

Effect of bait on deer harvests in Special Regulation Areas of Pennsylvania^a

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ABSTRACT In 2006, the Pennsylvania Game Commission (PGC) approved the use of bait when deer hunting in southeastern Pennsylvania. Use of bait was limited to the special regulation areas of Bucks, Chester, Delaware, Montgomery, and Philadelphia counties (Wildlife Management Units (WMUs) 5D and portions of 5C). Hunter surveys and harvest analyses were conducted in order to evaluate effectiveness of baiting on hunter success and deer harvest before the 2010 sunset provision on the regulation. Hunter surveys were conducted in the spring of 2008, 2009, and 2010. Survey response rates ranged from 63 to 73 percent. Fifty-nine to 66 percent of hunters who hunted in WMUs 5C and 5D hunted in the special regulation counties. Of the hunters hunting in the 5 counties where baiting was legal, less than 40 percent used bait. Success rates of hunters who used bait when hunting baited and unbaited areas were similar regardless of hunting season. Harvest distribution prior to and during the period when baiting was legal was analyzed. Harvest distribution did not increase within the 5 counties where baiting was legal in WMU 5C. Based on harvest and survey results that show no deer harvest benefits, it was recommended that baiting be discontinued

OBJECTIVES

1. Estimate and describe use of bait by hunters and its effect on harvest success in Special Regulations Areas.
2. Monitor hunter attitudes and opinions towards use of bait
3. Determine whether baiting increased deer harvests on the landscape (i.e., Wildlife Management Unit (WMU)), and for individual hunters

INTRODUCTION

A strategy in Pennsylvania's deer management calls for an evaluation of regulated baiting as a tool to increase deer hunter harvest in developed WMUs. Many states allow the baiting of deer during the regulated hunting season. Baiting regulations vary widely due in part to original intention of the baiting regulation itself as well as to its implementation.

It has long been held that baiting increases hunter success. Research has shown that artificial feeding alters natural foraging behavior resulting in changes in deer movement and distribution patterns. Baiting seeks to exploit these alterations to the advantage of hunters. Increasing the effectiveness of hunters in urban-suburban areas is critical to state agencies as hunting is the primary means of deer management.

However, while there is perceived increased hunter success with the use of bait resulting in potential increased harvest, baiting also carries with it the increase potential for the spread of

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disease. Feeding and baiting are suspected in the spread of many diseases including bovine tuberculosis, chronic wasting disease (CWD), and brucellosis. Therefore, state agencies must weigh the risks of baiting against the possible benefits.

In 2006, the Pennsylvania Game Commission (PGC) approved the use of bait when deer hunting in southeastern Pennsylvania. Use of bait was limited to the special regulation areas of Bucks, Chester, Delaware, Montgomery, and Philadelphia counties. Included in this regulation was a 3-year sunset provision. This allowed for an evaluation of the baiting in an urban-suburban area before it became socially established.

METHODS

We used surveys to estimate and describe use of bait by Pennsylvania hunters, estimate effect of bait on hunter success, and to monitor hunter attitudes and opinions towards use of bait. We surveyed hunters who indicated they hunted in WMUs 5C and 5D in previous years' annual Game Take surveys. Surveys were sent to hunters in February 2008 (following the 2007-08 hunting seasons), February 2009 (following the 2008-09 hunting seasons) and February 2010 (following the 2009-10 hunting seasons). Surveys were sent in mid-February followed by a postcard reminder approximately 10 days after the initial mailings. Because of response rates, no additional survey mailings were conducted.

Surveys booklets were 4 pages long and included 26 to 31 questions. The first 2 surveys were identical. The third survey was modified slightly to collect hunter effort and success from hunters who did not use bait.

Survey results were analyzed in SAS using PROC FREQ and PROC MEANS procedures. Further statistical analyses were conducted when needed.

In addition to survey results, we also estimated deer harvests for northern and southern counties within WMU 5C to determine if baiting affected harvest distribution. We estimated deer harvests using a closed, two-sample Lincoln-Petersen estimator (Chapman 1951). Deer were considered marked when they were checked in the field by PGC deer aging teams. The recapture occurred when marked deer were reported on report cards or online by hunters.

Because reporting rates in Pennsylvania vary by year, antlered and antlerless deer, and WMU (Rosenberry et al. 2004), annual deer harvest estimates were calculated for antlered and antlerless deer in each section of WMU 5C.

RESULTS

Survey response rates ranged from 63 to 73 percent for each of 3 surveys. Response sample sizes provided precision of +/- 2 to 3 percent for survey estimates.

Most hunters knew baiting was legal (73 to 77 percent) and 59 to 66 percent of WMU 5C and 5D hunters hunted in the 5 counties where baiting was legal. Results that follow refer to hunters who hunted in these 5 counties. Year refers to when the survey was conducted.

Of the hunters hunting in the 5 counties where baiting was legal, less than 50 percent used bait. The percentage of hunters using bait increased from 29 percent in 2008 to 37 and 38 percent in 2009 and 2010 respectively.

For hunters who did not use bait, the most common reason was that bait was not needed (40 to 50 percent). The second most common reason was that they believed baiting was not ethical (24 to 26 percent).

For hunters who used bait, the primary reasons were to see more deer (49 to 68 percent) and to draw deer from other properties (62 to 73 percent). Seeing deer during daylight hours was also an important reason for using bait (38 to 62 percent). Use of automatic feeders increased from 11 percent in 2008 to 23 percent in 2010. Corn was the most popular bait (83 to 91 percent), followed by salt/minerals (22 to 40 percent) and apples (27 to 31 percent).

Most hunters who used bait pre-baited for less than 1 week (58 to 70 percent pre-baited for 1 to 7 days). Only 11 to 16 percent pre-baited for more than 14 days.

Most hunters believed baiting increased their chances of success (74 to 81 percent) and most planned to use bait in the future (93 to 96 percent). The primary problem encountered when using bait was deer use of bait at night (13 to 23 percent).

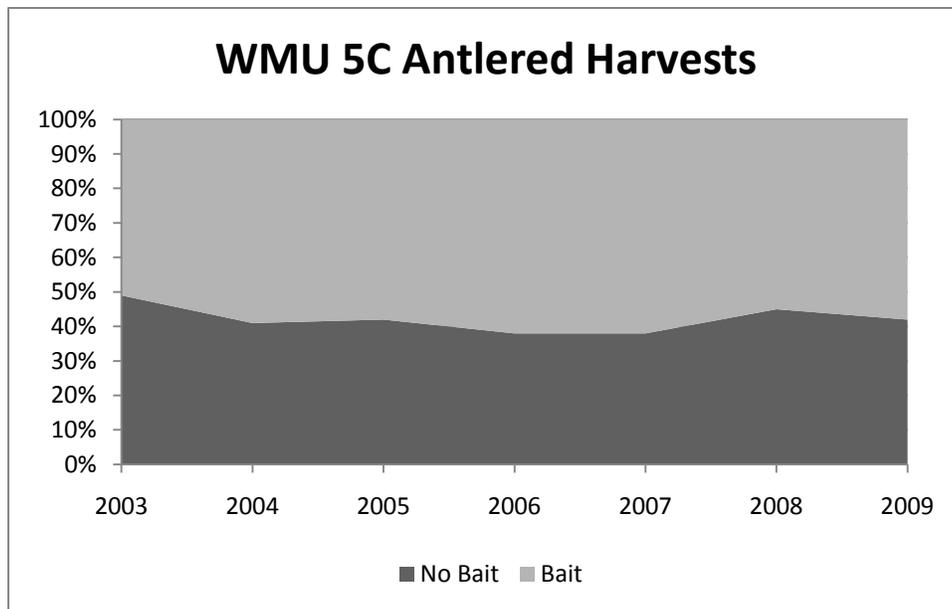
In 2010 survey, hunters who did not use bait were asked to provide information on effort and harvest success. Hunters who did not use bait hunted fewer total days for all deer seasons (average of 13 days) compared to hunters who used bait (average of 21 days). Hunters who did not use bait also harvested fewer deer per day (0.04 deer harvested per day hunted) compared to hunters who used bait (0.08 deer harvested per day hunted). Given the difference in days hunted, time spent hunting may confound effects of using bait on harvest success.

To further investigate the effect of bait on hunter success, we compared the effort and success of hunters who used bait when hunting baited and unbaited areas. For these hunters, success rates were similar between baited and unbaited areas regardless of hunting season (Table 1).

Table 1. Days hunted, deer harvested, and success rate (deer harvested per day) in baited and unbaited areas. Only includes results from hunters who used bait. Pennsylvania, 2008 to 2010.

Survey	Baited Areas			Unbaited Areas		
	Days Hunted	Deer Harvested	Success	Days Hunted	Deer Harvested	Success
<i>Fall Archery Seasons</i>						
2008	795	45	0.06	333	20	0.06
2009	590	28	0.05	124	9	0.07
2010	496	34	0.07	133	12	0.09
<i>Regular and Extended Firearms Seasons</i>						
2008	383	22	0.06	212	21	0.10
2009	229	29	0.13	153	24	0.16
2010	246	29	0.12	72	6	0.08
<i>All Deer Hunting Seasons</i>						
2008	1,356	78	0.06	677	47	0.07
2009	992	65	0.07	307	36	0.12
2010	867	68	0.08	230	19	0.08

Finally, we estimated harvest distribution prior to and during the period when baiting was legal. If baiting resulted in increased harvests, then the distribution of the WMU 5C harvest should have increased within the 5 counties where baiting was legal. This did not occur (Figure 1).



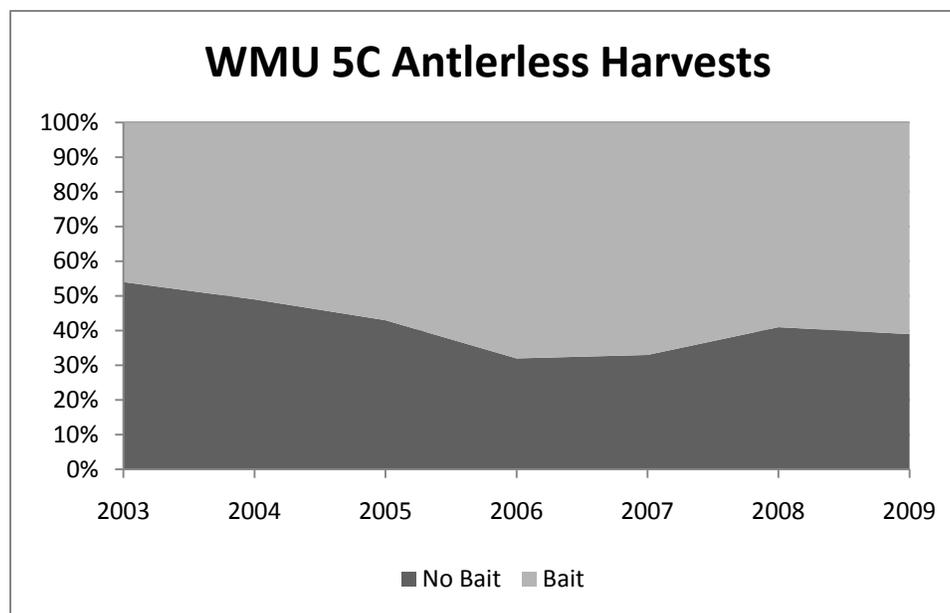


Figure 1. Percent of annual antlered and antlerless deer harvests occurring in 'no bait' counties (Berks, Lancaster, Lehigh, Northampton) and 'bait' counties (Bucks, Chester, and Montgomery) in WMU 5C. The baiting regulation started on December 26, 2006 and was fully implemented during the 2007, 2008, and 2009 hunting seasons. WMU 5C, Pennsylvania 2003 to 2009.

DISCUSSION

Baiting did not improve hunter success or increase landscape level deer harvests. Although hunters who did not use bait had lower success rates than hunters who used bait, the difference may also be explained by time spent hunting. Hunters who did not use bait spent less time hunting compared to those who used bait. When comparing hunters who used bait and their success hunting baited and unbaited areas, they reported harvesting the same or more deer at unbaited sites. Similarly, we observed no changes in harvest distribution within WMU 5C that would be consistent with increased harvest due to baiting. The distribution of antlered and antlerless harvests within WMU 5C did not change following legalization of bait in the southern part of WMU 5C. Consequently, we found no strong evidence that use of bait increased hunter success rates or deer harvests.

Failure of baiting to increase hunter harvest is not unique to Pennsylvania. Early research suggested that the use of bait could increase hunter success by as much as a third (Synatzske 1981). However more recent studies do not support these same findings. Surveys in Michigan and Wisconsin showed almost identical results. In Michigan, 44% of hunters were successful with bait while 52% of hunters were successful without bait. In Wisconsin, 50% of hunters were successful with bait while 54% of hunters were successful without bait (Dunkley and Cattet 2003). In fact, Wisconsin found increased hunting opportunity to be more effective in increasing harvest than baiting (VanDeelen et al 2006). Given hunter variability using bait regardless of the specific state regulation, there is no clear evidence supporting increased hunter success.

Distinguishing between baiting and feeding is not simple. Although the intent of baiting is to increase the opportunity to harvest deer, it differs from feeding's intent to provide supplemental food to deer, the distinction is not always clear. Often times the social aspects of wildlife management take a front seat to the biological and ecological passengers. Wildlife agencies repeatedly voice their opposition to the feeding of wildlife because of the risks associated with it. However, many of these same wildlife agencies also allow baiting. This is a contradiction in policy (Dunkley and Cattet 2003). As stated previously, regardless of the objective, feeding and baiting carry the same ecological and biological risks. Therefore, how can an agency justify support for a feeding ban but still allow the use of bait?

Baiting increases the risk of disease transmission. Feeding and baiting are suspected in the spread of bovine tuberculosis in deer, CWD in deer and elk, and brucellosis in elk and bison (Dunkley and Cattet 2003, Brown and Cooper 2006). Psoroptic mange and demodectic mange outbreaks have also occurred by the spread of mites while at feed/bait sites (Dunkley and Cattet 2003).

Research comparing different feeding/baiting strategies showed deer spend more time in close proximity to other deer at feed sites than at control sites with no feed; and deer spent more time foraging at pile and spread feed sites than at control sites (Thompson et al 2008). This leads to a greater potential for disease transmission. Feeding intensity was greatest at rationed piles than at troughs, ad libitum piles, and rationed or ad libitum spread techniques (Thompson et al 2008). There is also increased fighting and injury at feed sites (Brown and Cooper 2006).

Feeding/baiting sites may harbor and concentrate disease agents deposited by infected animals creating a reservoir of contaminated feed and infectious excreta. Deer cannot avoid fecal consumption at feed sites (Thompson et al 2008). Some diseases and parasites spread through ingestion of contaminated excreta material include bovine tuberculosis, CWD, salmonellosis, toxoplasmosis, large lungworm, and larval tapeworms (Davidson 2006, Tamgüney et al 2009).

While contagious and infectious diseases are a major concern, lactic acidosis or grain overload is associated with feeding as well. Lactic acidosis is the fatal disruption of the body's acid-base balance in the rumen (Dunkley and Cattet 2003) and has been documented in Pennsylvania.

Another issue of concern regarding deer health and feeding/baiting is emerging new syndromes being documented. Mild to marked hair loss syndrome and soft tissue inflammation of the muzzle are two newly recognized conditions associated with feeding (Keel 2009). The cause of the hair loss syndrome is unknown but many parasitic, infectious, toxic causes have been ruled out. Similar bacterial infections caused by *Dermatophilus congolensis* have been documented in association with feeding in Pennsylvania.

Baiting affects species other than deer. Feeding/baiting deer may be the objective but this does not stop other species from using the available resource for their benefit as well. Feed used to attract deer will likely draw turkeys, squirrels, raccoons, opossums, rodents, skunks, bears, and foxes, directly or indirectly. And just as feed/bait sites increase risk of disease exposure and transmission in deer, these sites will do the same for these nontarget species. Many of these

species are known carriers of transmissible disease. Some of which are high risk like rabies. Other diseases include canine distemper, parvovirus, leptospirosis, baylisascaris and ascarid roundworms, avian pox, sarcoptic mange, and trichomoniasis (Davidson 2006).

Aflatoxins, a fungal toxin, occur in grain crops. Grain products contaminated by more than 20 parts per billion (ppb) are banned from human food and maximum levels of 20-300 ppb are allowed in animals feeds depending on the species, age, and products to be consumed from that animal (Davidson 2006). Aflatoxin levels can increase during storage or after grains are placed at feed/bait sites. Aflatoxin exposure causes liver disease and neurological symptoms. Animals affected include birds, fish, and mammals, with birds being more susceptible than mammals (Davidson 2006). Corn is a common feed/bait used for deer. Surveys have found aflatoxin contamination in excess of levels allowable for animal feeds in deer bait piles and bait storage bins, and in corn sold as wildlife feed (Davidson 2006). One survey of 100 bags of deer corn found 40% had aflatoxin levels that were illegal, 20% had levels that would be toxic to birds and other nontarget species (Brown and Cooper 2006).

Feed/bait sites have high human activity as a result of maintenance. This also means that humans and, depending on the location of the feed/bait site, domestic pets also have increase exposure to these diseases and toxins.

Finally, feeding/baiting also encourages the perception of ownership among the public. As stated in Pennsylvania's constitution, wildlife are the property of all citizens, present and future. The practice of feeding/baiting allows people to establish "relationships" with individual or groups of deer and steps onto the slippery slope of domestication and privatization of what is meant to be a wild and public resource (Brown and Cooper 2006).

The negative consequences associated with baiting/feeding outweigh perceived benefits of baiting as permitted in Pennsylvania. The Wildlife Society encourages fish and wildlife agencies, to replace existing public baiting and feeding practices with habitat conservation and population management practices to improve food resources and habitat productivity for native wildlife populations (The Wildlife Society 2007). In addition, managers from states and provinces with a strong baiting culture warn that managers should resist establishment of baiting where it is currently not permitted and end the practice where it is currently entrenched (VanDeelen et al 2006). Based on these recommendations and findings from this study, we recommended allowing the baiting regulation to expire.

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