Winter Feeding

of

Deer and Turkeys

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Introduction

The winter feeding of deer and turkeys has been a controversial subject for a long time. Logic for many would seem to indicate the advantage of a winter feeding program. Many states, including Pennsylvania, have in the past conducted extensive winter feeding programs for deer and turkeys (Office of the Board of Commissioners 1917, Pinchot 1932, Wilson et al. 1932, Pa. Game Commission 1934, Merritts 1944, Chase and Severinghaus 1949, Pa. Game Commission 1952a,b; Freeburn 1961). However, most states have since abandoned winter feeding programs because they are ineffective and impractical, and scientific studies of these winter feeding programs are almost universal in pointing out the large numbers of disadvantages as opposed to very few advantages (Trippensee 1948, Allen 1954).

The issue of winter feeding of wildlife is an old one. Data more than 50 years old is referenced in this paper. The conclusions of those researchers from the past are little different from the conclusions being made today. Then why write this paper if the research has all been done? The answer is that public opinion and the political pressures that public opinion can exert on managers of wildlife (a public resource) sometimes conflict with the recommendations based on science. Hopefully, information in this report will allow commissioners, wildlife managers, legislators, and sportsmen to make informed decisions on this subject.

This paper details some of the research on the subject of winter feeding, gives pertinent conclusions, and lists actions taken by the Pennsylvania Game Commission with regard to the subject of winter feeding programs.

Winter Adaptations of Deer

The northern white-tailed deer's ability to cope with extremely harsh winter climate attests to the fact that it is an innately hardy and resourceful animal. Weather conditions that would quickly kill humans are easily survived by whitetails. Deer, unlike humans, undergo certain physiological and behavioral adjustments that contribute greatly to the animals' winter survival. Along with the deposit of subcutaneous fat, the change to a highly insulative coat minimizes heat loss to the cold environment (Halls 1984).

Even when ample feed is available, deer voluntarily restrict their intake during winter (French et al. 1955, Thompson et al. 1973). They likewise limit their feeding mainly to warmer daylight hours and are less active overall (Ozoga and Verme 1970). By midwinter, deer have in effect geared down to a relatively torpid, almost semihibernating state. Probably in response to the lengthening photoperiod of late winter, the animals' metabolism begins a shift back to its higher rate. Thereafter, increased energy demands rapidly sap the deer's scant internal reserves to the point where a whitetail's defense system may suddenly collapse. Grave debilitation and death most commonly result during the winter-spring transition period (Halls 1984).

Only in the most severe winters do Pennsylvania deer exhibit the "yarding" behavior prevalent in upper New York and New England, where winter conditions approach those of the northern limits of whitetail range. In normal or mild winters, living is relatively easy for deer in range that is not overpopulated, and there is little winter-induced mortality. Under these conditions the herd remains well dispersed over the range and no particular areas become unduly over browsed. Occasional winters, perhaps one in ten, have prolonged and extreme cold, unusually deep snows and/or icy conditions. These cause the deer to congregate in areas of maximum cover. They "yard up" and food supplies within reach are soon depleted.

Prolonged, unusually harsh conditions result in increased winter mortality. The highest percentage of winter losses are fawns. In two Pennsylvania studies, about 70 percent of losses were fawns (Drake 1972, Shope 1996). In an Idaho study of mule deer, 60 percent of winter losses were fawns (Haynes 1967).

Wildlife Conservation Officers have conducted deer mortality surveys throughout Pennsylvania nearly every spring since 1971. The highest deer losses since these surveys were started occurred in 1978 when 1.94 deer per surveyed mile were found. Hunter harvest and age data collected for 1977 and 1978 indicated a 10.6 percent decline in the number of 18-month-old bucks after that severe winter. After the severe winter of 1994, the mortality index (0.65 dead deer per mile) was about one third that of 1978. The expected result was a small decrease in the yearling age class. This, in fact, is exactly what occurred. Statewide, essentially no decrease in hunter harvests for both antlered and antlerless deer occurred. The point is that the most severe winter in the past twenty-four years reduced the buck harvest 10 percent, a significant but relatively small percentage. The less severe but still brutal winter of 1994 affected the statewide deer population and hunter harvests minimally (Pennsylvania Game Commission 1994, Pennsylvania Game Commission 1996).

Winter Adaptations of Wild Turkeys.

Pennsylvania is located toward the northern edge of wild turkey range and can experience fairly large winter turkey losses, particularly at higher elevations. Portions of the Allegheny Plateau were probably not historically populated with turkeys due to poor habitat and severe weather conditions (Wunz 1996). Today, in many areas of Pennsylvania, turkey overwinter survival remains a challenge.

Turkeys, like deer, have winter adaptations that help in their survival. Fat tissues comprise 25 percent of winter body weights in adult turkeys and 15 percent in juveniles. The increased winter fat serves as an energy reserve and as added insulation, thereby improving survival chances. Body weight losses of 35 percent in adult wild turkeys and 25 percent in juveniles can result in death, although some wild turkeys may lose a third of their body weight without any devastating effects. Adults have a survival edge over juvenile birds due to greater adipose and muscle tissue reserves. Turkey hens survive

longer than males when exposed to severe cold in fasting conditions. Although males may have greater fat reserves, females need relatively less food (Dickson 1992).

The effects of snow on food availability and turkey mobility are probably more important to survival than temperature alone. Winter wild turkey food is primarily hard mast that is available on the forest floor. They will also use ferns, bulbs, and tubers as well as grass, grass seeds, corn and grains, and what they can pick out of manure in the farmed areas. Vegetation found along spring seeps is another important winter food source. In winter, turkeys often frequent and roost in conifer stands on north and east facing slopes and bottom areas where terrain moderates the prevailing westerly winds. They often feed on lower, southern facing slopes where the snow melts faster.

Winter Feeding of Deer

The failure of supplemental feeding to prevent large losses of starving deer in winter has been a most perplexing and compelling problem to deer managers. Hypotheses have been generated to explain the failure of feeding attempts to prevent further losses of deer. Most of these concern rumen microorganisms. Some investigators suggest that all or some types of rumen microorganisms die during deer starvation, rendering deer unable to digest feeds (Nagy et al. 1967). Others document that an abrupt change of diet from roughage to a large quantity of readily fermentable carbohydrate may produce gastrointestinal disease (Wobeser and Runge 1975). Another researcher theorizes that toxic fermentation and/or metabolic products resulted from emergency feeding, produced perhaps by unnatural compositional changes in rumen microorganisms during starvation and refeeding (Dasman 1971). In many of the dead animals, a researcher found the formation of ulcers in the stomach and small intestine. Several bacterial infections were discovered developed in the linings of the stomach and intestinal tract which produced toxins that were absorbed by the body. General toxemia or poisoning resulted causing extensive damage to the liver, kidneys, and heart (Keiss and Smith 1966).

Observations from a New York study of 54 deer wintering areas in the Adirondacks following a very mild winter (1963-64) noted that starvation was negligible to totally absent everywhere except in those areas where artificial programs were in effect. Deaths here were attributed to excessive concentrations of deer and not enough artificial food to nourish all the deer lured in as a result of the free handout (Hesselton 1965). A Colorado study in an area near Gunnison in 1944 showed artificial feeding accelerated the death rate from 25 percent to as high as 42 percent (Keiss and Smith 1966).

Deer populations have the potential for rapid growth. Under normal circumstances, females on good range reproduce faster than females on poorer range. On excellent range, adult does can produce triplets, yearlings (1.5-year-old) can produce twins, and fawns can be bred and give birth during the first year of life. On our best range in Pennsylvania, better than half the female fawns will be bred (Palmer 1996).

There are natural limits to the numbers of deer that a given parcel of habitat can support. In the Northeast, these limits are a function of the quantity and quality of deer forage and/or the availability of good winter habitat. When the deer population exceeds this habitat carrying capacity, habitat quality decreases and herd physical condition declines (Ellingwood and Caturano 1988).

Deer clearly prefer natural foods, and high concentrations of them will over browse a range even when given ample artificial food. This has been widely observed when winter feeding programs have been attempted. Captive deer exhibit the same behavior. Large wooded paddocks at Penn State's deer research facility are quickly over browsed even though deer have free access to feeders. Apparently deer have an appetite for their natural foodstuffs even when fed a highly palatable, nutritionally complete diet (Amman and Cowan 1973).

A secondary disadvantage resulting from the close crowding of deer in feeding areas is the possibility of rapid spread of diseases and parasites. This is the case in Michigan where one deer was discovered in 1994 to be infected with *Mycobacterium bovis* (bovine tuberculosis). The discovery of 15 infected deer in 1995, and more than 40 in 1996, was the result of a survey of hunter-killed deer conducted by the Michigan Department of Natural Resources, Michigan State University, and local hunters. Surveillance of domestic animals in the area by animal health officials has not revealed evidence of infection. All affected deer originated from one location 11 miles wide and 12 miles long known as the "Club Country" due to the presence of private hunting clubs with high-density deer populations. The observed TB lesions were associated primarily with the lungs, and pathologists suspect that transmission occurred by aerosol exposure. Winter-long supplemental feeding by the hunting clubs was considered to be an important factor in creating artificially high concentrations of deer and favoring high levels of exposure to TB bacteria that are coughed up or exhaled by infected animals. The clubs have been asked to voluntarily stop feeding deer and to increase harvests (Southeastern Cooperative Wildlife Disease Study Briefs 1996).

Even if feeding were advantageous, another obstacle to effective feeding programs involves the social interactions of deer. As with many animals, age and size determine rank or standing when competition for food occurs. The social hierarchy, or pecking order, of a deer herd interferes with getting food to those deer most in need. Larger deer dominate feeding sites. The youngest and smallest deer, because of their shorter reach, are the first to suffer when a food shortage occurs. They are also the last to gain access to supplemental foods. Adult does will even prevent their own fawns from feeding until their own needs have been met (Riehlman 1994, Ozoga 1972).

The concentration of deer at feeding sites also can expose them to increased predation. Dogs allowed to run loose are a problem. Access trails developed to deliver food may also help predators get into otherwise snowbound areas (Riehlman 1994). One researcher in Michigan noted an increase in coyote predation at feeding sites and surmised that the carcasses of starved or accidentally killed deer provided a good food

source and attracted coyotes. Those deer weakened by malnutrition were more readily caught (Ozoga 1972).

Research on deer physiology indicates that the overall health of the animal going into winter is as important to survival as the availability of winter foods. While this research did not totally discount the importance of the winter season to deer, it does point out the importance of other seasons to winter survival. It was at first a logical conclusion that research emphasis should be put on that time of the year where weight loss occurs and mortality is most evident. However this study indicates that summer and fall foods that influence the accumulation of winter fat may be as important to winter survival as winter browse (Mauz 1978).

Winter feeding just does not pay. It is far better to enhance the natural range and keep the herd to a size that can be supported on natural winter range. This pays off in increased productivity. It has been proven that a smaller, well-fed base herd can produce more deer for hunters than a larger, poorly fed herd. The key to productivity is fawn survival. The key to fawn survival is how well the doe is able to nourish the unborn fawn. This crucial period occurs in winter and is dependent upon the amount and quality of food that is available. On good range we normally expect to gain about one and a half fawns per doe, while on poor range this average may drop to one or less. A base herd of 1,000 does on poor range may thus produce 1,000 fawns per year. By cutting this base herd to 750 does, we may increase the average fawns per doe to one and a half. This would mean a herd increase of 1,125 fawns per year or 125 more than was produced by the 1,000 does. At the same time, we are putting less pressure on our winter range (Haynes 1967). Approximately 50 percent of these fawns are next years' bucks. As improbable as it seems, reducing the overwintering doe population in certain overpopulated situations can actually increase the buck harvest (Shope 1995).

Winter Feeding of Turkeys

Since Pennsylvania is situated toward the northern periphery of the wild turkey's range and does sustain losses of turkeys in severe winters, the Game Commission has been a leader in field research regarding supplemental winter feeding-wild turkey population relationships.

In a 19-year study in the Potato Creek drainage of McKean County to determine the effect of supplemental winter feeding on wild turkey populations, winter turkey losses of up to 30 percent were found during severe winters with fluffy snow conditions. These losses occurred despite supplemental feeding in portions of the study area. Losses as high as 60 percent were documented in higher elevation areas. Successive severe winters impacted populations more heavily than individual ones. Populations usually recovered in a year or two following periodic losses while three consecutive severe winters (1976-78) resulted in depressed populations that took three years before showing signs of recovery (Wunz and Hayden 1981).

Two hunting preserves with controlled hunting in Elk County were also evaluated as part of this study. Expensive feeding programs were conducted on these properties of an intensity impractical for state agencies or sportsmen's groups. Food was distributed regularly along plowed roads. In one of the preserves, 150-200 turkeys consistently fed along roads. Following three successive severe winters, the entire preserve was searched on foot and snowmobile. Only 16 birds were found in 1978 despite continual feeding programs, the losses being attributed to winter mortality and poor recruitment. A similar decline occurred on the other preserve (Wunz and Hayden 1981).

Winter feeding records of the Kane Fish & Game Club were reviewed to evaluate the effectiveness of an extensive winter feeding program by a sportsman's organization. Turkeys using their 32 feeding stations declined from 208 birds in 1972 to 35 in 1978 (Drake 1996).

Despite supplemental feeding in the Potato Creek Drainage, two hunting preserves in Elk County, and in the Kane area, substantial population declines following severe winters were similar to those experienced throughout the entire northcentral region of Pennsylvania. Even though other factors, such as poor recruitment, may have contributed to population declines, intensive feeding programs did not prove effective in preventing these declines (Drake 1996).

There is potential for disease transmission through winter feeding of turkeys. Aflatoxicosis, a condition where toxins produced by fungi on spoiled feed, particularly grains, cause wildlife mortality, and may affect turkeys (Fischer et al. 1995).

Other states in northern turkey range, such as Minnesota (Drake 1996), New Hampshire (Porter 1978), and New York (Walski 1987), have also reported substantial losses of turkeys in severe winters. However, we are not aware of any literature supporting winter feeding programs as a means of substantially reducing turkey mortality during severe winters (Austin and DeGraff 1975).

Another factor to consider before investing money and manpower in supplemental winter feeding is the importance of winter survival in wild turkey population dynamics. In regard to winter mortality, one Pennsylvania study found that turkey populations usually recovered in one breeding season and appeared more dependent upon the previous summer's reproductive success than upon the mildness of the preceding winter or the number of breeders available (Drake 1996). A study conducted in New York State, which included the severe winter of 1994, found that annual population fluctuations were much more influenced by summer reproduction than by winter losses (Roberts et al. 1995). This study and others suggest that although winter turkey losses should not be disregarded, annual turkey population fluctuations are primarily affected by reproductive success (Roberts et al. 1995, Vander Hagen et al. 1988).

A 12-year study in New York showed that a wild turkey's greatest obstacle is surviving the spring, not winter. This study occurred in southern New York between

1969 and 1982 and looked at three main factors that influence population growth - hunter harvests, weather and land use. These researchers calculated that hunters are responsible for only 12 percent of all that influences turkey population growth. In areas that experienced turkey population drops, the researchers then looked at the effect of winter weather conditions but found no direct correlation. When the researchers determined that winter was not the archenemy, they studied data on spring temperatures and calculated the amount of food bearing terrain. They found that population figures increased significantly when poults were warm and well fed during critical development periods (Barham 1996).

For conditions to be ideal, the weather had to cooperate during the latter part of March through the last weeks of June. If May stayed cold, a hen was less likely to leave her nest and provide unguarded access to spring predators. The researchers speculated that cooler temperatures in March also delayed insects from hatching until May and June, thus providing a critical food source for poults at just the right time. Poults also needed protection from cold and wet conditions in the first weeks of life. The young birds are highly susceptible to hypothermia, so a dry May and sunny June improved poult survival. Even though weather appeared to play a major role in poult survival, food and shelter mattered most. Whatever the weather report, poult populations were consistently larger in areas with good nesting conditions and specific crops. In areas where shrubs and young trees made up more than 25 percent of the terrain, wild turkeys had appropriate cover for nesting. Optimum brood raising occurred in areas where at least 30 percent of the land consisted of alfalfa or other legumes that attracted a large insect population (Bayham 1996).

Long-term turkey population trends will be controlled by the quality and quantity of habitat for turkeys. Therefore, funds used for supplemental feeding would be better expended on wild turkey habitat enhancement to provide far more long-term benefits to wild turkey populations (Kennamer 1994).

If yearly overwinter survival of turkeys is poor, these losses may be more than compensated for with good recruitment. If populations are suppressed by successive poor winter survival and poor reproduction, this will be confirmed by Wildlife Conservation Officer summer turkey sightings. At this point, the proper management response would be to not extend, or reduce if necessary, fall either-sex season length to allow populations to recover, rather than to attempt to modify winter losses through supplemental feeding (Drake 1996).

A final point to consider is that even if the winter is severe, winter losses and population impacts may not be substantial. Despite the extremely severe winter of 1993-94, winter turkey losses were generally low, and following good reproduction during the summer of 1994, the spring and fall harvests in the three northernmost Turkey Management Areas (3, 4, and 5) were above average and statewide harvests were record highs (Drake 1996, Shope 1993).

Management Policies and Current Wildlife Populations

In 1977 the Game Commission developed a winter feeding policy of discouraging routine feeding and encouraging self-sustaining wildlife populations. This policy, still in effect, is based on experience and evidence that winter feeding is ineffective and inefficient. It stresses the necessity for population controls and habitat management, rather than regular use of winter feeding (Pennsylvania Game Commission 1995).

Population control of deer is accomplished primarily through the use of regulated hunting of antlerless deer. For turkeys, the length of the fall hunting season may be shortened to increase the numbers of hens that will nest the following spring, thereby increasing the population. The Commissions' habitat improvement efforts include timber harvesting in strategic areas to promote growth of seedlings and saplings, and planting of food plots of trees, shrubs, grasses, grains, and legumes. Agency habitat improvement operations are confined to state and federal forest lands, state game lands, and land under commission control (Pennsylvania Game Commission 1977).

Based on information gained in their population and carrying capacity studies, the Game Commission in 1979 adopted a deer management system based on overwinter deer density goals for each county. This system, still in use today, assigns each county an overwinter density goal based on the amount and quality of woodlands found in it. These goals are set below the biological carrying capacity to ensure forest regeneration and minimize problems in agricultural, suburban and urban areas. Recommendations for the number of antlerless deer permits that would move the population toward management goals are then made.

This type of overwintering management is not needed for turkeys because overpopulation hasn't become a problem. Turkey management efforts are toward maintaining huntable populations in suitable habitat throughout the state.

The population of deer and turkeys is hardly ever spread evenly over the habitat. There are areas with high populations and other areas with sparse numbers. Deer populations have been successfully reduced through antlerless deer harvests in many of the northern counties and are nearer to density goals there than other areas of the state. Food and cover availability is primarily the determining factor of population distribution (Pennsylvania Game Commission 1995).

The statewide prehunting season deer population for 1996-97 was estimated at 1,200,000 for a density of 45 deer per square mile of forested habitat; the 1996 winter density was approximately 30 deer per forested square mile. This winter density is 43 percent higher than the agency goal of 21 deer per square mile.

Turkey populations have increased significantly, especially in the last 20 years. The population of wild turkeys in Pennsylvania in 1996 was conservatively estimated at more than 300,000 (Unpublished data, Game Commission 1996). This number of wild

turkeys in Pennsylvania isn't a problem; turkeys may cause some crop damage, but this damage is not nearly as widespread as with deer.

What Sportsmen's Organizations Can Do

Hunting and conservation organizations and individual sportsmen feel a strong and urgent need to assist wildlife during periods of extreme weather, despite the fact that research data collected over a lengthy period indicates wildlife is extremely winter-hardy and winter feeding will normally not improve the winter survival odds for wildlife. Winter feeding is at best a chancy operation full of unforeseen possibilities that may damage both habitat and the animals intended for help. Most wildlife management professionals no longer endorse winter feeding.

Due to factors other than pure biology, the Game Commission is still involved in some aspects of winter feeding. Agency employees give out limited amounts of corn for winter feeding and also plow roads primarily to open travel lanes and uncover food plots. The Game Commission is also engaged in habitat improvement projects designed to provide more natural winter foods for deer, turkeys and other wildlife.

Projects being carried out by the Game Commission and recommended for sportsmen's organizations consist mostly of habitat improvement projects that provide long term habitat improvement and increase the carrying capacity of the habitat. Examples of these would be planting mast producing trees and shrubs, and protecting the plantings until large enough to survive deer browsing. Another example is planting meaningful amounts of evergreen cover in areas where they are lacking in order to provide thermal cover for wildlife. The timbering of privately held sections of mature forests to allow regeneration of natural browse is still another example of a habitat improvement program that would provide short-term habitat improvement.

Summary

All reports were critical of winter feeding programs for white-tailed deer. Some researchers stopped short of saying that winter feeding was harmful to deer; others felt that winter feeding of deer was probably harmful. No biological data found was supportive of a winter feeding program for deer. The only positive justifications given by any researchers were more or less political ones. For example, it may allow a "feel good" attitude by sportsmen because they feel that something beneficial (about winter starvation of deer) is being done and that they had an opportunity to participate in a conservation program. It appears that any winter feeding of deer will probably set the deer up for future trouble. A variety of unpredictable and not obvious things, all more or less bad, may occur.

For turkeys the research is clear that winter feeding of turkeys does not have a beneficial effect on turkey populations in Pennsylvania, and that disease (aflatoxicosis) may be a problem. The biggest problem with winter feeding of turkeys is that it is

ineffective and inefficient. When food is actually needed, the winter conditions that make feeding of the birds necessary, also make the logistics of finding the birds (they won't travel) and delivering the food (heavy, powdery snow) an impossible task for more than a small percentage of the total turkey population. Studies indicate that weather conditions that isolate birds from food sources, other weather conditions that effect nesting and poult survival, and habitat are the primary factors affecting turkey populations. Cold weather by itself was not generally indicated to be a limiting factor in overall turkey populations if birds were able to get to available natural food sources.

Based on review of available data we conclude that winter feeding programs for deer and turkeys in Pennsylvania would be a wasteful use of resources under any circumstances. A summation of the disadvantages is as follows:

1. leads to over browsing in the area around the feeding station.
2. creates animal dependency on the feed, curtailment of feeding may cause high mortality.
3. creates potential for spread of disease and parasites.
4. deer often exhibit gastrointestinal disorders when winter-fed.
5. animals exhibit aggressive behavior in feeding areas; the weakest and smallest eat last.
6. consolidation of animals attracts predators, breaking of trails in deep snow to replenish feed gives predators access.
7. disrupts deer when they are trying to conserve energy.

Keeping populations in balance with habitat capacity will allow habitat regeneration even through the occasional abnormally severe winter. Winter mortality will never be eliminated. It is a natural controller that ensures survival of the strongest of a species. By keeping populations and habitat in balance, winter mortality will be reduced and a sustained, huntable population can be maintained.

There is a need for renewed (or new) educational efforts to build understanding and support for management policies and goals. Few individuals, outside those involved in day to day wildlife management, could be expected to understand, for example, the intricate relationship between overwinter populations of deer and the numbers of huntable bucks the following year without being educated to the facts. Most dangers associated with winter feeding of wildlife are hidden from casual observation. Deer and turkeys are attracted to feeding areas and, to the casual observer, appear to benefit from this practice. Few believe that they may die because of it. Programs should be developed to better inform or educate interested groups and individuals and solicit their support for population management and habitat improvement goals and policies.

Winter feeding programs should be actively discouraged as a waste of money and effort as well as being potentially harmful to wildlife and habitat. These resources are better spent on habitat improvement. Habitat improvement projects should be coordinated between the various state and federal agencies that have cognizance, as well as with conservation and hunting organizations and clubs. A worthy project may be

providing funding or materials (plants, fencing, fertilizer, etc.) to receptive organizations to establish plots of mast producing shrubs and trees or evergreens for winter cover that would provide long-term habitat improvement. Professional guidance could be provided as to where these plots are needed and the best ways to establish them.

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