

## 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).

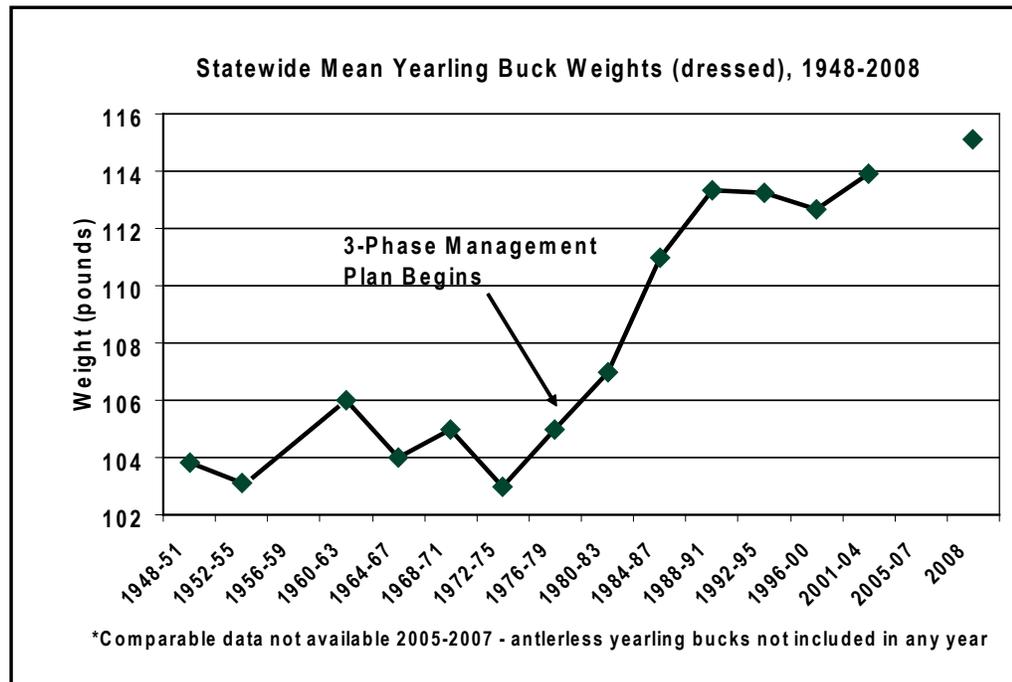
**Table 2.1 Reproductive rates of incidentally-killed adult (at least one year-old) female deer examined during winters in Vermont.**

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

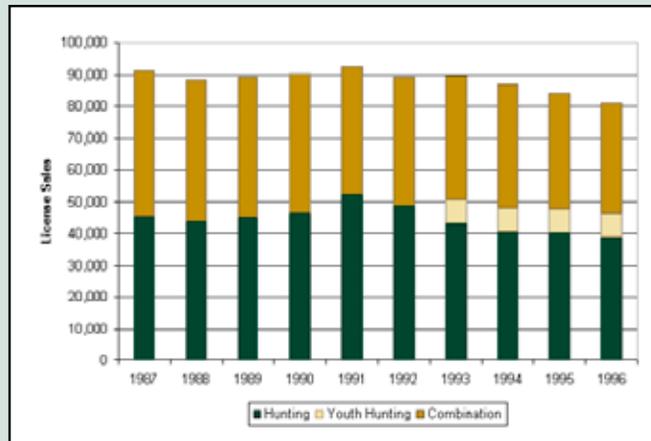


Figure 2.2 Resident hunting license sales, 1987–1996.

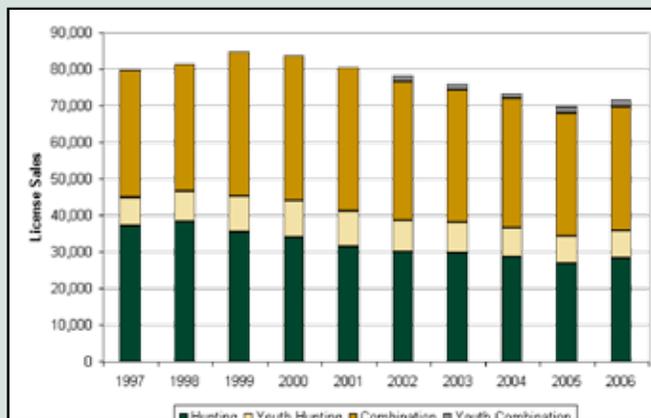


Figure 2.3 Resident hunting license sales during the 1997-2006 deer management plan period.

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

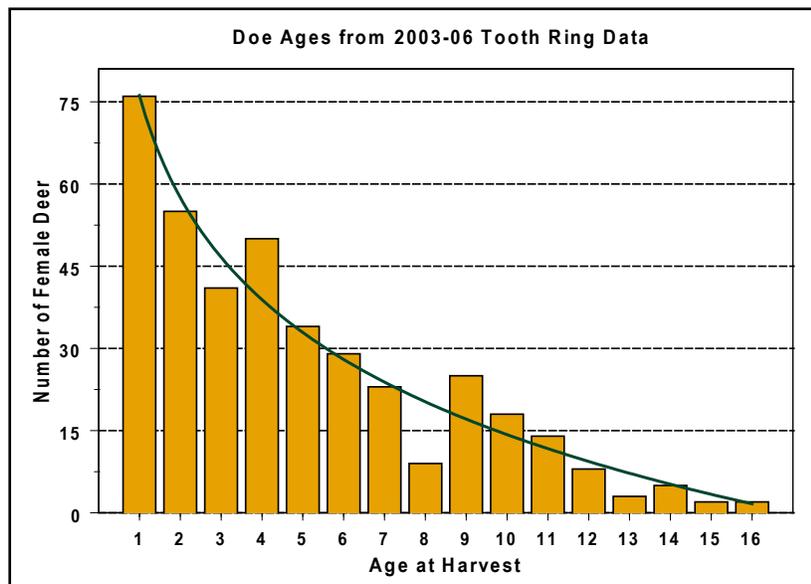


Figure 2.4 Laboratory-determined ages of 427 female white-tailed deer from the 2003–2006 annual Vermont harvests.

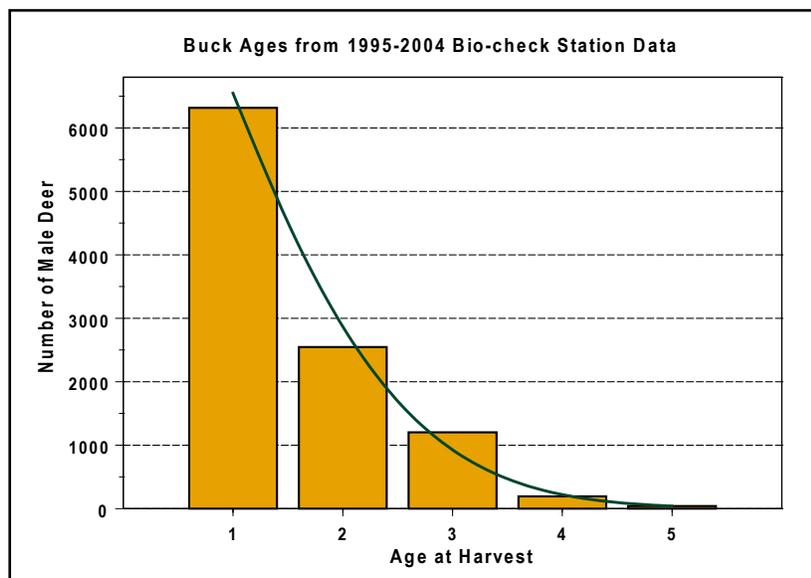


Figure 2.5 Ages of 10,300 male white-tailed deer from 1995–2004 as determined by Vermont biologists at check stations during the opening weekend of rifle season.

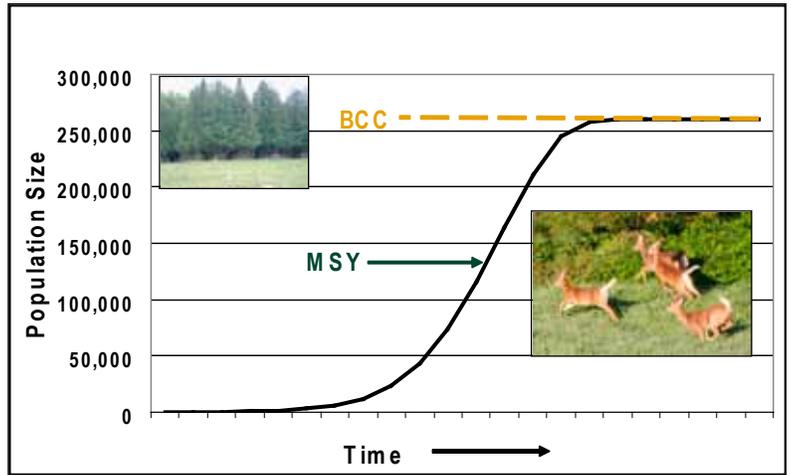
within the biological carrying capacity curve when the density of a herd is in balance with its habitat and when fawn recruitment is at its maximum level. A population at BCC recruits as many fawns as it loses adults, so it has no harvestable surplus. At MSY there are fewer deer overall in a population. 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.

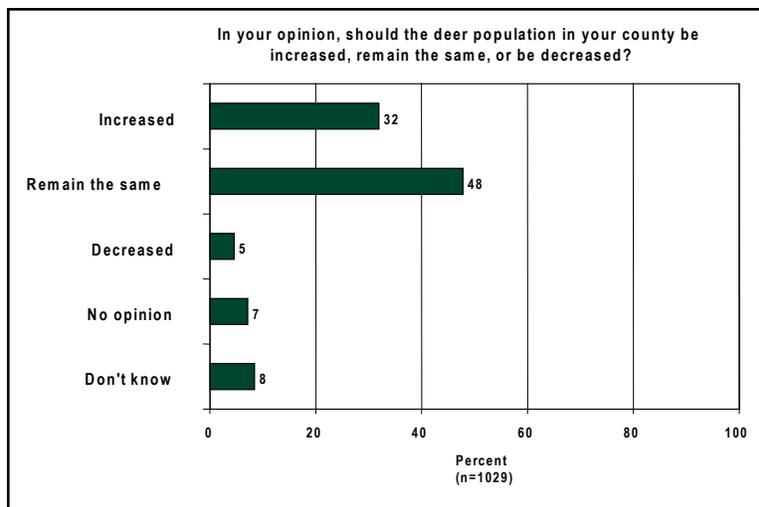


**Figure 2.6** Deer population size and growth rate at biological carrying capacity (BCC) versus maximum sustainable yield (MSY)

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."

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



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

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

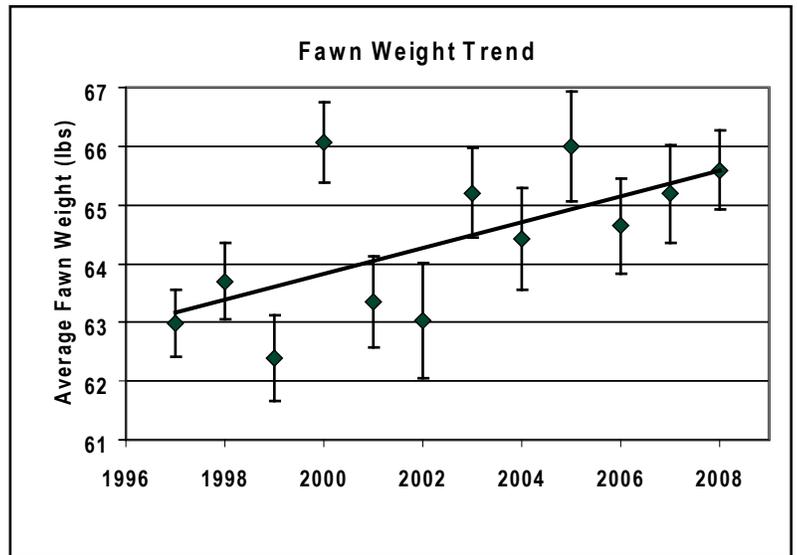


also produce at an optimal recruitment rate that is just above intermediate levels of abundance relative to BCC (Miller and Wentworth 2000; Fig. 2.6). This management strategy will dampen the boom and bust cycle of deer in Vermont.

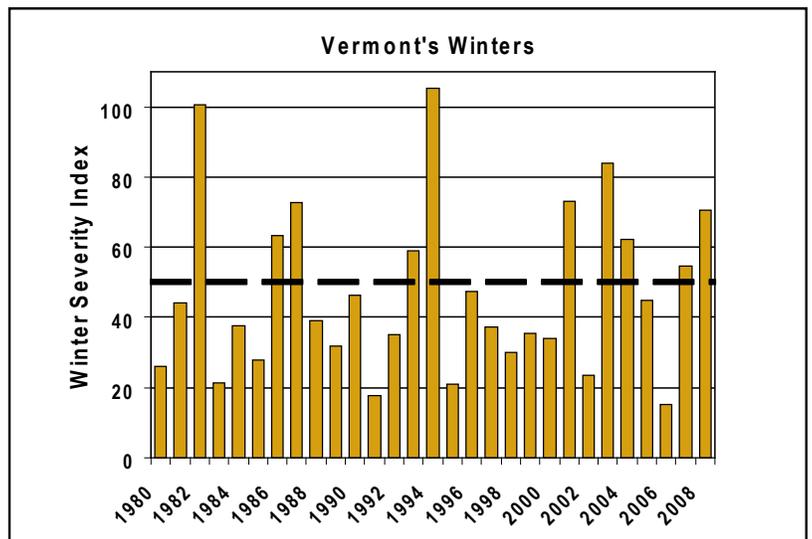
It appears that a sustainable harvest of deer having good body condition may be approximately the harvest level that occurred in the mid-1990s, and again in 2008. This is a total deer harvest of approximately 17,000 deer per year (Fig. 2.11). Vermont has never sustained annual harvests of 20,000 deer 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

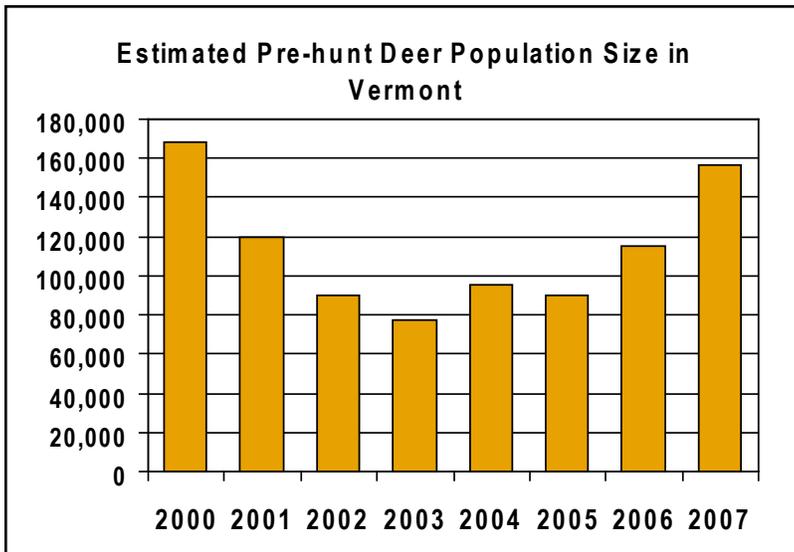


Figure 2.10 Pre-hunt total deer population estimates (+/- 15%) for Vermont from 2000–2007. Rapid population growth from 2005–2007 demonstrates tremendous growth potential of Vermont’s healthy deer herd given a mild winter as in 2006 and restricted antlerless deer harvests.

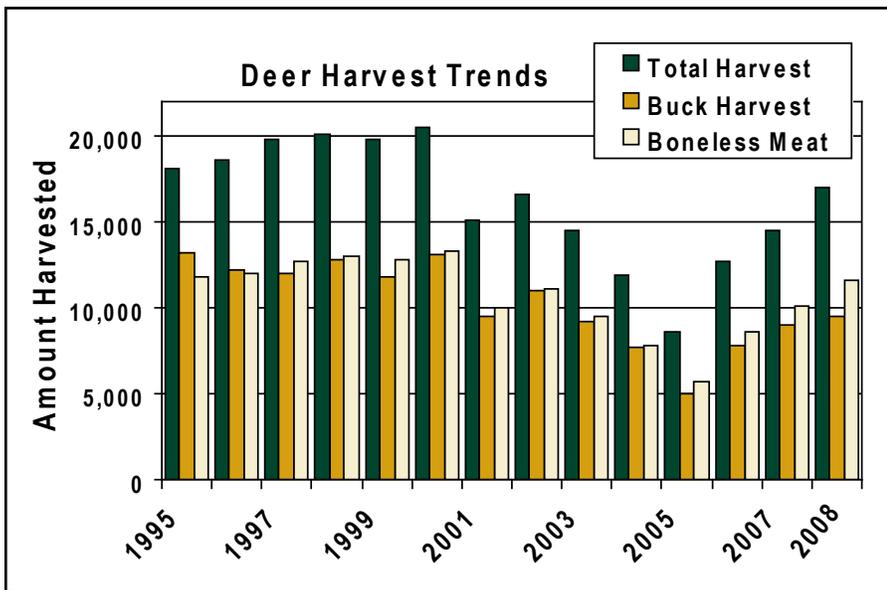


Figure 2.11 Annual total deer and antlered buck harvests in Vermont from 1995–2008. Boneless meat is represented as 100s of pounds, so the ten-thousand-line equals one-million pounds of meat. Pounds of boneless meat assume that hanging weight (skin, head, and feet removed) is 75% of field-dressed weight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

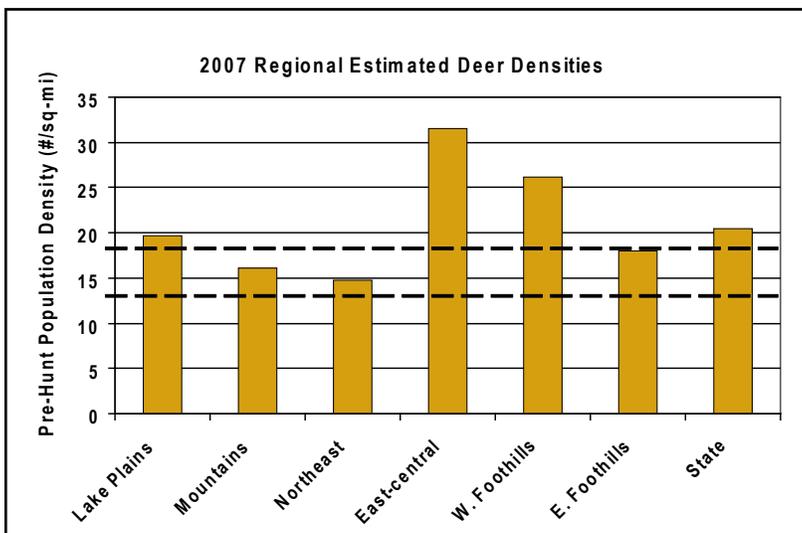


Figure 2.12 Regional pre-hunt deer population density estimates for Vermont in 2007 (see Table 2.9) in relation to statewide upper and lower population density objectives (i.e., horizontal dashed lines near 13 and 18 deer per square mile).

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

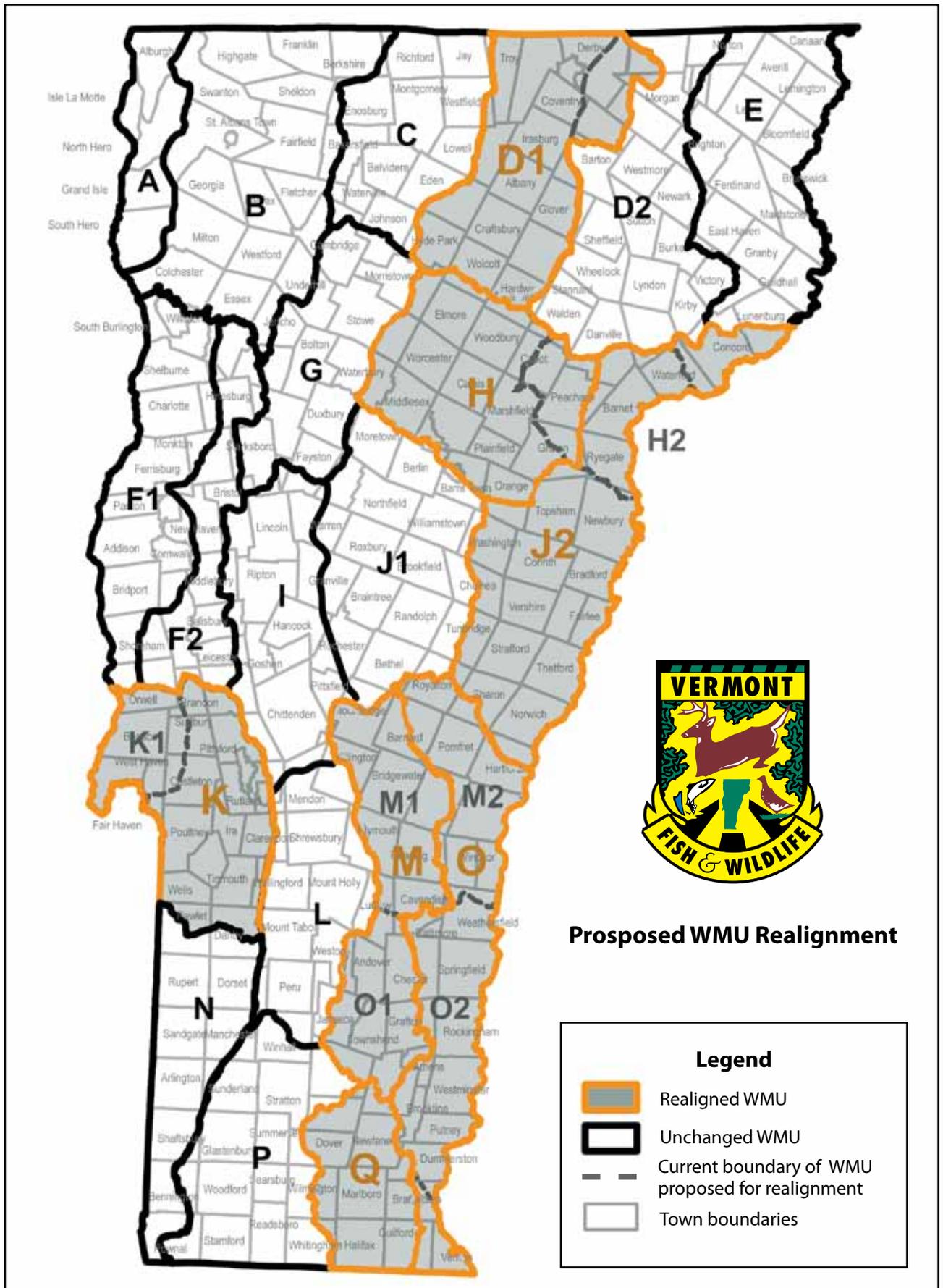


Fig. 2.13 Current and proposed WMU boundaries

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 <sup>2</sup> )	Density Goal Range (deer/mi <sup>2</sup> )		Population Goal Range (deer/mi <sup>2</sup> )	
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
<b>State</b>	<b>All</b>	<b>7,874</b>	<b>13</b>	<b>18</b>	<b>101,700</b>	<b>141,100</b>

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**

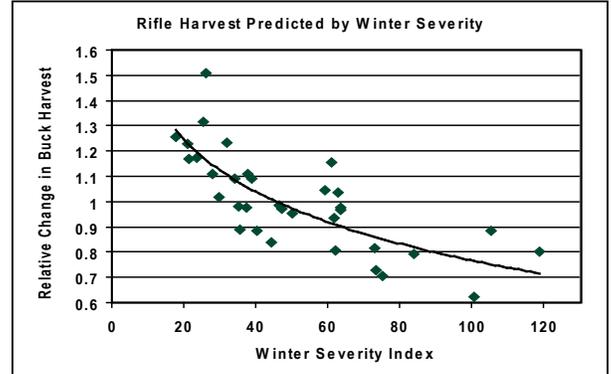
Generally, the effects of winter severity on the deer herd correlate with changes in deer population density. Data since 1970 demonstrate that fluctuations in rifle season buck harvests have fairly predictably paralleled changes in winter severity (Fig. 2.14). This suggests that winter severity has continually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

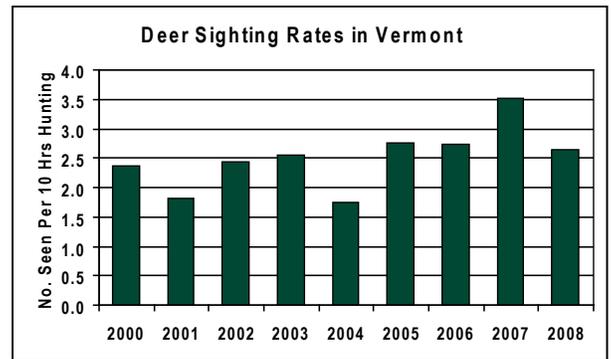
**ANTLER POINT RESTRICTIONS**

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.

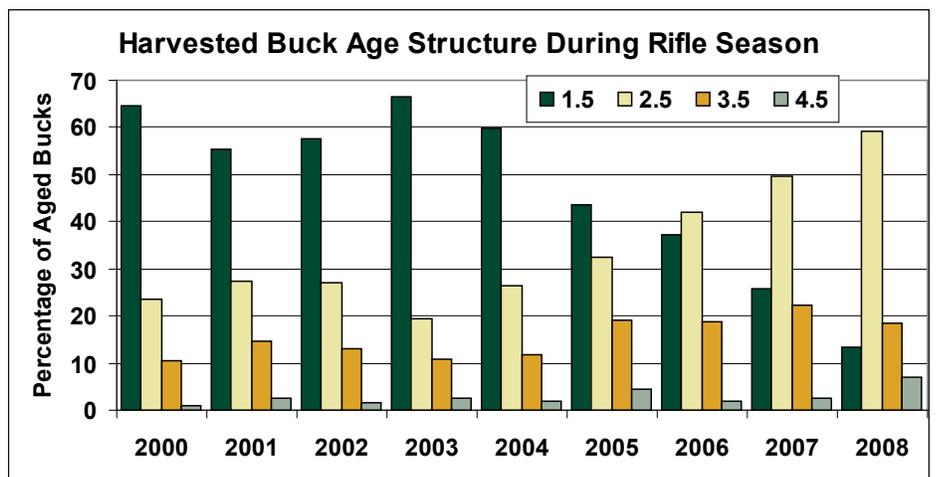
Prior to establishment of Vermont’s antler restriction regulation, about 50% of each year’s crop of yearling bucks in Vermont were spike-horns. This regulation protected these yearlings and resulted in a surge of two-year-old bucks and smaller increases in other age classes (Fig. 2.16).



**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



ROBERT CAMERON

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



MIKE CARPENTER

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.**

**O**rdinances 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



DAVE ADAMS

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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