new AR but the weights of harvested bucks have increased. Before the antler restriction, the average field-dressed weight of bucks checked by biologists was 125 pounds. By 2007, the average weight increased to 138 pounds. In 2007 9,000 bucks were harvested yielding 117,000 pounds more of field-dressed deer and 50,000 pounds more of edible deer meat than the same number of bucks harvested in 2003.

For the first time, the quality (that is, the antler and/or body size) of deer has begun to compete with the quantity of deer as a driver of satisfaction among Vermont hunters. The Department continually monitors social acceptance and biological integrity of the statewide antler restriction experiment. Already, new concerns related to the “quality of deer” have surfaced as some hunters and scientific publications have expressed concern that protecting the smaller yearlings from harvest could have an effect on the gene pool of the deer herd (Harmel et al. 2001, Strickland et al. 2001, Coltman et al. 2003, Demarais et al. 2005, Festa-Bianchet 2007, Coltman 2008). There are, however, several reasons why, at least in the short term, adverse effects on the gene pool are not likely:

1. Does contribute 50% to genetic recombination.
2. Twin fawns have different sires about 20% of the time, and in general, it is normal for small bucks to breed does (Sorin 2004).
3. Mature and heavy does tend to breed early, which may occur before the rifle season when most bucks are harvested (Haskell et al. 2008).
4. Dominant male deer are polygamous, they breed many does, which may mean they breed early and sire disproportionately more male than female offspring (Gomendio et al. 2006, Roed et al. 2007).

Also, many confounding environmental factors, such as food availability and winter severity, can affect antler size and shape, particularly deer population density as it relates to nutrition (Harmel et al. 2001, Williamson 2003, Keyser et al. 2005, Gomez et al. 2006, Strickland and Demarais 2008).

The Department has not yet conducted thorough research into the issue of deer population genetics to be able to determine whether this issue needs to be addressed. Prudence dictates that we monitor the results of this statewide experiment closely for signs of

change. Future research and knowledge may suggest the need to modify the antler restriction to better manage for the future.

The youth deer hunt has become particularly important as a source of unbiased data on bucks. Because youths can take any yearling buck, data from the youth hunt provides a sample of the entire yearling buck population and provides data that is comparable to data collected during seasons before the antler restriction. By comparing data from pre- and post-AR harvests, it will be possible to detect any changes that may result from the antler restriction that might have some potential future effect on the deer herd. Based on assessment of pre-AR data, the current AR of two points on one side protects about 50% of yearling bucks while an AR of three points on one side would protect about 90% of yearlings. In the future, a three-point on one side AR could be considered if genetic issues were found to be of concern or if hunter preference for older aged bucks was to increase.

The antler restriction has worked to slightly increase the age structure of bucks because it has increased yearling survival rate during the hunting season, a time when yearling bucks are most vulnerable to mortality. The antler restriction is not expected to increase the number of four-year old or older bucks because the harvest rate of two-year old and older bucks remains high. In the future, some modification of the current restriction to three-points on one side, some slot limit, or other regulation to achieve desired harvest and population objectives may be appropriate.

There are also ways other than antler restrictions that can be used to increase survival rates of bucks. Alternatives include several ways to restrict hunting opportunity of bucks, such as reduced seasons, restrictive weapons, and reduced bag limits (see Issue 4: Bag Limits). The main cause of mortality of Vermont bucks, 76% of the total buck harvest, is during the rifle buck season when, in fact, only one buck can be taken. Even if there was a need or hunter support to change this proportion, it would require a legislative change. The rifle deer season is set by statute and cannot be changed by the Fish and Wildlife Board. The Department will remain open to the use of all effective methods understanding that implementation is dependent on public acceptance.

Management Strategies

- 3.1 Collect adequate yearling buck data (weights, antler beam diameter, and number of points)



from the youth hunt to detect and track any changes in the buck population resulting from the current antler-point restriction (two points-on-one-antler minimum), and evaluate biologically acceptable alternatives if needed.

- 3.2 Evaluate a model assessment using genetic data to examine the likelihood of altering the genetic diversity of the buck population via the current antler restriction.
- 3.3 Inform the hunting public about deer management issues and results of antler-point restrictions and gather input concerning deer management and hunter satisfaction.

ISSUE 4. Bag Limits

GOAL: Provide suitable utilization of deer as food and provide opportunity to hunt deer in a way that maximizes potential for effective deer population management but does not overstress the heavily harvested buck population.

One of the Department’s objectives is to provide as much opportunity as is sustainably possible to hunt, fish, trap, and view wildlife in Vermont. In particular, restoring and increasing hunting opportunities and participation is one our foremost goals during this planning period that follows a period in which hunter participation has declined.

Vermont’s bag limit of three deer per calendar year has been a topic of some controversy among hunters since the poor deer season of 2001. Despite data consistently demonstrating the three-deer bag limit has very little effect on the overall harvest (Table 2.11), hunters were able to persuade the Fish and Wildlife Board to reduce the bag limit to two deer for the purpose of increasing the size of the deer population. The real impact of this action was a reduction in hunting opportunity and a reduction in the amount of time hunters spent afield. An unintended consequence of the change was a reduction in the number of female deer harvested because hunters did not wish to sacrifice an opportunity to hunt bucks during the rifle season by taking antlerless deer.

As history demonstrates, the third deer provided additional opportunity and an incentive for hunters to go deer hunting while very few deer, especially

Table 2.11 Percent of successful hunters harvesting 1, 2, or 3 deer for the period 2000 – 2008.

Year	1 deer	2 deer	3 deer	Deer Harvest
2000	83%	14%	3%	20,498
2001	83%	15%	1%	15,065
2002	85%	13%	2%	16,261
2003	88%	10%	2%	14,528
2004	90%	8%	2%	11,925
2005	93%	7%	X	8,546
2006	92%	9%	X	12,682
2007	89%	11%	X	14,516
2008	84%	15%	2%	17,046

bucks, were actually ever bagged as a third deer. Returning to a three deer limit in 2008, once again, afforded Vermont hunters more days afield and improved the harvest of does.

Management Strategies

- 4.1 Provide the public with ample opportunity to harvest white-tailed deer for food and other utilitarian purposes.
- 4.2 Advocate for an appropriate deer bag limit that allows maximum hunter opportunity while achieving deer population management strategies.

ISSUE 5. Muzzleloader and Archery Season Modifications

GOAL: Provide suitable opportunity to hunt deer in a way that maximizes the potential for effective deer population management but does not interfere with hunters during youth weekend or rifle and other fall hunting seasons.

While hunter participation in the rifle season has remained consistently high at 88% over the past decade, participation in alternative seasons has increased. Hunter participation in the muzzleloader season increased from 32% in 1996 to 43% in 2007 while participation in archery also increased from 27% to 33% (Duda et al. 2007). One survey found that more Vermont deer hunters (48%) preferred the muzzleloader season occurring after the rifle season than those who preferred a season occurring before the rifle season (30%).

The timing and length of the archery season or any proposal for an early muzzleloader season should be

carefully considered given the need for a special youth weekend before the rifle season and the interests of landowners. Since there is already a heavy harvest of bucks in Vermont, any early muzzleloader season should be tailored to the task of controlling doe numbers. Archery hunters tend to hunt from tree-stands more than muzzleloader hunters whose weapons have greater range. Many muzzleloader hunters prefer the late season because it provides greater likelihood that snow will be on the ground to improve tracking and visibility of deer.

The Department plans to enhance efforts to gather and use archery deer hunter observation data under the assumption that archers in tree stands observe deer at closer range and will be able to provide reliable observations, such as fawns per doe and buck to doe ratios. If these data prove useful, it will benefit all deer hunters.

Many Vermonters have expressed the opinion that more antlerless deer should be harvested before the November rut and December muzzleloader seasons suggesting that an early season could reduce the amount of browse consumed by 1,500 or more antlerless deer that would otherwise be harvested five or six weeks later. Most antlerless deer are currently being taken during early archery and youth seasons prior to the existing muzzleloader season. Taking more antlerless deer early in the season may be desirable.

One way to do this is to open a weekend or a few days to antlerless-only muzzleloader hunting prior to the regular rifle season, which could increase the number of antlerless deer taken before the regular rifle season. It is possible that this might also increase muzzleloader participation and the fill rate of antlerless deer tags as well as improve the Department's ability to manage Vermont's deer herd in areas where deer densities are high. The challenge is to create an early muzzleloader season without disturbing hunters participating in the other seasons — youth weekend, archery, turkey, small game, and rifle. This is a task that would require careful research and considerable input from the various user groups. The same arguments could be made for expanding the archery season. Many of the same challenges would also need to be addressed.

Because the Department relies on archery and muzzleloader hunters to harvest antlerless deer, it is prudent to regain their participation and ensure an



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ability to manage deer densities in Vermont. Archery and muzzleloader license sales declined from 74,193 in 2000 to 36,322 in 2005 as deer populations and hunting opportunity declined. Numbers rebounded to 43,585 in 2007 as deer numbers and opportunity again increased. In addition, longer archery seasons in neighboring states of New Hampshire, Massachusetts, Maine, and New York may have contributed to the decline in archery hunters in Vermont. It seems wise to investigate potential conflicts between seasons in neighboring states and then to assess how the situation in these states encourages or discourages nonresident participation in Vermont's early archery season.

Other means of increasing archery participation are through expanding archery season length or increasing archery season bag limits. Both strategies enhance the ability to harvest antlerless deer where needed, including areas with locally overabundant deer populations or where firearm ordinances restrict opportunities to harvest antlerless deer during the youth weekend or muzzleloader season.

Petitions to the Fish and Wildlife Board and the Department have asked for consideration to make crossbows legal for general use in Vermont and to expand archery seasons. Currently, only individuals who can show evidence of a physical disability that restricts the ability to draw a compound bow are permitted to use crossbows in Vermont. While legalizing the use of crossbows during the archery



season could increase the Department's ability to harvest does, mixed public response to the concept, however, suggests that this harvest management tool should be deferred until it is determined that other, more popular harvest strategies will not achieve population objectives.

In 2005 baiting and feeding deer was made illegal after a lengthy regulatory process involving a great deal of public involvement. When deer are baited or fed, there are serious concerns of disease threat and improper feeding methods that are actually detrimental to deer.

This practice also alters the natural digestive system and movement patterns of deer. Although there are still hunters who want to bait deer, the Department believes baiting poses a threat to the health of Vermont's deer herd and does not want to reopen this issue.

Management Strategies

- 5.1 Evaluate feasible options to expand antlerless deer-only hunting opportunities prior to the regular rifle season. These options will include, but are not limited to, an early muzzleloader season, expanded archery season, and increases in archery bag limits.
- 5.2 During the fall and winter of 2009-2010, survey public opinion on the various management options to achieve antlerless harvest objectives prior to the rifle season and develop a proposal of recommended hunting season changes for the Vermont Fish and Wildlife Board in 2010.

ISSUE 6. Captive Deer Hunting/ Deer Farming/ Cervid Importation

GOAL: Implement new captive hunting regulations and work with other state agencies to minimize the chance of introducing and transmitting diseases via captive deer.

In 1986, Vermont passed legislation authorizing the inclusion of certain deer species in agriculture as



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part of a modern, diversification effort. Fallow deer and red deer were identified as domestic deer species and were legalized to import, possess, and propagate in Vermont the same as any domestic farm animal. Since then, fallow deer, red deer, and elk have been legally imported for agricultural purposes and have been propagated at captive hunt facilities.

The concern with introducing other deer species centers on the potential for spreading disease. Since 1986, Chronic Wasting Disease (CWD) has emerged as a new disease on the national front that threatens Vermont's deer herd. CWD is a disease of the central nervous system similar in nature to "Mad Cow Disease." There is no known vaccine or cure and always results in the death of animals that contract it. This disease cannot be detected in live animals until the disease symptoms have appeared. One of the more troubling characteristics of CWD is that it can lie dormant in an individual animal for years before symptoms appear. Thus, the presence of the disease can go undetected until years after an animal has been transported to a new farm or location.

Animals infected with CWD can be brought into the state by deer farmers, captive hunt facility owners, and even an unsuspecting hunter who has legally harvested a deer or elk from outside of Vermont. The state has established laws and regulations governing the transportation and importation of live deer as well as deer carcasses and other cervids from states where CWD is known to occur. The Agency of Agriculture, Food, and Markets regulates animals

used for agricultural purposes and the Department of Fish & Wildlife enforces the regulations that govern any animal imported or possessed for the purposes of hunting. These regulations prescribe veterinary inspections, health certificates, and other measures that mediate the threat of CWD.

Before 2000, CWD was thought to be mostly concentrated in parts of Colorado and Wyoming, but more extensive surveillance has resulted in discovery of CWD in 12 additional states and 2 Canadian provinces. Long-distance movement of the disease has most likely been due to the transport of captive deer and elk (Williams et al. 2002, Sigurdson and Aguzzi 2007, Miller 2008). Recent scientific research strongly suggests that CWD can be transmitted through ingesting feces from infected animals. Scientists also believe that it is transmitted through animal-to-animal contact and through contact with an environment that has been contaminated with the infectious prion (a mutant protein). Scientists believe the spread of the prion occurs via lymph tissues, blood, saliva, feces, and urine and can persist in soils for years. For this reason scientists are concerned that if a captive deer has the disease and escapes from a facility, the disease can spread to free-ranging deer populations with devastating results. (Miller and Williams 2003; Miller et al. 2004; Seeger et al. 2005; Mathiason et al. 2006, 2009; Johnson et al. 2007; Andrievskaia et al. 2008; Gonzalez-Romero et al. 2008; Safar et al. 2008; Sigurdson 2008; Angers et al. 2009; Haley et al. 2009; Maddison et al. 2009; Race et al. 2009).

Given the history of CWD-prevalence among captive deer herds, it seems prudent to address the spread of captive deer urine across the landscape. The risk of establishing any new disease into Vermont's native deer and moose population is of great concern to the Department. The eradication of any disease from free-ranging wildlife is nearly impossible and extremely costly. The potential loss of these animals and a way of life enjoyed by many Vermonters is incalculable. The Department believes that prevention is the only suitable option for dealing with CWD.

Management Strategies

- 6.1 Evaluate the effectiveness of the captive hunting facility regulation.
- 6.2 Work with the Agency of Agriculture, Foods, and Markets and the deer farming industry to promote and enforce disease free importation and husbandry practices.

ISSUE 7. Disease Surveillance and Management

GOAL: Monitor disease issues and respond when necessary to protect the health of wildlife and/or humans.

According to state statute, "...the protection, propagation control, management and conservation of fish, wildlife, and fur-bearing animals in this state is in the interest of the public welfare, and that safeguarding of this valuable resource for the people of the state requires a constant and continual vigilance" (Title 10 V.S.A. §4081(a)). As human and deer populations expand or are transported with relative ease, the risk of disease transmission increases and with it the Department's ability to fulfill its statutory charge. Some diseases do not present a serious consequence to wildlife or humans. However, some diseases associated with deer such as chronic wasting disease (CWD), Lyme disease, hemorrhagic disease (HD), tuberculosis (Tb), and babsiosis, present risks to humans, as well as deer.

CWD, as discussed in Issue 6, is a fatal disease of the nervous system that afflicts white-tailed and mule deer, elk, and moose. It has no known cure or vaccine and can have a long incubation period. Hemorrhagic disease is a deer disease that is common in the Southeast and the Midwest. Twenty years ago the disease was only known to exist south of Pennsylvania and New Jersey (Davidson and Nettles 1997). In 2007, confirmed cases of HD were reported in Albany County, New York, in the Hudson River drainage basin that extends into southwestern Vermont. Although HD is well understood, it is not a disease that can be readily managed. It is a viral disease that is transmitted by a small biting midge fly, often called "no-see-ums." The disease occurs in warm months. As the first frosts of autumn occur, the disease abates as the flies die off for the season. Deer often survive HD, but it can cause localized, periodic, and sometimes heavy mortality. This is a disease that will bear watching in the future as global temperatures change and result in the northward spread of the vector of this disease.

One of the Department's goals is to "limit harmful or fatal human encounters with fish and wildlife species, and provide general public safety service incidental to our primary fish and wildlife duties." Lyme disease, babsiosis, and Tb are capable of crossing from wildlife

over to other species including humans. Although cattle are more closely associated with Tb distribution in North America, deer are capable of sustaining this bacterium in the wild and acting as a reservoir, having the potential to infect and re-infect cattle and human populations. Michigan has spent millions of dollars attempting to eradicate Tb from cattle and wild deer populations. This case is a clear example of how once a disease enters wild animal populations, it is nearly impossible to eradicate.

The incidence and distribution of Lyme disease in Vermont has steadily increased in the last decade and shows no signs of abating. This disease is caused by a mycobacterium transported by a complicated relationship between black-legged ticks, white-footed mice, and deer. Populations of all three of these species have grown as the landscape has become more suburbanized, creating favorable habitats for these species in close proximity to concentrated human populations. Lyme disease infection begins with a tick bite that transmits the bacteria. The site of the bite often erupts into a “bull’s-eye” rash that sometimes is accompanied by fever. As the rash soon disappears, the individual may believe that he/she has no disease. The disease, however, has merely moved to the next stage, which can lead to debilitating joint disease in humans and dogs if left untreated.

The use of urine from captive deer as a scent lure is legal in Vermont. Given the possible presence of CWD in captive deer that appear healthy and excretion of infectious prions in urine (see Issue 6 and References for citations of supporting scientific literature), it may be prudent to address the spread of captive deer urine across the landscape where disease-free native deer could contact the infectious agent. With recent advances in prion-detection methods, it is now unquestionable that scent lures originating from captive deer urine and used by hunters pose a risk of introducing CWD into CWD-free areas such as Vermont. Artificial, or synthetic, scents pose no such risk and have been commercially available since at least 2004.

Vermonters may be unaware of the seriousness of this particular disease issue and how it is transmitted from captive deer to wild populations. Dissemination of the Department’s CWD Response Plan may help educate the public. The plan includes identification of a CWD-positive free-ranging deer (deer or moose) and calls for total extermination of free-ranging deer within a five-mile radius for several years – that area

is equal to 79 square miles or about two Vermont towns. If infected deer continue to be found in the area, the control-area radius is then extended to ten miles – an area equal to 314 square miles. This is standard protocol among CWD-free states and provinces in North America. This disease has the potential to greatly impact populations of deer, deer hunters, and deer watchers alike — it is not to be taken lightly.

Management Strategies

- 7.1 Work with associated branches of government (for example, Agency of Agriculture, Department of Health) to monitor and control disease agents and deer populations where and when it is appropriate.
- 7.2 Contribute to the national CWD surveillance effort.
- 7.3 Monitor the progress of Hemorrhagic Disease as it moves toward the Vermont border.
- 7.4 Work closely with the Agency of Agriculture to ensure dairy farms and domestic deer farms maintain their tuberculosis-free status.
- 7.5 Investigate a prohibition on the use of deer-urine-based scent lures and, if appropriate, implement a public informational effort on the justification.
- 7.6 Inform Vermonters as to the gravity of CWD and repercussions if introduced into our environment through the dissemination of Vermont’s CWD Response Plan.

ISSUE 8. Locally Overabundant Deer Populations

GOAL: Promote awareness that hunting is the only practical option to reduce localized overabundant deer populations.

Ordinances in urban and suburban communities may restrict normal hunting activities, which prompt landowners to also post land against hunting. Deer, however, can live and propagate successfully in many of these environments. Without natural or human predation, deer populations grow quickly. This overabundance often results in increased foraging on agricultural or residential plantings, deer-vehicle collisions, and incidences of Lyme disease (McShea et al. 1997, Schwabe and Schuhmann 2002). As Vermont’s human population continues to grow, the



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expanding suburban setting will cause deer-human conflicts to become more and more common.

There are a variety of nonlethal and lethal options for mitigating conflicts with human residents and managing overabundant white-tailed deer in suburban environments (DeNicola et al. 2000). Nonlethal measures include trap and transfer, fencing, sulphur-based plant sprays, and other aversive measures such as noise makers and flashing lights. Trap and transfer methods incur many risks ranging from injury to captured animals to impacts upon the social stability of receiving deer populations. All of these nonlethal methods are impractical for alleviating localized deer overabundance problems (Buck et al. 2009).

Lethal measures include a myriad of controlled hunting strategies that limit the hunter's location, time of day, and implement (for example, bow-and-arrow, crossbow, muzzleloader, or shotgun). Implements that have a limited discharge range, for example, bows, are perceived by the public as being more acceptable for use in close proximity to buildings and people. Alternative hunting strategies can also effectively and safely reduce deer numbers. Experience from urban areas in other states has demonstrated that most residents who opposed alternative hunts before implementation actually came to support the hunts once they were applied successfully (Deblinger et al. 1995, Frost et al. 1997, Mitchell et al. 1997, McDonald et al. 1998, Kilpatrick and Labonte 2003).

Archery hunters have proven to be an effective general management tool for deer in Vermont and in other states as a way to control suburban deer populations (Kilpatrick and Walter 1999, Kilpatrick and Labonte 2003). Suburban residents may be more supportive of alternative hunts when they are allowed to restrict hunting activity on their own property and when archery hunters involved in the hunt have completed

a state-certified hunter safety course including a test for shooting proficiency (Kilpatrick et al. 2007). In 2006, there were 19,173 archery permits sold in Vermont resulting in a harvest of 2,553 deer for an overall success rate of 13%, which is similar to that for rifle hunting. Of the 2,553 deer harvested during the 2006 archery season, 59% were adult does. As previously discussed, increasing the harvest of adult does is the most effective way to reduce a deer population when this becomes the desired management objective.

Management Strategies

- 8.1 Demonstrate the effectiveness of archery hunting to reduce locally overabundant deer in Vermont's suburban environments.
- 8.2 Provide communities with up-to-date and comprehensive information on deer overabundance and consider community views when deciding how to best manage deer problems in suburban, agricultural, and forested areas.
- 8.3 Encourage communication and cooperation between antlerless deer hunters and landowners that seek relief from locally overabundant deer.

ISSUE 9. Two-year Regulation Cycle

GOAL: Consider a more efficient two-year regulatory cycle that allows for annual adjustments when environmental factors deem it appropriate.

As a means to reduce costs of deer management, increase management continuity, and make regulations more consistent from year to year for hunters, the Department will investigate the feasibility of a two-year regulatory cycle instead of the one-year cycle it now operates. This could save time and money developing and printing deer hunting regulation changes every year. This approach is used in other states, New Hampshire, for example.

Management Strategies

- 9.1 Provide outreach to legislators, board members, and hunters to develop an understanding of the rationale behind deer management and proposed actions to improve management.
- 9.2 Evaluate the benefits and deficiencies of implementing a two-year regulation cycle for deer season recommendations.



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MOOSE

I. Management History

In the 1700s when New England was beginning to be settled, the Vermont landscape was 95% forest. As forest dwellers, abundant moose populations roamed freely. Early town records and explorers' accounts indicate that the animal was widely distributed throughout Vermont. The French Canadians and Abenaki Indians who raided Deerfield, Massachusetts, in 1704 cached meat from 20 moose at a site on the Connecticut River near Brattleboro to provide food for their return march home to Canada (Williams 1707). An Abenaki hunter who lived near Crystal Lake in Barton also told of killing 27 moose and many beaver in that vicinity in the winter of 1783-1784 (Collins 1903).

Native Americans and European colonists killed moose opportunistically throughout the year for food. As Vermont's population grew the unregulated hunting of moose played a part in their disappearance from the state by the nineteenth century. Probably of far greater importance, however, was the loss of moose habitat when the native forests were converted to agricultural lands. This land conversion (forest into fields) began in about 1800 and peaked by 1880 after which only 37% of Vermont remained forested. By the late nineteenth century Vermont's remaining woodlands were concentrated along the higher elevations of the Green Mountains and in Essex County. Moose had become so rare that when a young bull was shot in March 1899, at Wenlock (now Ferdinand) in Essex County, newspaper reports called it "a strange animal" and "the last moose in Vermont."

During the twentieth century, hill farms went out of business on a vast scale. Forests gradually covered hard-won fields, and moose began to reappear in Vermont. By the 1960s, 25 moose were thought to exist in Essex County. By 1980, forests covered 80% of the land area of the state, and moose numbers had increased to a point where they were regularly seen in Essex County. Moose were also observed in neighboring counties. The absence of predation on moose by mountain lions and wolves, as well as by humans allowed rapid population growth. By 1990,



WAYNE LAROCHE

moose were abundant enough to support a limited, regulated hunt. The size and age structure of the moose population approximated populations in areas of North America where regulated hunting was routine.

Modern moose management began in Vermont in 1992 with the adoption of the state's first plan that used biological data derived from studies conducted in the state and the results from studies conducted on moose in nearby states and provinces of Canada. Public opinion was solicited via a series of public meetings held throughout the state during 1991 and 1992.

Vermont's first modern moose season was a three-day hunt held in 1993 in wildlife management unit (WMU) E in which 30 permits were issued and 25 moose were taken. In 1995 the season was expanded to include a second area, D2, and the season was lengthened to four days including a weekend. WMU E was subdivided into two parts prior to the 1996 season in order to distribute the moose harvest more uniformly across this area. In the new units E1 and E2, some of the hunters were issued antlerless-only licenses in order to achieve an equal adult sex ratio in the harvest and to take cows to stabilize the size of the herd by reducing the number of young moose entering the population in those WMUs. Antlerless-only permits have been issued in these units every year since 1996. Four additional units were opened to moose hunting in 1997.

No changes were made in the 1998 moose season because the Department was in the midst of drafting a new ten-year Moose Management Plan. Public comment concerning the new plan was obtained via mail and telephone surveys, open houses, public meetings, and written comments. To expand public benefits, the final plan called for further expansion of the area open for moose hunting whenever appropriate. Continued growth of the moose herd has resulted in expansion of moose hunting into a total of 17 WMUs, with 78% of the state open to regulated moose hunting.

By the early 2000s, the moose population in WMU E was causing significant damage to forest regeneration. Estimated moose densities were nearly double the target levels set in 1996, yielding population densities of about 1.75 moose per square mile.

Moose densities well over 3 per square mile in WMU E were overbrowsing forest regeneration, not only to their own detriment, but also to the detriment of other wildlife species that utilize low growing trees and shrubs for food and cover. Landowners, especially large industrial forestland owners whose livelihood and investment depends on a healthy and growing forest, were especially anxious to see moose densities reduced.

Large increases in permit numbers issued in units E and D2 were prescribed for the 2004 season (Table 3.1) in an attempt to move toward the goal of returning the moose density in these areas to their 1996 and 1999 levels, respectively. By this time, moose had approached the biological carrying capacity of the habitat.

Today, moose hunting in Vermont is regulated by a special license that limits the permit holder to a specific WMU. A moose harvest objective is determined each year for each WMU, and a specific

Table 3.1 Vermont Moose Season Results 1993 - 2008

YEAR	PERMITS ISSUED	MOOSE HARVESTED	% HUNTER SUCCESS	UNITS OPEN
1993 ¹	30	25	83	E
1994	40	28	70	E
1995 ²	75	61	81	D2, E
1996 ³	100	78	78	D2, E1, E2
1997	165	100	61	Above plus C, D1, H1 & H2
1998	165	97	59	
1999	200	120	60	Above plus G, I & J1
2000	215	137	64	
2001	229	155	68	
2002	365	221	61	Above plus B, J2, L, M1 & P
2003 ⁴	440	298	68	Above plus O1
2004	833	539	65	
2005 ⁵	1,046	640	61	Above plus Q
2006	1,115	648	58	
2007 ⁶	1,251	592	47	
2008	1,251	605	48	Above plus M2
Totals	7,520	4,344	58	

¹ 3-day, mid-week season.

² Season lengthened to 4 days and opening day moved to Saturday.

³ Antlerless-only permits issued for the first time. WMU E split into subunits E1 and E2.

⁴ Season lengthened to 6 days.

⁵ Season split into two 6-day periods; antlerless permit holders in D2, E1 & E2 hunt 2nd week.

⁶ Second season lengthened to 9 days.

number of licenses are issued to achieve target harvests. The license allows a party of up to two hunters, and an optional guide, to take a single moose during a season held in mid- to late-October. Hunters are selected by random draw from a large pool of applicants who apply prior to the license drawing. Licenses are either-sex or limited to cows and calves as necessary to achieve area-specific population goals (Table 3.1)



GINNY GARRISON

1998-2007 Plan Accomplishments

Vermont's second moose management plan was adopted in 1998 and incorporated biological data on the herd gathered between 1980 and 1997 along with public input. The results of the public input revealed that Vermonters generally wanted to see more moose statewide while wanting to stabilize populations in the Essex County area. Vermonters desired the benefits of a healthy moose population, but they also expressed serious concerns regarding moose/vehicle collisions and the upward trend in human conflicts with moose.

The ten-year moose management plan adopted in 1998 was designed to address the interests and concerns of the public and strive for a healthy, expanding moose population in balance with its habitat. The objectives and accomplishments of that plan are summarized below.

► **Objective 1. To maintain a healthy, viable moose population in Vermont.**

Vermont's statewide moose population was estimated at 2,100 animals in 1997. This objective included six strategies:

Strategy 1.1 Maintain a minimum fall population of at least 500 moose.

❖ **Action:** The Department estimated that the state-wide moose population following the 2007 moose hunt was about 4,000 animals. This number more than met the minimum objective of 500, but in the Northeast Kingdom region of the state the moose population grew at a rate that was unsustainable ecologically.

Strategy 1.2 Maintain an adult sex ratio of 40 – 60 bulls per 100 adults.

❖ **Action:** Harvest and mortality reports provide the information on the sex ratio

and age structure of Vermont's moose population. This data suggested that the adult male to female sex ratio was very close to a normal, 50:50.

Strategy 1.3 Maintain an adult age-class distribution of at least 25% greater than age four.

❖ **Action:** The Department kept track of nonhunting, or "incidental," mortalities occurring within the moose's "biological year" to determine an age-class distribution. The biological year (BY) for moose begins June 1, at the time of the annual birth pulse of calves, and ends May 31 of the following year. Figure 3.1 illustrates the age structure of Vermont's moose population over a five year period. Although the graph has a normal shape or curve, the percentage of younger moose, age classes one through three, declined from 71% in the early 1990s to 58%. This is likely due to the decrease in reproductive rate noted earlier resulting from increased moose density. Forty-two percent of these moose were more than four years of age.

❖ **Strategy 1.4 Continue to monitor various biological indices, such as carcass weight, beam diameter, ovulation rate, and occurrence of parasites.**

❖ **Action:** The Department monitored the health of the moose herd throughout the state and found the physical condition of the animals was deteriorating. Biologists found that over the previous nine years Vermont's cow moose ovulation rates had dropped dramatically (Fig. 3.2). Other indicators of the moose herd's health were the decline in the dressed carcass weight of yearling bulls and the smaller beam diameter for yearlings (Fig 3.3 and 3.4). These trends strongly indicated that the moose herd was exceeding its BCC in some parts of the state, most notably in WMUs E1 and E2. Biologists also watched for diseases and health related issues caused from two common parasites, the winter tick and the roundworm. There were, however, no apparent health effects from either of these parasites during this period.

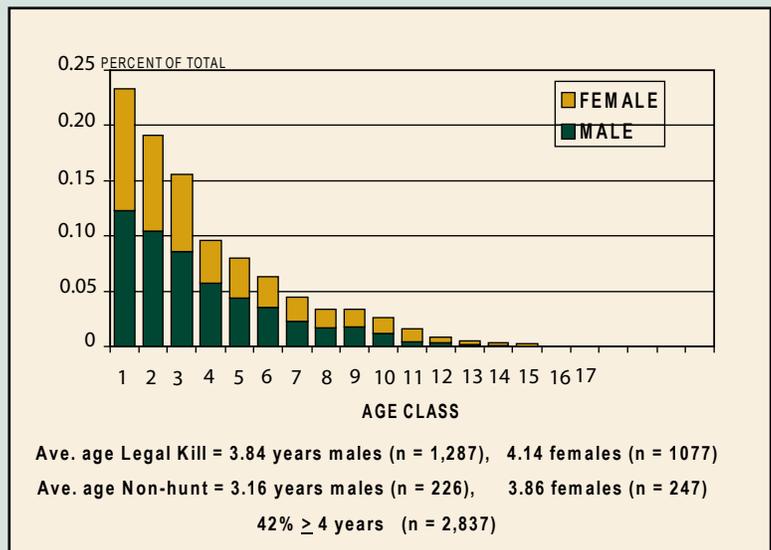


Figure 3.1 VT moose ages for legal and non-hunting mortalities for calendar years 2003 – 2007.

1998-2007 Plan Accomplishments (continued)

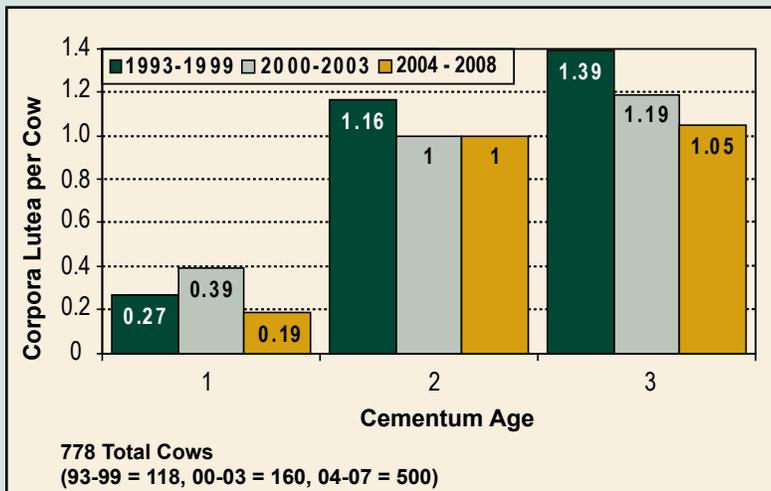


Figure 3.2 Comparison of ovulation rates for legally harvested cows from three time periods

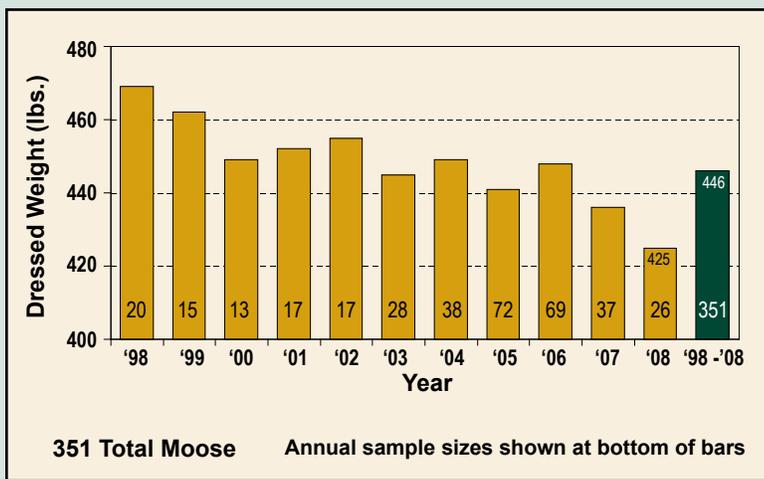


Figure 3.3 Yearling male carcass weight from Vermont moose harvests.

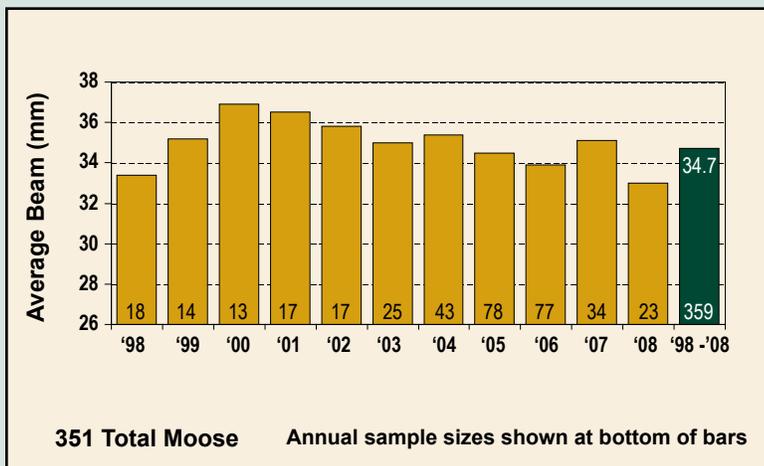


Figure 3.4 Yearling beam diameter from Vermont moose harvests.

Strategy 1.5 Develop a model to assess relative moose habitat suitability at the WMU or regional level throughout the state.

❖ **Action:** The Department assisted a graduate student at the University of Vermont (UVM) who modified a moose habitat suitability index (HSI) model that was used to evaluate moose habitat in WMUs E and I (Koitzsch 2000). The HSI values (1.0 equals ideal habitat) were estimated to be 0.64 and 0.34 for WMUs E and I, respectively. The Department expanded use of this model and sought funding and partnerships with research institutions to perform this work.

Strategy 1.6 Consider implementing field studies to investigate and monitor moose browsing in selected WMUs.

❖ **Action:** With the assistance of staff biologists, a UVM graduate student investigated the incidence of moose bark stripping on mountain ash throughout the state (Scharf and Hirth 2000). This study found that one third of mountain ash trees in northern regions were wounded by moose bark stripping. Also, forest inventories conducted on 85,000 acres of private timber lands in Essex County indicated 25% of the plots were browsed, 68% of which were heavily browsed.

➤ **Objective 2.** To provide for the controlled growth of Vermont's statewide moose population in all WMUs except for the Northeast Kingdom region where population stabilization is desired.

Strategy 2.1 Continue to utilize annual, mid-October, regulated moose hunts to stabilize the moose population in WMUs E1, E2, and D2 at 1996 levels.

❖ **Action:** The 1998 moose plan called for stabilization of the moose populations in the

1998-2007 Plan Accomplishments (continued)

Northeast Kingdom region. Density goals were about 1,000 moose in WMU E and 400 in WMU D2. Improved moose estimation methods revealed that the number of permits was still too few to achieve the objectives. Data gathered by the Department produced estimates of moose densities above the goals and continued evidence that moose were overbrowsing their range in the Northeast Kingdom.

Permit numbers for this region continued to increase during the plan period, partly in response to declining hunter success rate which made it necessary to issue more permits in order to meet harvest objectives, and partly in response to the need to expedite population reductions to protect forest habitat.

Strategy 2.2 *Continue to utilize regulated moose hunts to slow rate of growth of the moose population in WMUs C, D1, H1 and H2.*

❖ **Action:** Moose hunting first occurred in WMUs C, D1, H1, and H2 in 1997. The combined population estimate for these units had remained relatively stable since 2001 at about 700 moose.

Strategy 2.3 *Utilize regulated moose hunts to slow rate-of-growth of the moose population in WMUs G, J1, and I beginning in 1999.*

❖ **Action:** Moose hunting was initiated in WMUs G, J1, and I in 1999. The estimated moose population for these units increased from 290 (2001) to 370 (2004) and has since been successfully reduced to an estimated current population of 300 moose.

► **Objective 3. To maximize benefits from Vermont's moose population within acceptable social and biological limits.**

The Department continued to work toward balancing an abundant moose population and sustainable habitat with protection of the forest and prevention of conflicts with humans. During this planning period, the Department employed several strategies. These strategies involved regulating hunting, working with landowners to open access to hunting, and promoting habitat management through public outreach, education, and activities.

Strategy 3.1 *Continue with annual moose hunts in WMUs C, D1, D2, E1, E2, H1, and H2*

Strategy 3.2 *Open WMUs G, J1, and I to limited hunting beginning in 1999.*

Strategy 3.3 *Annually evaluate the potential for regulated moose hunting opportunities in other WMUs.*

❖ **Action:** All three of these strategies from the 1998 moose plan were implemented through regulation.

Strategy 3.4 *Coordinate with large property owners to find ways to enhance moose hunter access.*

❖ **Action:** The Department worked with large industrial forest landowners in the Northeast Kingdom to facilitate the opening of gates during the moose season and with the Vermont Horse Council and the Vermont Department of Forests, Parks & Recreation to facilitate the use of draft horses to haul moose carcasses out of roadless areas.

Strategy 3.5 *Promote the "Hunters Sharing the Harvest" program to moose hunters as a*

way of providing moose meat to needy households throughout Vermont.

❖ **Action:** The Department annually provided a 50-page guidebook to each moose hunting permit holder that included a description of the "Hunters Sharing the Harvest Program" and listed some examples of local food shelves that could store and distribute moose venison to their patrons. (There is currently no organized program or system to track donations.)

Strategy 3.6 *Cooperate with natural resource professionals and landowner organizations in dissemination of moose habitat management guidelines.*

❖ **Action:** In 1995, the Department, in cooperation with the Vermont Department of Forests, Parks & Recreation, published a booklet entitled: "A Landowner's Guide - Wildlife Habitat Management for Vermont Woodlands" (Regan and Anderson 1995). This publication, which includes a chapter on moose habitat, was made available to state biologists, private consulting foresters, and landowners through forest management workshops.

Strategy 3.7 *Develop and implement educational displays explaining Vermont's moose management for use at fairs, outdoor shows, and moose check stations.*

❖ **Action:** In 2001 the Department produced five sets of a seven-panel poster-board display covering many aspects of moose life history and management. These sets have since been used annually at moose weighing stations and in other outreach venues.

Strategy 3.8 *Construct at least two moose observation towers*

1998-2007 Plan Accomplishments (continued)

with parking areas near state highways in the Northeast Kingdom region, contingent on funding partnerships with the private business sector, regional chambers of commerce, and/or governmental tourism agencies.

❖ **Action:** The Department began work in 2006 on siting and designing a moose viewing tower off State Highway 105 in the Essex County town of Ferdinand.

Strategy 3.9 *Cooperate with a private interest in the publication of a "Vermont Moose Watcher's Guide."*

❖ **Action:** A professional wildlife photographer and author from Maine published the "Moose Watchers Handbook" in 2001, which included directions to popular moose viewing sites in Maine, New Hampshire, and Vermont (Silliker Jr. 2001).

► **Objective 4. To minimize negative interactions between humans and moose.**

Strategy 4.1 *Utilize annual limited-entry moose hunts to either stabilize or slow the growth rate of regional moose populations as noted above under Objective 2.*

❖ **Action:** The number of nonhunting moose mortalities steadily increased through the early part of the past ten years. Nonhunting moose mortalities during the last several years have seemed to decrease in the face of increased numbers of permits. Many of these mortalities (41%) occurred in the Northeast Kingdom units of D2, E1, and E2.

Strategy 4.2 *Develop and implement a policy for Department response to "nuisance" moose by 2000.*

❖ **Action:** To address damage caused by moose to livestock fencing, maple sap tubing, and

Christmas tree plantations, a Commissioner's rule was enacted in 1996 that under certain conditions allows a landowner suffering property damage to shoot the moose. To try to avoid this situation, the Department assisted the United States Department of Agriculture, Wildlife Services office in Berlin, Vermont, in developing an informational brochure describing possible ways to curb moose damage.

The Department also developed a protocol for sick or diseased moose that posed a potential hazard to public safety. These situations can arise when sick moose wander into urban areas, farmyards, or busy highways. A Department protocol for dealing with all "nuisance" moose still needs to be completed in the next planning period.

Strategy 4.3 *Continue to cooperate with the Vermont Agency of Transportation (VTrans) to erect warning signs at traditional moose highway crossings.*

Strategy 4.4 *Cooperate with the VTrans in implementing at least three roadside brush-clearing projects to improve visibility at the most dangerous moose crossings, where feasible.*

❖ **Action:** The Department worked with VTrans to evaluate several methods of reducing moose/vehicle collisions. VTrans considered the advice of the Department for the placement of moose crossing signs and the clearing of roadside brush adjacent to frequently used road-side salt licks in order to enhance the ability of approaching motorists to detect moose

Strategy 4.5 *Continue with annual press releases to remind motorists of moose hazards and explore potential for including a warning message with helpful driving tips concerning deer and moose collisions in the Department of Motor Vehicle's Driver's Manual and in all new vehicle registrations or renewals.*

❖ **Action:** The Department issued biannual press releases to newspapers and broadcast media each year to advise motorists during times of the year when movement of moose poses the greatest hazard to motorists. The Department also partnered with the Vermont Frost Heaves PBA basketball team to raise driver awareness concerning the hazard of moose on highways.



TOM MERRIFIELD

II. 2010-2020 Moose Management Issues, Goals, and Strategies

The overall goal of moose management in Vermont is to manage Vermont's moose to sustain healthy, viable populations consistent with biological, social, and economic considerations, and provide maximum hunting opportunities.

ISSUE 1. Regional Population Goals

GOAL: To maintain regional populations of healthy moose at or below cultural carrying capacity.

The Department uses several approaches in estimating moose populations — surveys, mortality data, and aerial censuses. Two annual hunter surveys (one for deer hunters and one for moose hunters), annual moose hunter success rates, and nonhunting mortality records provide the basis for the Department's moose permit allocation recommendations. Observations and knowledge provided by state game wardens, foresters, biologists, and landowners are also considered when making decisions and recommendations.

Since 1999, Vermont has conducted deer and moose hunter surveys that provide a measure of relative moose density trends by WMU across the entire state. The deer hunter survey asks hunters to identify and record the number of bulls, cows, calves, or moose of unknown sex or age that are observed. The moose hunter survey requests hunters to report any preseason scouting activities. Hunters are asked to record the number of scouting trips they took; the number of hours they spent scouting; and the number of moose they saw during these trips. The numbers are standardized to determine the average number of moose sighted per hundred hours scouting.

Moose hunter success rate is calculated as the percentage of all permit holders that harvested and registered a moose. Success rates are calculated annually for each WMU that is open to hunting. The current year hunter success rate is compared to the previous year to assess changes at the WMU level, considering number and type of permits issued. Hunter success can be affected by individual hunters' effort (time spent afield), weather conditions during the hunt, moose behavior, population levels, and the accessibility of moose to hunters (for example, the distribution of roads and trails in moose habitat).

The moose sighting rate from deer hunter surveys in WMU E has declined during the past four years, thus, the estimated moose density has also declined. The population density estimate for November 2008 was 2.59 moose per square mile, an estimated 1,526 moose. With the current permit quota, the target density for WMU E should be achieved following the 2010 hunting season. Moose sighting rates for D2, after remaining fairly stable for several years, finally decreased in November 2008. Using a rolling three-year average for deer hunter survey moose sighting rate data, the moose density in D2 is currently estimated to be 1.16 moose per square mile. It is possible that by maintaining the current permit quota of 340 for one more year that the D2 population may closely approach the target density of one moose per square mile. Permit numbers have been steadily increased in these units from 30 in 1998 to 110 in 2009. The combined population estimate for these units has remained relatively stable since 2001 at about 700 moose.

The Department maintains a statewide database of all reported nonhunting moose deaths. Nonhunting mortality data is collected and reported on a biological year basis that begins on June 1, after most of the moose calves have been born, and ends on May 31. Summaries of nonhunting moose mortalities are prepared each year and assessed prior to development of season recommendations. This information also helps us assess changes in moose numbers through time.

New Hampshire conducts aerial censuses using forward-looking infrared (FLIR) cameras that enhance the ability to observe moose on the ground and has developed a model that provides more accurate estimates of moose populations. Although potential differences in topography, road access, hunter behavior, and other factors could influence moose sighting rates between northern New Hampshire and northeastern Vermont which could affect the applicability of this model in Vermont, the Department has found the model to be useful in estimating moose densities in the state. The Department is seeking to conduct its own aerial FLIR count of moose in Vermont to verify that the New Hampshire model provides accurate estimates in Vermont. Flights are scheduled for December 2009.

Moose hunting has expanded into several additional WMUs since 1999 as populations have grown large enough to sustain hunting (see Table 3.1, page 41). As moose have become more abundant, public

attitudes toward the moose herd have changed over the nine-year period (1996-2007) as well. Results from the 2007 statewide telephone survey indicated, with some regional variations, that overall Vermonters (54%) want to see the moose population remain the same, 19% want to see it increased, and 10% want to see it decreased. Analyses of the data, with the 17% “don’t know/ no opinion” responses removed, is shown in Table 3.2.

Table 3.2 Public opinion on desired regional moose population size by region of residence, in percent (sample size in parenthesis).

Region*	Decrease	Remain the Same	Increase
Northeast Kingdom (99)	31 (31)	54 (53)	15 (15)
Greater Chittenden (268)	9 (24)	69 (184)	22 (60)
Central Vermont (243)	11 (26)	64 (156)	25 (61)
Southern Vermont (246)	10 (25)	66 (161)	24 (60)

*Northeast Kingdom: Caledonia, Essex and Orleans Counties
 Greater Chittenden: Franklin, Chittenden and Grand Isle Counties
 Central Vermont: Addison, Lamoille, Washington and Orange Counties
 Southern Vermont: Rutland, Bennington, Windsor and Windham Counties

With this public feedback in mind, the Department proposes to maintain regional moose numbers at their current levels in most areas of the state, with the exception of the Northeast Kingdom region, where moose numbers need to be reduced to a level below biological carrying capacity, and in a few WMUs where an increase in moose populations may be acceptable (WMUs I, L, P, and Q, and perhaps others). The Department will solicit more public input on this issue prior to setting final objectives on moose herd numbers for WMUs. Web-based questionnaires will be used early in this management plan cycle to solicit public input.

Based on November 2008 population estimates for each WMU (Fig. 3.5.), the Department will make adjustments in two units. The Department proposes continuing with a population target of 1,000 moose in WMU E (1.75 moose per square mile), but to readjust the target for WMU D2 from 400 to 600 moose. This new objective for WMU D2 equates to one moose per square mile, which should be well

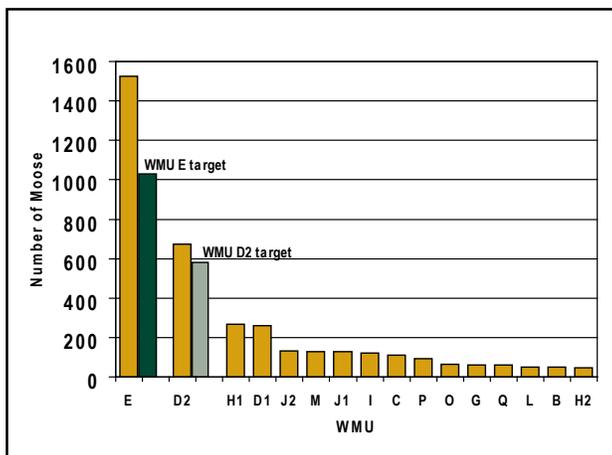


Fig. 3.5 Estimated moose population by WMU from sighting rates of 2006 -2008 November deer seasons.

below biological carrying capacity. This change is proposed because areas of current overbrowsing in D2 are limited, whereas historically higher moose densities (1.4 moose per square mile, 800 total) created overbrowsing. With the growing importance of moose hunting in this region, 600 moose may be an acceptable population level to area residents.

Management Strategies

- 1.1 Maintain a statewide fall post-hunt population of between 3,000 and 5,000 moose.
- 1.2 Maintain a sex ratio of between 40 to 50 bulls per 100 adults (moose of at least age-class one).
- 1.3 Maintain an adult age-class distribution of at least 25% of at least age-class four.
- 1.4 Maintain an average ovulation rate of more than 1.15 for cows age class of at least three.
- 1.5 Assess relative moose habitat condition of individual WMUs or regions of the state using forest inventory data and a GIS-based Habitat Suitability Index Model.
- 1.6 Reduce and maintain WMU E moose densities to 1.75 moose per square mile (approximately 1,000 moose post-hunt).
- 1.7 Reduce and maintain WMU D2 moose densities to 1.0 moose per square mile (approximately 600 moose post-hunt).
- 1.8 Allow slow population growth in WMUs I, L, P and Q while not exceeding one moose per square mile.
- 1.9 Stabilize moose population in other WMUs at current levels.

ISSUE 2. Moose / Human Conflicts

GOAL: To minimize motor vehicle/moose collisions and other forms of damage caused by moose.

As the moose population has expanded, so have the negative interactions with humans. Damage to fences and maple sugaring equipment are common problems. More and more moose are finding their way into developed neighborhoods or becoming habituated to humans. Both situations are rarely resolved without significant public disturbance and usually result with the moose's demise.

Vehicle collisions are the most serious human/moose encounters. Although deer collisions are far more common and often result in costly damage to vehicles, they rarely result in serious human injury. Moose collisions, on the other hand, often result in serious human injury or even death. The Department is continually looking for ways to reduce the number of motor vehicle collisions with moose. Currently, there are approximately 77 signed crossing areas statewide. Many of these signs carry a 40 mph speed advisory per the Department's recommendation.

The number of nonhunting moose mortalities steadily increased through the early part of this decade. Nonhunting moose mortalities during the last several years have decreased slightly (Fig. 3.6) with increased numbers of permits. Many of these mortalities (41%) occurred in the Northeast Kingdom units of D2, E1, and E2.

The Department began drafting a protocol for dealing with moose that are not sick but pose a

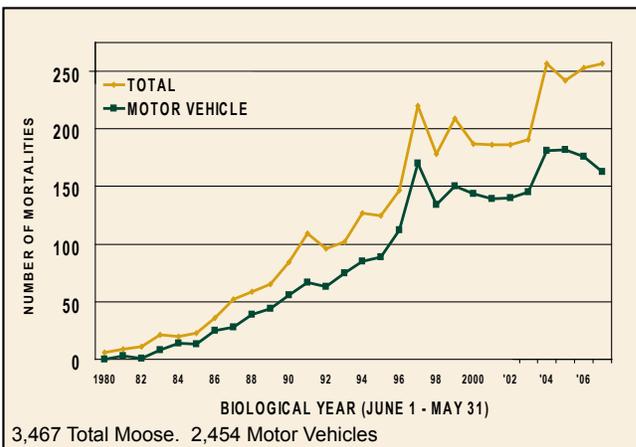


Fig. 3.6 VT non-hunting moose mortalities for biological years 1980 – 2007.

threat to public safety. When finalized, this protocol will conform to the Department's umbrella policy governing how it handles "nuisance" or "hazardous" wildlife in general (Regan 1998). Under the umbrella policy, humane treatment of animals is an important consideration. Euthanasia is recognized as sometimes being the only cost-effective and practical response.

Management Strategies

- 2.1 Develop and implement a policy for Department response to "nuisance" moose.
- 2.2 Continue to cooperate with the Vermont Agency of Transportation (VTRANS) to erect warning signs at traditional moose highway crossings.
- 2.3 Cooperate with VTRANS in implementing roadside brush-clearing projects to improve visibility at the most dangerous moose crossings, when feasible.
- 2.4 Cooperate with VTRANS to investigate the use of new technology that may help reduce moose/vehicle collisions.
- 2.5 Continue with annual press releases to remind motorists of moose hazards during seasons of increased moose movements.

ISSUE 3. Moose Hunting Opportunities

GOAL: To maximize quality moose hunting opportunity.

HUNTING SATISFACTION

Feedback the Department receives from various sources indicates a favorable satisfaction rate from moose hunters on the present structure and timing of hunting seasons. No major changes are being proposed in the current new plan.

Management Strategies

- 3.1 Provide quality moose hunting opportunity in all WMUs where feasible.
- 3.2 Coordinate with large property owners to enhance moose hunter access.
- 3.3 Provide information to hunters on how they can share moose meat with needy households throughout Vermont.
- 3.4 Conduct outreach efforts prior to any significant reduction in total permit numbers made in response to moose population changes.

3.5 Provide public opportunity to harvest moose for food and other utilitarian purposes.

MOOSE PERMIT LOTTERY

An average of 10,448 Vermonters have applied for a moose permit each year for the last five years. Beginning with the 2007 permit lottery, hunters who had applied the previous year but had not won a permit were awarded an extra chance, or “bonus point.” Unsuccessful applicants now accumulate a bonus point for each year they apply and fail to draw a permit. Each “point” adds another occurrence of their name into the lottery pool of applicant names increasing their odds of winning a permit. This recent change has helped satisfy those who have applied for many years without success and seems to have been favorably received by moose hunters. No further changes to the permitting process are currently being contemplated.

Vermont has issued a relatively high number of permits in recent years to reduce the moose population in the Northeast Kingdom. For the 2009 season, 1,230 permits were proposed statewide with 940 allocated to WMUs D2, E1, and E2 alone. Once population goals are reached in the Northeast Kingdom, the number of permits issued may be reduced.

Management Strategies

3.6 Maintain and improve hunter satisfaction by managing a preference point lottery system.

SPECIAL ARCHERY SEASON

Bow-hunting enthusiasts have encouraged the Department and the Fish and Wildlife Board to consider a special archery-only season for moose. Although bows can be used in the current moose season, some archers feel they might have more success in calling moose into close range if they were able to hunt during the peak of the rut and without competition from more mobile firearm hunters. Because of this interest, the Department included the following question in the 2007 telephone survey: “Currently, moose may be harvested during the season with rifles, handguns, muzzleloaders, bows, or shotguns. Do you support or oppose establishing an archery-only season for moose in Vermont in addition to the regular moose hunting season?”

This question was asked only of survey participants who were hunters. Of 252 respondents, 50% were opposed (39% strongly opposed and 11%



moderately opposed) and 39% were supportive (23% strongly and 16% moderately). Four percent neither supported nor opposed the idea while 7% answered “Don’t know.” The 39% of responding hunters corresponds closely with the proportion of Vermont hunters who bow hunt for deer, so it seems likely that most opponents are not archery hunters. Most of the respondents opposing an archery moose season were probably concerned that their chances of winning a moose permit in the regular season lottery would diminish. A similar opposition was expressed prior to the initial deer archery season in Vermont. Subsequently, many rifle hunters took up archery hunting, and the deer archery season became widely accepted. Archery deer season has subsequently added a significant recreational opportunity for Vermont’s deer hunters.

In reality, a limited archery season would have minimal impact on chances for a regular moose season hunter to win a lottery permit because permit numbers are based upon harvest objectives and the success rate of hunters. Archers are expected to have a lower success rate and would be expected to take a small portion of the target moose harvest.

The Fish and Wildlife Board received several petitions in the spring of 2008 for the establishment of a special archery season for moose. Consequently, the Department will propose a Board regulation to establish a short moose archery season, potentially beginning the first Saturday in October. The season might run for nine days with perhaps 50 permits issued via a lottery. Success rates will likely be less than 30%, so the archery moose harvest would be expected to take less than 20 moose statewide. This small harvest would have minimal biological impact on the moose population even if it was in addition to the regular permits set by harvest objective.

Management Strategies

3.7 Propose to implement a limited special archery-only moose hunting opportunity.

ISSUE 4. Moose Viewing

GOAL: Provide safe and quality moose viewing opportunity.

A public opinion survey found that nearly 57% of Vermont residents participated in viewing or photographing wildlife (Duda and Young 1996). White-tailed deer are the most viewed and photographed (89% of respondents). Due to their large size, interesting features, and historical scarcity, viewing moose remains a special thrill for most Vermonters. Moose can often be easily observed and photographed from vehicles while feeding along roadside salt licks or shallow wetlands. People frequently make special trips to the Northeast Kingdom and other areas to observe moose thereby contributing to the economy in rural areas of the state.

The Department answers many inquiries each year concerning when and where to observe moose. Efforts are underway to place a moose viewing tower at a favorite viewing spot east of Island Pond. This project should continue to move forward with completion expected by 2010.

Management Strategies

- 4.1 Construct at least one moose observation tower with a parking area near a state highway in the Northeast Kingdom region and investigate other locations in other regions.
- 4.2 Include moose in a guide to wildlife viewing sites on the Department's website.

ISSUE 5. Moose Habitat

GOAL: Maintain necessary habitat to support 3,000 to 5,000 moose on a sustained basis.

The moose is a northern forest species and uses different habitats during various seasons of the year. In general, moose prefer thick, brushy habitat for concealment and as sources of abundant food. Lowland softwood forests, beaver ponds, and other shallow bodies of water are favorite spring and summer habitats for moose. During the hot summer months, moose can suffer from overheating and must have access to dense shade or water for cooling. Moose also use ponds to escape biting insects and

predators. Moose frequent upland hardwood or mixed forests during the fall and winter. Younger age classes of these forest types provide abundant browse, especially in recently cutover areas. Managing habitats specifically for moose is difficult because this species has a large home range (4 to 10 square miles).

Moose are not as social as deer. Although it is not uncommon to encounter several moose together during the post-rut period, by late winter moose are usually either solitary or found in groups of two or three animals. These small individual groups of moose may each seek out middle-aged to mature softwood stands where they can escape deep snows and severe winter weather.

Moose habitat management is typically a by-product of areas where commercial logging has occurred and produced abundant browse. Forested landscapes that are actively managed therefore contribute to productive moose range. Clearcutting more than 50% of a moose home range within a few years, however, can result in an unfavorable balance of forest age classes which may cause moose populations to decline (Girard and Joyal 1984).

While clearcuts may provide plenty of food, moose prefer to remain close to cover. Thus, there is relatively less browsing within the interior of larger clearcuts, particularly during the winter, than within areas closer to forest shelter. The browse within clearcuts of ten acres or less in size maximizes browse availability to moose. Special habitats that may be critical to moose survival or productivity include late-winter concentration areas, aquatic feeding areas, and salt licks.

Logging practices in Vermont over the past few decades have generally had a favorable impact on moose, especially in the Northeast Kingdom. Timber harvesting in this region increased significantly during the 1980s. Hardwood browse became abundant even in many of the former softwood stands (Moulton et al. 1984).

Many large private forestlands throughout the state are currently enrolled in Vermont's Use Value Appraisal program and/or are under working forest easements. These legal instruments mandate sustained timber harvesting, which benefit moose. Most of the larger state forests and wildlife management areas also have active timber harvesting and habitat management plans designed to sustain a diversity of habitat conditions. Thus, the quality of forested moose habitats in Vermont should remain good

for many years. Exceptions may occur on the “wilderness” designated areas of federal lands, such as the Green Mountain National Forest, which tend to minimize the early successional forests favored as forage for moose. When possible, the Department will advocate for active management to provide for all seral stages of forest vegetation and adequate amounts of early successional habitat to provide for moose and other wildlife species that favor younger forests. In isolated cases, loss of small areas of older softwood trees might be detrimental to wintering moose. In the past, the Department has been able to obtain cooperation from industrial forestland owners in reserving some of these important winter moose habitats from timber harvest.

Vermont also has a wetlands protection law that often affords protection of these important habitats. Thus, natural and roadside salt licks are not likely to disappear in the foreseeable future. Increasing human development, however, is likely to continue to slowly erode moose habitat in Vermont. More important than actual loss of acres of moose habitat will be increases in human/moose conflicts expected as residential development and road systems extend into moose habitat.

Private landowners who wish to consider moose habitat in their land management plans can receive habitat management recommendations from the Department of Fish and Wildlife. A booklet entitled “A Landowner’s Guide, Wildlife Habitat Management for Vermont Woodlands” is scheduled to be updated and reprinted in 2010.

Management Strategies

- 5.1 Implement field studies to investigate, measure, and monitor the degree of moose and deer browsing within selected WMUs.
- 5.2 Provide natural resource professionals and landowners with moose habitat management guidelines.



ISSUE 6. Deer-Moose Competition and Forest Impacts

GOAL: Balance the nutritional needs of regional moose and deer populations with the need for adequate forest regeneration.

White-tailed deer and moose play a significant role in the ecology of Vermont’s forests. As herbivores (plant eaters), seed dispersers, and prey, they can have a large impact on other plants and animals in forest systems. The presence of these animals has profound implications for the structure and function of forested ecosystems. If deer and moose were to disappear from the forest system, a wide variety of changes would ripple through the forest.

Deer and moose feeding habits are a significant influence on the ecology of the forest. Deer have been estimated to eat between four and ten pounds of plant matter each day while moose may eat more than 40 pounds per day. In winter, both species prefer the twigs of many hardwood and softwood trees. In summer, deer focus their feeding on a variety of green herbaceous plants while in the fall, fruits, nuts, and seeds make up an important part of their diet. In summer, moose continue feeding on hardwood and softwood trees but also eat succulent, sodium rich, aquatic vegetation in or near swamps, bogs, and wet forest edges. Browsing by deer and moose is a natural and desirable aspect of Vermont’s forest ecology, but too many deer and/or moose in a given area can cause problems for forests and people.

As the moose population has increased, the question of how to determine carrying capacity for both species separately and in combination has become a challenge. The Department needs to develop new ways to assess forest habitat and its capacity to support both moose and deer while maintaining a healthy native forest. There is also a need to monitor changes in the forest at various scales across the state and through time.

Management Strategies

- 6.1 Develop a study to assess the carrying capacity for moose and deer on Vermont’s forestland.
- 6.2 Develop a decision making process that assists managers in determining the appropriate mix of moose and deer densities for a given WMU based on cultural and ecological factors.

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JOHN HALL

BLACK BEAR

I. Management History

The black bear is a native species in Vermont. It is the smallest of the three North American bear species, grizzly and polar bear comprising the other two, and the only one of the three found in the eastern United States.

To survive in Vermont, black bears require large tracts of forestland. As a result, historical accounts suggest that the state had a fairly abundant bear population when the first settlers arrived. The influx of settlers into Vermont significantly changed habitat conditions for bears. With their axes, the settlers literally cut their farms out of the forests and progressively whittled away the black bear's habitat – confining bears to those mountainous areas too steep or rocky to farm. It was then that Vermont's bear population reached its lowest point.

Loss of habitat was not the only reason for the decline of the bear population. The rapidly expanding human population used their fat, flesh, and hide to sustain themselves. Not being held in high esteem, bears were treated as vermin, readily associated with crop loss and livestock depredation. In 1831 the Vermont Legislature imposed a bounty on bears. Over the next 110 years, 1,295 bounty claims were paid out.

It was habitat change, however, not changes in the bounty laws that saved the Vermont black bear from extinction. Decades of farmers leaving the land following the Civil War led to a pattern of reforestation that provided great benefit to the bear population. Sentiment towards black bears began to change as well. Perhaps echoing the conservation views championed by President Teddy Roosevelt, Vermonters began to view bears and other wildlife as an important natural resource. In 1941 not only was the bounty on bears repealed, but they could only be hunted between June 1 and December 31 each year. Not insensitive to the potential bear damage farmers could incur, Vermont's Legislature obligated the Department, then known as the "Fish and Game Service," to reimburse persons for damages to "livestock." This is still the law.

Laws and regulations affecting the management of black bears during the twentieth century became more frequent as Vermont's human population



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continued to grow. Beginning in 1955 the reporting of harvested bears was required. In 1961, the season was shortened to the 91 days between September 1 and November 30. Other changes regulating the harvest of bears occurred over the next three decades, including prohibiting trapping (1967), limiting the harvest to one bear per season (1968), a prohibition on baiting and requiring bear houndsmen to hold a special permit (1972), and reducing the season length twice (1974 and again in 1990).

During this time of changing management and reforestation, the bear population has grown from an estimated 2,000 bears in 1975 to approximately 5,000 in 2008. Today bears are found in approximately 80% of Vermont from the Massachusetts border to Canada. Compared with their status 100 years ago, black bears are in a secure position. The greatest threat to the survival of black bears is in the form of fragmentation of their habitat (for example, roads and mountainside homes). This situation presents new management challenges for the twenty-first century. Vermonters have indicated they are satisfied with current population levels and wish to see them maintained during the next ten-year management period.

Ensuring the existence of a viable bear population and meeting public expectations for an abundant bear population while, at the same time, not having so many bears that they become a nuisance to agriculture and home owners will be the focus of the management actions contained in this plan.



1997-2006 Plan Accomplishments

➤ **Recommendation 1. *Revise black bear population objectives to reflect public interest in slightly increasing bear populations and repopulate suitable areas currently unoccupied by a breeding bear population.***

➤ **Strategy 1.1 *Analyze population data to determine current population levels and establish revised population objectives.***

❖ **Action:** The Department monitored growth of the state's black bear population. Population models indicated that Vermont's black bear population was relatively stable between 1985 and 1990 with about 3,000-3,400 bears existing in the state. Estimates indicate that the steady growth in the bear population occurred over the next ten years with about 4,800-5,200 bears existing by 2000.

➤ **Strategy 1.2 *Reduce black bear harvests by establishing a bear license or regional management zone.***

❖ **Action:** Reduced Vermont bear harvests from 1996 through 1998 resulted from a combination of widely distributed food supplies and the shortening of the length of the bear season beginning in 1990 that contributed to an increase in the statewide bear population. The plan's population goals were met without establishing a bear license or regional bear management zones. Another reason, however, that these actions were not taken was an increasing level of nuisance bear activity. As nuisance bear complaints increased, Department staff became concerned that a black bear license might reduce hunter participation to the point where harvests would

no longer be an effective bear management "tool." When a bear license was proposed, initial legislative language proposed a fee that the Department felt would discourage hunter participation. For these reasons, the Department abandoned efforts to establish a black bear license.

➤ **Recommendation 2. *Continue bear habitat conservation strategies such as Act 250, land acquisition, review of wood-to-energy harvest operations, and town and regional planning. The Department should pursue regulated logging and explore instituting a habitat stamp.***

➤ **Strategy 2.1 *Continue Department efforts on Act 250, land acquisition, review of wood-to-energy harvest operations, and town and regional planning.***

❖ **Action:** Between 1997 and 2006, Department staff reviewed 283 Act 250 projects that could potentially affect an estimated 1,000 acres of critical black bear habitat. As a result of subsequent revisions in these projects, a total of 12,621 acres of black bear habitat were protected during this ten-year period. The Department also published *Conserving Vermont's Natural Heritage*, a book to guide town planning for wildlife habitat, including black bear habitat. A new Department employee was assigned to work with town and regional planning agencies to guide conservation of wildlife habitat.

➤ **Strategy 2.2 *Pursue regulations on logging in critical bear habitat.***

❖ **Action:** The Department participated on the Heavy Cutting Committee that directed legislation on heavy cutting in Vermont. Department recommendations

to include critical bear habitat in this legislation were not incorporated into the law.

➤ **Strategy 2.3 *Investigate establishing a habitat stamp.***

❖ **Action:** Various funding "stamps" were discussed with a legislative committee but no action on a habitat stamp occurred.

➤ **Recommendation 3. *The Department will propose establishing a black bear license.***

❖ **Action:** As described in Recommendation 1, efforts to establish a black bear license were abandoned due to concerns over an increasing bear harvest, increased nuisance bear complaints, and potential for decrease in bear hunter participation. The concern was that this action might result in an increase in the bear population to a point where it exceeded the target population objective established by the plan.

➤ **Recommendation 4. *Regional management zones may be used to adjust bear harvests to meet higher population objectives.***

❖ **Action:** Regional management zones were also considered as a management tool to increase bear numbers in areas where suitable habitat remained unoccupied. Expansion of the bear population during the previous planning period eliminated the need to adopt management zones.

➤ **Recommendation 5. *No changes to season length or structure will be initiated until after it is determined if a black bear license will be established.***

❖ **Action:** Bear population goals were achieved without the implementation of a bear license, regional management

1997-2006 Plan Accomplishments

zones, or changes in the season structure. Changes in length of the season could be needed in the future to meet bear population objectives.

► **Recommendation 6. The Department will propose hunting hours for bears be changed to correspond to those for deer.**

❖ **Action:** These changes were established in state statute.

► **Recommendation 7. Work closely with the Vermont Bear Hound Association to discuss issues of concern.**

❖ **Action:** Department staff participated in many meetings with the Bear Hound Association to discuss bear issues, such as length of training season, nonresident dogs, procedures for addressing public perception/landowner conflicts, and public education. This

cooperative effort has resulted in regulatory changes in bear hound permits related to the ownership and residency requirements of dogs listed on permits. It has also led to successful dealings with negative human-bear interactions. The Department worked to modify state statutes related to black bear causing property damage.

► **Recommendation 8. The Department will establish a monitoring program on the sale of all bear parts through a mandatory tagging program.**

► **Strategy 8.1 Evaluate level and nature of sale of bear parts.**

❖ **Action:** The Department conducted a survey of successful bear hunters to determine the nature of using harvested bears and bear parts, including whether parts were being sold. Survey results

indicated that bear hunters fully utilized harvested bears. The sale of gall bladders and other parts was found to be insignificant and no threat to the sustainability of Vermont's bear population.

► **Strategy 8.2 Department will establish a monitoring program through mandatory tagging for the sale of bear parts.**

❖ **Action:** Results from the Vermont hunter survey indicated that a mandatory tagging program was not necessary to protect Vermont's bear population. It was determined that costs associated with mandatory tagging would not provide a cost-effective benefit in management of the already growing bear population. Department staff continued to monitor the global and national markets for bear parts.

II. 2010-2020 Black Bear Management Issues, Goals, and Strategies

ISSUE 1. Bear Population Size and Distribution

GOAL: Identify an appropriate bear population objective that ensures the viability of a wild, free-ranging bear population, provides for hunting opportunities, and satisfies human social expectations and tolerances for nuisance bear occurrences.

Black bears can be found throughout Vermont where preferred food and cover is located (Fig. 4.1). They are secretive animals that prefer to travel among forest and shrub habitat, usually only using fields and large forest openings at night or in low light. Normal bear behavior includes a strong avoidance of humans. Given these bear characteristics, the greatest bear population densities are found along the spine of the Green Mountains and in the Northeast Kingdom counties of Orleans,

Caledonia, and Essex. Because male and female bears lead separate lives, it is important to recognize the differences in the territorial ranges that each sex selects. Males are more solitary and tend to roam further in search of food and shelter. During the breeding season (June) older, more dominant males will search wider areas for receptive females. Females, on the other hand, tend to use smaller home ranges having high quality food sources and security for raising cubs.

Central to the management of a species is the need to accurately estimate the size of its population, the factors that influence growth and decline of the population, and the distribution of the population across the landscape. Based on this information, management goals can be met that satisfy the species' biological needs and human expectations.

Unlike other big game species, estimates of the bear population must be made using five-year averages. There are several reasons for this: bears live longer, they have a low reproductive rate, and harvests vary, depending on food supplies. Although the five-year averages do not pinpoint current bear populations,



they do reflect population trends very well up to the previous year. The data for making population estimates include all known bear mortalities (nonhunting and hunting) and include such factors as age, sex, and location of harvest.

Figure 4.2 illustrates the estimated average Vermont black bear population beginning with the five-year period 1983-1987. The graph shows two periods of population increases – the early 1990s and the late 1990s/early 2000s. The 2003 – 2007 estimated population was between 4,600 and 6,100 bears in 2007. This represents an estimated 27% increase over the 1997 population estimate. These increases in the black bear population are consistent with management goals laid out in the previous plan.

In developing the current management plan, the Department sought Vermonters’ opinions on whether bear populations in their county should increase, stay the same, or decrease. The majority of Vermonters surveyed (57%) wanted to see bear populations in their county remain the same, 16% wanted the population to increase, 7% wanted it to become lower, and 20% either didn’t have an opinion or didn’t know (Fig. 4.3)

In general, Vermonters’ opinions on bear populations were consistent across regions of the state. There were two exceptions: in Central Vermont 22% of the respondents supported an increase in the population and in Chittenden County 28% of respondents either had ‘No Opinion’ or ‘Didn’t Know’ (Table 4.1). Of those Vermonters favoring to increase bear populations, wanting to see more bears and the value of bears to

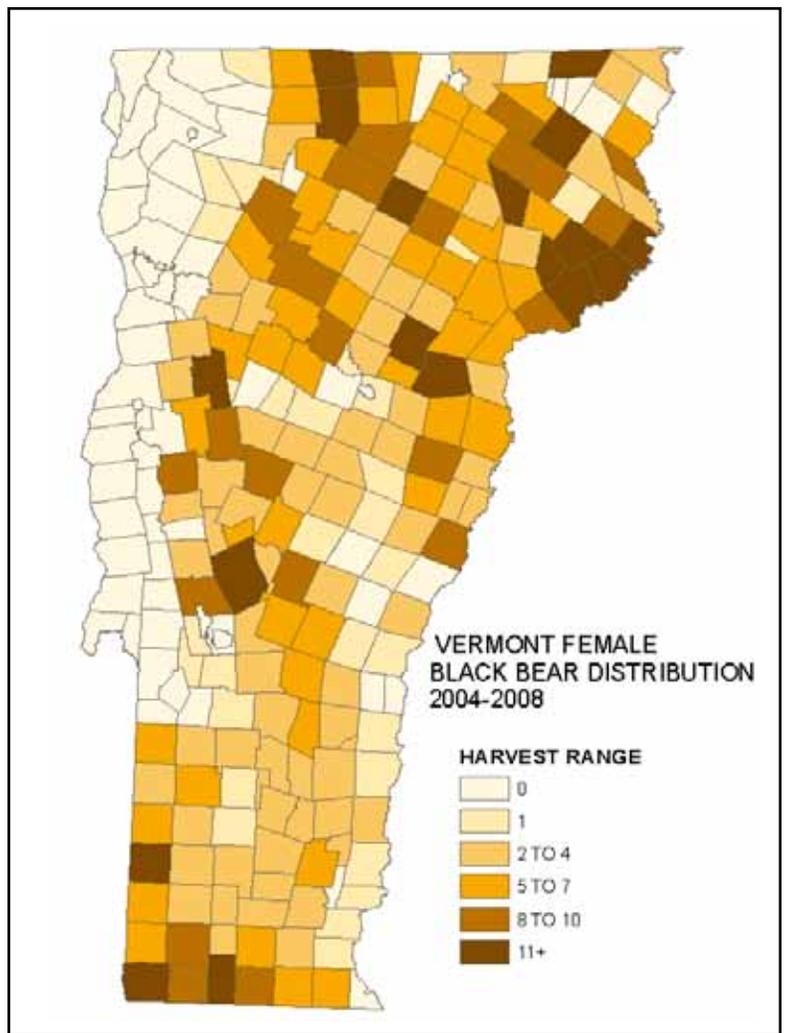


Figure 4.1 Distribution of female bears from harvest data, 2004-2008.

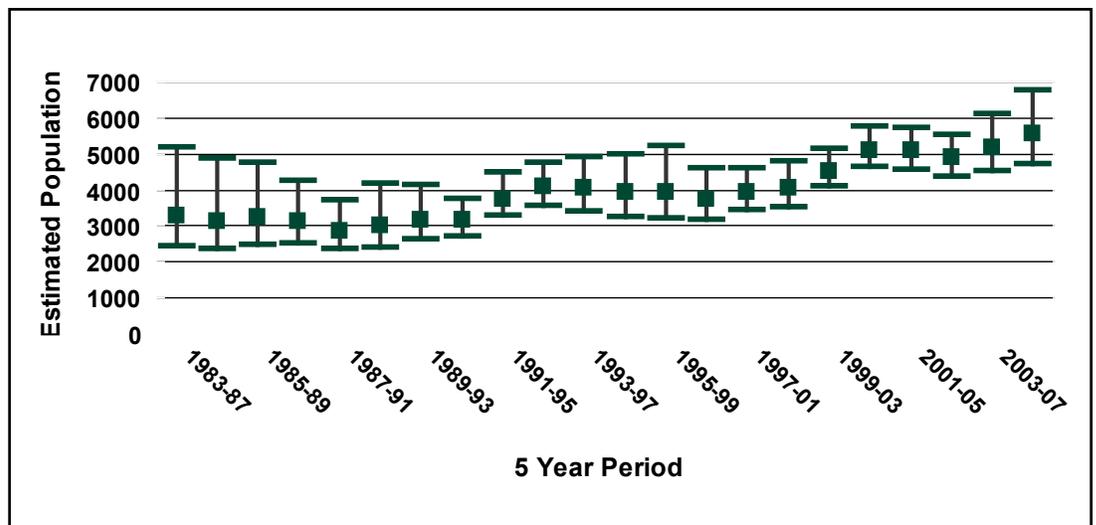


Figure 4.2 Estimated Black Bear populations by 5-year blocks, with 80% confidence limits, 1987-2008.

the ecosystem were given as the primary reasons. Residents of the Central and Southern Vermont regions who wanted bear population increases were particularly interested in seeing more bears. Statewide, reducing bear-human conflicts was the primary reason given for wanting decreases in local bear populations.

In contrast to Vermonters' general satisfaction with bear populations in their county, bear hunters satisfaction declined significantly from 75% to 54% since the previous survey was conducted in 1996. Dissatisfaction increased from 20% to 32% during the same survey interval. The survey was not able to query the rationale for the decline, but factors other than bear population levels, such as access to unposted land or a low bear harvest the previous year may have influenced respondents' opinions.

Management Strategies

- 1.1 Update and re-evaluate Vermont's black bear population model to reflect the most current harvest and biological parameter data available.
- 1.2 Evaluate and develop hunting season structures that align population estimates with biological data, habitat limitations, and public satisfaction data to sustain a bear population between 4,500 and 6,000 animals.

ISSUE 2. Bear Habitat Conservation

GOAL: Maintain a no net loss of function and value of existing bear habitat.

Historically, black bear management programs concentrated on regulating the legal harvest of the species to ensure that the population was sustainable. Today, management objectives in Vermont revolve around maintaining wild, free-ranging, viable populations of black bear as well as the conservation of bear habitat. Wildlife managers are looking toward conservation of large blocks of interconnected forestland and protection of the most critical areas of black bear habitat as the best

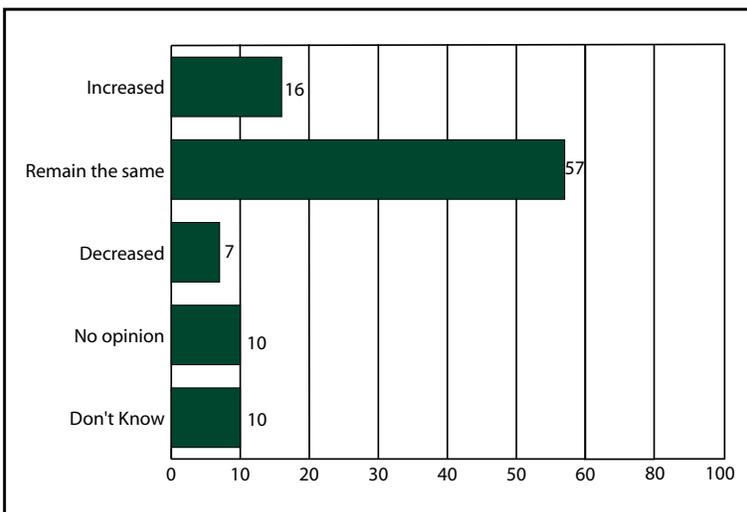


Figure 4.3 .Vermont residents' opinion regarding future bear population change

Table 4.1 Vermont Residents' Opinions on Desired Bear Populations by Region.

Region	Increase	Same	Decrease	No Opinion	Don't Know
Chittenden	10 %	56 %	5 %	14 %	14 %
Northeast Kingdom	17 %	60 %	9 %	8 %	6 %
Central Vermont	22 %	54 %	7 %	7 %	10 %
Southern Vermont	18 %	60 %	7 %	7 %	9 %

long-term strategy for sustaining Vermont's bear population.

In Vermont, black bears require large forested areas that have a variety of food resources, particularly hard mast such as acorns and beechnuts, and provide core habitat for successful reproduction and allow them to avoid humans (Hugie 1982; Hammond 2002). Black bears rely on concentrated stands of American beech trees located at least one kilometer from roads and houses as an essential fall source of high nutrition food needed to build fat reserves prior to denning for the winter (Hammond 2002; McLaughlin 1998; McLaughlin et al. 1994; Wolfson 1992; Hugie 1982; Beeman et al. 1977). Researchers have found during years that beechnuts are in short supply, bears travel great distances to find alternative food sources and incur heavier mortality rates (McLaughlin et al. 1994). The availability of hard mast in the fall affects the minimum reproductive age and rate and cub survival. Simply put, concentrated stands of beech trees used by black bears are critical to the survival and reproduction of bears in Vermont.



Other important hard and soft mast food resources in Vermont include acorns, cherries, berries, apples, and mountain ash.

Vermont's bear population has increased in recent decades as forests have increased over the landscape and recent bear management strategies have encouraged population growth. Bears are now found throughout much of the state, yet the greatest concentrations of Vermont bears are found in "core" habitats that tend to be remote from roads, human developments, and human activity. Vermont black bears need large forested blocks of sufficient size to meet the home range and food requirements of female bears and cubs. The existing range, although becoming increasingly more fragmented in some parts of the state, has been sufficient to support an increasing bear population. Large public and private forest land holdings play an important habitat conservation role in this regard.

A recent study at the University of Vermont, however, indicates that increases in human development will diminish bear habitat (Donovan et al. 2007). The study projects that between the years 2000 and 2020, the number of housing units in Vermont will increase by at least 12,107 and that most of these units will occur in what are now relatively undeveloped locations. Under this scenario, the occurrence of black bear would likely decline in some areas of the state in the next 12 years (Fig. 4.4).

In the mid-1980s, the Department recognized the negative impact that housing developments were having on key black bear feeding and travel areas and began recommending through Act 250, the state's land use and development law, protection of

critical bear habitat. For six years during the 1990s, Department biologists studied the movements and behavior of radio-collared bears in relation to roads, houses, ski trails, and various recreational activities. The findings from this study have helped the Department in its efforts to work with developers to include the habitat needs of bears into their long-term planning processes (Hammond 2002).

Today, the Vermont Fish & Wildlife Department provides advice and technical assistance for the protection of critical bear habitat, such as beech and oak stands, wetlands, and travel corridors. For example, the Department has been working with the Vermont Agency of Transportation to address the issue of habitat connectivity by developing wildlife suitability maps identifying areas that support animals that require large areas, such as black bear and moose. These maps help identify areas that should be conserved and managed so that animals can safely cross roads that bisect their habitat. The map also provides towns and regional planning commissions with a focus for land use planning (Fig. 4.5).

Public opinion surveys suggest that Vermonters continue to strongly support many forms of habitat conservation. Surveys also found that the public supports land conservation efforts in order to maintain the existing habitat base. In addition, 89% of the respondents said it was important to them to know that species like the black bear exist in Vermont, even though they are seldom seen. Eighty percent of Vermonters support using Act 250 as an important habitat protection tool (Duda et al. 2007). Although Act 250 is unique and effective legislation, it does not apply to development involving all critical bear habitat. A survey conducted by Responsive Management (Duda et al. 2007) found that 92% of the general public supported the Department working with town or regional planning commissions to design town plans that address and preserve important wildlife habitat. As a result, the Department has increased its efforts to work with towns and regional planners by providing technical assistance and on the ground assistance for related issues involving conservation of wildlife habitat.

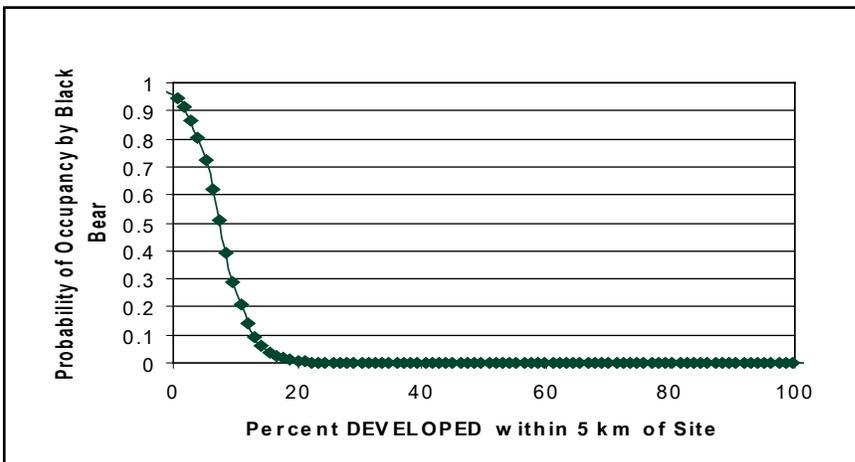


Figure 4.4. Probability of occupancy of a site by black bear in Vermont in relation to the percent of development.

Management Strategies

- 2.1 Maintain and enhance habitat protection efforts through Act 250, wood-to-energy harvest review, work with town and regional planning commissions, land acquisition, and other conservation methods.
- 2.2 Provide technical assistance in managing for critical bear habitat in the Use Value Appraisal program.
- 2.3 Revise and update “A Landowner’s Guide, Wildlife Habitat Management for Vermont Woodlands” to include habitat management recommendations for black bears.

ISSUE 3. Human/Bear Conflicts

GOAL: Minimize the overall number of negative interactions occurring between bears and humans to achieve acceptable levels of human safety and social acceptance.

Bear populations, like all wildlife populations, are normally restricted by two factors — biological carrying capacity and cultural carrying capacity. As described previously, biological carrying capacity is the maximum number of animals an environment will support on a sustained basis. Population density and distribution depends on availability of food, cover, and space. Cultural carrying capacity is the maximum number of bears that can coexist compatibly with local human populations. Bear habitat can often support more animals than the public is willing to tolerate. Bears are large animals capable of causing extensive property damage and even human injury.

Department personnel have documented an increase in the number of people reporting conflicts with bears since the last management plan (1997-2008). This is also reflected in survey data from 2007 that found 14% of wildlife damage incidents were related to nuisance bears. This represents a seven-fold increase from 1996 when only 2% of incidents were related to nuisance bears. In spite of this increase in bear/human conflicts, a large majority of Vermonters (70%) are tolerant of bears on their property while only 18% are not (Duda et al. 2007). Had Vermont residents not had this tolerance for bears, the Department expects that many more might have registered reports of conflict given the increase in both bear numbers and the human population in the past ten years.

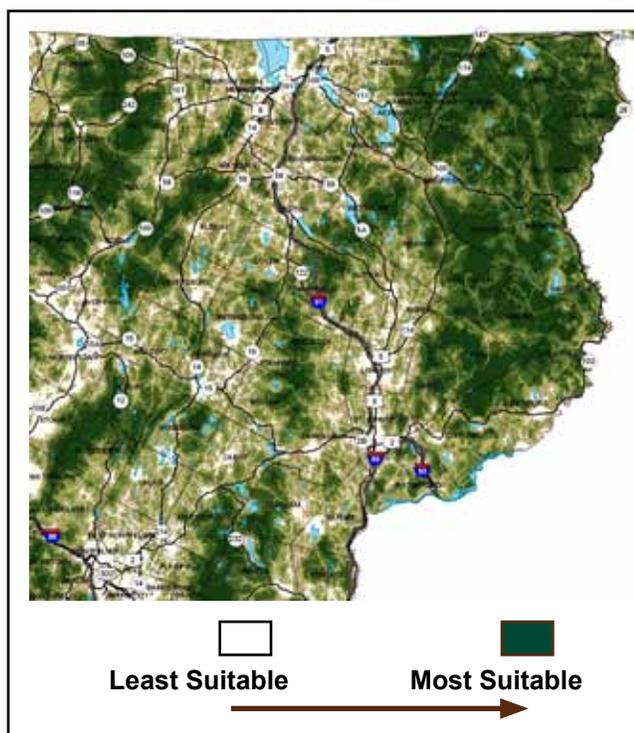


Figure 4.5 Wildlife Suitability Map example for black bear and other wide-ranging species.

Hunting plays a significant role in shaping Vermont’s cultural carrying capacity for bears. The Vermont Fish & Wildlife Department uses regulated hunting both to provide harvest and utilization of bears and as a tool to maintain bear numbers at target population levels throughout the state. Hunting also teaches bears to be wary of humans. This reduces the number of bears that might become “nuisance animals” causing damage to livestock or farmers’ crops, raiding dumpsters, or entering buildings in search of food.

The history of hunting and utilizing bears for food in Vermont is a long one. The Department believes that regulated hunting and the training of hunting dogs helps keep Vermont’s bears wild, which in turn has encouraged a higher cultural carrying capacity. The extreme wariness of the Vermont black bear may be related to the bounty system that was in place for 110 years ending half way through the twentieth century. Following the end of the bounty system, liberal hunting seasons and the chasing of bears with hounds has continued to make bears wary of humans. Currently, nuisance bear situations are more likely to occur when there is a shortage of natural food sources that cause them to become bolder in their search for food.

Generally, the wariness of black bears limit their exposure to human-occupied landscapes. A



shortening of the bear hunting season in 1990 resulted in a planned increase in the bear population, resulting in more bears attempting to establish home ranges in less secluded areas that had previously been unoccupied. Vermont now has more bears living in closer proximity to human residences. This situation has increased the likelihood of undesirable human interactions. These situations include, but are not limited to, the destruction of farmers' crops, commercial beehives, and fruit orchards; the killing of livestock; the raiding of garbage barrels and bird feeders; and an increase in the number of bear-motor vehicle collisions.

The Department has developed posters, brochures, and public service announcements designed to increase awareness and to help the general public understand black bear behavior and to live better with black bears (Fig. 4.6). These public outreach efforts advise citizens to remove bird feeders from their yards when bears are not in hibernation and discourage feeding bears through the slogan, "A fed bear is a dead bear." Game wardens also advise and help landowners who report damage from bears.



Management Strategies

- 3.1 Update statewide policy for handling black bear/human conflicts.
- 3.2 Improve and disseminate outreach/education materials and messages for minimizing human/bear conflicts.
- 3.3 Monitor bear/human conflicts and explore new strategies for reducing the number of complaints from the public.
- 3.4 Use permitted houndsmen with trained bear hounds to haze bears and keep them wary of humans.

ISSUE 4. Bear Management Strategies and Season Structure

GOAL: Optimize public hunting opportunity for the utilization of bears for food and other appropriate purposes and ensure hunter satisfaction within biologically sustainable regulations.

People hunt for many different reasons, but over 90% of hunters who were surveyed listed the reason they hunt black bear was "for food." Most hunters also have a deep appreciation of the out-of-doors and love and respect the species they pursue during hunting season and watch during the rest of the year. This appreciation often results in hunters leading efforts for increased harvest regulation, habitat protection, and other conservation initiatives.

There are currently 25 laws and regulations that regulate the harvest, utilization, and sale of bears in Vermont. Black bear season is currently set on a statewide basis with no regulatory differences among wildlife management units. The season length is one of the longest in the nation, running from September 1 to the Wednesday following the opening day of the November deer rifle season. Use of trained hunting dogs to hunt bears is allowed in Vermont by permit only. Baiting for the purpose of taking bears is prohibited. The bag limit is currently set at one bear per licensed hunter per season.

The management of Vermont's black bear population through regulated hunting offers several challenges.

Figure 4.6 Two-foot by three-foot black bear poster developed by the Department for distribution to the public.

Annual black bear harvests are sometimes more reflective of food availability, weather events influencing the timing of denning, and other factors affecting bear movements instead of simply increases or decreases in the population (Fig. 4.7). For this reason, managing a bear population requires reviewing several years of harvest information before proposing regulatory changes to the hunting season. The low reproductive rate and longevity of black bears further complicate management by delaying bear population responses to harvest adjustments (Fig. 4.8).

Black bear hunting participation rates in Vermont are relatively low, remaining significantly below that of white-tailed deer and wild turkey. They have decreased from an estimated 28% of hunters in 1996 to 17% in 2007 probably as a result of shortening the length of the bear season that overlaps with the November rifle deer season. Prior to shortening the season in 1990, bear harvest levels were greatly affected by deer hunters that opportunistically harvested black bear while pursuing deer. Given these facts, it may come as no surprise that bear hunting satisfaction decreased from 75% to 54% between 1996 and 2007.

There are a variety of management strategies available for stabilizing and maintaining existing bear populations in Vermont while providing hunting opportunities. Listed below are management tools that can, individually or in combination, aid in regulating the bear harvest to meet the statewide population goals of 4,500 to 6,000 bears. It must be emphasized that bear season length and structure have historically been adjusted to increase or reduce the statewide bear population.

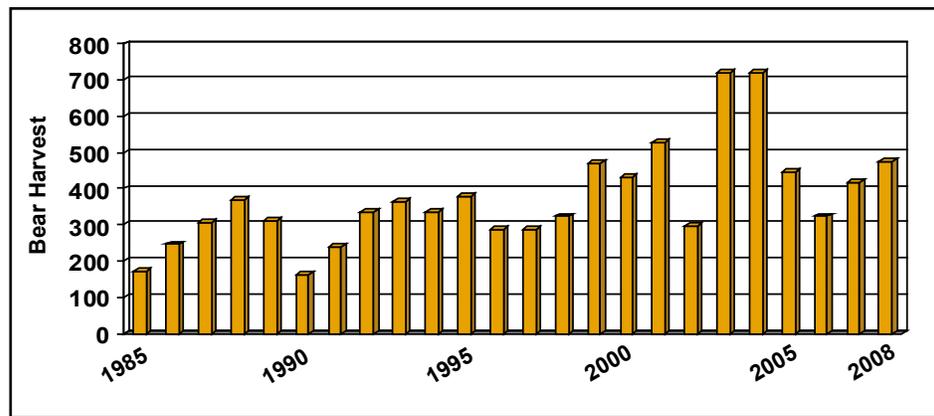


Figure 4.7. Annual Vermont black bear harvest, 1985-2008.

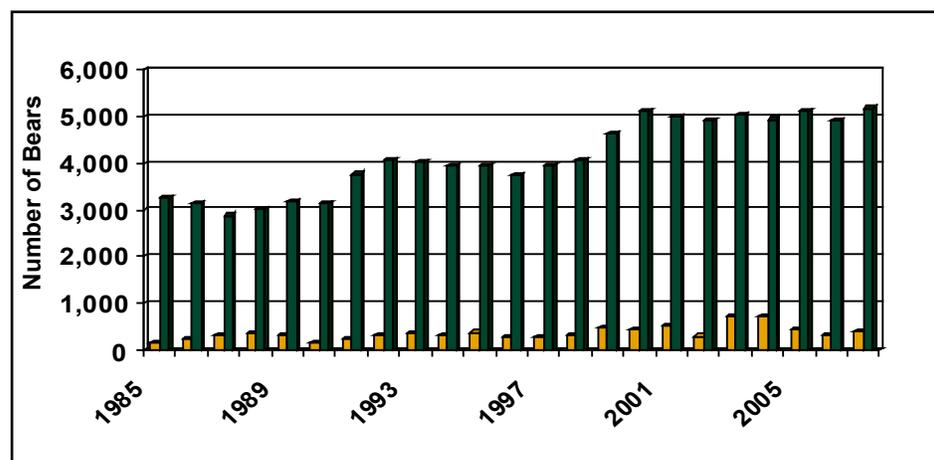


Figure 4.8 Vermont bear harvest as a proportion of population estimate.

Bear License

A key component to an accurate population measure based on harvest is the parameter of hunter effort. Simply examining harvest differences each year cannot provide a reliable correlation between harvest and total numbers of bears. Bear hunters in Vermont are not required to purchase a separate bear license. A bear tag is included as part of the big game hunting license. This license has a long history (at least 45 years) and has resulted in the expectation that a bear tag is part of the value purchased with the big game license.

A separate black bear license would be one way to determine the number of hunters intending to pursue bears each year. However, the sale of separate bear licenses would not provide other important information such as hunting hours expended in pursuit of bears, the number of bear sightings, or WMU preferences. Collection of all of these data could be accomplished without requiring a separate bear license. Since 2000, surveys indicate that 46% of



all bears harvested were taken incidentally by hunters while hunting another game species. Deer hunters took the largest percent of bears, 29% (Table 4.2).

Survey results from 2007 indicate opposition to the establishment of a separate black bear license has remained at 61%. The percent of hunters supporting a separate bear license had declined to 29% in 2007 from 31% in 1995. These results suggest implementation of a separate license would be difficult. Given that Vermont's bear population has been increasing, it is possible that it will be necessary to extend bear season further into the November deer rifle season in the future. Reducing the number of hunters that may take a bear by requiring a new and separate bear license could jeopardize the Department's future ability to control total bear numbers.

Bag Limit

Vermont's statewide bear season bag limit of one bear was first established in 1968. Bag limits may be effective means of adjusting harvest levels to meet particular population goals. The single bear season bag limit has served Vermont well in initially reducing bear harvests and allowing for population growth. New population goals that require stabilizing or potentially reducing the number of bears could involve re-examining the current bear season bag limit. However, increasing the annual bag limit for bears might call for reducing the length of the bear hunting season, a move that could require eliminating the current overlap of bear season with the first five days of the deer rifle season. Increasing opportunity for one segment of the hunting population will likely decrease opportunity for another.

To date, only Oregon, Washington, and Alaska have fall season bag limits greater than one. Several states and Canadian provinces hold a spring bear season that includes its own bag limit. Although increased fall bag limits are a relatively untested management tool, they may be important in stabilizing bear populations if they can be implemented cautiously and other management tools prove to be ineffective.

Table 4.2 Percent of Vermont bears harvested while hunting for a specific species 2001 – 2008.

SPECIES HUNTED	SEPTEMBER	OCTOBER	NOVEMBER	TOTAL	PERCENT
Bear	1,233	883	264	2,380	54%
Deer	0	473	797	1,270	29%
Birds	4	16	3	23	<1%
Other	15	55	14	84	2%
Unknown	270	230	132	632	14%
Total	1,522	1,657	1,210	4,389	100%

It would be critical to monitor any increased harvest from expanded bag limits to evaluate its effects on regional bear populations and the sex and age of the animals harvested.

The Department believes that revising the bear season bag limit is one possible way to stabilize and control the bear population. Since this method would reallocate the bear resource, any proposal to change bag limits, however, will need to follow a rigorous public outreach effort and significant buy-in from the hunting public.

Regional Management Zones

Management of black bear is currently conducted on a statewide basis because data in measuring hunter effort and distribution are inadequate to inform fine scale regulation of harvest. Although simple to administer, comply with, and enforce, a statewide bear season does limit the flexibility of the Department to adjust the harvest in response to regional issues or variables. In spite of its small size, Vermont does have significant regional differences in bear density, bear habitat use, food supplies, weather patterns, road access, habitat fragmentation, hunting pressure, number of nuisance complaints, and development pressure. As a better understanding of bear population distribution develops, the flexibility to tailor hunting seasons to regional differences may be necessary.

Season Length and Structure

Vermont has regulated the annual bear harvest for the past 40 years by simply adjusting the length of the hunting season. In particular, the number of days that bear season is open during the November deer rifle season has the greatest effect on the total bear harvest especially during years when food supplies are abundant and bears continue to feed instead of going to their dens for the winter.

In 1990, Vermont's bear season was shortened by four days in November (from the second Sunday of deer season to the first Wednesday) in order to reduce bear harvests and increase the population. As previously discussed, this management action was very effective and resulted in a significant increase in Vermont's bear population.

The Department has demonstrated that incremental changes in the number of days that bear season extends into the November rifle deer season is an effective means to regulate the harvest of bears and to adjust the bear population. However, creative ways to achieve population goals on a local or regional basis may be needed in the future. As human and/or bear populations grow, greater flexibility may be needed to address the specific issues to best respond to the needs of bears and people.

Hunting Bears with Hounds

Bear hunting with hounds can be a controversial method to locate and pursue a bear. The Department recognizes and acknowledges that there are issues of public concern such as hounds on private property, the use of telemetry, and the length of the training season. Nevertheless, the Department continues to support bear hunting with hounds as a legitimate and biologically sound hunting method that has advantages in that chasing bears keeps bears wild and minimizes nuisance and other conflicts with humans. Vermont game wardens routinely recommend bear houndsmen to property owners who are dealing with nuisance bears. Houndsmen have come to the rescue of many a farmer who has had problems with bears in their corn, apple orchard, or beehives. Many times, chasing a bear away will prevent its death at the hands of the property owner.

Bear houndsmen are required to have a permit to train and hunt bear with dogs in Vermont. The number of nonresident bear houndsmen permitted to hunt in Vermont is limited to 10% of the resident permit numbers. Recent law changes have placed greater restrictions on the ownership and residency of the dogs permitted to run on the permits of Vermont resident houndsmen. Because the number of bears taken with the aid of hounds is only about 10-15% of the total bear season harvest, bear hunting with dogs is not the most important method for controlling the bear population. The benefits of hunting bears with dogs are significant, however, and the Department will continue to address issues of public concern that would restrict hound hunting in Vermont. The

Department will also continue to work closely with the Vermont Bear Hound Association to discuss and understand the issues of concern and identify actions that can be taken to address them.

Sale of Bear Parts

The Department continues to participate in and monitor national and international assessments of the effect of trade in bear parts on wild bear populations. Recent changes in the market for bear parts along with increasing black bear populations in North America have reduced concerns over this activity in recent years. The 1992 listing of the American black bear as a CITES Appendix I species now also provides significant monitoring of international trade.

The Department will continue to monitor the sale of black bear parts. If trends and activity in the sale of bear parts, particularly gallbladders, is found to be detrimental to Vermont's bear population or pose a threat to bear populations in other parts of the world, it may propose further regulation or prohibition of such sales.

Guided Commercial Bear Hunts

Bear hunters have expressed their concern that commercial guides have been securing exclusive hunting rights to key bear feeding areas such as cornfields near traditional bear travel routes. This allows guides to offer clients a "guarantee" of sorts that they will take a bear because of the high concentration of bears in these areas. Because cornfields may attract bears from several miles, it has been suggested that the cumulative harvest of bears at these sites could have a disproportionate impact on bear populations in several nearby towns. On face value, this seems to be a plausible argument, but it has not been borne out by statistics.

Guiding, when properly administered, can be a quality introduction to hunting and a form of hunter mentoring. These are important components of hunting recruitment and retention. Poorly administered guide services that are purely profit-driven can be very damaging to hunting. Developing some standard for commercial guiding may be a way to assess the effect on the bear population from the guiding industry through analysis of hunter effort and harvest data. A standard might also serve as a marketing tool for guides. Guide programs administered by fish and wildlife departments in other states are not self-supporting and are costly to administer.



Management Strategies

- 4.1 Hunting season management strategies and season structure will be evaluated and adjusted to maintain the population goal of 4,500 to 6,000 bears. Changes in hunting season structure will consider, when necessary, the use of season length, regionalization, or incremental changes to season bag limits to achieve population goals.
- 4.2 Work with partner organizations on issues related to bear management as they are raised throughout the management plan period and develop specific strategies to address them. Such strategies may range from legislative changes to educational efforts.



TIM HALL

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WILD TURKEY

I. Management History

Records from the late 1700s and early 1800s indicate wild turkeys were present in southern Vermont. Most turkeys in the state seem to have existed along the Taconic Mountain Range in the southwest and along the Connecticut River Valley in the southeast. Massive loss of forestland and unregulated market hunting in the early nineteenth century led to the disappearance of Vermont's wild turkeys by the mid-1800s.

A number of private fish and game clubs attempted to re-establish the birds during the late 1950s at various locations around the state by releasing turkeys raised on game farms. This effort failed, however, because these birds lacked the inherent hardiness and survival skills of wild turkeys. These stocking attempts convinced the Department that successful reintroduction of turkeys into Vermont would require live-trapping of the hardier wild birds from another state.

In the late 1960s, the Department made arrangements with the New York Department of Environmental Conservation to permit Vermont biologists to live-trap wild turkeys and relocate them. Vermont first released 17 wild New York birds in Pawlet, Vermont, in 1969. A second release of 14 wild birds was made in Hubbardton in 1970. Today's wild turkey population of more than 50,000 birds directly descends from this original stock of 31 New York wild turkeys. The Department initially expected the expansion of the wild turkey population to be limited to the part of the state reported to be historical wild turkey range, south of US Route 4. Only 30 years after introduction, turkeys ranged across the entire state. These hardy birds have far exceeded expectations and have successfully exploited Vermont's mosaic of forestland and dairy farms.

The Department began efforts to expand wild turkey range within the state soon after their initial introduction. Over a ten-year period ending in mid-1980s, live-trap and transfer techniques were employed to capture and move wild birds from the original release area in Rutland County to other parts of the state. Birds were released in Bennington, Brattleboro, Bristol, Dummerston, Grand Isle, Halifax, Jericho, Milton, Norwich, Pownal,



Rockingham, Shaftsbury, Springfield, Strafford, and Weybridge. Birds were also restocked in Alburg, Fairfax, Georgia, Grand Isle, and Swanton in the mid-1990s to augment a struggling local population perhaps limited by overharvesting in the fall.

Vermont's first, modern wild turkey hunting season was held in parts of Addison, Bennington, and Rutland Counties in the spring of 1973. A season was held for 12 days (May 9-20) with a limit of one bearded turkey. Twenty-three turkeys were harvested by 579 permitted hunters. The first fall hunt, held in 1975, occurred in a limited area of southwestern Vermont.

Over the past 30 years, wild turkeys have thrived in Vermont and public participation in turkey hunting has continued to increase. Reduction in fall harvest opportunities imposed following the disastrous and extremely severe winter of 1993-94 helped stimulate rapid turkey population growth and expansion. The population is estimated to have increased from approximately 12,000 to 45,000 birds in the period from 1995 through 2001. The increase in spring turkey harvest mirrors the species' population growth (Fig. 5.1).

Turkey hunting opportunities have been expanded to new areas of the state as the population has grown. The entire state of Vermont was opened for the first time to spring turkey hunting in 2004. In addition, relatively liberal fall turkey hunting opportunities, compared to those in other states, are now offered

in most areas of the state. Average annual combined spring and fall harvest of turkeys now totals about 5,800 birds per year. Viewing opportunities have also expanded tremendously for thousands of Vermonters who delight in simply viewing wild turkeys in their natural setting. As a result of the Department's turkey management initiatives, the wild turkey population has risen to the highest level in Vermont history. The wild turkey population is currently estimated to exceed 50,000 birds statewide.

Wild turkey research has found that short-term turkey population fluctuations result from combinations of random environmental conditions such as rainfall and temperature events that affect nesting hatching success, survival of poults and winter survival. Long-term population trends, however, are primarily influenced by changes in the quantity and quality of suitable habitat across the landscape.

Forests now dominate close to 75% of Vermont's land area with only about 15% in an open, nonforested condition. Although the eastern wild turkey is primarily regarded as a forest-dwelling bird, ideal turkey habitat includes a diverse mix of habitat types, forest succession stages and open land, which provides the greatest opportunity for feeding, nesting, and brood rearing. Research shows that turkey nesting rates are consistently higher and turkey populations more stable in habitats consisting of a mosaic of forests and fields than in those areas composed mainly of either mostly forest or mostly open land. The highest densities of turkeys in Vermont follow this pattern, occurring in areas where the available habitat is closer to the ideal mosaic mix of conditions.

Forests are an important habitat component for turkeys especially when forests consist of oak, beech, and pine stands that produce abundant hard mast crops (acorns, beechnuts, and other seeds) that are consumed by the birds in the fall and winter months. Forests also provide the large, dominant trees used by turkeys for roosting. These types of forests are relatively common in Vermont, especially in the

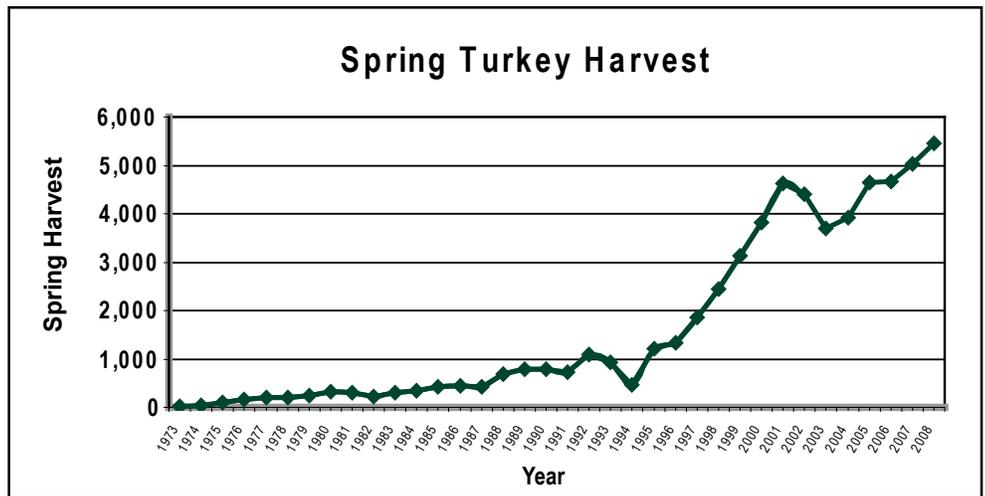


Figure 5.1. Spring Turkey Harvests 1972 - 2008

Champlain Valley, Connecticut River Valley, and the foothills of the Green Mountains and Taconic Mountains. Forest management practices can be used to insure availability of adequate mast crops and roost trees through time.

Clearings and openings in the forest are also a vital habitat component for Vermont's wild turkey population. Whether created as farm pastures, hay fields, or openings within the forest, herbaceous plants such as grasses and clover provide critical habitat for turkey broods. These open areas have abundant insect populations on which young turkeys rely during early growth. The most beneficial clearings are old pastures, dominated by a mix of forbs, weeds, and fruit-bearing shrubs, as opposed to monocultures of grasses. Management can be used to enhance openings through periodic, selective mowing, liming, and fertilizing to favor desirable plant species.

Turkey brood range is a very important habitat consideration. Hen turkeys nest on the ground and prefer nesting in locations having lateral cover of herbaceous plants and shrubs. Recent clear cuts, thinned timber stands, fields, and croplands provide cover suitable for nesting and brooding turkeys. The best management practices for enhancing forest nesting habitat are conventional forest regeneration practices, especially even-aged timber management and group selection methods.

Trends in agriculture may affect the future distribution and abundance of turkeys statewide. As the number of Vermont farms continues to decline and the trend toward increasing forestation and forest age progresses, availability of open land may limit wild turkey production in Vermont.

II. 2010-2020 Turkey Management Issues, Goals, and Strategies

The overall goal of wild turkey management in Vermont is to manage the state's wild turkeys to sustain healthy, abundant populations that will provide hunting and viewing opportunities and will satisfy social expectations and tolerances for turkeys. This management goal aims to sustain an abundant wild turkey population that is truly wild and that is below both the biological carrying capacity of its habitat and the cultural carrying capacity.

ISSUE 1. Turkey Population

GOAL: To adequately assess Vermont's wild turkey populations and trends.

Sustaining healthy wild turkey populations in each wildlife management unit (WMU) that is consistent with Department goals requires an ability to accurately estimate abundance of turkeys or at least trends in relative abundance. Harvest data, nesting success indices as provided by brood surveys, and hunter pressure through license sales are critical elements of the Department's ability to monitor turkey population trends.

Management Strategies

- 1.1 Annually collect and assess turkey harvest data to determine trends as well as summer/fall turkey sighting survey data in order to direct future management decisions.
- 1.2 Conduct the public annual Internet turkey brood survey

1999-2008 Plan Accomplishments

Vermont's wild turkey population was estimated to be approximately 23,000 to 25,000 birds in 1998 at the time the previous turkey management plan was written. The population had risen to 50,000 to 55,000 birds by 2008, a doubling of the population during the ten-year management period. New spring turkey harvest records have been set in eight of the past 11 years. Wild turkey enthusiasts throughout our state have enjoyed countless hours of harvest and viewing opportunities of this highly regarded native wildlife resource.

The following is a list of specific issues and recommendations that were originally proposed in the 1999 plan with the resulting action taken to address them during the past ten-year planning cycle.

► **Recommendation 1. Adjust spring hunting hours to begin one-half hour before sunrise to noon (previous hours were 5:00 a.m. to 11:00 a.m.).**

► **Recommendation 2. Adopt turkey hunting season zones based on existing wildlife management units (WMUs).**

❖ **Action:** Both of these recommendations were adopted by regulation in 2000.

► **Recommendation 3. Change (expand) existing spring turkey hunting zones.**

❖ **Action:** The expansion of spring turkey hunting was adopted by numerous regulation changes throughout the planning period.

2000 – Expanded spring hunting to include all of WMUs H1, H2, and G

2001 – Expanded spring hunting to include Zones B, D1, and D2; WMU A opened to spring hunting by

permit, 75 permits issued
2002 – Held the first spring youth season first weekend prior to start of May season; 80 permits issued in WMU A

2003 – Opened WMU A to all licensed hunters, no WMU A permits required

2004 – Expanded spring season to include all of Zone C and E, resulting in entire state of Vermont open to spring hunting for all licensed hunters

► **Recommendation 4. Change fall hunting zones and season length, and establish threshold guidelines for initiating, liberalizing, or curtailing fall hunting seasons.**

❖ **Action:** Changes to the fall wild turkey season were adopted by regulations established in 2000 and 2003.

2000 – Expanded the fall season in J1 to include the entire zone with seven-day shotgun season

– Expanded fall hunting in Zones H2 and J2 to include the regular bow and arrow season and a new archery-only season during the current seven-day shotgun season in adjacent zones

– Reduced fall shotgun season in WMUs G, I, L, M1, M2, O1, O2, P, Q from 16 days to 7 days in length

2003 – Expanded fall bow hunting season length in H1 to include regular bow and arrow season and through regular seven-day shotgun season

– Expanded fall seven-day shotgun hunting in J2 and H2

along with the Department staff summer turkey survey.

- 1.3 Continue the turkey project’s investigation into the genetic variability and structure of the statewide population.
- 1.4 Evaluate new wild turkey population estimation methods and models for use in Vermont.
- 1.5 Evaluate the use of a public Internet survey to assess winter flock sightings.

ISSUE 2. Public Satisfaction with Current Population Levels

GOAL: Assess public and hunter satisfaction with current turkey population levels and management program.

Respondents to a 2007 public opinion survey were asked their opinion about wild turkey population levels around the state. The majority of Vermonters (60%) were satisfied with the turkey population in their county; 15% wanted more turkeys, 10% wanted fewer turkeys, and 15% had no opinion. In an effort to gauge the current level of satisfaction among Vermont’s turkey hunters, the Department asked survey participants: “How satisfied are you with your wild turkey hunting experience in Vermont over the past five years?” Ninety-two percent (92%) of the respondents indicated that they were either “Very Satisfied” or “Somewhat Satisfied” with their hunting experience in Vermont. This level of satisfaction for turkey hunting was higher than any other big game species and 16% higher than the opinion survey taken in 1998. The complete results of this question are reported in Table 5.1.

Management Strategies

- 2.1 Provide statewide spring bearded-bird-only seasons (including the Youth and regular May season) and limited fall either-sex hunting seasons in WMUs that can sustain a fall harvest so as to provide for population stability.
- 2.2 Prioritize high quality spring hunting over additional fall harvest opportunity.
- 2.3 Manage fall turkey harvests through changes in fall hunting season length within WMUs depending upon stability or growth of three-year average spring harvest densities, except in WMU A Champlain Islands where inadequate forest cover exists to sustain a fall firearm harvest.

ISSUE 3. Fall Turkey Hunting

GOAL: To provide appropriate opportunity for sustainable fall hunting while maintaining current levels of high quality spring turkey hunting.

The topic of fall turkey hunting is perhaps one of the most misunderstood facets of turkey management in Vermont and generates the most comments from the hunting community. While there is inherent variation in both annual production and survival of wild turkeys, fall either-sex hunting can play a pivotal role in regulating population size. Research on wild turkeys and population modeling in several other states indicates that significant fall hunting pressure can suppress turkey population growth and reduce spring population densities. Although the effects of spring turkey hunting may not be entirely benign due to potential nest disturbance, illegal harvesting of hens, and effects on age structure of male turkeys, fall turkey hunting can have a much more profound impact on turkey populations. Vermont’s experience with fall turkey hunting in Grand Isle and Franklin counties in the mid-1980s demonstrated how quickly heavy fall harvests can reduce turkey populations. This is the principal reason that the current fall season bag limit and season length is less in zones with lower turkey densities. In some cases these limits are more conservative than some hunters would prefer.

The Department supports the management practice of using fall hunting zones to regulate turkey populations in areas having the best turkey habitat and highest densities for the following reasons:

- *Fall wild turkey seasons impact turkey populations by primarily removing female turkeys.* Sixty-five to 70% of Vermont’s fall harvest consists of female turkeys. This large

Table 5.1 2007 Hunter Satisfaction Survey Results

Satisfaction level	Percent of respondents
Very satisfied	57%
Somewhat satisfied	35%
Neither satisfied nor dissatisfied	0%
Somewhat dissatisfied	7%
Very dissatisfied	1%

female fall harvest reduces the number of hens nesting the following spring. Fall harvests of hens followed by a severe winter and/or poor reproduction the following spring can quickly change the abundance of turkeys — thus fall hunting in this situation can only add to the mortality rate.

- ***The illegal harvest of female turkeys may be more of a factor in the fall season when entire broods are vulnerable to harvest.*** Several states have documented higher illegal take during the fall season.
- ***Turkeys in Vermont are living at the northern fringe of their continental range and are more vulnerable to natural mortality from severe winters and cold, wet springs.*** Severe winters can result in substantial population losses and depress spring reproductive success. While Vermont can experience severe winter conditions throughout the state, this factor is especially significant in the more northerly and higher elevation wildlife management units. The harvest of female turkeys can be additive to these natural mortalities.
- ***The regulatory process does not allow for timely changes to the fall hunting season in response to annual fluctuations in turkey productivity.*** Changing harvest regulations via the mandatory, Administrative Procedures Act is a very deliberative, lengthy process. The time frame for developing a change in turkey regulations, from preparing a proposed rule until final adoption of the rule, requires approximately 18 to 22 weeks. This severely limits the Department's ability to respond quickly to significant increases or decreases in poult production or survival. This also requires the Department to be conservative when proposing harvest regulations.

When asked in the 2007 opinion survey, the majority of turkey hunters (68%) support the current management strategy to limit fall turkey hunting for the purpose of maximizing spring turkey

harvests. Although this indicates strong support for the current approach, there may be opportunities to systematically enhance/expand fall turkey hunting without compromising the goal of providing quality spring turkey hunting in Vermont.

Management Strategies

- 3.1 Provide public opportunity to harvest wild turkey for food and other utilitarian purposes.
- 3.2 Facilitate healthy, abundant spring turkey populations that are stable using modest, fall hunting seasons/bag limits to control the population. When the three-year spring average harvest density reaches the specific threshold value, liberalization of fall hunting in a WMU may be called for (initiate shotgun seasons, extend gun seasons). See Table 5.2.
- 3.3 Consider reducing the current guideline for the threshold as to when fall gun hunting opportunities could be initiated in a new WMU, from the three-year average spring harvest density of one bird per square mile, to an average harvest density of .75 bird per square mile.
- 3.4 Lengthen the current fall seven-day shotgun season to a nine-day season.
- 3.5 Expand the fall shotgun season to include WMUs H1, D1, and B with a nine-day shotgun season.
- 3.6 Expand the fall archery turkey season, coinciding with the opening of the deer archery season, to allow archery hunting statewide.
- 3.7 Investigate establishing a new separate "Fall Gun Season Only" tag.



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Table 5.2 Spring Wild Turkey Harvest 1998-2008

WMU	Spring Harvest per Square Mile											3-year Average
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2006-08
A	1.10	1.57	1.86	1.90	1.62	3.33	2.76	2.38	2.86	3.19	3.10	3.05
B				0.28	0.37	0.25	0.43	0.59	0.83	0.84	1.32	1.00
C							0.20	0.25	0.39	0.29	0.49	0.39
D-1				0.34	0.37	0.23	0.39	0.56	0.70	0.54	0.99	0.74
D-2				0.36	0.44	0.25	0.35	0.53	0.60	0.53	0.65	0.59
E	0.01	0.03	0.02	0.04	0.08	0.05	0.17	0.25	0.27	0.20	0.28	0.25
F-1	2.14	2.90	3.59	3.92	4.14	3.50	3.40	3.36	3.14	3.78	2.61	3.18
F-2	1.73	1.55	2.76	2.64	2.34	2.02	2.12	2.04	1.99	1.80	1.57	1.79
G	0.10	0.18	0.26	0.21	0.25	0.16	0.32	0.29	0.35	0.37	0.40	0.37
H-1	0.11	0.41	0.60	0.63	0.80	0.52	0.60	0.79	0.77	0.68	0.85	0.77
H-2	0.58	0.78	1.24	1.03	1.64	1.37	1.37	1.56	1.16	1.40	1.78	1.45
I	0.17	0.19	0.24	0.24	0.30	0.20	0.23	0.25	0.24	0.24	0.20	0.23
J-1	0.49	0.46	0.74	0.85	0.84	0.64	0.78	0.81	0.60	0.90	0.86	0.79
J-2	0.41	0.67	0.63	0.83	0.78	0.54	0.74	0.78	0.67	0.83	0.66	0.72
K-1	1.29	1.96	1.95	2.00	1.85	1.70	1.09	1.08	1.42	1.34	1.28	1.35
K-2	1.43	1.66	1.74	2.02	1.35	1.50	1.33	1.49	1.34	1.50	1.30	1.38
L	0.11	0.21	0.25	0.33	0.25	0.21	0.15	0.28	0.26	0.28	0.30	0.28
M-1	0.23	0.31	0.41	0.34	0.23	0.26	0.17	0.36	0.27	0.47	0.42	0.39
M-2	0.53	0.62	0.87	0.86	0.65	0.65	0.51	0.77	0.75	0.88	1.08	0.90
N	0.92	1.01	1.24	1.47	0.92	0.91	0.67	0.79	0.91	0.97	1.09	0.99
O-1	0.21	0.19	0.34	0.44	0.27	0.33	0.21	0.41	0.31	0.44	0.45	0.40
O-2	0.58	0.77	0.61	0.91	0.75	0.75	0.49	0.72	0.75	0.84	0.93	0.84
P	0.12	0.14	0.15	0.16	0.17	0.13	0.10	0.17	0.15	0.21	0.25	0.20
Q	0.40	0.53	0.34	0.40	0.44	0.44	0.43	0.50	0.50	0.59	0.50	0.53

ISSUE 4. Wild Turkey/Human Conflicts

GOAL: To minimize and manage agricultural damage and nuisance turkey incidents.

Some wild turkey nuisance complaints and/or negative interactions with the public are unavoidable. While complaints have increased in recent years as the turkey population has grown, the annual number of complaints is relatively low compared with those for black bear and white-tailed deer.

The majority of the nuisance wild turkey complaints stem from turkeys' consumption or spoilage of silage or other stored crops. This situation often occurs when deep snow limits turkey mobility and restricts the birds' access to natural foods. Extreme weather creates intense stress on wild turkey populations whose fall food supplies become buried under snow at the same time that cold temperatures cause fat reserves to dwindle. Wild turkeys have a strong survival instinct that leads large winter flocks to exploit a convenient high calorie agricultural crop. Given this natural survival instinct, it is difficult to discourage them, especially once birds have established a pattern of regular feeding around a farm. While fall hunting may reduce the numbers of

offending birds to some degree, it will not solve this problem.

Farmers can protect silage in exposed bunkers by periodically placing waste silage close to the forest where turkeys are taking shelter. By starting this early before turkeys become accustomed to going to the bunker, the birds may be diverted to a food source that has little value to the farmer.

Dairy farmers have expressed concerns regarding potential transmission of diseases to their livestock from turkey feeding/defecation in feed bunkers. Vermont, New Hampshire, and Minnesota have conducted numerous investigations involving disease testing of local wild turkey flocks and, to date, have found no evidence of the presence of Salmonella DT 104 bacteria in these birds. Thus, farmers' concerns for disease transmission between wild turkeys and dairy cows appear to be unwarranted.

A turkey damage control regulation has been promulgated as another method to help address the nuisance issue. Under the "turkey damage rule," a landowner under game warden supervision may take a pre-approved number of offending turkeys that have been determined to have caused repeated or substantial damage to cultivated crops. The use of lethal control by shooting is normally considered to be the last option. With the assistance of a game warden, Department biologists, and U.S. Department of Agriculture's Wildlife Services personnel, other control methods such as hazing and/or fencing are attempted first. Frequently, complaints can be handled simply by providing technical or management assistance over the phone to educate landowners regarding turkey behavior and methods to change problem behavior.

Local National Wild Turkey Federation (NWTF) members can assist in quelling wild turkey/human conflicts. It is possible, given the demographic shift from farming to increased rural development, that nonagricultural nuisance complaints may increase in the near future. With this in mind, the Department will continue to adapt its approach to fit the issue.

Management Strategies

4.1 Provide property owners with access to coordinated services of personnel trained to deal with nuisance turkey issues including wildlife biologists, game wardens, and USDA Wildlife Services staff to assist with nuisance complaints

via technical guidance/assistance on techniques to minimize/discourage damage.

4.2 Conduct follow-up site visits to nuisance complaint sites when necessary and provide hazing equipment to help ameliorate persistent nuisance situations.

4.3 Solicit assistance from local volunteers through the Vermont Chapter of the National Wildlife Turkey Federation (NWTF) to help provide on-the-ground assistance to landowners via hazing and behavior modification efforts.

4.4 Assist USDA Wildlife Services staff with development of educational materials to inform and educate farmers about techniques for minimizing conflicts.

4.5 Compile and evaluate wild turkey damage complaint reports from farmers, state game wardens, biologists and wildlife service personnel to document problems, management approaches and results.

4.6 Develop/modify a standard set of protocols/guidelines/solutions to perceived and actual conflicts caused by wild turkeys (nuisance animals, agricultural damage).

ISSUE 5. Turkey Habitat Management and Conservation

GOAL: To encourage conservation and appropriate habitat management practices to support and sustain Vermont's wild turkey population.

Habitat quality and quantity are necessary to achieve wild turkey management goals. Land use changes that convert habitat to a lower quality or result in permanent habitat loss diminish its ability to sustain healthy, abundant turkey populations.

Management Strategies

5.1 Continue efforts on wildlife management areas and other public lands to provide habitat demonstration areas to promote appropriate commercial and noncommercial vegetation management practices beneficial to turkeys and other wildlife. This includes the use of prescribed fire and other management practices to establish and maintain long-term mast production areas.

5.2 Provide technical information and assistance regarding turkey habitat management to private





landowners and other land managers, town planning commissions via staff biologists, habitat demonstration projects, LIP and WHIP program lands, etc.

- 5.3 Update the “A Landowner’s Guide, Wildlife Habitat Management for Vermont Woodlands” and make it available on the Department’s website and in published form.
- 5.4 Work with the NWTf regional biologists and chapter volunteers on development of the North American Wild Turkey Management Plan.
- 5.5 Work with partnering organizations on high priority projects and issues.

ISSUE 6. Perception Regarding the Interaction Between Deer and Wild Turkeys, Ruffed Grouse and Wild Turkeys, and Various Predators and Wild Turkeys

GOAL: To improve the public’s knowledge, awareness, and understanding of the role of the wild turkey and its interactions within the ecosystem.

While the number of wild turkeys has increased dramatically throughout Vermont over the last decade, ruffed grouse and deer have at times declined in abundance. This leads some hunters to assume that turkeys could somehow be having a negative impact upon these other popular species. Some hunters believe that turkeys are eating more and more of the available food. However, biologists throughout the range where these species overlap believe that changes in deer or grouse numbers have nothing to do with the size of the turkey population. The factors limiting survival and populations of deer and grouse

are different than those limiting turkeys. Although the effects of winter severity can limit all three species, their effects vary by species. In winter, deer require softwood cover and woody browse. Turkeys don’t eat woody browse. While the formation of crusts on the snow surface can trap or prevent grouse from burrowing below the snow’s surface, crusts make it easy for turkeys to get around in search of food.

Through all the restoration efforts and the tremendous population growth there have been no documented reports of wild turkeys having any negative impact on other wildlife or threatened or endangered species. Because of their general and opportunistic feeding habits and adaptability, the wild turkey seems to be able to find a noncompetitive niche in which to survive regardless of the other species found in the area. One researcher noted that turkeys “usually have filled a vacant environmental niche wherever they have been introduced and no significant environmental problem has been attributed to them.” (Wunz 1992, National Wild Turkey Federation 2001).

DEER AND WILD TURKEYS

The most common concern expressed regarding turkeys competing with deer is that they out-compete deer for hard mast such as acorns or beech nuts. While it’s true that both deer and turkeys feed more on mast during years of mast abundance, but so do bears, squirrels, grouse, blue jays, and numerous small mammal species. Of these, turkeys may leave the most obvious evidence of feeding due to their scratching, but it’s highly unlikely that the birds consume mast to the detriment of deer. Autumn is the period of greatest wild food abundance. Wild apples, corn and other agricultural crops, grasses and forbs, berries and seeds of all kinds are used by both turkeys and deer and many other animals. In fact, a Pennsylvanian researcher used fencing to determine that of all species feeding on red oak acorns, deer actually obtain the greatest proportion of mast. Regarding beech mast, a Michigan researcher (Rosemier et al. 2005) found that in non-mast years, rodents actually consume most of the beechnuts. Considering the fact that only two 150 pound deer (300 lbs) equal the biomass of a flock of about 30 juvenile turkeys (or 15 large adults), it is easy to see how a few deer could easily consume considerably most of the mast crop.

While high turkey densities are believed to have no significant negative impact upon deer populations,

high deer densities do have a harmful impact upon turkeys, ruffed grouse, and other forest birds because excessive browsing of shrubs reduces protective cover, food sources, and nesting sites (Witmer and DeCalesta 1991).

RUFFED GROUSE AND WILD TURKEYS

Dan Dessecker, a forest biologist with the Ruffed Grouse Society, points out that “In order for increasing wild turkey populations to be able to exert a direct negative influence on local ruffed grouse, there would have to be some form of competition” (Dessecker 1996). This competition would be expected to focus on some limited resource, such as space, food, breeding areas, nesting sites, or some other resource. Dessecker notes that it’s highly doubtful that these two species compete for any limited resource. Ruffed grouse thrive in dense young forest stands. Turkeys prefer relatively open mature forests.

Regarding breeding areas, grouse drum on logs surrounded by dense shrubs, and turkey gobblers display in fields or forest openings. Although hens of both species nest in middle-aged or mature forest, their nest site requirements are quite general with both species using a wide range of sites that are found throughout forests. Again, it is very unlikely that there is limited space and competition for nest sites.

Research has shown that wild turkeys do not affect other bird species by eating young birds or destroying nests. Dr. Bill Palmer, a game bird biologist in Florida, used micro-video cameras and radio-tagged hens to monitor more than 400 quail nests and broods in an area with very high turkey populations (30-60 turkeys per square mile). The research did not record a single turkey destroying a nest or eating or killing a quail chick (Zimmer 2002). Gary Zimmer, another Ruffed Grouse Society forest biologist, points out that young grouse can fly well at only three weeks of age. When threatened the brood flushes in all directions to find cover and hide. That would make it nearly impossible for a turkey, with its poor sense of smell, to locate and harm grouse chicks (Zimmer 2002).

Competition for food is also not likely to be significant between turkeys and ruffed grouse. Both birds are generalists, in that they feed on an extremely wide variety of foods throughout the year. During winter, the most stressful period when food resources are most scarce, turkeys and grouse typically use different food sources (Whitaker 1998).



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Ruffed grouse feed on the buds of trees and shrubs. Dessecker notes that turkeys are heavy birds that can only stand on stout tree limbs, so they prefer to feed on the ground on waste grains, acorns and beechnuts, and residual fruits and seeds, such as highbush cranberry, burdock, and ash seeds.

Dave Neu, a regional biologist for the National Wild Turkey Federation, states, “Ruffed grouse and wild turkey are two species that have evolved together for thousands of years and their habitats slightly overlap. There is no documented evidence that either species directly impacts populations of the other” (Zimmer 2002). Although turkey populations have increased while grouse have decreased in some portions of Vermont, the population changes are mainly due to changes in agriculture and forest habitat. As young forests mature, the habitat becomes more suitable for turkeys and less attractive to grouse. Thus, populations of both species birds respond to changing habitat conditions rather than turkeys displacing grouse. Gary Zimmer stated it best when he said that “Any impact caused to ruffed grouse populations by turkeys is insignificant compared to declines in young-forest habitats...” (Zimmer 2002).

PREDATORS AND WILD TURKEYS

Department personnel are often asked why they don’t promote a bounty on coyotes or some other form of predator control to “protect” wild turkeys or other game species. It is well established that predator “control” will not protect wild turkeys. Predator/prey relationships are extremely dynamic and complex. These relationships involve a variety of factors that defy a simple, quick fix. Wild turkeys are prey to a long list of predators including coyotes, bobcats, foxes, fisher, weasels, skunks, opossum, raccoons, snakes, hawks, owls, domestic dogs,





and humans. In the case of implementing “coyote control,” for example, assuming that this could be effective, removal of coyotes would only reduce competition among the remaining host of predators that would continue to prey on turkeys. Coyotes, in fact, prey upon weasels, opossums, raccoons, foxes, and rarely skunks. All of these species are effective predators of nests, chicks, and nesting turkey hens. For this reason, it is possible that removal of coyotes could allow the populations of these other predators to increase resulting in more, not less, turkey predation and an overall decrease in a turkey population. Complex species relationships are common in nature. In fact, the rapid growth in Vermont’s turkey population has occurred during a time when the coyote population has been abundant.

Many of the qualities that hunters admire so much about these birds, such as their incredible eyesight, ability to detect movement and wariness, are products of the turkey’s long evolutionary history that they share with their predators. As wild turkey populations increase, the potential role of this species as a significant source of prey for other Vermont animals may now be greater than ever before.

Management Strategies

6.1 Promote sound scientific principles regarding inter-species competition and predator-prey relationships through a variety of outreach methods including public speaking events, web-based information and links, and print and broadcast media.

ISSUE 7. Developing and Maintaining an Informed Public is Crucial to the Management Success of the Wild Turkey Project.

GOAL: To ensure continued information exchange and program acceptance by keeping the general public, state and federal agencies informed on the status of the wild turkey resource in Vermont.

Habitat conservation and public use of the turkey resource are best accomplished when citizens are well-informed. Understanding the public’s opinion regarding turkey biology, habitat, and management issues is important in making acceptable management decisions.

Management Strategies

- 7.1 Disseminate wild turkey project information to the public/media professionals via biological reporting stations, teacher workshops, private and public landowner visits/conferences, slide/video presentations, mail correspondence, popular and technical reports, etc.
- 7.2 Use the Department’s library to fill all public requests for its video production “The Wild Turkey in Vermont” as well as its wildlife study guide “The Wild Turkey Education Kit.”
- 7.3 Continue involvement with standing professional committees, regulatory bodies and cooperative agreements with nongovernmental organizations to assist the Department with meeting the goals and objectives of this plan.

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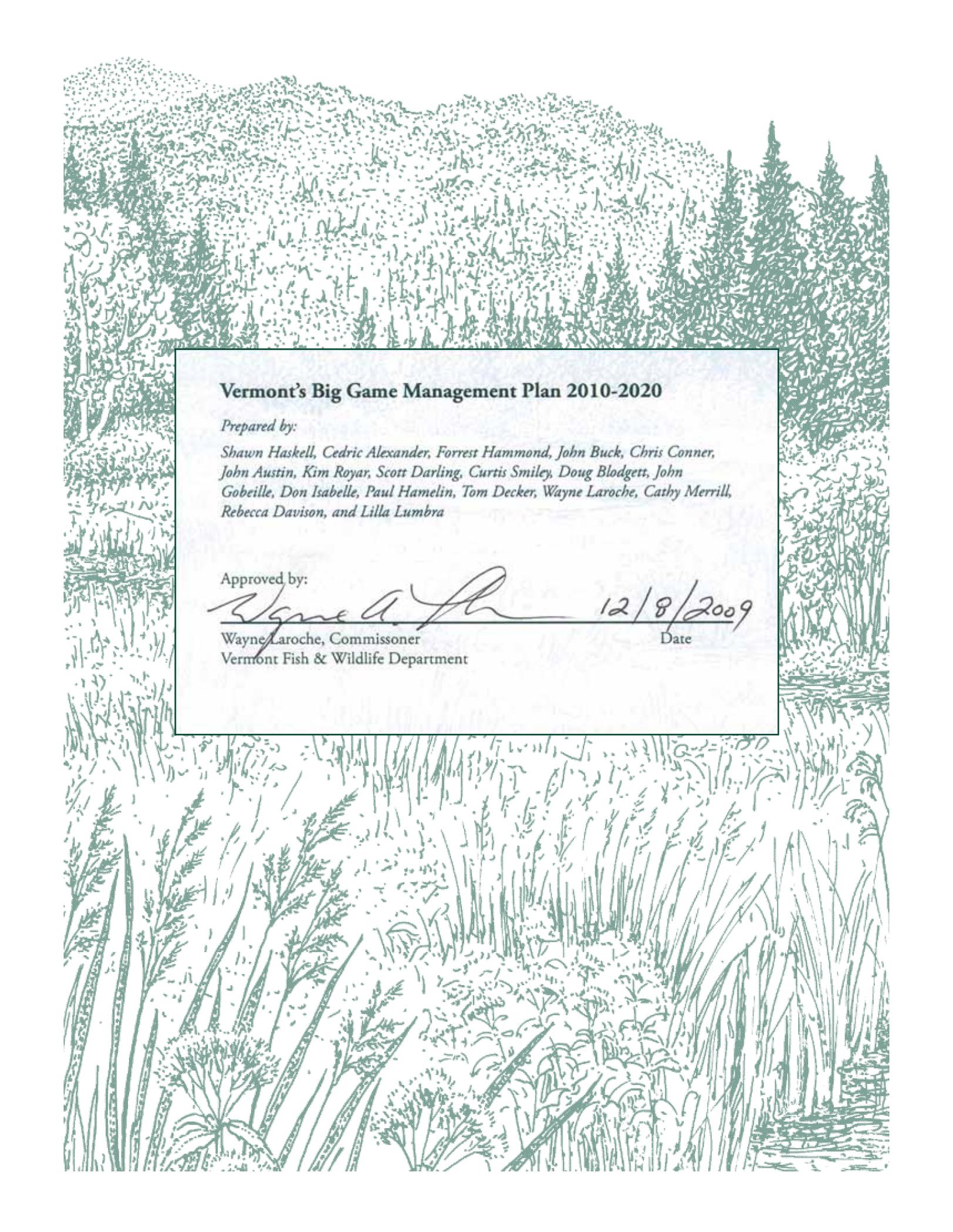
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Vermont's Big Game Management Plan 2010-2020

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