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TITLE: White-tailed Deer Research/Management

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TITLE: Deer Health, Forest Habitat Health, Deer Harvests, and Deer Population Trends by Wildlife Management Unit (WMU)

PERIOD COVERED: 1 July 2006 through 30 June 2007

COOPERATING AGENCIES: Pennsylvania Cooperative Fish and Wildlife Research Unit (PCFWRU), Pennsylvania Department of Conservation and Natural Resources (DCNR), Pennsylvania State University (PSU), and U.S. Forest Service (USFS)

WORK LOCATION(S): Statewide

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Abstract: We monitored Wildlife Management Unit (WMU) deer health, forest habitat health, and deer population trends using reproductive parameters from road-killed does, advanced tree seedling and sapling regeneration (ATSSR) from the Pennsylvania Regeneration Study, deer harvest estimates and compositions, and field studies. Deer health was judged to be good in 6 WMUs, fair in 12 WMUs, poor in 2 WMUs, and uncertain in 2 WMUs. Forest habitat health was judged to be good in 1 WMU, fair in 16 WMUs, and poor in 4 WMUs. Hunters harvested 361,560 deer (135,290 antlered and 226,270 antlerless) in the 2006-07 deer seasons. Deer populations in most WMUs remained stable. Antlerless allocations were designed to reduce the population in 3 urban/suburban WMUs, increase the population in 1 WMU, and keep the population steady in all remaining WMUs. We recommend the continuation of current regulations to monitor deer populations, and modification of antlerless allocations to change the antlerless deer harvests.

OBJECTIVE

To monitor deer health, forest habitat health, deer harvests, and deer population trends by WMU.

METHODS

Deer Health

To obtain data on deer health, Wildlife Conservation Officers examined female deer killed by various causes from 1 February through 31 May 2006. They recorded location (county, township, and WMU), date killed, cause of death, and number and sex of embryos for each doe on a form attached to a deer jaw envelope. They measured embryos so that we could determine conception and projected birth dates and removed 1 side of the lower jaw from each deer for age determination. Jaws were forwarded to Region Wildlife Management Supervisors, who along with the

Deer Management Section, made the age assignments in July 2006. Personnel in the Bureau of Automated Technology Services (BATS) processed the reproductive data and provided summary reports for the state and each WMU.

Based on results from published studies (Cheatum and Severinghaus 1950, Verme 1965, Verme 1967, Verme 1969, Hesselton and Sauer 1973, Hesselton and Jackson 1974, McCullough 1979, Stoll and Parker 1986, Folk and Klinstra 1991, Osborne et al 1992, Taylor 1996, Swihart et al 1998), we defined good, fair, and poor deer health as follows. For 3-year-old and older females, at least 1.7 embryos per doe was considered good, less than 1.5 embryos per doe was considered poor. For 2-year-old females, at least 1.5 embryos per doe was considered good and less than 1.1 embryos was considered poor. For 1-year-old females, if at least 30% were pregnant, deer health was considered good. If 10% or fewer were pregnant, deer health was considered poor. For all values, fair falls between cutoffs for good and poor.

Collecting enough annual data for each WMU remains a challenge. To better utilize available data, we pooled 2-year-old and 3-year-old and older female reproductive rates when there was no significant statistical difference between age class reproductive rates. For pooled data, we considered good deer health to be greater than 1.65 embryos per doe, poor deer health to be less than 1.40 embryos per doe (Cheatum and Severinghaus 1950, Verme 1965, Verme 1967, Verme 1969, Hesselton and Sauer 1973, Hesselton and Jackson 1974, McCullough 1979, Downing and Guynn 1985, Stoll and Parker 1986, Folk and Klinstra 1991, Osborne et al 1992, Taylor 1996, Swihart et al. 1998). Fair deer health fell between the cutoffs for good and poor. If health determinations (e.g., good) from pooled data differed from unpooled data, we assigned WMU deer health based on 3-year-old and older females only.

Due to uncertainty associated with sampling and use of generalized cutoffs based on published results, we did not expect complete agreement in reproductive assessments across age classes within a WMU. As a result, we considered reproductive measures of 2-year-old and older females for pooled data and 3-year-old and older females for unpooled data as most important in assessing WMU level deer health, because these age classes produce the greatest number of offspring and have the greatest effect on the population. Pregnancy rates of 1-year-old females followed 3-year-old and older embryo counts in importance because female fawn breeding stops at high population sizes (McCullough 1979). In New York, Hesselton and Jackson (1974) demonstrated that female fawns, or 1-year-old females, are most sensitive to range conditions.

Forest Habitat Health

To obtain data on forest regeneration, advanced tree seedling and sapling regeneration (ATSSR) data are collected as part of a systematic sampling scheme from public and private lands in WMUs from the Pennsylvania Regeneration Study being conducted as part of the Forest Inventory Analysis (FIA) by Pennsylvania Department of Conservation and Natural Resources (DCNR), Pennsylvania State University (PSU), and U.S. Forest Service (USFS). Subsets of all plots are collected each year, with a complete sampling of plots occurring every 5 years. ATSSR from 2 groupings of tree species are available from the Pennsylvania Regeneration Study. The measure selected for use in deer management is the grouping of dominant canopy species and species capable of achieving high canopy status. "The composition of the ATSSR has a direct impact on the future composition of the forest overstory (Marquis and others 1994). To cover the range of future forest character and client needs 2 composition groupings are used. The first groups tree species by preference for timber management. The second composition grouping represents the forest's ability to regenerate the existing dominant canopy. Dominant species include those that contribute at least 2% of the State's total-tree biomass and are able to grow into the existing

canopy; Other High Canopy species include all others that are capable of attaining canopy dominance" (McWilliams et al. 2004:13-14).

We requested ATSSR data for dominant canopy species and species capable of achieving high canopy status by WMU from the USFS and DCNR. Because of the sampling scheme used in the Pennsylvania Regeneration Study, it takes 5 years to visit all sample plots. Based on input from cooperating agencies that designed and conduct the Pennsylvania Regeneration Study, we defined forest habitat as good if 70% or more of the sampled plots contained adequate regeneration. If less than 50% of the plots contained adequate regeneration, forest habitat health was considered poor. Fair falls between cutoffs for good and poor.

Deer Harvest Estimates and Composition

To estimate deer harvests and collect data for monitoring deer population trends, 33 data collection teams examined deer in assigned areas across the state. Each team collected data for 3 days during the first week of the regular firearms season, 2 days during the second week of the season, and 2 days after the close of the season. Data collected included age, sex, location of harvest (WMU, county, and township), and hunting license number from ear tags. Deer teams determined deer age as 6 months (fawn), 18 months (yearling), or at least 30 months (adult) using tooth wear and replacement (Severinghaus 1949). Aging teams also removed incisors from males 30-months-old or older for age determination by cementum annuli analysis. Data collection teams also recorded points of antlers to determine antler characteristics by age class.

A data entry company is contracted to enter deer aging and harvest report card data. Bureau of Automated Technology Services (B.A.T.S.) validated and processed harvest data and ran harvest data analysis programs. For each WMU the analyses included: the number of antlered and antlerless deer checked by aging teams, the number of antlered and antlerless deer checked by deer aging teams and reported by hunters, the total number of antlered and antlerless deer reported by hunters, age and sex composition of the harvest, reproductive data, and reported regular firearms, muzzleloader, and archery harvests.

Deer harvests were estimated using mark-recapture methods. When estimating deer harvests, we used a closed, 2-sample Lincoln-Petersen estimator where deer were considered marked when they were checked in the field by deer aging teams. Recapture occurred when marked deer were reported on report cards sent in by hunters.

Because reporting rates in Pennsylvania vary by year, antlered and antlerless deer, and management unit (Rosenberry et al. 2004), deer harvest estimates were calculated for antlered and antlerless deer in each WMU using Chapman's (1951) modified Lincoln-Petersen estimator. This estimator is recommended (Nichols and Dickman 1996) because it has less bias than the original Lincoln-Petersen estimator (Chapman 1951).

Deer Population Trends

We used multiple methods to monitor deer population trends including a modified Sex-Age-Kill (SAK) deer population monitoring procedure, antlerless hunter success index (i.e., estimated antlerless harvest divided by the number of antlerless licenses), and an antlered harvest index (i.e., estimated antlered harvest for a WMU).

We used the SAK method of population reconstruction (Eberhardt 1960, Creed et al. 1984, Skalski and Millspaugh 2002) with modifications for Pennsylvania's antler restrictions to monitor deer population trends. Modifications involve estimation of 1.5-year-old and 2.5-year-old and older male populations.

Population trend monitoring relies on research data from Pennsylvania (e.g., Long et al. 2005), harvest estimates, and deer aging data. Population monitoring began with adult males (males 1.5 years of age and older) and progressed to females and fawns.

The modified SAK procedure began by estimating males 2.5 years of age and older from harvest estimates and adult male harvest rates. Once the population of males 2.5 years of age and older were estimated, we determined the 1.5-year-old male population. Because protection levels of 1.5-year-old males varied among WMUs and harvest rates could also vary, we worked back in time to generate harvest rates for 1.5-year-old males. First, we determined the pre-hunt population of 1.5-year-old males in the preceding year using current year population estimate of 2.5-year-old males, survival rate from 1.5 to 2.5 years of age, and estimated harvest of 1.5-year-old males in the preceding year. Harvest rate of 1.5-year-old males from the preceding year was then calculated using the pre-hunt population and estimated harvest of 1.5-year-old males. Current year population of 1.5-year-old males was determined using a 3-year running average of harvest rates of 1.5-year-old males from the 3 previous years. Following determination of the 1.5-year-old males and males 2.5 years of age and older, calculation of female, fawn, and the total populations followed procedures similar to Skalski and Millspaugh (2002).

When interpreting results from the modified SAK procedure, it is important to know that due to the nature of population reconstruction methods, such as those used in the SAK procedure, the most accurate population estimate for a particular year occurs at some point in the future when data for each cohort of deer is complete (Skalski et al. 2005). Consequently, for the most recent years, population numbers should be viewed as indices rather than estimates (Skalski et al. 2005). Second, due to necessary assumptions of this population monitoring procedure, population numbers used to assess trends should be viewed as relative (i.e., whether trends are increasing, decreasing, or remaining stable), not absolute numbers. As we accumulate more years of data and results from on-going internal and external evaluations, refinements to this procedure will occur.

Population trends are reported as changes from year to year (λ) and are calculated as $\lambda = \frac{\hat{N}_{t+1}}{\hat{N}_t}$ where $\hat{N}_{t+1}$ is the deer population in year *t+1* and $\hat{N}_t$ is the deer population in year *t* (Skalski et al. 2005). A value of λ = 1.00 would indicate no change in deer population. Values greater than 1.00 indicate increases and values less than 1.00 indicate decreases. Deer management objectives and recommendations are based on population trends. As a result, we do not make management recommendations in response to individual λs, but rather we based management recommendations on multi-year trends.

Winter Mortality Survey

The winter mortality survey was not completed this year. Efforts are underway to develop a new protocol for conducting this survey.

RESULTS

Deer Health

WCOs examined 632 females during the 2006 pre-fawning season. Three hundred sixty-eight were pregnant and 358 were usable for determining conception dates. Twenty-four percent of the fawns, and 85% of the adults were pregnant. Pregnant fawns averaged 1.06 embryos/doe. Pregnant adults averaged 1.81 embryos/doe. The average reproductive rates for pregnant and barren fawns and adults were 0.26 and 1.53 embryos/doe, respectively. The average reproductive rate for all females

was 0.97 embryos/doe. The median conception date for all does was 11 November. Eighty-nine percent of all breeding occurred between 16 October and 16 December, with the median date fawns bred as 30 November, 3 weeks later than adult does. The median projected birth date for all fetuses examined was 28 May. Over the last 7 years, conception timing has changed little (Table 1).

WMU deer health assessments were based on reproduction from 3 consecutive years, 2004 to 2006. We pooled these 3 years because annual sample sizes for each age class are too small to make reliable inferences. In WMUs 2E and 5A, health assessments are uncertain and this may be due to small sample sizes (Table 2). Using criteria described in the methods, we identified 6 WMUs with good deer health, 12 with fair deer health, 2 with poor deer health, and 2 with uncertain deer health (Table 2).

Forest Habitat Health

WMU forest habitat health assessments were based on the first 5 years of the Pennsylvania Regeneration Study, 2001 to 2005. Results from the 2006 growing season were not available in time to be included in this year's assessment. Using criteria described in the methods, we identified 1 WMU with good forest habitat health, 16 with fair forest habitat health, and 4 with poor forest habitat health (Table 3).

Deer Harvest Estimates and Composition

PGC personnel checked an average of 467 (range: 72 to 882) antlered deer and 877 (range: 161 to 1,836) antlerless deer per WMU during the 2006 firearms season (Table 4). Based on deer checked and report cards sent in by successful hunters, hunters harvested an estimated 361,560 deer in the 2006-07 deer seasons (Table 4). The antlered harvest was 135,290, an increase of 12% over the 2005-06 harvest of 120,500. The antlerless harvest was 226,270, down 3% from 233,890 in 2005-06. Due to decreasing deer population trends, antlerless license allocations for the 2006-07 hunting seasons were reduced by 2% from the 2005-06 hunting seasons (Table 5). The reduction in antlerless licenses explained much of the change in antlerless harvests.

Antlered harvests were composed of 56% 1.5-year-old males and 44% 2.5-year-old and older males (Table 6). Since the implementation of antler restrictions during the 2002-03 hunting seasons, the age structure of the antlered harvest has increased, as has the number of 2.5-year-old and older bucks being harvested (Table 6). Antlerless harvest composition has changed little since 2001-02 hunting seasons (Table 7).

Results of cementum annuli analysis were not received in time for inclusion in this report. Results will be reported in next year's annual report.

Deer Population Trends

As part of ongoing evaluations of our methods of monitoring deer population trends, we conducted an external review of our modified SAK methodology. In 2006, we asked deer biologists and biometricians from various states in the Northeast, Southeast, and Midwest to review our modified SAK procedure. Results of the peer-review generally found our methods to be reasonable and logical, but a number of issues for further investigation were also identified. Efforts to address these issues are underway in the form of current and proposed studies and planned investigations. Deer harvest estimates, which are used in the antlered harvest and antlerless hunter success indices, have been previously peer-reviewed (Rosenberry et al. 2004).

Population changes (λs) for most WMUs exceeded 1.00 from 2005 to 2006 based on preliminary population estimates for 2006 (Table 8). Increases in some WMUs from 2005 to 2006 likely resulted from an increase in antlered deer harvest. Whether this increase is due to higher deer populations or change in antlered harvest rate is not known at this time. Following the 2007-08 hunting seasons, antlered deer harvest data will provide more information upon which a better assessment can be made.

Deer Management Recommendations

All deer hunting seasons and regulations will remain in place for the 2007-08 hunting seasons. These regulations include a 12-day concurrent antlered and antlerless firearms season for all hunters; a 7-day antlerless muzzleloader season in October; a 3-day antlerless rifle season in October for junior, senior, disabled, and military license holders; sale of unsold antlerless licenses, up to 2 per hunter, that remain after all hunters have had an opportunity to purchase one; and field possession regulations that allow a hunter to harvest another deer after tagging the first deer harvested. The Board of Commissioners also approved expanded antlerless only hunting seasons for archery and firearms in WMUs 2B, 5C, and 5D.

The Board also approved the 2007-08 antlerless deer license allocation (Table 5). Allocations were intended to hold most WMU population trends steady with 4 exceptions. Reducing deer populations in WMUs 2B, 5C, and 5D remained the objective. In WMU 4B, antlerless license allocations were reduced to facilitate a population increase based upon an evaluation of deer and forest habitat health, deer population trends, and recommendation from a Citizen's Advisory Committee (see Project Job No. 21012).

RECOMMENDATIONS

1. Increase annual WMU sample sizes of females collected for monitoring deer health.

2. Identify and develop additional analyses and measurements to improve utility of forest habitat health measure where needed (e.g., a direct measures of deer browsing).

3. Maintain deer aging sampling effort. Current numbers of deer checked in the field provide reasonably precise harvest estimates in most WMUs. Harvest estimates are least precise in smaller WMUs where it is more difficult to collect sufficient data.

4. Identify and develop a method to more accurately estimate reporting rates for early archery and October muzzleloader and rifle seasons deer harvests. A previous evaluation suggested use of firearms season reporting rates results in over-estimates of early season deer harvests. Fortunately, the effect on the overall harvest estimate was minimal because most deer were harvested during the regular firearms season.

5. Identify and develop a method of estimating adult male populations that is less dependent on current regulations.

6. Continue to evaluate validity of assumptions and population monitoring procedures through internal and external peer-review. Prioritize research needs based on internal and external reviews.

7. Develop a new protocol for conducting the winter mortality survey. The new protocol should provide estimates of winter-killed deer across the landscape.

8. Continue concurrent antlered and antlerless firearms seasons for all hunters. This provides more hunting opportunities to hunters and maintains consistency in hunting seasons that is important to monitoring population trends. In addition, the antlerless allocation can control the antlerless harvest without changing season length (see RESULTS section).

9. Continue antler restriction regulations to allow rigorous evaluation of their effects on the deer population and changes in hunter support over time.

10. Continue to allow hunters to purchase and use the entire antlerless allocation.

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Table 1. Number of does examined, median conception date, percent of does bred between 16 October and 16 December, mean embryos per adult doe (≥ 2 years of age), and adult doe pregnancy rates from 2000 to 2006, Pennsylvania.

Year	*n*	Median Conception Date	Percent bred 16 October to 16 December	Mean embryos per adult doe	Adult doe pregnancy rates (%)
2000	1,075	14 November	90	1.60	90
2001	942	17 November	91	1.58	92
2002	520	14 November	86	1.64	91
2003	618	14 November	93	1.60	92
2004	601	15 November	90	1.53	89
2005	883	14 November	90	1.51	87
2006	632	11 November	89	1.53	85

Table 2. Number of does examined and assessment of deer health by WMU and age class. Data are based on samples collected from 2004 to 2006, Pennsylvania.

	1-year-olds			2 or 3-year-olds and older			
WMU	*n*	% Preg.	Health	*n*	Embryos per doe	Health	WMU Health
1A	59	42	Good	61	1.51	Fair	Fair
1B	49	22	Fair	64	1.72	Good	Good
2A	46	11	Fair	74	1.45	Fair	Fair
2B	109	25	Fair	136	1.54	Fair	Fair
2C	67	25	Fair	89	1.27	Poor	Poor
2D	59	20	Fair	47	1.68	Good	Good
2E	8	38	Good	19	1.37	Poor	Uncertain
2F	27	11	Fair	48	1.42	Fair	Fair
2G	21	5	Poor	62	1.58	Fair	Fair
3A	17	6	Poor	38	1.42	Fair	Fair
3B	34	3	Poor	51	1.55	Fair	Fair
3C	34	6	Poor	33	1.45	Fair	Fair
3D	42	12	Fair	87	1.26	Poor	Poor
4A	62	15	Fair	79	1.58	Fair	Fair
4B	27	33	Good	29[1]	1.92[1]	Good[1]	Good[1]
4C	20	15	Fair	21	1.43	Fair	Fair
4D	33	27	Fair	72	1.42	Fair	Fair
4E	40	13	Fair	31	1.68	Good	Good
5A	9	44	Good	14	1.36	Poor	Uncertain
5B	40	25	Fair	41	1.44	Fair	Fair
5C	63	37	Good	130	1.76	Good	Good
5D	14	7	Poor	40	1.73	Good	Good

[1] Data based on 3-year-old females only because 2-year-old and 3-year-old females reproductive rates differed.

Table 3. Number of plots sampled, percent with adequate regeneration, and qualitative assessment of forest habitat health by WMU. Data are based on samples collected from 2001 to 2005, Pennsylvania.

WMU	*n*	% with adequate regeneration	Health
1A	74	61	Fair
1B	92	49	Poor
2A	66	61	Fair
2B	44	64	Fair
2C	170	50	Fair
2D	93	66	Fair
2E	62	56	Fair
2F	130	32	Poor
2G	273	41	Poor
3A	62	53	Fair
3B	157	51	Fair
3C	87	55	Fair
3D	126	50	Fair
4A	91	62	Fair
4B	80	68	Fair
4C	69	54	Fair
4D	93	53	Fair
4E	53	75	Good
5A	32	66	Fair
5B	43	67	Fair
5C	46	33	Poor
5D	5	n/a	n/a

Table 4. Number of deer checked by PGC personnel, number of report cards sent in by successful hunters, and estimated harvests for antlered and antlerless deer by WMU, Pennsylvania 2006-07.

	Antlered			Antlerless		
WMU	Deer Checked	Report Cards	Harvest[1]	Deer Checked	Report Cards	Harvest[1]
1A	426	1925	5,800	1167	4819	13,200
1B	643	2271	6,800	1836	3832	12,000
2A	360	2536	8,100	968	6100	17,000
2B	206	1752	5,800	718	4751	16,500
2C	757	3330	9,000	1283	4916	12,100
2D	689	3742	10,900	1588	7369	20,400
2E	359	1681	5,400	440	2319	7,400
2F	882	2608	7,200	1202	2863	8,000
2G	568	2796	7,200	360	2046	4,600
3A	481	1812	4,500	917	3419	8,800
3B	601	2234	6,500	1155	3700	10,600
3C	540	2343	6,700	783	3149	9,200
3D	372	1891	5,000	690	3113	7,400
4A	377	2034	5,900	565	3028	7,800
4B	468	1982	5,000	789	2826	6,600
4C	416	2551	6,100	889	3972	8,900
4D	656	2949	6,800	880	3621	9,900
4E	355	1834	4,100	650	3446	9,000
5A	75	992	2,200	218	2044	5,200
5B	504	3033	7,000	1129	5460	11,400
5C	476	3118	7,700	910	8229	16,100
5D	72	576	1,300	161	1785	4,100
Unk.		109	290		26	70

[1] Estimated harvests are rounded to the nearest 100 or 1,000 based on precision of harvest estimate. Unknown WMU harvests are rounded to the nearest 10 due to the small number.

Table 5. Antlerless license allocations by WMU, 2003-04 to 2007-08, Pennsylvania.

WMU	2003-04	2004-05	2005-06	2006-07	2007-08
1A	44,000	48,000	40,000	42,000	42,000
1B	37,000	33,000	27,000	30,000	30,000
2A	45,000	55,000	55,000	55,000	60,000
2B	45,000	68,000	68,000	68,000	68,000
2C	65,000	75,000	53,000	49,000	49,000
2D	58,000	58,000	56,000	56,000	56,000
2E	29,000	23,000	21,000	21,000	21,000
2F	44,000	44,000	30,000	28,000	28,000
2G	52,000	52,000	29,000	19,000	26,000
3A	28,000	32,000	27,000	29,000	29,000
3B	45,000	48,000	41,000	43,000	43,000
3C	40,000	37,000	32,000	27,000	27,000
3D	50,000	50,000	38,000	38,000	38,000
4A	37,000	43,000	35,000	29,000	29,000
4B	38,000	49,000	35,000	31,000	23,000
4C	46,000	44,000	39,000	39,000	39,000
4D	58,000	55,000	40,000	40,000	40,000
4E	38,000	38,000	38,000	38,000	38,000
5A	28,000	32,000	28,000	25,000	22,000
5B	60,000	64,000	56,000	53,000	53,000
5C	66,000	71,000	71,000	79,000	84,000

5D	20,000	20,000	20,000	20,000	20,000

Table 6. Number of antlered deer aged, age composition of harvests, and approximate number of 2.5-year-old and older males harvested in Pennsylvania, 2001-02 to 2006-07. Three and 4-point antler restrictions started in 2002-03. Percentages may not add up to 100 percent due to rounding.

Year	*n*	% 1.5-year-old males	% 2.5-year-old and older males	No. of 2.5-year-old and older males
2001-02	18,893	78	22	44,700
2002-03	11,688	68	32	52,900
2003-04	11,367	56	44	62,600
2004-05	10,555	50	50	62,000
2005-06	9,062	52	48	57,800
2006-07	10,819	56	44	59,500

Table 7. Number of antlerless deer aged and age composition of harvests in Pennsylvania, 2001-02 to 2006-07. Percentages may not add up to 100 percent due to rounding.

Year	*n*	% 0.5-year-old males	% 0.5-year-old females	% 1.5-year-old and older females
2001-02	25,450	22	18	60
2002-03	30,077	22	18	60
2003-04	28,236	21	18	61
2004-05	24,640	22	18	61
2005-06	19,459	23	19	58
2006-07	19,074	23	19	58

Table 8. Change (λ[1]) in deer density by WMU, 2004 to 2006, Pennsylvania[2].

WMU	2004	2005	2006
1A	0.96	1.10	1.10
1B	0.96	1.12	1.12
2A	0.97	0.99	1.12
2B	1.07	1.15	1.29
2C	0.85	1.00	1.05
2D	0.92	0.95	1.24
2E	0.83	1.23	1.00
2F	0.90	0.90	1.23
2G	0.89	0.99	1.42
3A	1.00	1.04	1.10
3B	1.00	0.99	1.05
3C	0.90	0.87	1.40
3D	0.87	0.97	1.29
4A	0.90	0.73	1.74
4B	0.89	0.80	1.61
4C	1.03	0.90	1.11
4D	0.85	0.95	1.33
4E	0.88	1.21	0.82
5A	1.00	0.81	0.91
5B	0.91	1.01	1.09
5C	0.97	1.00	1.06
5D	1.13	0.81	0.96

[1] λ = 1.00 indicates no change in deer density. Values greater than 1.00 indicate increases, less than 1.00 indicate decreases.

[2] λs from prior years may not match λs previously reported because λs are updated as new harvest and population data become available.