

PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
RESEARCH DIVISION
PROJECT ANNUAL JOB REPORT

PROJECT CODE NO.: 06210

TITLE: White-tailed Deer Research/Management

PROJECT JOB NO.: 21001

TITLE: Estimating Management Unit Deer Population Sizes & Growth Rates

PERIOD COVERED: 1 July 2003 through 30 June 2004

COOPERATING AGENCIES: None

WORK LOCATION(S): Statewide

PREPARED BY: Bret Wallingford, Christopher Rosenberry, and Marrett Grund

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Abstract: We estimated reproductive parameters using road-killed does, and deer harvests by management unit using sex and age of harvested deer, license numbers of successful hunters, and reported harvests. Wildlife Conservation Officers (WCOs) also conducted winter deer mortality surveys along predetermined routes in their respective districts. Three hundred ninety-nine does were used to determine conception and fawning dates. The average reproductive rate was 1.11 embryos/doe with the median conception date of 14 November. The median projected birth date was 3 June. Hunters harvested 464,890 deer (142,270 antlered and 322,620 antlerless) in the 2003-2004 deer seasons. Population estimates for 2004 were removed from this report due to weaknesses discovered in the modeling procedures prior to finalizing this annual report. Due to these weaknesses, we used a population index based on hunter success to assess population trends from 2003 to 2004. Results based on this index can be found in the 2004-05 Annual Report. We recommend development of a new population estimating procedure, expanding the Deer Management Assistance Program (DMAP), continuing current antler restrictions to allow a rigorous evaluation of their effects on deer populations and hunter support, and allowing hunters to purchase and use the entire antlerless allocation without regard to individual limits.

OBJECTIVE

To determine deer population sizes and harvest recommendations by management unit.

METHODS

To obtain data on reproduction by age class, WCOs examined female deer killed by various causes from 1 February through 31 May 2003. They recorded location (county, township, and proposed management unit), 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 wildlife biologists who made the age assignments in July 2003. Personnel in the Bureau of Automated Technology Services (BATS) processed the reproductive data and provided summary reports for the state and each county.

During the 2003 rifle seasons for deer, 32 data collection teams examined deer in assigned areas. Each team spent 3 days during the first week of the rifle season, 2 days during the second week of rifle season, and 2 days after the close of deer season. Data collected were ages, sexes, WMUs and counties of harvest, and hunting license numbers of successful hunters of harvested deer found in butcher shops and other locations. Deer teams determined deer ages using tooth wear and replacement (Severinghaus 1949). Data collection teams also recorded points of antlers to determine antler characteristics by year class.

BATS personnel entered and processed data from these biological collections and from 2003-2004 deer harvest report cards submitted by hunters. BATS also provided a PC download for population analysis. For each county the download included: the reported antlered harvest, the reported antlerless harvest, reporting rates, age and sex breakdowns of the harvest, reproductive data, combined reported antlerless rifle and antlerless archery harvests, and the total antlerless rifle and archery harvests. All categorized harvest data were converted from counties to WMU.

Harvest data were then incorporated into a population model to simulate historical deer herd dynamics for each WMU. Estimated herd numbers were then projected to predict a 2004 pre-hunt deer herd size for each WMU and the number of antlerless licenses required to stabilize or decrease pre-hunt deer densities by 5% were calculated by simulating deer herd dynamics between 2004 and 2005.

This is the second year that a new population model was used. A basic assumption of the population model was that the percent yearling males in adult buck harvests reflected the proportion of yearling males in the actual population. The intent of the revised antler restriction regulation was to intentionally reduce buck harvest mortality rates on yearling bucks. Therefore, the percentage of yearling bucks in annual buck harvests would not be expected to reflect the live population thereby invalidating the old model. The new population model is often referred to as an "accounting model" where the "balance" of deer changes as "withdrawals" occur in the form of non-hunting and hunting mortality and "interest" is accrued in the form of newborn fawns. Deer herd dynamics were modeled in each WMU with a beginning year of 1998 to align the population estimates from the new model with those of the old model.

In late March and early April, WCOs conducted winter deer mortality surveys in their assigned districts. Each WCO walked 3 1.5-mile routes along stream bottoms to locate possible winter losses. They recorded the sex and age of all dead deer found and submitted the data to us for analysis. We converted the data to a deer/mile index and compared it with previous winter loss index values.

In 2003, a deer management assistance program was initiated for landowners of public access land. This was a new method of regulated harvest of antlerless deer for landowners with land management goals that are affected by high populations of deer. Applications were received by 1 July 03, and reviewed by Wildlife Management staff in early July.

RESULTS

WCOs examined 618 females during the 2003 prefawning season. Four hundred and twelve were pregnant and 399 were usable for determining conception dates. Twenty-eight percent of the fawns, and 92 percent of the adults were pregnant. Pregnant fawns averaged 1.25 embryos/doe. Pregnant adults averaged 1.74 embryos/doe. The average reproductive rates for pregnant and barren fawns and adults were 0.34 and 1.60 embryos/doe, respectively. The average reproductive rate for all females was 1.11 embryos/doe. The median conception date for all does was 14 November. Ninety-three percent of all breeding occurred between 16 October and 16 December (Fig. 1), with the median date fawns bred as 30 November, 13 days later than adult does. The median projected birth date for all fetuses examined was 3 June (Fig. 2).

Hunters harvested 464,890 deer in the 2003-2004 deer seasons (Table 1). The antlered harvest was 142,270, a decrease compared to the 2002-2003 harvest of 165,416. Several factors are likely responsible for the decrease in the buck harvest relative to last year. A new regulation making the minimum length of a point 1 inch was at least partially responsible for the buck harvest decline. The antlerless harvest was 322,620, down from 352,113 in 2002-2003. The antlerless harvest decrease was due partially to the antlerless license decrease. The 2003-2004 deer season was the third year of concurrent deer season in Pennsylvania. With increasing experience under antler restrictions and concurrent seasons, we expect hunter behavior in harvest selection to become more consistent in future years.

Modeled statewide deer densities were removed from this report due to weaknesses in modeling procedures. These weaknesses resulted in inaccurate population estimates for 2004. In the absence of population estimates, we used a population index based on hunter success to assess population trends from 2003 to 2004. Results based on this index can be found in the 2004-05 Annual Report.

Statewide, WCOs found 0.42 dead deer/mile on winter survey routes in 2004. This is an increase over previous years, indicating some loss did occur due to winter severity. However, in most counties, winter losses were below the high losses recorded in 1978 (Table 2).

Approximately 1,086 square miles of Pennsylvania land were enrolled into the PGC's new Deer Management Assistance Program (DMAP). The PGC provided 31,784 DMAP coupons to landowners of which 23,548 (72%) were redeemed for DMAP licenses. Mandatory reporting regardless of hunter success was required during the 2003/04 season and approximately 95% of DMAP hunters submitted report cards to the PGC. Hunters harvested 6,168 antlerless deer with these licenses which translates into a 28% success rate. Success rates were comparable among different types of DMAP applicants. Hunters hunting on private lands, qualified leased lands, and public lands had success rates of 30%, 33%, and 27%, respectively. Overall, 5.7 antlerless deer were harvested per square mile which was similar to the harvest density associated with antlerless licenses (7.2 antlerless deer per square mile).

Several recommendations were proposed and accepted by the Commissioners at the January meeting and approved in April. Most regulations regarding seasons and bag limits for deer remained unchanged. The Deer Management Assistance Program (DMAP) was expanded to include additional landowners. Eligible lands for DMAP are: publicly-owned lands; private land owners or lessees where no fee is charged for hunting; and private land hunting clubs established prior to Jan. 1, 2000, that own 1,000 or more contiguous acres.

The Board also expanded the use of crossbows statewide during any of the firearms deer seasons, including the regular two-week concurrent deer season, the early muzzleloader season and the late flintlock season. In addition, in Wildlife Management Units 2B, 5C and 5D - the most urbanized areas in the state - crossbows would be legal during any established deer season. Statewide, hunters using crossbows during the early muzzleloader season or late flintlock season would need to have a muzzleloader stamp in addition to their general hunting license and appropriate WMU antlerless deer license. However, late-season flintlock hunters using a crossbow would be permitted to take an antlered deer or an antlerless deer anywhere in the state with their unused antlered deer tag, just like other late-season flintlock hunters.

Other important regulations that remain in place are a 12-day concurrent antlered and antlerless rifle 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 also approved the 2004-2005 antlerless deer license allocation of 1,039,000 (Table 1). Last year, hunters purchased 946,043 antlerless deer licenses, which resulted in a harvest of 322,620 antlerless deer.

RECOMMENDATIONS

1. Develop a new method for estimating management unit deer populations.
2. Expand DMAP to allow landowners a method of managing deer herds on their properties inline with their land-use objectives.
2. Keep current antler restriction regulations to allow a rigorous evaluation of their effects on the deer population and changes in hunter support over time.
3. Allow hunters to purchase and use the entire antlerless allocation without regard to individual limits.

LITERATURE CITED

Severinghaus, C. W. 1949. Tooth development and wear as criteria of age in white-tailed deer. *Journal of Wildlife Management* 13:195-216.

Table 1. 2003-04 deer harvests and 2004 antlerless licenses in each Wildlife Management Unit, Pennsylvania.

WMU	2003-04 Harvest		2004 Antlerless License Allocation
	Antlered	Antlerless	
1A	5,980	15,930	48,000
1B	6,710	16,980	33,000
2A	7,820	16,530	55,000
2B	4,390	10,610	68,000
2C	11,660	25,430	75,000
2D	10,560	23,380	58,000
2E	5,000	11,150	23,000
2F	7,450	17,700	44,000
2G	10,110	20,370	52,000
3A	4,450	8,860	32,000
3B	6,520	13,720	48,000
3C	6,480	15,770	37,000
3D	4,870	13,150	50,000
4A	6,090	12,110	43,000
4B	4,350	10,520	49,000
4C	5,950	13,590	44,000
4D	7,470	16,170	55,000
4E	5,220	12,120	38,000
5A	3,400	7,660	32,000
5B	8,370	17,970	64,000
5C	6,870	16,640	71,000
5D	1,780	4,330	20,000
Unknown	720	1,930	-----
Total	142,220	322,620	1,039,000

Table 2. Dead deer found on winter survey routes in 2004 and dead deer found/mile surveyed in 2004 and 1978 in Pennsylvania.

County	2004		Dead deer/mile	
	Miles	Dead deer	2004	1978
Adams	9.50	1	0.11	0.33
Allegheny	10.25	10	0.98	0.15
Armstrong	10.70	9	0.84	0.11
Beaver	7.00	21	3.00	0.00
Bedford	14.80	14	0.95	1.35
Berks	10.60	2	0.19	0.00
Blair	18.00	15	0.83	4.00
Bradford	9.50	6	0.63	0.81
Bucks	9.50	4	0.42	
Butler	0.00	0		0.09
Cambria	10.10	8	0.79	2.18
Cameron	5.00	1	0.20	13.60
Carbon	15.00	1	0.07	0.13
Centre	17.00	11	0.65	3.35
Chester	19.00	0	0.00	0.00
Clarion	0.00	0		1.88
Clearfield	14.50	7	0.48	5.17
Clinton	12.00	2	0.17	0.87
Columbia	11.50	4	0.35	0.83
Crawford	0.00	0		0.33
Cumberland	8.00	6	0.75	0.55
Dauphin	12.25	0	0.00	1.67
Delaware	1.50	1	0.67	
Elk	9.15	12	1.31	1.86
Erie	0.00	0		0.08
Fayette	12.00	0	0.00	0.00
Forest	0.00	0		0.42
Franklin	11.10	3	0.27	0.29
Fulton	4.50	0	0.00	0.75
Greene	9.00	5	0.56	0.83
Huntingdon	15.10	6	0.40	0.95
Indiana	11.00	2	0.18	2.16
Jefferson	0.00	0		1.00
Juniata	5.80	0	0.00	2.67
Lackawanna	9.70	6	0.62	2.24
Lancaster	17.70	1	0.06	0.00
Lawrence	0.00	0		0.33
Lebanon	4.50	0	0.00	
Lehigh	4.50	1	0.22	0.00
Luzerne	14.50	0	0.00	0.78
Lycoming	23.20	8	0.34	0.70
McKean	16.10	10	0.62	1.23
Mercer	0.00	0		0.00
Mifflin	6.25	1	0.16	0.77
Monroe	11.50	0	0.00	4.10
Montgomery	9.00	2	0.22	0.14
Montour	4.50	0	0.00	0.00
Northampton	5.90	5	0.85	
Northumberland	4.50	1	0.22	1.67
Perry	8.00	0	0.00	1.01
Philadelphia	0.00	0		
Pike	11.00	1	0.09	4.33
Potter	20.50	23	1.12	3.69
Schuylkill	10.50	0	0.00	0.74
Snyder	5.55	0	0.00	0.63
Somerset	19.00	62	3.26	3.93
Sullivan	4.50	2	0.44	0.75
Susquehanna	10.20	2	0.20	3.97
Tioga	23.50	26	1.11	4.17
Union	10.50	1	0.10	1.09
Venango	5.50	2	0.36	0.38
Warren	0.00	0		2.10
Washington	10.25	3	0.29	0.29
Wayne	12.20	5	0.41	16.42
Westmoreland	14.30	8	0.56	3.03
Wyoming	4.50	0	0.00	0.00
York	21.5	0	0.00	
2004 Totals	621.2	319	0.51	
1978 Totals	686.05	1,330		1.94

Fig. 1. Conception time periods based on 399 roadkilled does, Pennsylvania, 2003.

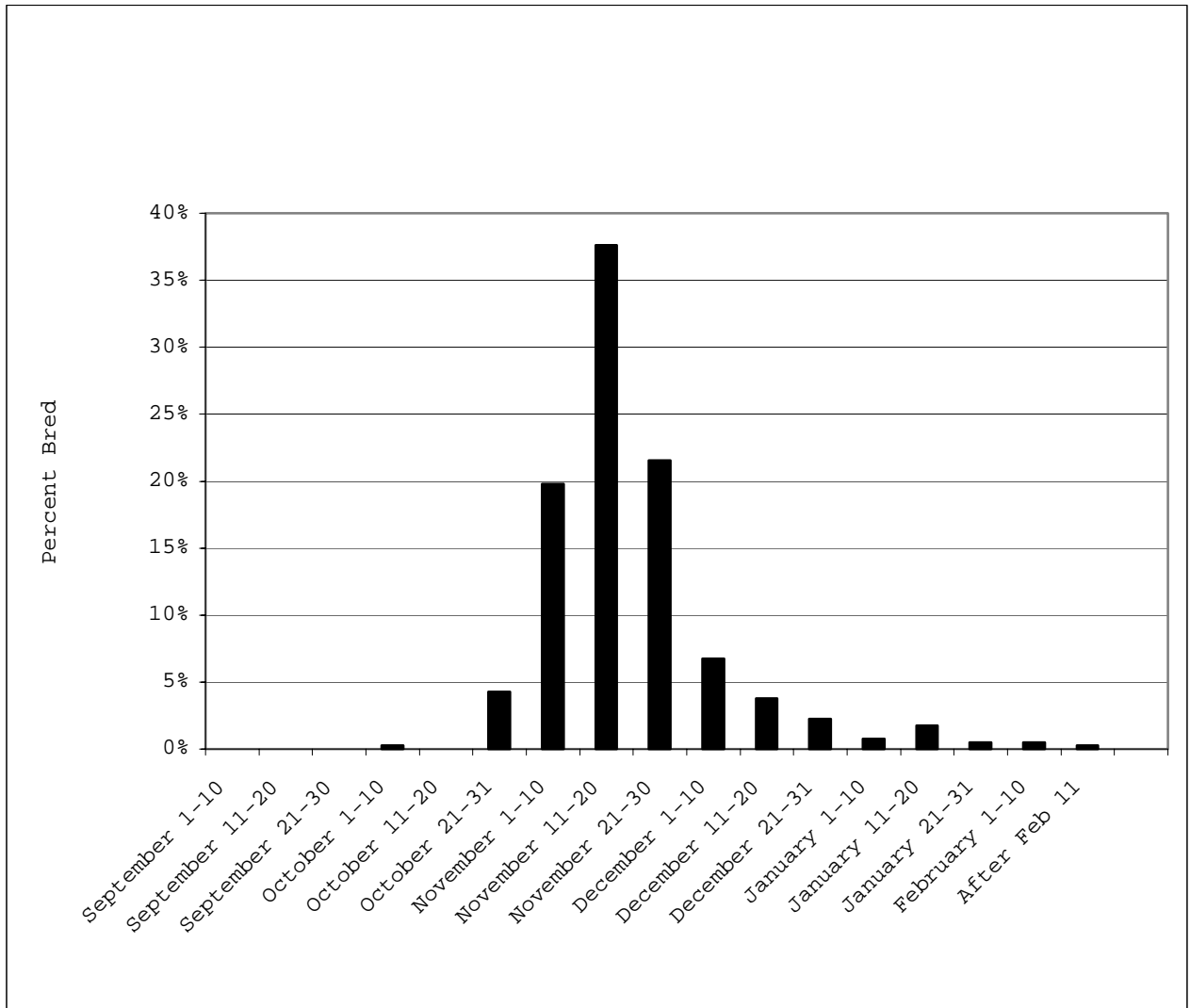


Fig. 2. Projected birth dates of fetuses of 399 roadkilled does, Pennsylvania, 2003.

