

**Annual Report to the Vermont Legislature on
Management of the Deer Herd**

Vermont Fish and Wildlife Department

**Wayne A. Laroche
Commissioner**

January 2009

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Introduction

This report fulfills the requirements of Legislative Act Number 136, An Act Relating to Management of the Deer Herd, passed during the 2004 legislative session. Section 6 of the Act specifies reporting requirements as:

Annually, on or before January 15, the commissioner of fish and wildlife shall report to the house committee on fish, wildlife and water resources and the senate committee on natural resources and energy on the effects of the fish and wildlife board's management of the deer herd pursuant to this act. At a minimum, the commissioner shall address the impacts on:

- (1) The size of the deer population;*
- (2) The health of the deer population;*
- (3) The ratio of males to females;*
- (4) The age distribution;*
- (5) The advisability of redefining wildlife management district boundaries;*
- (6) The satisfaction of the hunting community; and*
- (7) The number of hunters choosing to hunt in specific wildlife management units.*

Deer management is one of the most important projects administered by the Fish and Wildlife Department. Few Vermonters have not had some level of contact with deer and even fewer are without an opinion as to how to manage them. The project is managed by a team of four biologists, one ecologist, and one game warden.

Deer management objectives are: 1) maintain a deer population at a level that is in balance with its habitat and the landscape that supports a variety of wildlife throughout Vermont – that is, an abundant healthy deer herd; and 2) maintain a deer population at a level that is satisfactory to the recreation, agriculture, forestry, and safety interests of the people of Vermont.

Findings

Population Size and Health

The Department estimates the pre-hunt size of the deer herd based on rifle harvest and hunter effort data. These data become available in early February. The statistical model used (i.e., a multinomial mark-recapture removal model fit in Program Mark) is well founded

in wildlife science and yields an accurate estimate of the pre-hunt buck population size. Such estimates are available back to 2000 when the hunter effort surveys began. To estimate total population size, the buck:doe and fawn:doe ratios must also be estimated. The buck:doe ratio is derived from age data (see below), and the fawn:doe ratio is estimated from reproductive data collected in Vermont and published fawn survival data. Figures 1 and 2 illustrate these results. The hard winter conditions of 2001 and 2003 had an impact on Vermont's deer herd, but subsequent mild winters, particularly 2006, and reduced antlerless deer harvests allowed rapid recovery (Figure 3).

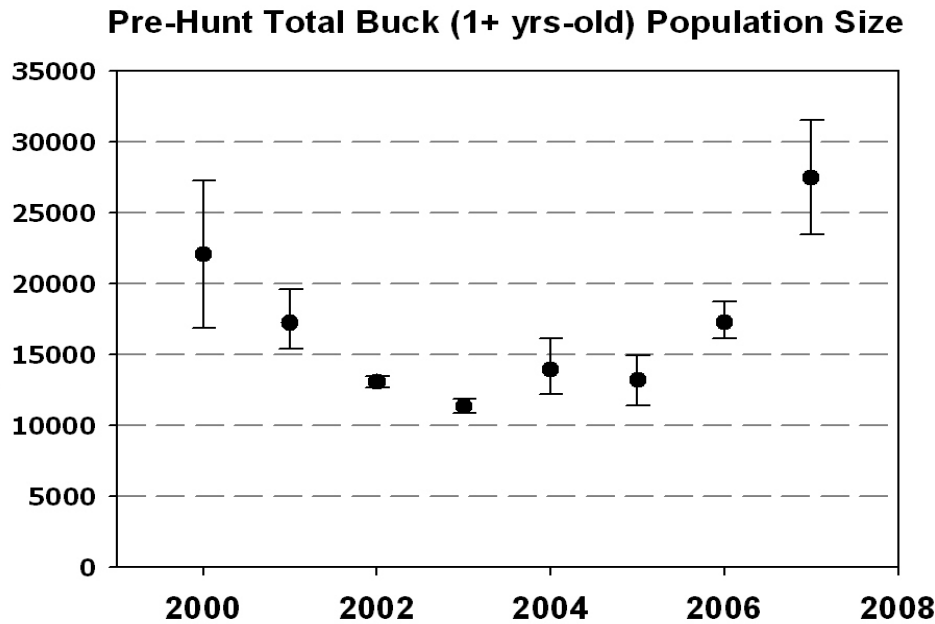


Figure 1. Estimated pre-hunt buck population size in Vermont from 2000–2007. Error bars are 95% confidence intervals.

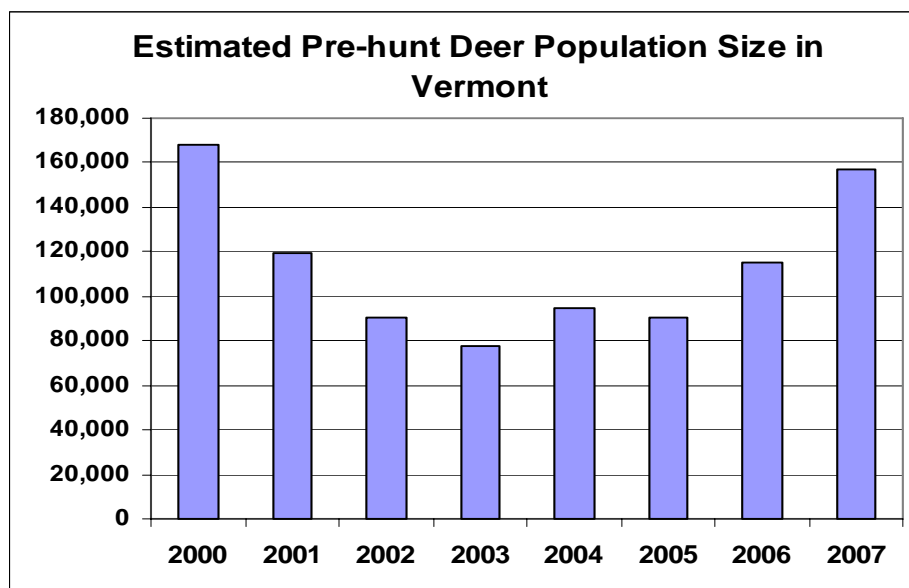


Figure 2. Estimated total pre-hunt deer population size in Vermont 2000–2007. Uncertainty is about 20% of the estimate. Estimated total population size in 2007 is less than in 2000 despite more estimated bucks because the antler-restriction regulation changed the buck:doe ratio after 2005.

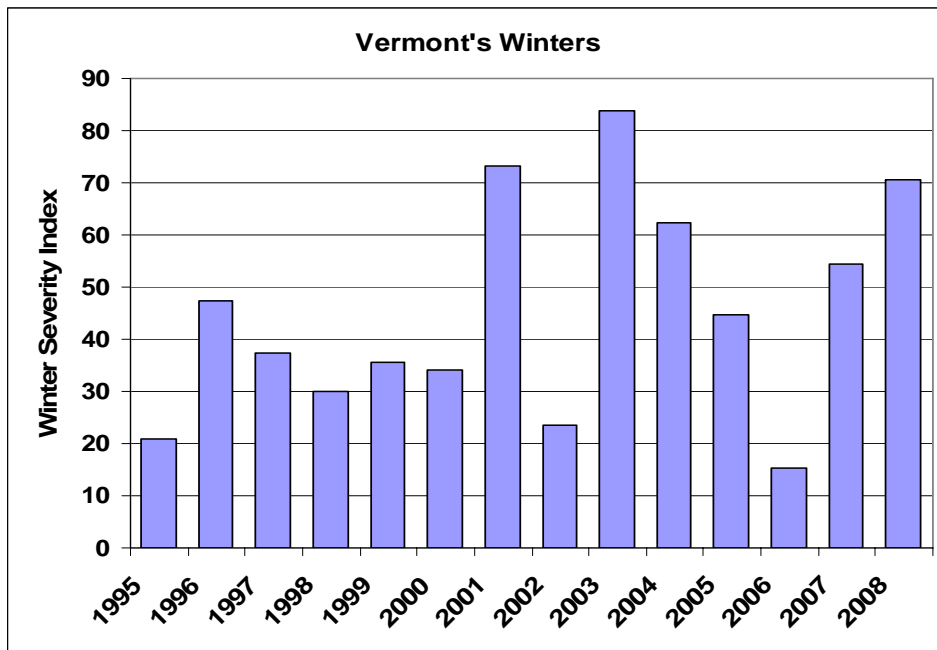


Figure 3. Vermont's winter severity indices (WSI) from 1995–2008. Volunteers at 40 locations statewide collect data on daily snow depths and low temperatures. One point is given to each day with snow depth >18 inches, and one point is given for each day with a temperature dropping to below 0°F. WSI = 50 is long-term average.

The past winter of 2007-08 had many people concerned with potential impacts on the deer herd, and many were confused by increased antlerless deer permits despite the perception of a harsh winter. However, there were two very different winters in Vermont last year – a mild winter in western Vermont and a severe winter elsewhere (Figure 4).

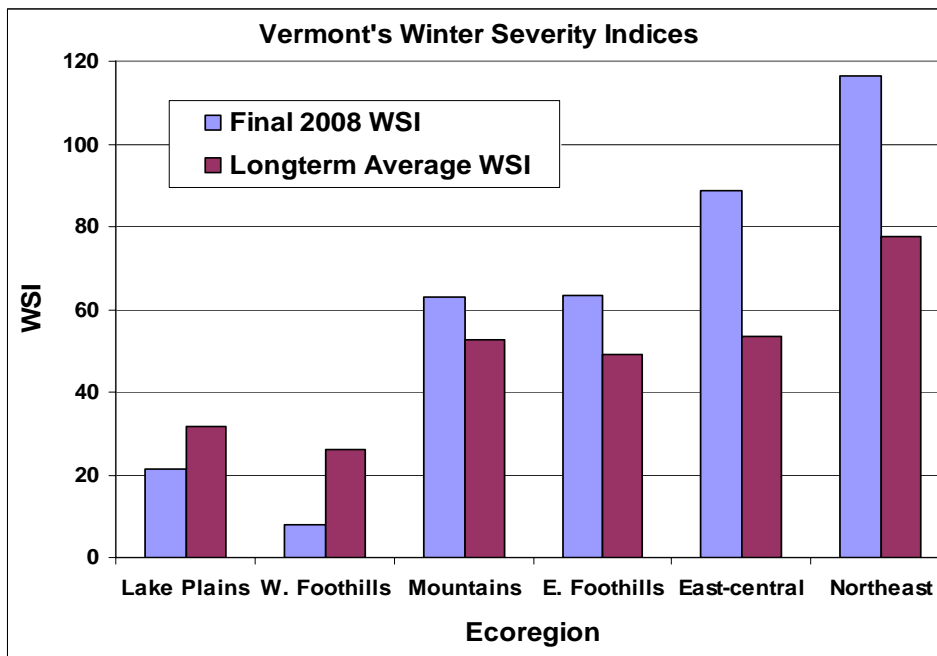


Figure 4. Regional long-term average winter severity versus 2007-08 final WSI. Lake Plains is WMUs A, B, F1, and F2; Western Foothills is K1, K2, and N; Mountains is C, G, I, L, and P; Eastern Foothills is M1, M2, O1, O2, and P; East-central is H1, H2, J1 and J2; Northeast is D1, D2, and E.

Also, despite deep snow accumulations in much of the state, a rain-thaw event in late February followed by freezing temperatures caused the snowpack to freeze solid through March, thus allowing deer to walk on top of as much as 4 or 5 feet of snow. The abundance of deer in early 2008 and their ability to move freely was also evidenced by road-kill reports from game wardens (Figure 5).

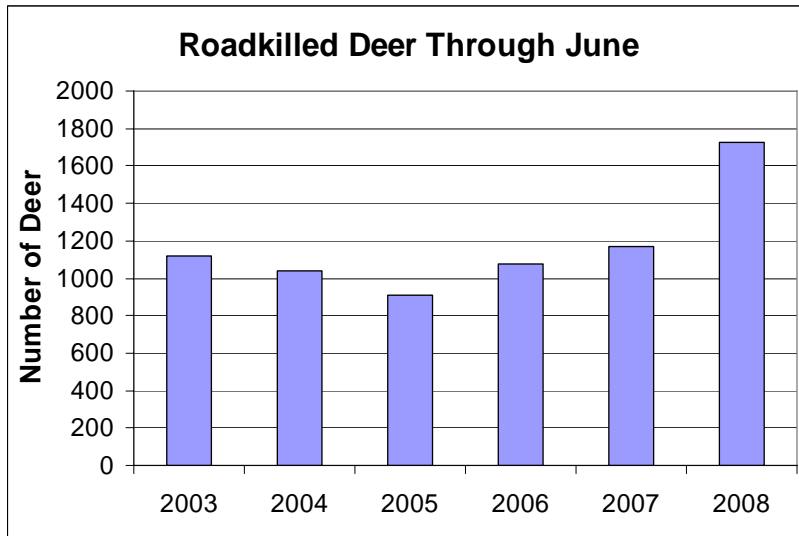


Figure 5. Number of road-killed deer reported by game wardens from January through June, 2003–2008.

The primary way the Department can maintain the health of the deer population is by making appropriate annual antlerless deer harvest recommendations to the Fish and Wildlife Board resulting in issuance of adequate numbers of antlerless deer permits and by protecting critical habitat. An overabundance of deer results in overbrowsed food resources, damaged habitats, and unhealthy deer. Too many deer damage deer wintering areas thus making the population more susceptible to rapid decline when severe winters follow in subsequent years. It is not possible to eliminate the influence winter weather can have on deer population dynamics in Vermont. Maintaining a healthy deer herd is the best way to minimize the boom and bust population cycles that have occurred historically in Vermont.

Three of six regions in Vermont were estimated to be above maximum deer density objectives in 2007 (Figure 6). Given the nature of the 2007-08 winter and regional population densities, antlerless deer harvest recommendations for 2008 were focused mainly on western Vermont and the East-central region (Figure 7). No antlerless deer permits were allocated to the Mountains and Northeast regions, and permits were not increased in the Eastern Foothills region.

The Department relies on archers, muzzleloader hunters, and youth to harvest female deer and manage Vermont's deer populations from becoming overabundant when winter weather is mild. With a decline in such hunters occurring after 2000, the ability to prevent overabundance following mild winters has come into question. Some muzzleloader permits remained unallocated in WMUs A and N in 2008. Currently, the health of deer in western Vermont is threatened by overabundance. Road-killed fetal counts by game wardens in winter 2007-08 found a fetal rate of 1.54 fawns per doe (1.36–1.71, 95% CI) in the three regions within population objectives, and 1.37 fawns per doe (1.21–1.53, 95% CI) within the

three regions with populations greater than population objectives. More data will be collected, but concern for overabundance in western Vermont appears warranted. The Department will continue to recruit archers and muzzleloader hunters back into Vermont's hunting population to help maintain herd health.

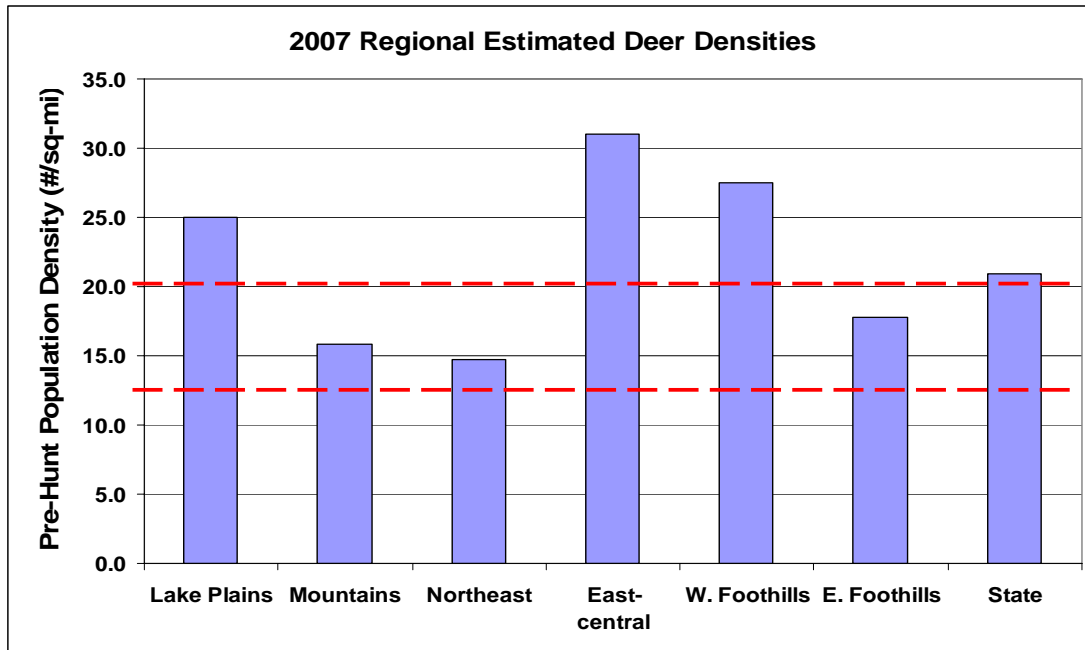


Figure 6. Regional pre-hunt deer population estimates for 2007 in Vermont. The horizontal dashed lines represent preliminary generalized maximum and minimum population objectives – more detail on new population objectives will be found in the new 10-Year Big Game Management Plan to be made publicly available in 2009.

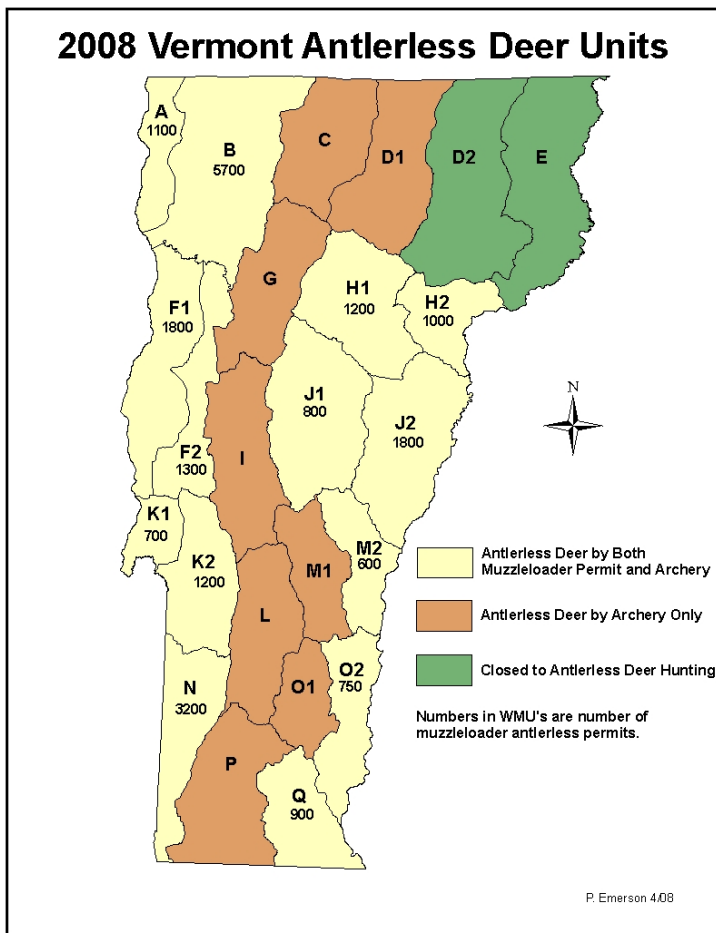


Figure 7. Vermont's 2008 antlerless deer seasons.

Management actions taken since the late 1970s have improved the health of Vermont's deer herd (Figure 8). In 2008, the Department moved its biological deer check stations from opening weekend of rifle season to Youth Weekend to continue to obtain data from a representative sample of the population via youth hunters who can take any buck (Figure 8). For data collection purposes it is important that Youth Weekend does not carry the antler-restriction regulation which all other deer hunting seasons do.

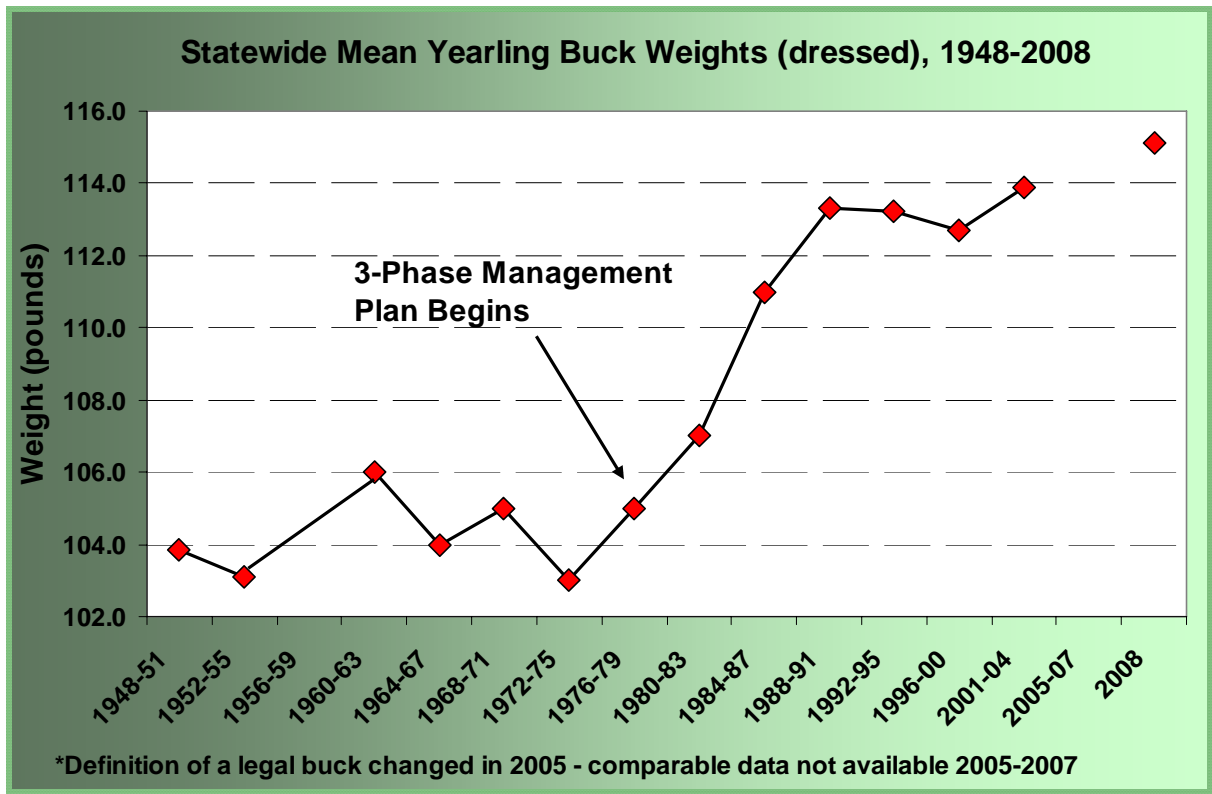


Figure 8. Vermont’s average yearling buck weights as a measure of herd health from 1948–2004. The informal three-phase management plan enacted in 1979 was to: 1) radically reduce the deer population in the early 1980s; 2) maintain a reduced deer herd through the 1980s to allow chronically overused habitats to recover; and 3) allow the population to recover in the late 1980s and early 1990s.

It is imperative to the long-term health of winter deer habitat and stability of the deer herd that deer numbers be controlled within the capacity of Vermont’s winter deer habitat. Harvest opportunities in 2009 may or may not be similar to those in 2008 depending on the outcome of winter 2008-2009.

Disease concerns are another aspect of deer health that the Department is concerned with. Vermont’s deer are largely disease free with respect to the major diseases that afflict deer and cause deer mortality in North America. The Department continues to monitor for Chronic Wasting Disease by sampling brainstems from 400 hunter-harvested deer annually as well as other target deer exhibiting signs of illness. A total of 1,965 deer have been tested since 2002 with none testing positive for CWD; 2008 results are pending. The Department will continue to recommend management actions to the Fish and Wildlife Board to protect Vermont’s deer herd from disease. Current relevant rules include carcass importation restrictions, feeding and baiting restrictions, and regulation of captive hunt facilities.

Deer Population Sex Ratios and Age Distribution

Antler point regulations designed to reduce the hunting mortality on yearling bucks went into effect in 2005. Data from biological check stations indicated that about 50% of yearling bucks had two antler points (i.e., “spike-horns”), so restricting spike-antlered deer

from harvest would protect a substantial portion of these young bucks from hunting mortality and encourage an older buck age structure. This is particularly true for Vermont where annual harvest rate of legal bucks typically exceeded 50% (Figure 9). Three-quarters of the buck harvest typically occurs during the single-buck 16-day rifle season (76.4% in 2007; see 2007 Harvest Report), and the change back to a three deer annual limit as designed by the Board in 2008 should have little to no impact on buck harvest rates. The three deer annual limit was designed to improve the ability to remove antlerless deer when and where needed given current limitation of hunting effort.

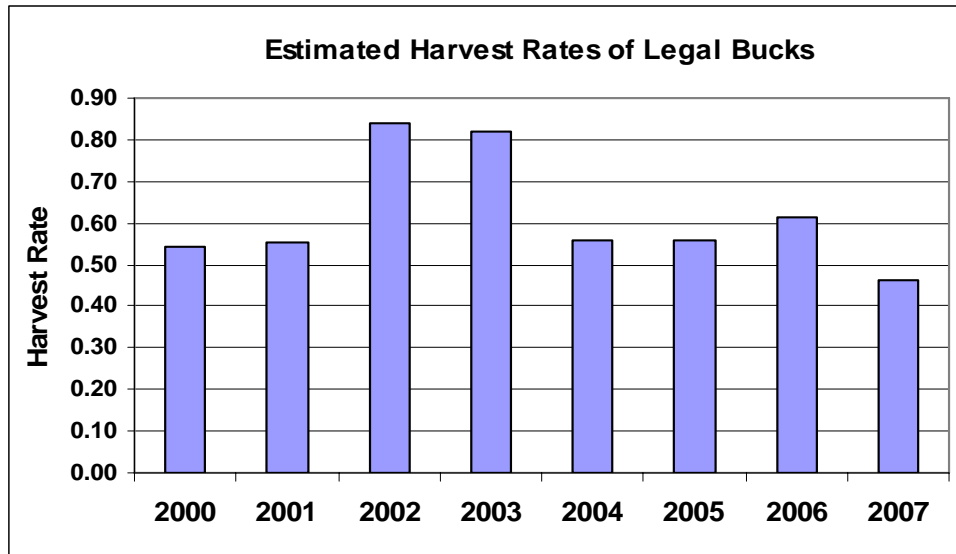


Figure 9. Estimated annual harvest rates of legal bucks in Vermont 2000–2007.

With the current annual hunting mortality of bucks, it is no surprise that bucks tend not to survive many years in Vermont (Figure 10). In contrast, females may live much longer (Figure 11). Fitting mathematical models to existing age data (i.e., the lines in Figures 10 and 11) for Vermont’s deer prior to the antler regulation in 2005 reveals an annual survival rate of about 35% for males and 80% for females. These data can also be used to estimate a statewide buck:doe ratio simply by entering the same number of male and female yearlings into a theoretical population, multiplying the annual survival rate until 16 years-old, and then adding each estimated cohort size. The result yields a 1:3.25 buck:doe ratio. However, if the yearling buck survival rate is increased to 60% under the current antler restriction (as previously expected and now evident in Youth Weekend harvest data), the new result is 1:2.7 bucks:doe; this buck:doe ratio should be achieved by 2009. The exact buck:doe ratio is not known, but the estimates should be accurate, and the result of the antler restriction is clear. Sex ratios of road-killed deer support the increased buck component in Vermont’s deer herd in the past two years (i.e., 3.26 from 1998–2005; 2.67 in 2006–2007). More such data would be useful to reconstruct Vermont’s deer population on a regional basis. For this reason, the Department initiated a bowhunter survey in 2008 designed to do just that.

Buck Ages from 1995-2004 Bio-check Station Data



Figure 10. Ages of bucks estimated by Department biologists during rifle seasons using the tooth wear and replacement technique from 1995–2004.

Doe Ages from 2003-06 Tooth Ring Data

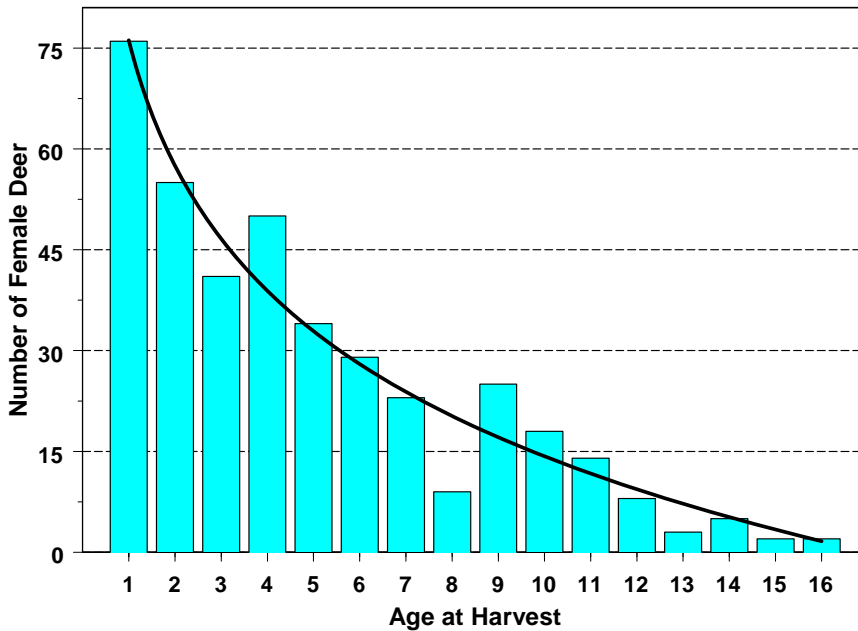


Figure 11. Ages of female deer as determined by laboratory analysis cementum annuli in the root of a central incisor tooth, 2003–2006. Teeth submitted to the Department by successful hunters via U.S. mail.

Age structure of Vermont’s buck harvest, and presumably the buck population, was historically about 62% yearlings. That percentage changed in 2005 with the onset of the current antler-point regulation (Figure 12). Subsequent deviations from the 2005 rifle harvest age structure are indicative of actual change of age structure in the population; this

was evident in 2006 and 2007 (Figure 12). With high annual hunting mortality of 2- and 3-year-old bucks, we expect age structure to have stabilized by 2008. With increased yearling buck survival and more older bucks in the population, yearlings should become about 52% of the buck population. For an estimate of rifle season age structure in 2008, we collected teeth from male deer submitted for CWD sampling; results will be available in summer 2009. We are also considering alternative ways to estimate rifle season age structure of the harvest.

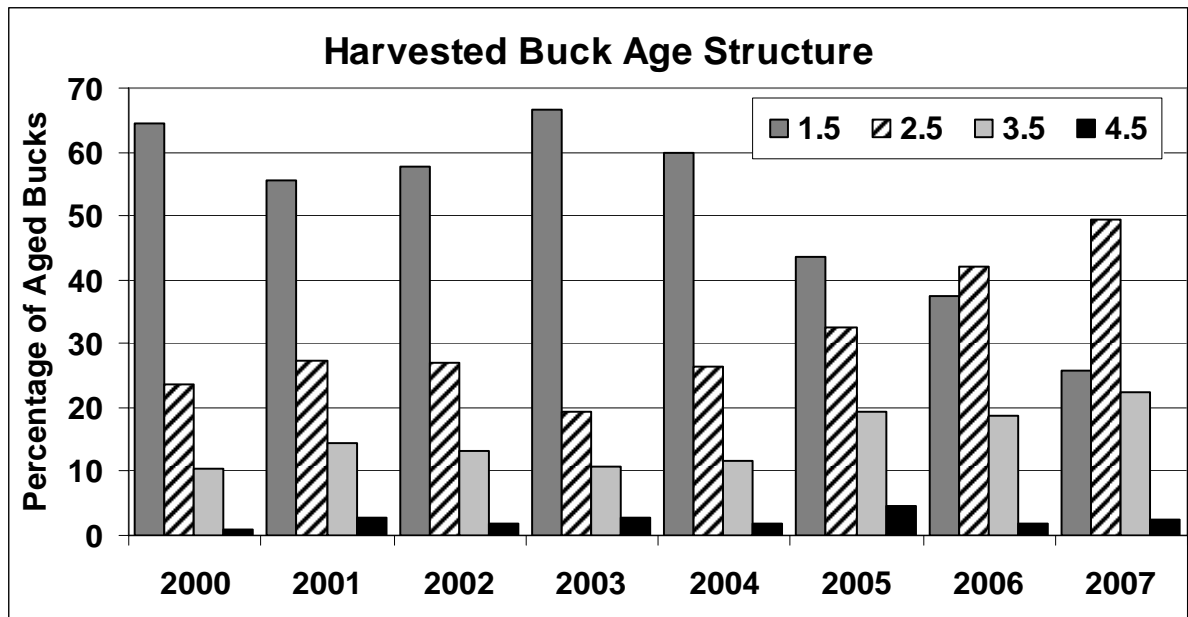


Figure 12. Ages of bucks taken during opening weekend of rifle season as determined by Department biologists using the tooth wear and replacement technique, 2000–2007.

Hunter Effort Analysis, WMU Redistricting, and Hunter Satisfaction

To help estimate the relative density of the deer population within regions of the state and to understand hunter distribution and activity levels, a hunter effort survey was initiated in 1999. This annual survey of 5,000 randomly selected Vermont deer hunters asks each hunter to keep a daily log of the hours hunted, Wildlife Management Units (WMUs) hunted, and the number of bucks and antlerless deer seen each day. By analyzing the returns biologists are able to estimate the number of hours hunted, percentage of licensed hunters afield each day, and number of deer seen per ten hours of hunting effort. These data are analyzed at the state (Figure 13) and WMU level (Table 1). Several factors can affect deer sighting rates other than actual deer population density, so statewide sighting rates may not always be the most effective strategy to track actual population size (Figures 2 & 13). However, long-term trends or averages among WMUs provide meaningful comparisons (Table 2). Relative daily hunter effort is useful for population modeling but also provides insight into the importance of hunting early in the rifle season when the hunters' chances (catch-per-unit-effort) are best to find and take a legal buck (Figure 14). Toward the end of the rifle season, a hunter may be able to improve his/her odds of success by finding remote areas where previous hunting pressure was comparatively low.

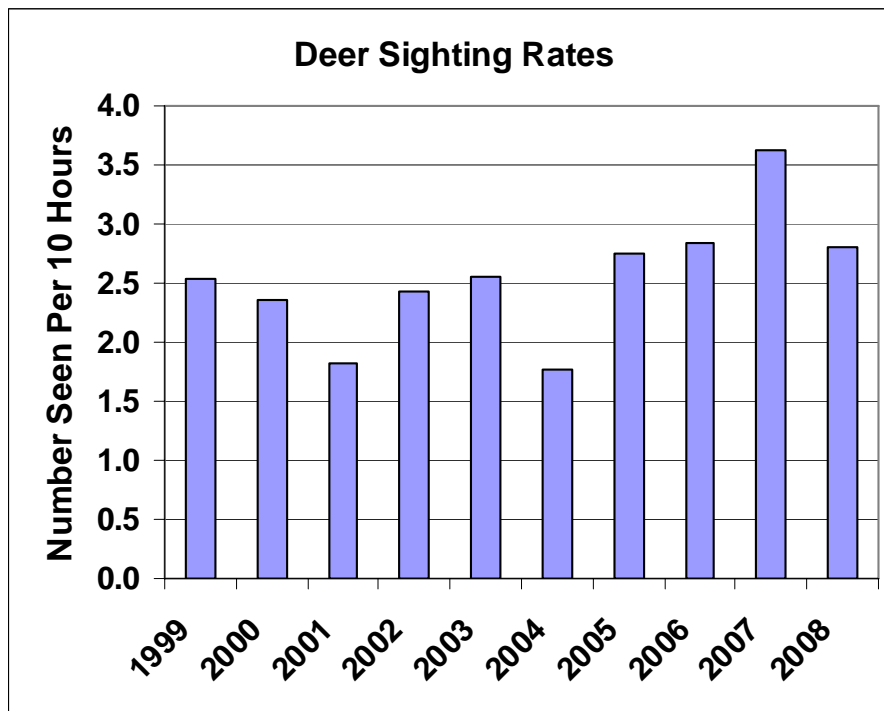


Figure 13. Sighting rates of deer made by hunters during rifle seasons 1999–2008.

Table 1. 2006 hunter effort analysis by wildlife management unit; such data are similar among years.

WMU	Days Hunted	% of Total	Total Hours	Mean Hours /Day	Deer Seen /10 Hours	Hunter Hrs./ Mi ²	Est. Hunters /Mi ²	Harvest	Harvest /Mi ²
A	154	0.02	849	5.51	5.80	18.7	41.3	118	2.6
B	596	0.09	3273	5.49	4.76	6.4	14.1	758	1.5
C	332	0.05	2067	6.23	2.66	5.8	11.4	236	0.7
D1	476	0.07	2482	5.21	5.10	6.6	15.4	366	1.0
D2	456	0.07	2545	5.58	2.79	4.5	9.9	308	0.5
E	269	0.04	1457	5.42	1.54	2.4	5.4	120	0.2
F1	232	0.04	1271	5.48	5.70	5.8	12.8	177	0.8
F2	195	0.03	1122	5.75	3.36	5.1	10.7	201	0.9
G	194	0.03	1184	6.10	2.39	3.3	6.5	192	0.5
H1	373	0.06	2297	6.16	3.06	5.8	11.5	299	0.8
H2	191	0.03	1015	5.31	3.57	5.6	12.8	175	1.0
I	157	0.02	977	6.22	1.21	2.5	4.8	123	0.3
J1	445	0.07	2203	4.95	5.02	4.5	11.0	347	0.7
J2	427	0.07	2510	5.88	4.38	5.3	10.9	506	1.1
K1	102	0.02	590	5.78	8.19	6.0	12.6	129	1.3
K2	268	0.04	1382	5.16	3.88	4.8	11.3	357	1.2
L	270	0.04	1448	5.36	1.77	4.1	9.3	149	0.4
M1	103	0.02	635	6.17	2.29	2.7	5.2	121	0.5
M2	196	0.03	1066	5.44	5.38	5.0	11.2	227	1.1
N	298	0.05	1572	5.28	3.68	5.3	12.1	354	1.2
O1	109	0.02	567	5.20	1.89	3.0	6.9	82	0.4
O2	231	0.04	1200	5.19	3.64	4.6	10.7	230	0.9
P	229	0.04	1261	5.51	1.61	2.7	6.0	185	0.4
Q	207	0.03	1266	6.12	1.54	4.6	9.2	199	0.7
State	6545	1.00	36438	5.57	3.64	4.6	9.0	5959	0.8

Table 2. Sighting rates (deer seen per 10 hours hunting) by rifle season hunters.

	2000	2001	2002	2003	2004	2005	2006	2007	Mean
Total	2.36	1.82	2.43	2.56	1.75	2.75	2.84	3.63	2.52
WMU									
A	1.53	1.35	2.00	6.03	2.72	3.51	4.57	4.84	3.32
B	3.20	2.14	3.35	3.18	2.10	3.62	3.88	4.04	3.19
C	1.78	1.14	2.07	2.67	1.23	2.41	1.87	3.40	2.07
D1	2.19	1.78	1.48	2.07	1.12	3.26	4.40	2.85	2.39
D2	1.26	1.59	1.74	1.69	1.01	2.70	2.03	3.62	1.96
E	1.05	0.48	0.26	0.53	0.52	0.75	1.16	1.94	0.84
F1	3.18	2.57	3.92	3.79	2.44	3.60	3.74	5.29	3.57
F2	2.68	1.92	3.50	2.66	2.09	3.11	3.02	4.31	2.91
G	1.98	1.10	1.42	2.79	1.69	1.57	1.86	2.84	1.91
H1	2.80	1.86	1.49	3.84	1.48	2.22	2.55	5.37	2.70
H2	3.37	1.60	2.60	2.88	1.95	2.71	2.84	3.15	2.64
I	1.80	1.19	2.18	1.63	1.05	1.63	1.32	3.09	1.73
J1	3.05	2.26	2.23	2.83	1.82	3.62	3.94	4.35	3.01
J2	2.48	1.94	2.92	4.08	2.60	3.40	3.34	4.18	3.12
K1	3.13	3.02	3.53	4.03	2.28	4.04	5.59	5.23	3.86
K2	2.67	2.73	2.71	1.98	2.33	3.49	2.57	3.23	2.72
L	1.75	1.84	2.28	1.24	1.23	1.62	1.52	1.79	1.66
M1	1.38	1.04	3.50	1.40	1.08	1.91	2.41	2.01	1.84
M2	3.39	3.75	2.28	3.63	2.31	3.94	4.37	4.55	3.53
N	4.28	2.10	3.75	2.81	3.53	3.13	3.25	2.83	3.21
O1	1.70	0.80	1.97	1.77	1.86	2.23	1.45	2.36	1.77
O2	1.69	1.54	2.82	2.00	1.03	2.39	2.49	4.10	2.26
P	0.70	0.73	1.62	0.87	1.80	2.10	1.22	1.38	1.30
Q	1.75	1.14	2.08	1.90	2.27	2.01	1.37	3.54	2.01

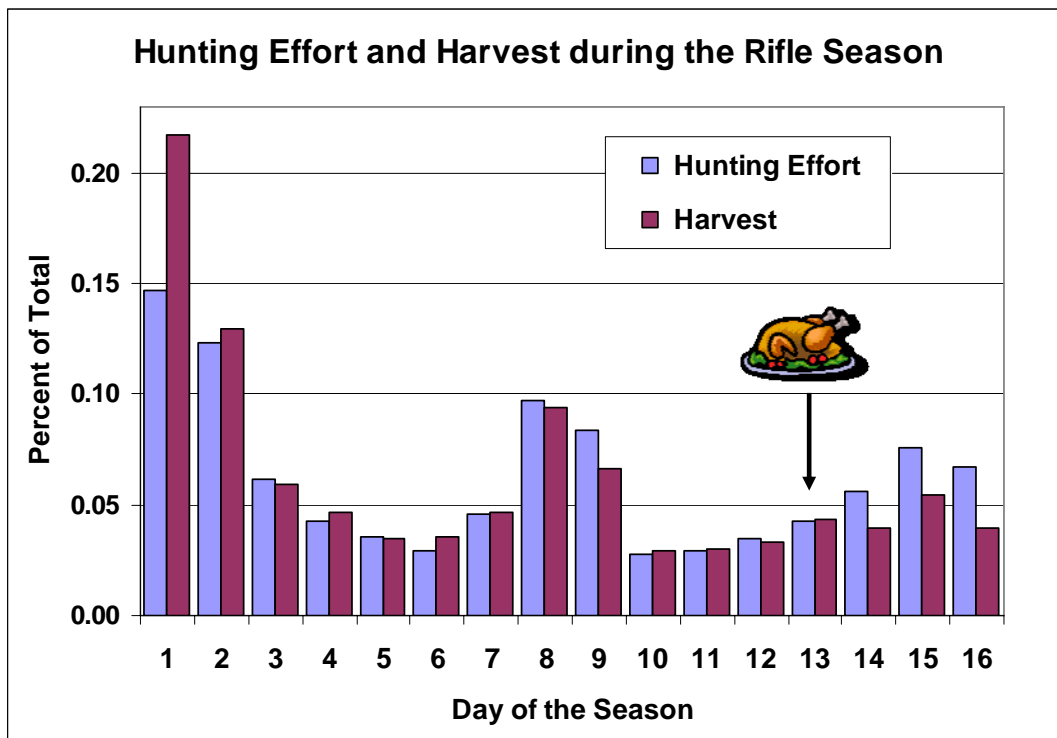


Figure 14. Hunting effort and harvest in 2007 during Vermont’s historic 16-day hunting season with day #13 on Thanksgiving.

Wildlife Management Units were established in 1978 to enable the Department to prescribe antlerless deer management recommendations on a regional habitat/deer density basis. To provide hunters with an identifiable boundary, major highways were used as legal definitions for the WMUs. The Department is working to complete the next 10-year deer management plan in 2009. We are revisiting the idea that some WMU boundaries might be modified in a way that retains identifiability for hunters but makes the WMU more ecologically relevant.

Based on anecdotal evidence such as phone calls, letters, and e-mail, hunters reported seeing more deer and deer sign during the past two hunting seasons. Deer hunter satisfaction seems to be greatly improved over recent years with older bucks in the population demonstrating breeding behavior with visible signs such as rubs and scrapes. Hunters seem generally pleased with the 2008 deer hunting results and the new deer harvest regulations. Hunters seem to have a more positive outlook on deer hunting and deer management in Vermont. The Department will continue to use hunters to manage the deer herd and take further steps to maintain or improve the flow of data and other input to and from hunters.

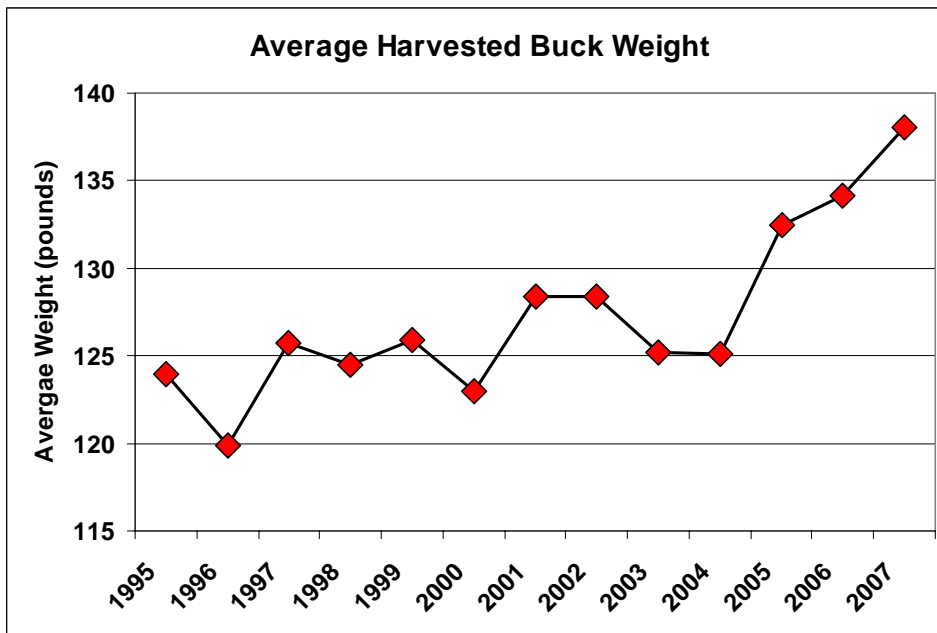


Figure 15. Statewide mean averages of Vermont bucks weighed by Department biologists during opening weekend of rifle seasons from 1995–2007.

Along with increased average age of harvested bucks has come increased average weight (Figures 12 & 15). Based on data from biological check stations, average harvested buck weight increased 13 pounds, from 125 pounds during the decade prior to the antler regulation to 138 pounds in 2007. Increased buck weight has resulted in an increase in yield of useable meat. With a buck harvest of about 9,000 (as in 2003 and 2007), about 115,000 pounds more deer (field-dressed weight) and 50,000 pounds more meat resulted from the heavier bucks taken in 2007 compared to the similar harvest of 2003. Vermonters and visitors harvested about 505 tons of local venison in 2007.