

AN INDEPENDENT, SCIENTIFIC ASSESSMENT OF THE PENNSYLVANIA GAME COMMISSION'S ESTIMATED 2015 DEER HARVEST

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Abstract. This report represents the sixth in a series of independent, scientific assessments of PGC's annual deer harvest estimates. PGC has estimated that 315,813 deer were harvested in Pennsylvania during the 2015-16 hunting season. However, the author has calculated that in order for this number to be accurate, from a biological perspective there would need to be 1.6-1.9 million deer in the state. From a geographical perspective, this number would represent 59-72 deer per square mile (dpsm) on every square mile of forestland in the state up to one acre in size, or 35-43 dpsm on every square mile of Pennsylvania land area including the city streets of Pittsburgh and Philadelphia. Further, from social and economic perspectives, considering that many woodlands during the fall deer season are devoid of orange coats and gun shots, that camps stand empty and for sale across the northern tier, that bankruptcies and lost family businesses proliferate throughout Potter and other northern-tier counties, and that an official Pennsylvania Legislative Budget and Finance Committee investigation reported that as of 2012 PGC's deer-reduction program was costing the Commonwealth \$285 million per year, then even without the scientific evidence within this document, common sense dictates that the agency cannot be harvesting today nearly the same number of deer per year as were harvested during the heydays of deer hunting from the 1960s through the '90s – not even close. Therefore, it is again concluded that PGC's erroneous harvest claims can only be explained by incompetence or deception. **This circumstance clearly exemplifies the need for change and accountability regarding PGC's deer management program.**

Preface. On March 9, the board of commissioners stated that PGC's 2015-16 harvest estimates would soon be released, and smirked that sportsmen would likely again respond with skepticism -- claiming that harvest numbers cannot be accurate. The commissioner further stated that if this year's assessment of PGC's estimated harvest were correct, then "the herd would be wiped out by now."

His statements epitomize the problem with PGC's deer management program. This annual assessment does not predict the extermination of deer, but instead provides incontrovertible scientific documentation that if the agency were actually harvesting their claimed number of deer, that there would need to be about 1.9 million deer in the state – a density of 59-72 deer per square mile (dpsm) on all forested land in the state up to one acre in size, or 35-43 dpsm on every square mile of land area in Pennsylvania including the city streets of Pittsburgh and Philadelphia. While the commissioner continues in his attempt to convince sportsmen and legislators that PGC's annual harvest claims are accurate, he fails to accept the fact that in order for the agency's harvest claims to be true, there would need to be a greater density of deer on every square mile of forested land in the Commonwealth than had existed in the heydays of deer hunting during the decades prior to the herd reduction program.

Within the past few weeks, both the commissioners and PGC staff have stated that their goal is to increase the deer herd in areas throughout the northcentral region from a density of less than 10 dpsm to 15 dpsm, and eventually possibly to 20 dpsm. Considering that it would require 59-72 dpsm to harvest the number of deer that the agency annually claims, it is obvious that the Game Commission's harvest claims are grossly overestimated and scientifically impossible.

I. INTRODUCTION

For the past six years (2010-15), the author has scientifically assessed the Pennsylvania Game Commission's annual deer harvest estimates in order to determine their validity. This document provides an independent, scientific assessment of PGC's 2015 estimated deer harvest, and is intended to provide sportsmen and decision makers with sound scientific information toward making wise deer management decisions.

II. METHOD

From the PGC's estimated harvest, the following determinations have been made (Table 1).

- (1) Herd mortality (the number of deer lost from all causes) has been calculated. This number includes the hunting harvest.
- (2) From this number, the size of the population that would be required to annually replace the number of deer lost to mortality (including hunting) and to achieve the PGC's annual deer harvest estimates is calculated considering that in a stable population annual production equals total yearly mortality.
- (3) Finally, the total population has been used to determine deer densities (the number of deer per square mile (dpsm)) that would exist throughout the state if PGC's harvest estimates were accurate.

The reader should remember that the projected herd sizes in this report do not represent the author's estimate of the actual number of deer that exist in Pennsylvania, but, instead, represent the number of deer that would be required if PGC's claimed annual harvests were accurate.

Two scenarios are considered: (1) a deer population and harvest dynamic that is uninfluenced by predation; and (2) separate calculations that include the impacts of predation. It should be noted that the PGC has not considered the impact of predation (especially on fawns by bears and coyotes) when preparing annual deer management plans and determining the allocations of antlerless permits, stating, *"We have no evidence to suggest that fawn survival rates we observed were preventing population growth."*

In addition, in Table 2 the author presents a comparison of PGC's recent deer harvest estimates with harvests of the past – especially with the period from 1986-1999 which represented the "heydays" of deer hunting in Pennsylvania prior to the beginning of herd reduction in the year 2000.

Note that PGC's annual harvest estimates do not include the DMAP harvest.

III. RESULTS

PGC estimated that 315,813 deer were harvested during the 2015-16 hunting season – representing an increase of nearly 4% over the previous year's claimed harvest of 303,973 deer.

A. ASSESSMENT OF PGC'S ESTIMATED 2015 DEER HARVEST

From the scientific assessment of PGC's 2015 harvest estimate, the following results were calculated.

Scenario 1: Predation IS NOT Considered

If predation by coyotes and bears had no impact on fawn survival rates (as is claimed by the PGC), then 1,270,877 deer would be required in order for the PGC to harvest 315,813 deer – the agency's published 2015 harvest estimate. (See the results of two population dynamics methods in Table 1.)

The associated densities of deer that would be required to produce a harvest of 315,813 deer (as is claimed by the PGC) would be:

- 48 deer per square mile (dpsm) on all forested land within the state.
- 36 dpsm on all forest and agricultural lands, combined.
- 28 dpsm on all land area throughout the state, including cities, developed, and industrialized areas.

Scenario 2: Predation IS Considered

To include the impacts of predation (by coyotes and bears) on fawn recruitment and, therefore, on the overall size of the population, two separate studies were considered (see Table 1).

(a) PGC Study. According to a 2000-01 PGC study that was conducted in both forested and agricultural areas, a combined total of 22.5% of fawns were killed by predators.

Using the results from PGC's 2000-01 predation study, 1,556,823 deer would be required in the state in order to replace deer that are lost to hunting, predation, and all other causes. If this number of deer occurred in the state, then a stable herd could exist that would be able to provide a harvest of 315,813 deer – as has been claimed by the PGC in 2015. The corresponding densities of deer would be:

- 59 dpsm on all forested land in the Commonwealth.
- 44 dpsm on all forest and agricultural lands, combined.
- 35 dpsm on all land area within the state.

(b) Eastern States Studies. From recent studies that have been conducted throughout Eastern states, about half of all fawns were lost to predation during their first three months of life (Journal of Wildlife Management, May 2014). It is reasonable to assume that there is a comparable predation impact on fawns in Pennsylvania, and, therefore, that roughly 50% of the state's yearly fawn crop is being lost to predators. Considering that it is likely that Pennsylvania's coyote population has dramatically increased since the PGC/PSU 2000-01 study, and that in 2012 over 40,000 coyotes were harvested, then it is, again, likely that the rate of predation on fawns in Pennsylvania is now closer to 50% of the annual fawn crop than to 22.5%. Also, considering that the state's bear population has remained relatively stable at 20,000-25,000 animals during this period, it is likely that the continuing increase in predation (from 22.5% to 50%) can be attributed to coyotes.

Regarding the recent results from these Eastern-states fawn-predation studies, a statewide herd size of 1,906,316 deer would be required in order for the PGC to harvest their claimed 2015 estimate of 315,813 deer (Table 1). The corresponding deer densities would be:

- 72 dpsm on all forested lands in Pennsylvania.
- 54 dpsm on all forest and agricultural lands, combined.
- 43 dpsm on every square mile of land area within the state – including cities, developed and industrial areas, forest and agricultural lands, parks, golf courses, playgrounds, and roadways.

Table 1. An Independent Assessment of the PGC's Estimated 2015 Deer Harvest

(A) FOUR <u>ANALYSES</u>	(B) PGC-ESTIMATED <u>DEER HARVEST</u>	(C) TOTAL ANNUAL MORTALITY ⁽¹⁾ & <u>RECRUITMENT⁽²⁾</u>	(D) HERD SIZE NEEDED TO ACHIEVE PGC'S <u>ESTIMATED HARVEST⁽³⁾</u>	(E) <u>CORRESPONDING AVG. DENSITY OF DEER (dpsm)</u>		
				<u>ON ALL PA FORESTLAND⁽⁴⁾</u>	<u>AGRICULTURAL +FORESTLAND⁽⁵⁾</u>	<u>ON ALL PA LAND AREA⁽⁵⁾</u>
1. Predation IS NOT Considered⁽⁶⁾						
a. Standard Method ⁽⁶⁾	315,813	444,807	1,270,877	48 dpsm	36 dpsm	28 dpsm
b. Empirical Method ⁽⁷⁾	315,813	N/A	1,263,252	48 dpsm	36 dpsm	28 dpsm
2. Predation IS Considered						
a. PGC 2000-01 Study ⁽⁸⁾	315,813	544,888	1,556,823	59 dpsm	44 dpsm	35 dpsm
b. Eastern States Studies ⁽⁹⁾	315,813	667,211	1,906,316	72 dpsm	54 dpsm	43 dpsm

(1) As stated in PGC's 2009-2018 Deer Management Plan, *hunting represents 71% of mortality of white-tailed deer ≥ 6 months of age* (Rosenberry 2009).

(2) As stated in PGC's 2009-2018 Deer Management Plan, recruitment is the number of fawns born in spring that survive until fall. To maintain a population at a stable level, the annual recruitment must equal the annual mortality (Rosenberry 2009).

(3) As published by the Alabama Department of Conservation and Natural Resources (Cook and Gray 2008) and determined from classic research in Michigan (Hickie 1937; Caughley 1977), once a population has reached a stable level, unabated the herd will increase annually by about 35%. With approximately 35% annual mortality, a population will generally remain stable. A deer herd will continue to grow with annual mortality rates of less than 35%. The total population will decline with a 40% or greater annual mortality rate.

(4) There is a total of 16,992,800 acres (26,551 square miles) of forestland (private and publicly-owned) in Pennsylvania, representing 59% of the state's land area (Finley and Jones 1993; and Devlin 2010).

(5) There is a total of 5,736,960 acres (8,964 square miles) of agricultural lands (croplands and pasture lands) in Pennsylvania (USDA Economic Research Service, 2007). Combined with 26,551 square miles of forestlands, forests and agricultural lands represent 79% (35,515 square miles) of Pennsylvania's land area (National Resources Inventory, 2007). Note that nonforested urban and developed areas represent the remaining 21% of Pennsylvania's 44,820 square miles of land area (Finley and Jones 1993). An additional 1,238 square miles of the state's surface area is covered by water.

(6) The PGC does not consider early fawn predation and total fawn mortality <6 months of age (Rosenberry et al 2009). Therefore, this method does not include any impacts caused by predation.

(7) *Sustainable deer harvest compared to deer population* (Downing and Guynn 1985; and Rosenberry et al 2009), calculated a sustainable harvest to be about 25% of a healthy population.

(8) From a 2000/01 PGC/PSU study, the impact of early fawn predation ≤ 3 months of age is considered at 22.5% (Vreeland (PGC) et al 2004).

(9) According to recent studies in Eastern states, about 50% of fawns were lost to predation during their first three months of life (Journal of Wildlife Management, May 2014).

**Table 2. Comparison of Recent PGC Claimed Deer Harvests
With Historical Pre-Reduction Harvests**

(A) <u>PERIOD</u>	(B) <u>PGC-ESTIMATED DEER HARVEST</u>	(C) <u>TOTAL ANNUAL MORTALITY ⁽¹⁾ & RECRUITMENT⁽²⁾</u>	(D) <u>HERD SIZE NEEDED TO ACHIEVE PGC'S ESTIMATED HARVEST⁽³⁾</u>
I. Average from 1986-1999	379,137	533,996	1,525,702
II. Average from 2000-2004 (Period of Intense Herd Reduction)	476,471	N/A	N/A
III. Average from 2005-2015			
A. Predation IS NOT Considered ⁽⁴⁾	332,021	467,612	1,336,035
B. Predation IS Considered @ 22.5% ⁽⁵⁾	332,021	572,825	1,636,643
C. Predation IS Considered @ 50% ⁽⁶⁾	332,021	701,419	2,004,053
IV. Yearly from 2011-2015 (Predation IS Considered)			
A. 2011 ⁽⁷⁾	336,200	562,068	1,605,909
B. 2012 ⁽⁷⁾	343,110	573,621	1,638,916
C. 2013 ⁽⁶⁾	352,920	757,038	2,162,966
D. 2014 ⁽⁶⁾	303,973	642,197	1,834,847
E. 2015 ⁽⁶⁾	315,813	667,211	1,906,316

(1) As stated in PGC's 2009-2018 Deer Management Plan, *hunting represents 71% of mortality of white-tailed deer \geq 6 months of age* (Rosenberry 2009).

(2) As stated in PGC's 2009-2018 Deer Management Plan, recruitment is the number of fawns born in spring that survive until fall. To maintain a population at a stable level, the annual recruitment must equal the annual mortality (Rosenberry 2009).

(3) As published by the Alabama Department of Conservation and Natural Resources (Cook and Gray 2008) and determined from classic research in Michigan (Hickie 1937; Caughley 1977), once a population has reached a stable level, unabated the herd will increase annually by about 35%. With approximately 35% annual mortality, a population will generally remain stable. A deer herd will continue to grow with annual mortality rates of less than 35%. The total population will decline with a 40% or greater annual mortality rate.

(4) Deer population metrics if predation were not considered in calculations.

(5) From a 2000-01 PGC/PSU study, the impact of early fawn predation \leq 3 months of age is considered at 22.5% (Vreeland (PGC) et al 2004).

(6) According to recent studies in Eastern States, about 50% of fawns were lost to predation during their first three months of life (Journal of Wildlife Management, May 2014).

(7) Predation is considered at 18.7% with specific reference to predation intensity on forested, agricultural, and developed land areas (Vreeland et al 2004).

B. COMPARISON OF RECENT PGC CLAIMED DEER HARVESTS WITH HISTORICAL HARVESTS

As presented in Table 2, after essentially collapsing the statewide deer herd with excessive antlerless permits from 2000 through 2004, during the following 11 years (2005-2015) PGC has claimed that hunters have been harvesting appreciably the same number of deer as had been annually harvested during the heydays of deer hunting from 1986-1999. Prior to herd reduction in 2000, PGC had estimated that about 1.5 million deer existed in the state. The author of this report concurs, in that this number had been calculated by the author as having been necessary in order to sustain the high annual harvests from 1986-1999. Statistical verification of a population of 1.5 million deer indicates that PGC was accurately reporting population and harvest metrics to sportsmen, the agency's Board of Commissioners, and State Legislators prior to herd reduction in the year 2000 (see Table 2, analysis I).

However, while the bear population has remained fairly stable from 1986 to the present, the coyote population has increased from a few thousand animals to an estimated 250,000-400,000 coyotes today. Therefore, while fawn predation by bears has likely remained rather stable for decades, coyote predation on fawns has increased dramatically. Considering the annually increasing impacts of coyote predation, there would need to be about 1.9 million deer in the state in order for PGC to achieve their claimed high annual harvest figures (see Table 1 and Table 2, analysis IV).

IV. CONCLUSION

Three principal conclusions are drawn from this independent, scientific harvest assessment:

- (1) It is virtually impossible that the PGC's estimated 2015 deer harvest is accurate.
- (2) The Commonwealth's deer herd and deer harvests are significantly lower than the PGC indicates.
- (3) Predation is dramatically impacting fawn recruitment and significantly hindering herd growth.

Considering that 59-72 dpsm would be required on all forested lands within the state in order for the PGC to have harvested their claimed 315,813 deer in 2015, or 35-43 dpsm on every square mile of land within the Commonwealth, it is highly unlikely that PGC's harvest estimates are even close to being accurate. Even if only 800,000 deer now exist in the state, this would represent corresponding average densities of 30 dpsm and 18 dpsm, respectively, on all forested lands or on all of the land area in the state. At 800,000 deer, only a maximum of 162,286 deer could be harvested in order to maintain a stable population – about half the estimated number of deer that the PGC claims has been harvested each year from 2005 to the present. If high harvests were occurring during this period (as is being claimed by the PGC), then the herd would likely be collapsing in some areas of the state.

As has been controversially concluded regarding the author's past deer-harvest assessments, the PGC's improbably high 2015 harvest estimate of 315,813 deer cannot be justified by scientific analysis, and can, therefore, only be explained by PGC incompetence or deception. This circumstance stresses the need for change and accountability regarding PGC's deer management program.