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Current Knowledge of White-Tailed Deer Feeding

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Abstract

I conducted a comprehensive review of articles related to feeding white-tailed deer (*Odocoileus virginianus*) to determine the state of knowledge, identify gaps with current understanding, and identify priorities for future white-tailed deer research involving feeding that could be informative to landowners, managers, and users. The 297 peer-reviewed articles on white-tailed deer feeding I reviewed were on a variety of topics. General trends were that half of articles involved feeding deer in captive settings to determine dietary, nutritional, physiological, or anatomical relationships. Few articles evaluated more complex topics, such as productive processes, health and disease, and ecosystem functioning, which are important to deer management decision-making. My analysis highlights that the science of wildlife management has not kept pace with the art (scope, scale, and realities) of people feeding white-tailed deer. Wildlife scientists should provide reliable, relevant information on feeding white-tailed deer to landowners and other decision-makers, particularly given how widespread the practice is, particularly in Texas, USA.

Keywords

Behavior, Diets, Economics, Feeding, Nutrition, *Odocoileus virginianus*, Productive Processes, Reproduction, White-Tailed Deer

1. Introduction

Many ecologists have argued that feeding wildlife is irresponsible on the grounds of nutritional, ecological, ethical, and wildlife health concerns [1] [2]. Nonetheless, feeding wildlife continues and is widely practiced throughout much of the United States [3]. Moreover, biologists, managers, and private landowners need reliable information to make sound management decisions related to white-tailed deer populations. Year-round or seasonal feeding of deer is a common manage-

ment practice in regions where nutritional stress occurs regularly and in suburban or urban areas [4]. For example, feeding deer commonly occurs during winters in northern latitudes and during summer in semi-arid regions where frequent and reoccurring drought is common [3]. Furthermore, in regions like Texas, USA, deer are often fed to enhance harvest potential and viewing opportunities [5], a situation that is enhanced through the high amount of private land ownership (95%) in Texas, USA [6].

Management plans for white-tailed deer (*Odocoileus virginianus*) populations, a popular game species throughout North America and beyond, are common on both public and private lands [7]. These management plans often include legal feeding of deer populations to: 1) enhance harvest potential and viewing opportunities, 2) supplement deer during nutritionally stressful periods, and 3) increase carrying capacity above that of native habitat [5]. In Texas, USA, landowners supporting white-tailed deer hunting generate an estimated $5 billion in total economic output, contributing $3.8 billion to the state's gross domestic product annually [8]. Additionally, in 2006, it was estimated that landowners and lessees in southern Texas, USA, alone spent $34.7 million on hunting operations, including significant expenditures for supplemental feeding of deer populations [9] [10].

While some scientific literature has highlighted negative aspects of feeding deer, the practice remains popular and thus should receive continued objective focus. In many cases, clear and robust relationships are lacking. In 2006, The Wildlife Society performed a technical review of baiting and supplemental feeding of game wildlife species [3]. This comprehensive review presented the potential threats, risks, and benefits of feeding wildlife, including deer. Over the past 20 years, several literature reviews have evaluated specific aspects of feeding white-tailed deer. For example, researchers [11] assessed whether feeding deer degraded vegetation and did not find conclusive evidence that feeding deer resulted in concentrated feeding on the most palatable native foods. Additionally, in an *In My Opinion* article of the *Wildlife Society Bulletin*, others [1] presented nutritional, ecological, and ethical arguments against feeding deer. However, exhaustive systematic reviews of scientific literature within the past two decades related to feeding white-tailed deer have not occurred.

Here, I present a comprehensive review of peer-reviewed articles related to feeding white-tailed deer to determine the state of knowledge, identify gaps with current understanding, and identify priorities for future white-tailed deer research involving feeding. An underlying notion of this review is that many important, yet complex, questions that are relevant to deer management on private lands remain unexplored and unanswered. This effort is timely given how widely implemented, yet disproportionally studied, the art and science of feeding white-tailed deer is, particularly in Texas, USA.

2. Methods

I performed a systematic review of all articles on white-tailed deer (hereafter, deer)

feeding. My criteria for inclusion were that articles focused on assessing the ecological and biological impacts of deer feeding, whether those impacts were on the deer themselves or on the environment. I excluded articles that involved temporarily baiting deer for 1) capture, 2) determining fence-line breaches, 3) delivery of pharmaceuticals in a disease management or population control context, and 4) harvest. Additionally, I excluded articles reporting predators or parasites feeding on deer and any study of Cervids that did not include *Odocoileus virginianus*. Finally, I excluded review articles because I was mainly interested in evaluating how primary research studies report the impacts of feeding deer.

I queried Google Scholar in July 2025 using the following statement in the "search" field: (white-tailed deer) AND (feeding). This generated over >72,200 articles. From these, I excluded articles using the above criteria and did not include proceedings papers, theses or dissertations, books, and book chapters, or gray literature (such as agency publications) because these articles were not necessarily peer reviewed and to avoid duplication of studies in my analyses. Following these conservative criteria, I identified 297 articles for analysis, ranging from 1935 to July 2025 (Text S1, available in **Appendix**).

I developed a database describing the sources of each of the articles (author, year, title), and topic, research questions, methods, and results of articles. Each article was reviewed by one reviewer and OpenAI (ChatGPT 5 Teams, New York, NY, USA) to cross-validate the database. When different entries were found between human reviewer and artificial intelligence, a third-party human reviewer reexamined the article to obtain a consensus on divergent entries. For each article, I used the database to determine what (topic), when (decade, 1930-present, representing studies across 90 years), where (state and region), and whether articles reported data from captive (high study control) or free-ranging environments (low study control). For topics, articles generally fell into 9 categories. These were: 1) diets, nutrition, physiology, and anatomy, 2) habitat relationships, 3) behavior and movement, 4) population dynamics, 5) productive processes (antler and body growth, reproduction), 6) health and disease, 7) ecosystem function, 8) economics, and 9) genetics (Figure 1).

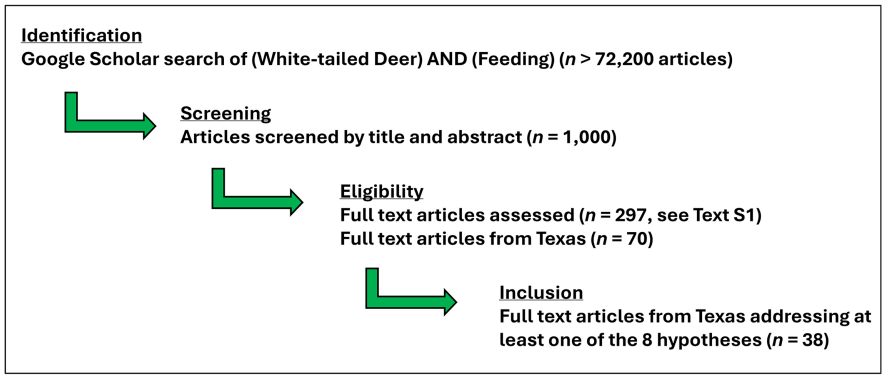

Figure 1. Diagram of selection process for review of white-tailed deer feeding articles from 1935-July 2025.

Additionally, given the relatively high number of articles from Texas, USA (n = 70), I performed a follow-up summation of studies that occurred in Texas, USA only. Specifically, I assessed whether articles supported, did not support, or were inconclusive regarding the following hypotheses: 1) feeding alters deer habitat use or vegetative composition, 2) feeding alters deer behavior or movement, 3) feeding increases physical condition (e.g., body or antler size), 4) feeding alters ecosystem functioning, 5) feeding increases deer population performance (e.g., fertility, recruitment, or survival), 6) feeding increases disease transmission risks, 7) feeding is more cost efficient than habitat management, and 8) feeding alters deer population genetics. For hypotheses 1) and 2), I included articles that involved food plots as a form of feeding deer.

3. Results

The 297 white-tailed deer feeding articles I reviewed were on a variety of topics (Table 1). General trends were that half of articles involved feeding deer in captive settings (149 of 297, 50%) to determine dietary, nutritional, physiological, or anatomical relationships. These articles often maintained a high level of study control with low complexity. Articles on free-ranging wild deer with limited study control that investigated more complex topics (e.g., antler growth, reproduction, health, disease, genetics, economics, and ecosystem functioning) were comparatively few (Table 1).

Table 1. Total number of articles (with %) reviewed and articles reviewed from Texas, USA (with %) during assessment of white-tailed deer feeding articles by topic from 1935-July 2025.

Topic	Total articles (%)	Texas articles (%)
Diets, nutrition, physiology, and anatomy	146 (49)	32 (46)
Habitat relationships	36 (12)	12 (17)
Behavior and movement	53 (18)	9 (13)
Population dynamics	7 (2)	2 (3)
Productive processes	21 (7)	7 (10)
Health and disease	19 (6)	2 (3)
Ecosystem function	8 (3)	4 (6)
Economics	5 (<2)	1 (<2)
Genetics	2 (<2)	1 (<2)
Total	297	70

The first deer feeding article occurred 90 years ago, in 1935, and was published in *Ecology* (Text S1). A relatively low number of articles occurred from the 1930's through the 1960's (from 2 - 15 articles/decade, Figure 2). From the 1970's

through the 2010's, the number of deer feeding articles was high (from 49 - 57 articles/decade) and peaked in the 1990's. The 2020's represented only 5.5 years of articles.

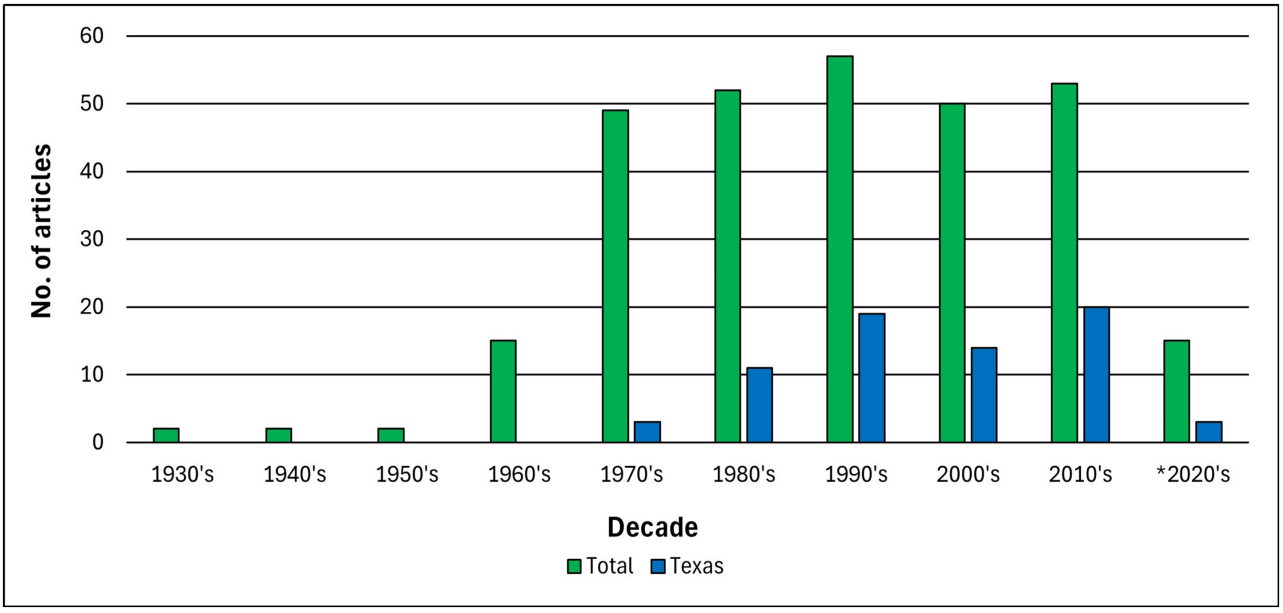

Figure 2. Total number of articles reviewed ($n = 297$, green) and articles from Texas, USA ($n = 70$, blue) during assessment of white-tailed deer feeding articles from 1935-July 2025. Note: 2020's only included 5.5 years.

Many articles (31%) were from the Midwest US and several involved emergency feeding of free-ranging deer in the winter (Table 2). Texas (24%), Canada (12%), the Northeast US (10%), the Southeast US (9%), and the Mid-Atlantic US (8%) comprised the top 6 regions for deer feeding articles. As expected, few articles were from the western US, Mexico, and overseas on introduced ranges (<1% - 2%) where white-tailed deer were less common and feeding as a deer management tool was rare.

Table 2. Total number of articles (with %) by region, number of states in region, and number of articles per state reviewed during assessment of white-tailed deer feeding articles from 1935-July 2025.

Region[a]	No. of articles (%)	No. of states	No. of articles per state
Midwest	92 (31)	12	7.7
Texas	70 (24)	1	70
Canada	37 (12)	1	37
Northeast	30 (10)	6	5.0
Southeast	28 (9)	12	2.3
Mid-Atlantic	24 (8)	5	4.8

Continued

Northwest	6 (2)	5	1.2
Mexico	4 (<2)	1	4
Southwest	3 (<2)	3	1.0
West	2 (<1)	4	0.5
Czech Republic	1 (<1)	1	1
Total	297		

[a]Midwest includes the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; Northeast includes the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Southeast includes the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia; Mid-Atlantic includes the states of Delaware, Maryland, New Jersey, New York, and Pennsylvania; Northwest includes the states of Idaho, Montana, Oregon, Washington, and Wyoming; Southwest includes the states of Arizona, New Mexico, and Oklahoma; and West includes the states of California, Nevada, Utah, and Colorado. Texas, Canada, Mexico, and Czech Republic are stand-alone regions and Alaska and Hawaii did not have anything to report on feeding white-tailed deer (*Odocoileus virginianus*).

Table 3. Summary of articles from Texas, USA between 1984 and July 2025 on feeding white-tailed deer ($n = 38$) relative to hypotheses.

Hypothesis	Supporting	Inconclusive	Not supporting
Feeding (here, including food plots) alters deer habitat use or vegetative composition	[17] [34]	[35] [36]	[18] [19] [37]
Feeding (here, including food plots) alters deer behavior or movement	[20] [35] [38]-[41]	[42]-[44]	[21]
Feeding increases physical condition (e.g., body or antler size)	[15] [22] [45]	[46]-[48] [50] [51]	[49]
Feeding alters ecosystem functioning		[23] [52]	[24] [53]
Feeding increases deer population performance (e.g., fertility, recruitment, or survival)	[15] [25] [45]	[29] [54]-[57]	
Feeding increases disease transmission risks	[30]	[29]	[58]
Feeding is more cost-efficient than habitat management	[26]		
Feeding deer alters population genetics		[27]	

For articles from Texas, USA ($n = 70$), where both deer and deer management were common, many articles involved studies conducted in captive settings. These relationships mirrored those from the full dataset. However, articles from Texas, USA often covered topics with greater complexity, compared to the full dataset (Table 1). For example, half of all articles on the topics of ecosystem function (4 of 8) and genetics (1 of 2) occurred in Texas, USA. Additionally, one-third of all papers on the topic of productive processes (7 of 21) occurred in Texas, USA. Furthermore, articles from Texas, USA first were published in the 1970's and peaked in the 2010's (Figure 2). Lastly, I identified 38 articles from Texas, USA (54%) involving feeding deer that directly or indirectly addressed at least one of the 8 hypotheses (Table 3).

4. Discussion

At the global level, my analyses of white-tailed deer feeding articles found that: 1) most articles were from deer herds in the northern latitudes of their range (56%) including the Midwest, Northeast, Northwest, and Canada; 2) most articles were performed on captive deer in controlled settings (50%); and 3) almost half of the articles (49%) described basic relationships among feeding with observations of nutritional, physiological, or anatomical parameters. These foundational articles were first published almost a century ago and still serve as an important basis for deer management. However, articles concerning multifaceted and complex relationships with free-ranging white-tailed deer were less common. A notable exception to this was articles involving feeding and deer health and disease. Feeding deer in tuberculosis or chronic wasting disease endemic areas is a significant health risk to livestock and deer populations [12] [13], though feed treated with pharmaceuticals for deer is regularly deployed in disease management contexts [14].

Articles from Texas, USA suffer from the same limitation as the global articles, in that articles involving free-ranging deer and intricate topics were uncommon. For example, the most complete and thorough article from Texas, USA, which included >10 years of data and feeding deer maintained at different densities in 81 ha enclosures [15]. Nonetheless, scientists' work in [15] and the related book [16] are the most comprehensive presentations of white-tailed deer density, feeding, habitat, and precipitation relationships from Texas, USA, and should serve as a valuable resource to deer biologists in Texas, USA and other regions.

I was further interested in evaluating the Texas, USA articles to determine our knowledge gaps related to feeding deer. I framed these lines of inquiry around 8 hypotheses (Table 3). First, I was interested in evaluating whether feeding deer alters deer habitat use or vegetative composition and I included articles where feeding included food plots. Several articles were assessed in support and not in support of the hypothesis. For example, [17] found heavier deer browsing nearer feeder sites than control sites, but others found that feeding had no effect on palatable shrubs for deer or forb standing crop [18] [19]. Given the divergent outcomes, I conclude that more study is needed related to this hypothesis before definitive inferences

can be drawn.

Second, I assessed whether feeding deer alters deer behavior or movement and again included articles where feeding included food plots. Most articles that assessed the topic found that feeding deer alters their behavior. For example, does often avoided bucks at feeding sites due to intraspecific aggression [20]; however, others found that feeding deer had little impact on deer spatial dynamics [21]. I conclude that feeding deer alters their behavior, but not necessarily their spatial dynamics or home ranges.

Third, I evaluated whether feeding deer increases physical condition. Researchers in [22] determined that feeding programs benefit bucks more than does (see hypothesis 2) above) and that bucks with access to feed had larger body mass (12% - 23%) and antler size (14%) than unfed bucks. Additionally, others found fed populations to have improved fitness of individual deer and deer populations [15]. I conclude that feeding deer has potential to increase physical condition, particularly for bucks.

Fourth, I assessed whether feeding deer alters ecosystem functioning. For example, whether feeding decreases ground nesting bird nest success or reduces small mammal abundance. I did not identify articles that supported this hypothesis. However, others [23] found cover was more important to nest success than proximity to deer feeders and still others found that feeding deer did not alter small mammal abundance [24]. I conclude that feeding deer does not alter ecosystem functioning, as measured by ground nesting bird nest success or small mammal abundance.

Fifth, I evaluated whether feeding deer increases deer population performance. As previously mentioned, fed deer populations had improved fitness of individual deer and deer populations [15]. Additionally, others have observed increased fawn production in supplementally fed pastures [25]. I conclude that feeding deer has the potential to enhance deer population performance.

There were a few articles from Texas, USA that directly addressed hypotheses 6) - 8). As previously mentioned, in disease-endemic regions, deer feeders can function as a fomite and increase disease transmission risks [13]. Additionally, scientists in [26] determined that feeding deer may be more cost-efficient than habitat management, though there is insufficient study to form sound conclusions. Furthermore, the article involving deer feeding and genetic relationships was not designed to evaluate feeding [27], therefore meaningful conclusions cannot be made related to this hypothesis, and more study is needed.

There was an additional topic that surfaced related to feeding white-tailed deer in Texas, USA. Most deer populations in Texas, USA experience frequent and reoccurring periods of drought, which often impacts deer populations more than feeding or deer density. For example, rainfall was determined to be more important than feeding relative to forb standing crop [18]; rainfall was found to be more important than deer density relative to deer diet quality, vegetation composition, and population parameters [15]; with variable rainfall the repeatability of antler char-

acteristics was 13% - 18% greater among deer herds that were fed [28]; variable rainfall in southern Texas, USA makes adult deer survival important and feeding deer provides a buffer during drought years [29]; and rainfall drives small mammal abundance, not feeding deer (distance from feeders) or deer density [24]. Given the importance of rainfall in semi-arid regions of Texas, USA to deer populations, future research must incorporate precipitation into studies.

If you are like me (a moderately productive ungulate ecologist with 30 years of experience conducting studies and publishing peer-reviewed articles on wildlife ecology relationships), you may have shied away from controversial or complex study questions related to feeding wildlife, specifically white-tailed deer. Additionally, you may have published articles that served to reinforce the widely accepted view among ecologists that question the validity of feeding deer [30]. There are legitimate concerns and risks in establishing a career in human-centric, utilitarian enterprises, not the least of which is that the discipline of Wildlife Ecology and Management projects a sentiment that feeding wildlife is bad [1] [3]. For me, and since my undergraduate years, this instilled an unspoken attitude that many private landowners, wildlife managers, hunters, and biologists who feed deer are at best, uninformed. Over time, and in my more mature state, I have come to appreciate the realities of land ownership and the importance of private land stewardship, which includes keeping existing parcels of land intact and unfragmented [31]. A major part of this includes the realities that landowners must generate sufficient revenue from the land to keep the ranch together through diversifying revenue streams; for example, from gas, oil, livestock grazing, hunting, and ecotourism [32]. This is counter to public lands, where funding is often received piecemeal, retroactively, and at the whims of the current political climate. In my experience through past work for the US federal government and academia, I believe efforts by private landowners have been 1) underappreciated by many wildlife ecologists and university faculty, and 2) that private land realities are often counter to what is being taught to natural resources and wildlife management students, which inappropriately reinforce the notion that, public land is good and private land is bad for wildlife conservation. Simply stated, this is false.

My analysis of deer feeding articles highlights that the science of wildlife management has not kept pace with the art (scope, scale, and realities) of people feeding white-tailed deer. This is particularly true on intensively managed private lands in southern Texas, USA, where large antlers and other productive processes are of paramount importance to the people who own, manage, or hunt on the land from an economic, reputation, or social standpoint. Here, literally tons of feedstuffs are distributed, often year-round, to maximize these productive processes. For a scientist, the easy path is to keep beating the drum that private landownership and our management practices are bad. The harder path, a path worthy of the vocation of a wildlife biologist [33], is to better understand how to implement these practices for the benefit of all 3 components of Wildlife Management (*i.e.*, wildlife, habitat, and people) through science. The scientific community needs to be and do

better as a whole, related to the practice of feeding wildlife and specifically white-tailed deer.

5. Research Implications

Feeding white-tailed deer is not going to go away anytime soon and I am not suggesting that ecologists should embrace the practice. However, wildlife scientists should provide reliable information on feeding white-tailed deer to landowners, users, managers and other decision-makers, particularly given how widespread the practice is, so that they can make the most effective decisions given their management objectives. From my literature review, several clear lines of future study surfaced (*i.e.*, gaps in knowledge) that are needed to better inform decision-makers and landowners. First, more research is needed involving complex topics, such as feeding impacts on productive processes (e.g., antler growth and reproduction), population dynamics (e.g., variability in deer populations during different times of the year), deer health and disease, and ecosystem functioning. Second, more research is needed regarding what to feed (e.g., protein or energy) during different times of the year and under differing range conditions to best support deer populations. Third, detailed and complete studies involving the economics of feeding deer are needed; for most private landowners, the bottom line is of paramount importance and value, yet this is poorly studied. Fourth, investigations that compare the costs, benefits, and value of habitat manipulation (e.g., prescribed fire or herbicide treatments) to areas where deer are fed are needed to determine the comparative values of these forms of deer management. Lastly, all 4 of the above knowledge gaps need to be evaluated over sufficient periods of time to capture regular oscillations in annual precipitation, with rainfall being the primary driver of rangeland productivity in Texas, USA.

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Ethics Statement

No animals or humans were used as subjects of study during the completion of this literature review.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix: Access to Supplementary Material (Text S1)

Owing to its excessive file size, Text S1 cannot be included or linked directly within this manuscript. For legitimate access to this supplementary material, researchers are requested to contact the author via email.