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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

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COOPERATING AGENCIES: Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania State University, and U.S. Forest Service

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 proportion of fawns in the antlerless harvest, advanced tree seedling and sapling regeneration and deer impact from the Pennsylvania Regeneration Study, deer harvest estimates and compositions, and field studies. Proportion of juveniles in the antlerless harvest has remained stable in all WMUs 2009 to 2014. Forest habitat health was judged to be good in 4 WMUs, and fair in 16 WMUs. Deer impacts were determined to be acceptable in 17 WMUs and too high in 3 WMUs. Three WMUs (2B, 5C, and 5D) were not included in the forest habitat health assessment because of high levels of human development. Hunters harvested 303,973 deer (119,260 antlered and 184,713 antlerless) during the 2014-15 deer seasons. Deer populations in 21 WMUs remained stable, and 2 WMUs increased. No WMUs showed a decreasing population trend. The Board of Commissioners set antlerless allocations to increase deer populations in 18 of 23 WMUs.

OBJECTIVE

To monitor deer health, forest habitat health, deer harvests, and deer population trends by Wildlife Management Unit (WMU).

METHODS

Deer Health

To monitor deer health (i.e., population productivity defined as proportion of fawns in the antlerless harvest), 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 were recorded electronically on Pendragon Forms 5.1 software using a Windows Mobile hand-held computer (Trimble Nomad), and downloaded to a Harrisburg data collection point. 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). Data collection teams also recorded points of antlers and when antlers were physically present, presence or absence of a brow tine on each antler to determine antler characteristics by age class.

We assessed population productivity by monitoring trends in proportion of juveniles in the antlerless harvest (Rosenberry et al. 2011b). We identified proportion of juveniles in the antlerless harvest trends as increasing, decreasing, or stable based on graphical and statistical methods, specifically the Mann-Kendall Test for Trend (Mann 1945, Kendall and Gibbons 1990). We chose this test because it provides a statistical test of trend in data without complex calculations and does not require actual differences between years. Since effective state agency deer programs must consider public involvement and perceptions, it is important that we assess trends with a test that is statistically appropriate, utilizes information available to the public (e.g., a graph of estimates over time), and is relatively easy to explain.

Forest Habitat Health

We used forest regeneration to assess forest habitat health. Forest regeneration is not just a measure for the benefit of the forest, but also for deer and wildlife. For deer, seedling and sapling trees provide food and cover. As a result, measuring regeneration is an important measure of the sustainability of a forest, and available food and cover that benefit deer and other wildlife.

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 (PRS). This study is being conducted as part of the U.S. Forest Service (USFS) Forest Inventory Analysis in collaboration with Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania State University. Subsets of all plots are collected each year, with a complete sampling of plots occurring every 5 years. Advanced tree seedling and sapling regeneration from 2 groupings of tree species are available from the PRS. 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 et al. 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).

Based on recommendations from Wildlife Management Institute (Wildlife Management Institute 2010), more plots were included in our analysis of forest regeneration. From 2006 to 2010, only data from plots that were 40 to 75 percent stocked were analyzed. Beginning in 2011, data from all forested plots were analyzed.

We requested ATSSR data for dominant canopy species and species capable of achieving high canopy status by WMU from the USFS and DCNR. Determination of adequate regeneration was based on levels of deer browse impact observed in the area of each plot. For example, a higher count of seedling and sapling regeneration is required to replace the existing canopy where deer impact is "very high" compared to a lower count of seedling and sapling regeneration where deer impact is "very low". The scaled levels of deer impact indicate deer population size in relation to food availability in a given area (i.e., carrying capacity). Areas with ample food to support the local deer population will be evident by very low to medium deer impact. Areas lacking food to support the local deer population will be evident by high to very high deer impact. These critical stocking guidelines were derived from extensive literature reviews and decades of research on deer-habitat interactions (Marquis et al. 1992). In 2008 we began using browse impact and associated stocking levels in the habitat health measure. Because of the sampling scheme used in the PRS, it takes 5 years to visit all sample plots.

Based on input from cooperating agencies that designed and conduct the PRS and an internal Game Commission review of the forest habitat health measure, 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 levels for "good" and "poor".

Similar to the deer health measure, the forest habitat health measure is based on a sample of plots from across a WMU and we use a statistical test to assess regeneration levels. By using a statistical test to assess differences from predetermined levels (e.g., 70%), we take into account both the point estimate and associated variation.

When data are collected according to proper sampling design, estimates can be statistically compared to 50% and 70% levels using a t-test. The t-test determines whether the estimate is different from the 50% or 70% level based on standard statistical procedures. Since reliability of statistical tests is related to sample sizes, forest habitat health determinations are made based on 5-year data sets to maximize sample size and reliability of statistical tests.

Decision Rules Used to Determine Forest Habitat Health.--We developed a set of criteria to assign a value of "good", "fair", or "poor" for forest habitat health. A WMU's forest habitat health was considered "good" if the observed percentage of plots with adequate regeneration was greater than, equal to, or not significantly different than 70%. If a WMU's forest habitat health was not significantly different from 70% and not significantly different from 50%, then forest habitat health was considered "fair". A WMU's forest habitat health also was considered "fair" if: 1) the observed percentage of plots with adequate regeneration was equal to 50%; or 2) between 50% and 70% and significantly less than 70%; or 3) not significantly different than 50%. A WMU's forest habitat health was considered "poor" if the observed percentage of plots with adequate regeneration was significantly less than 50%.

In addition to forest health, we also assessed deer impact on the forest. These data were collected as part of the PRS. Deer impact was assessed on a scale from 1 (very low) to 5 (very high). We identified a score of 3 (moderate) as acceptable deer impact. Similar to the deer and forest health measures, the deer impact measure is based on a sample of plots from across a WMU and we use a statistical test to assess deer impact levels. By using a statistical test to assess differences from predetermined levels (e.g., 3), we take into account both the point estimate and associated variation.

When data are collected according to proper sampling design, estimates can be statistically compared to a score of 3 using a t-test. The t-test determines whether the estimate is different from 3 based on standard statistical procedures. Since reliability of statistical tests is related to sample sizes, deer impact determinations are made based on 5-year data sets to maximize sample size and reliability of statistical tests.

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 were recorded electronically on Pendragon Forms 5.1 software using a Windows Mobile hand-held computer (Trimble Nomad), and downloaded to a Harrisburg data collection point. 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). Data collection teams also recorded points of antlers and when antlers were physically present, presence or absence of a brow tine on each antler to determine antler characteristics by age class.

A data entry company was contracted to enter deer harvest report card data. The Pennsylvania Game Commission's (PGC's) Bureau of Automated Technology Services 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, 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, online, or via phone reporting system by hunters.

Because reporting rates in Pennsylvania vary by year, antlered and antlerless deer, and WMU (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 a modified Sex-Age-Kill (SAK) model to account for Pennsylvania's antler restrictions to monitor deer population trends (i.e., Pennsylvania Sex-Age-Kill [PASAK] model, Norton 2010, Rosenberry et al. 2011a). 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, Keenan 2010, Norton 2010), harvest estimates, and deer aging data. Population monitoring began with mature males (males 1.5 years of age and older) and progressed to females and fawns. Step-by-step methods and results of the PASAK model were presented to the Board of Commissioners at the January 2011 meeting and posted on the Game Commission's website (Rosenberry et al. 2011a). We also used additional data and further modified the procedure for estimating antlered harvest rates based on age structure of the antlered harvest. This method provided similar population estimates and the benefit of estimates based on annual data rather than multi-year averages used by Norton (2010).

We identified population trends as increasing, decreasing, or stable based on graphical and statistical methods, specifically the Mann-Kendall Test for Trend (Mann 1945, Kendall and Gibbons 1990). We chose this test because it provides a statistical test of trend in data without complex calculations and does not require actual differences between years. Since effective state agency deer programs must consider public involvement and perceptions, it is important that we assess trends with a test that is statistically appropriate, utilizes information available to the public (e.g., a graph of estimates over time), and is relatively easy to explain.

RESULTS

Deer Health

Age data from nearly 15,000 antlerless deer were used to assess proportion of juveniles in the antlerless harvest. Proportion of juveniles in the antlerless harvest ranged from a low of 0.29 in WMU 3D to a high of 0.48 in WMU 5D (Table 1). All WMUs exhibited stable trends from 2009 to 2014.

Forest Habitat Health

WMU forest habitat health assessments were based on the 5 years of the Pennsylvania Regeneration Study from 2010 to 2014. We identified 4 WMUs (WMUs 3A, 3B, 3D, and 5A) with good forest habitat health, and 16 with fair forest habitat health (Table 2). In 3 highly developed WMUs (i.e., 2B, 5C, and 5D) regeneration data were not used or considered in making deer management recommendations. Results from this report cannot be compared to some previous years' reports. In reports from 2006 to 2010, only plots with 40 to 75% stocking levels were analyzed. In this year's report, all plots were analyzed. Deer impact was acceptable in 17 WMUs and too high in 3 WMUs (Table 2).

Deer Harvest Estimates and Composition

PGC personnel checked an average of 370 (range: 37 to 660) antlered deer and 661 (range: 56 to 1,563) antlerless deer per WMU during the 2014 firearms season (Table 3). Based on deer checked and harvest reports by successful hunters, hunters harvested an estimated 303,973 deer in the 2014-15 deer seasons (Table 4). The antlered harvest was 119,260, down 11% compared to the

2013-14 harvest of 134,280. The antlerless harvest was 184,713, down 16% from the harvest of 218,640 in 2013-14. Some of this decrease was attributable to fewer antlerless hunting opportunities (i.e., lower antlerless license allocations and shorter antlerless firearms seasons in WMUs 4A and 4C).

Antlered harvests were composed of 43% 1.5-year-old males and 57% 2.5-year-old and older males (Table 4). Compared to years prior to 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 harvested (Table 4). Antlerless harvest composition has changed little since 1997-98 hunting seasons (Table 5).

Deer Population Trends

Based on PASAK, deer population trends were stable in 21 WMUs, and increasing in 2 WMUs (Table 6). No WMUs show a decreasing trend.

Deer Management Recommendations

We continue to recommend consistent regulations that provide more hunting opportunities and use antlerless allocations to adjust antlerless harvests and population trends. Additional regulations we recommended included 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 1; and field possession regulations that allow a hunter to harvest another deer after tagging the first deer harvested. For antlerless allocations, we provided, as requested, allocation options that would increase, decrease, or stabilize the deer population with either a 5-day antlered and 7-day concurrent firearms season or a 12-day concurrent firearm season. Increases and decreases in the population would be achieved by a decrease or increase of 1 deer per square mile in the antlerless harvest. To assist the Board of Commissioners in their decisions, we provided measures of deer health (i.e., proportion of juveniles in the antlerless harvest and population trend), forest habitat health (i.e., percent plots with adequate regeneration), deer impact, and deer-human conflicts from a survey of Pennsylvania citizens (Duda et al. 2012). Based on these data, WMU 3A has achieved its deer management goals. We therefore recommended a decrease in the antlerless allocation to allow a population increase. We recommended population stabilization in all other WMUs except WMUs 3C and 4B. WMUs 3C and 4B have deer impacts that are too high (Table 2). In WMU 4A, we recommended a stabilized deer population with the antlerless allocation, but an additional 13,500 DMA antlerless permits to reduce the deer population. Because of CWD, we recommended an increase in the antlerless harvest of 1 deer per square mile to increase sample sizes for disease testing and to help reduce the spread of CWD to other areas. Research comparing aggressive deer harvest in Illinois with reduced harvest in Wisconsin showed a reduced rate of disease spread with increased harvest (Manjerovic et al. 2014.)

Action by the Board of Commissioners

The Board of Commissioners retained the 5-day antlered/7-day concurrent firearms season in WMUs 2A, 2C, 2D, 2E, 2F, 2G, 2H, 3B, 3C, 4A, 4B, 4C, 4D, and 4E, and added WMUs 1A, 1B, 3A, and 3D. The Board of Commissioners decided to reduce recommended antlerless allocations in 17 WMUs and increase the allocation by 500 tags in WMU 2H. Recommended allocations were approved in WMUs 2B, 3A, 4A, 5A, and 5B. Allocations below recommended

levels will allow populations to increase. This is of particular concern in WMU 2C where the presence of CWD did not prevent a reduction to 31,000, or 33% below recent years' average.

RECOMMENDATIONS

1. Identify and develop additional analyses and measurements to improve the forest habitat health measure's ability to account for factors other than deer that affect forest regeneration and to most directly monitor deer impacts on forest regeneration.

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

3. 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.

4. Return to 12-day concurrent antlered and antlerless firearms seasons for all WMUs. Deer hunter surveys indicate Pennsylvania's future hunters and their mentors prefer the 12 day concurrent season. Time to hunt was the top reason for increased hunter interest for all ages. The 12-day concurrent firearm season 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.

5. Continue antler restriction regulations in accordance with goals and objectives of the 2009-2018 deer management plan. Monitor changes to antler restrictions in WMUs 1A, 1B, 2A, 2B, and 2D using harvest age structure data and antler characteristics.

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

7. In WMUs containing CWD-positive deer in the free-ranging population, reduce the population by 1 antlerless deer per square mile to help minimize the spread of CWD.

8. Set antlerless license allocations to achieve deer management goals as defined in the deer management plan.

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Table 1. Number of antlerless deer examined in 2014, proportion of juveniles in the antlerless 2014 harvest, and trend in the proportion of juveniles in the antlerless harvest by Wildlife Management Unit (WMU) from 2009 to 2014, Pennsylvania.

WMU	*n*	Proportion of juveniles in antlerless harvest	Trend
1A	724	0.46	Stable
1B	1,519	0.39	Stable
2A	829	0.38	Stable
2B	536	0.44	Stable
2C	922	0.42	Stable
2D	1,444	0.40	Stable
2E	532	0.36	Stable
2F	636	0.37	Stable
2G	292	0.30	Stable
2H	57	0.33	Stable
3A	486	0.36	Stable
3B	653	0.38	Stable
3C	661	0.36	Stable
3D	514	0.29	Stable
4A	383	0.32	Stable
4B	483	0.40	Stable
4C	498	0.40	Stable
4D	490	0.31	Stable
4E	628	0.38	Stable
5A	252	0.34	Stable
5B	1,053	0.40	Stable
5C	1,170	0.42	Stable
5D	147	0.48	Stable

Table 2. Number of regeneration plots sampled, percent with adequate regeneration, mean deer impact and qualitative assessments of regeneration and deer impact by Wildlife Management Unit (WMU). Data are based on samples collected from 2010 to 2014, Pennsylvania. Results are based on all forested plots and cannot be compared to some previous years that only included 40% to 75% stocked plots.

WMU	*n*	% plots with adequate regeneration	Forest health assessment	Mean deer impact	Impact assessment
1A	27	55	Fair	2.8	Acceptable
1B	25	56	Fair	3.0	Acceptable
2A	31	39	Fair	2.9	Acceptable
2B	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]
2C	60	58	Fair	2.9	Acceptable
2D	37	45	Fair	2.9	Acceptable
2E	20	61	Fair	2.7	Acceptable
2F	44	57	Fair	2.7	Acceptable
2G	65	54	Fair	3.0	Acceptable
2H	27	56	Fair	2.6	Acceptable
3A	24	66	Good	3.0	Acceptable
3B	49	65	Good	3.1	Acceptable
3C	34	55	Fair	3.4	Too high
3D	45	61	Good	3.3	Too high
4A	31	61	Fair	2.6	Acceptable
4B	31	60	Fair	3.4	Too high
4C	29	58	Fair	3.1	Acceptable
4D	52	48	Fair	3.1	Acceptable
4E	19	56	Fair	3.1	Acceptable
5A	11	75	Good	3.1	Acceptable
5B	14	38	Fair	3.2	Acceptable
5C	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]
5D	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]

[a] Regeneration data from these highly developed WMUs were not analyzed or considered in making deer management recommendations.

Table 3. Number of deer checked by Pennsylvania Game Commission personnel, number of report cards sent in by successful hunters, and estimated harvests for antlered and antlerless deer by Wildlife Management Unit (WMU), Pennsylvania, 2014-15.

	Antlered			Antlerless		
WMU	**Deer checked**	**Report cards**	**Harvest[a]**	**Deer checked**	**Report cards**	**Harvest[a]**
1A	251	1,730	5,100	746	3,351	10,800
1B	571	1,824	5,800	1,563	2,449	8,800
2A	378	1,705	5,100	842	2,579	9,600
2B	102	1,615	4,300	543	3,000	13,000
2C	498	2,685	7,000	915	2,839	9,029
2D	593	3,709	11,400	1,491	5,432	16,400
2E	363	1,524	4,400	548	1,660	5,600
2F	599	2,142	6,000	662	1,873	5,900
2G	416	2,007	4,800	305	1,480	4,700
2H	72	594	1,700	56	410	1,100
3A	265	1,243	3,300	501	1,516	4,300
3B	533	2,035	6,000	676	2,367	8,100
3C	660	2,586	6,500	680	3,146	10,300
3D	354	1,603	4,200	539	1,994	5,200
4A	284	1,396	3,300	288	1,469	6,805
4B	354	1,805	4,600	492	1,975	5,600
4C	423	2,164	4,800	514	1,920	5,000
4D	462	2,274	6,500	498	2,150	6,848
4E	516	2,284	5,800	641	1,963	5,900
5A	86	983	2,400	263	1,479	3,300
5B	348	2,533	6,900	1,088	4,156	12,400
5C	355	3,069	8,000	1,209	7,176	22,200
5D	37	554	1,300	149	1,540	3,800
Unk.		23	60		9	31

[a] 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. Harvests in WMUs 2C, 4A, 4D, and Unk. include deer harvests reported via DMA2 permits.

Table 4. Number of antlered deer aged, age composition of harvests, and approximate number of 2.5-year-old and older males harvested in Pennsylvania, 1997-98 to 2014-15. Three and 4-point antler restrictions started in 2002-03. In 2011, the 4-point antler restriction was modified to 3-points not including the brow tine. 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 harvested
1997-98	18,563	81	19	33,600
1998-99	21,350	81	19	34,500
1999-00	20,011	80	20	38,900
2000-01	22,145	82	18	36,600
2001-02	18,893	78	22	44,700
2002-03	11,694	68	32	52,900
2003-04	11,367	56	44	62,600
2004-05	10,559	50	50	62,000
2005-06	9,062	52	48	57,800
2006-07	10,819	56	44	59,500
2007-08	8,014	56	44	48,000
2008-09	9,357	52	48	59,200
2009-10	8,443	49	51	55,200
2010-11	9,032	48	52	64,400
2011-12	10,311	50	50	63,770
2012-13	10,588	48	52	69,000
2013-14	9,937	47	53	71,200
2014-15	9,225	43	57	67,978

Table 5. Number of antlerless deer aged and age composition of harvests in Pennsylvania, 1997-98 to 2014-15. 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
1997-98	28,743	24	20	56
1998-99	24,913	23	20	57
1999-00	18,502	24	20	56
2000-01	30,460	22	20	58
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
2007-08	17,770	24	20	56
2008-09	17,152	22	18	60
2009-10	16,519	22	18	60
2010-11	14,837	23	18	59
2011-12	16,050	21	19	60
2012-13	15,563	22	18	61
2013-14	15,924	21	18	62
2014-15	14,909	20	18	61

Table 6. Pennsylvania Sex-Age-Kill (PASAK) model estimates of post-hunt deer populations by Wildlife Management Unit (WMU), 2006 to 2014, Pennsylvania.

WMU	2008	2009	2010	2011	2012	2013	2014	2015	Trend
1A	34,007	36,152	44,148	41,549	42,420	48,472	55,114	49,169	Stable
1B	52,810	58,926	44,469	46,503	51,697	55,713	53,799	47,438	Stable
2A	45,462	50,336	56,286	49,033	68,080	53,996	43,379	30,033	Stable
2B	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	Stable
2C	87,046	72,402	62,340	66,729	64,888	61,386	68,683	66,027	Stable
2D	69,732	88,666	86,493	101,182	102,440	113,774	144,084	110,214	Increasing
2E	32,623	42,709	38,317	38,134	30,384	44,546	45,529	50,549	Stable
2F	47,288	67,724	46,887	70,765	53,210	83,063	65,614	61,020	Stable
2G[b]			41,125	44,582	58,441	60,019	49,313	40,343	Stable
2H[b]			12,338	15,410	12,554	13,356	16,537	16,872	Stable
3A	32,425	32,513	31,412	39,532	31,224	41,358	45,317	36,181	Stable
3B	56,162	46,869	48,895	49,768	58,481	53,709	63,803	55,249	Stable
3C	45,511	54,141	65,624	59,245	64,359	67,720	58,925	67,997	Stable
3D	31,623	37,563	25,378	30,250	31,299	29,225	25,127	33,778	Stable
4A	47,414	34,628	30,789	38,125	49,191	36,579	42,196	23,772	Stable
4B	30,479	39,044	43,550	37,273	60,340	52,903	50,517	45,362	Stable
4C	44,569	45,224	44,256	58,091	45,093	45,586	49,072	50,265	Stable
4D	43,299	62,529	46,284	73,017	70,495	67,011	61,428	56,905	Stable
4E	35,121	37,339	36,311	51,706	44,225	48,318	50,707	59,206	Stable
5A	22,602	20,504	20,512	21,098	35,598	28,014	29,715	25,032	Stable
5B	54,020	59,568	53,213	55,951	60,723	75,260	63,591	60,538	Stable
5C	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	Stable
5D	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]	Increasing

[a] PASAK model estimates are not available for these WMUs. See Rosenberry et al. 2011 for further information. Population trend assessment in these WMUs is based on antlered harvests and antlerless catch per unit effort estimates.

[b] WMUs 2G and 2H were created in 2013 by dividing WMU 2G.

Table 7. Antlerless license allocations by Wildlife Management Unit (WMU), 2005-06 to 2014-15, Pennsylvania.

WMU	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1A	42,000	42,000	42,000	42,000	41,705	42,000	42,000	49,000	47,000
1B	30,000	30,000	30,000	30,000	27,844	30,000	33,000	31,000	30,000
2A	55,000	60,000	55,000	55,000	54,879	65,000	59,000	49,000	46,000
2B	68,000	68,000	68,000	68,000	68,000	71,000	67,000	62,000	60,000
2C	49,000	49,000	49,000	49,000	44,107	58,000	50,000	43,000	38,000
2D	56,000	56,000	56,000	56,000	50,123	60,000	62,000	61,000	61,000
2E	21,000	21,000	21,000	21,000	20,407	25,000	21,000	22,000	21,000
2F	28,000	28,000	28,000	28,000	22,148	34,000	27,000	29,000	27,000
2G[a]	19,000	26,000	26,000	26,000	15,210	23,000	33,000	28,000	22,000
2H[a]								6,000	5,500
3A	29,000	29,000	26,000	26,000	25,247	26,000	26,000	23,000	18,000
3B	43,000	43,000	43,000	43,000	33,761	40,000	40,000	39,000	33,000
3C	27,000	27,000	27,000	27,000	26,358	29,000	35,000	35,000	32,000
3D	38,000	38,000	37,000	37,000	31,622	39,000	39,000	32,000	25,000
4A	29,000	29,000	29,000	29,000	27,521	28,000	29,000	28,000	28,000
4B	31,000	23,000	23,000	23,000	22,148	23,000	26,000	24,000	26,000
4C	39,000	39,000	35,000	35,000	34,351	35,000	35,000	27,000	25,000
4D	40,000	40,000	40,000	40,000	30,052	37,000	36,000	35,000	33,000
4E	38,000	38,000	30,000	30,000	26,899	29,000	28,000	26,000	21,000
5A	25,000	22,000	19,000	19,000	18,269	19,000	19,000	19,000	19,000
5B	53,000	53,000	51,000	51,000	50,812	50,000	51,000	50,000	49,000
5C	79,000	84,000	92,000	113,000	121,960	117,000	111,000	103,000	95,000
5D	20,000	20,000	22,000	22,000	22,000	22,000	19,000	18,000	18,000

[a] WMUs 2G and 2H were created in 2013 by dividing WMU 2G.