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Original Article

Regulated Commercial Harvest to Manage Overabundant White-Tailed Deer: An Idea to Consider?

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ABSTRACT Declines in hunter recruitment coupled with dramatic growth in numbers of white-tailed deer (*Odocoileus virginianus*) have challenged our ability to manage deer populations through regulated hunting. We review the efficacy of current regulated hunting methods and explain how they are unable to reduce deer numbers sufficiently in some environments. Regulated commercial harvest would provide an additional tool to help state wildlife agencies manage overabundant populations of white-tailed deer. We outline potential means to govern regulated commercial deer harvest and explain how it is compatible with the North American Model of Wildlife Conservation. We identified several benefits, including reduced overabundant populations of deer; source of healthy, natural, green, locally produced protein; promotion of economic growth, entrepreneurship, and market expansion; and public engagement and appreciation. We also address expected concerns associated with this concept, such as privatization of wildlife; overexploitation; food safety; competition with existing commodities; law enforcement; and challenges of changing laws, regulations, and attitudes. We suggest developing a professional forum to address the issue of regulated commercial harvest of white-tailed deer and other overabundant species of wildlife. © 2011 The Wildlife Society.

KEY WORDS commercial harvest, *Odocoileus virginianus*, overabundance, population management, white-tailed deer, wildlife-damage management.

The marriage of sport hunting and conservation of white-tailed deer (*Odocoileus virginianus*) epitomizes the success of the North American Model of Wildlife Conservation (NAMWC). The white-tailed deer currently is the most popular big-game species in the world, and populations are robust nearly everywhere within their historic range and thriving to the point of overabundance in many areas (McShea et al. 1997). This is not the way it has always been (McCabe and McCabe 1984). By the late 19th century, populations of white-tailed deer in North America were locally extirpated or in severe decline due to unregulated hunting (including market-hunting) and habitat degradation (McCabe and McCabe 1984).

Early market-hunting of deer was supported by a lucrative demand for meat, hides, and other parts (McCabe and McCabe 1984). Early attempts at regulating harvests of white-tailed deer were ineffective, presumably due to poor enforcement and lack of public acceptance (Jacoby 2001), but perhaps also because scientific understanding of sustainable harvesting was rudimentary and a conservation ethic was in its infancy. The Lacey Act of 1900 is considered the first law that successfully regulated harvest of white-tailed deer and other wildlife (McCabe and McCabe 1984). It aided in ending market-hunting with the key provision prohibiting anyone to ". . .import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law whether in interstate or foreign commerce" (Michigan State University 2010:16 USC 3371–3378). The law effectively enabled wealthy and politically prominent advocates for recreational hunting to restrict commercial trade of wildlife to the point at which market-hunting was no longer economically viable.

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Additional advocacy by recreational hunters, creation of wildlife agencies, passing of state-level game laws, and a maturing science of sustainability and conservation played major roles in restoring populations of white-tailed deer in North America. Objective assessments of the state of conservation and management of white-tailed deer today, however, suggest that we are victims of our own success and perhaps constrained by paradigms and philosophies that rightly achieved prominence when protection and recovery of deer populations were the most imperative goals. This issue is especially evident in many developed regions where deer populations now exceed biological and social carrying capacities. We assert that management paradigms must expand to accommodate new realities while also holding fast to the values that enabled development of the NAMWC and our wildlife management successes. We propose the development of a framework for regulated commercial harvest as an additional tool for managers to address overabundant populations of white-tailed deer. We begin by describing the historic and current status of management for populations of white-tailed deer in North America and the problems created by overabundance. We then discuss current methods used to address the problem associated with overabundance of white-tailed deer. We conclude by describing and discussing a potential framework for regulated commercial harvest of white-tailed deer and how it fits within the NAMWC.

POPULATION DENSITY

The population of white-tailed deer in North America was estimated to be about 24–33 million when European settlement began (McCabe and McCabe 1984). Populations were reduced regionally to near extirpation by unregulated market-hunting and other factors. By 1984, through management efforts, populations had rebounded back to about 15 million. We surveyed every state in the United States and determined the current size of the U.S. population of white-tailed deer is just over 30 million (Table 1). Populations and ranges of white-tailed deer are dynamic on both short- and long-term scales. Recent increases in deer numbers are a result of increasing densities within their range. Prior to European settlement, the density of white-tailed deer in eastern North America was estimated at 2–4 deer/km^2 (McCabe and McCabe 1984, Alverson et al. 1988). By the 1990s, densities of white-tailed deer ranged between 15 deer/km^2 and 50 deer/km^2 (Healy 1997, VerCauteren and Hygnstrom 1998, Rosenberry et al. 1999, Long et al. 2005, Potvin and Breton 2005). Deer densities that exceed approximately 8 deer/km^2 can significantly impact ground- and scrub-nesting birds and change composition and abundance of plant species within forest ecosystems (DeCalesta 1994, McShea et al. 1997). High densities of deer often become a prominent management concern in developed landscapes (Jones and Witham 1995, Kilpatrick and Walter 1997). Some developed areas have reported densities of white-tailed deer between 50 deer/km^2 and 114 deer/km^2 (Peck and Stahl 1997, DeNicola et al. 2008).

Table 1. Population estimate for white-tailed deer (*Odocoileus virginianus*) in the contiguous United States, determined from estimates from state wildlife agencies, reported between January and March 2010.

State	Estimate
AL	1,500,000
AR	750,000
AZ	85,000
CA	0
CO[a]	612,760
CT	62,163
DE	45,000
FL[b]	
GA	1,200,000
IA	500,000
ID	200,000
IL	800,000
IN	575,000
KS	280,000
KY	900,000
LA	750,000
MA	1,750,000
MD	234,000
ME	259,000
MI	1,750,000
MN	1,200,000
MO	750,000
MS	1,750,000
MT	249,000
NC	1,100,000
ND	500,000
NE	165,000
NV	0
NH	90,000
NJ	140,000
NM	5,000
NY	780,000
OH	675,000
OK	480,000
OR[c]	6,000
PA[d]	
RI	16,000
SC	750,000
SD	215,000
TN	900,000
TX	3,000,000
UT[e]	
VA	850,000
VT	130,000
WA	120,000
WI	1,700,000
WV	650,000
WY	52,000
Total	28,526,000

[a] Mule deer (*O. hemionus*) and white-tailed deer combined.
[b] No population estimate performed.
[c] Columbian subspecies only.
[d] No reported population estimate.
[e] Only incidental sightings.

Under the current paradigm for regulated hunting, state agencies have managed deer herds to provide a reasonable balance between ecological services (intrinsic values, viewing, and hunting opportunities) and perceived negative impacts (impacts on plant communities, damage to crops, deer–vehicle collisions [DVCs]; VerCauteren and Hygnstrom 2011). Opportunity for hunting has traditionally involved relatively unrestricted access to mature males and greater

regulation of harvest of females. Because deer have a promiscuous–polygynous mating system, restricting harvest of females frequently enables populations to expand in the face of exploitation to fully occupy available habitats leading to densities that may exceed social carrying capacity and threaten biological resources. Consequently, population reduction requires higher harvests of female deer (Xie et al. 1999, Patterson and Power 2002).

THE DEVELOPED LANDSCAPE CONUNDRUM

White-tailed deer can prosper in proximity to human development (McShea et al. 1997). Fecundity and female survival is high in suburban landscapes and natural regulatory mechanisms are not sufficient to cause populations to equilibrate at relatively low or moderate densities (Etter et al. 2002). White-tailed deer habituate to humans in urban areas because of the minimal downward pressure on their populations, fostered by the exclusion of large predators and little to no hunting. Humans may exacerbate the problem through direct and indirect feeding of deer (Williamson 2000), including spill over from bird feeders, placement of food as an attractant, and maintenance of landscape plantings (Swihart et al. 1995). These subsidies enable many suburban populations of deer to escape nutrition-based density-dependent constraints on population growth, resulting in sustained high densities of deer. Exurban development is the fastest growing type of developed landscape (Nelson and Sanchez 2005), with human dwellings being more dispersed than in suburban areas and interspersed throughout wildlife habitat (Odell and Knight 2001). Exurbia is residential development occurring outside municipality boundaries among farms and undeveloped land, with human density and average property size intermediate between the suburbs and rural areas (Nelson 1992, Storm et al. 2007*a*,*b*). Deer–human interactions may be problematic in exurban developments given the juxtaposition of development with habitat of white-tailed deer (Storm et al. 2007*a*,*b*). Survival rates of deer within exurbia are generally high because DVCs and hunting harvest occur at a lower rate than in suburban and rural landscapes, respectively (Storm et al. 2007*a*). Hunting typically is legal in exurban areas; however, it may be more controlled than in rural landscapes (Harden et al. 2005). Storm et al. (2007*b*) suggested alternative approaches to managing deer populations in exurban areas given the limitations of hunter harvest in these landscapes.

Problems associated with overabundant white-tailed deer include increases in DVCs; damage to gardens, landscape plantings, and native vegetation; and increased risk of humans contracting tick-borne diseases (Wilson et al. 1985, Swihart et al. 1995, Etter et al. 2000, Côté et al. 2004, Gubanyi et al. 2008). Conover (1995) estimated >1 million DVCs occur in the United States annually. In 2 suburban areas near Omaha, Nebraska, the estimated density of white-tailed deer increased from 9 deer/km^2 to 27 deer/km^2 from 1984 to 1994, with a ≥192% increase in DVCs (S. E. Hygnstrom, University of Nebraska-Lincoln, unpublished data). Estimated annual vehicle damage from DVCs for 13 states in the northeastern United States was >US$390 million (Drake et al. 2005). Damage by white-tailed deer to agricultural crops in 13 states in the northeastern United States was estimated annually at nearly US$172 million (Drake et al. 2005). White-tailed deer can also severely impact garden plants (Storm et al. 2007*b*), native vegetation (Horsley et al. 2003), nontimber forest products (Hygnstrom et al. 2009), and nurseries (Conover 1984). Risk of Lyme disease also is a concern because abundance of white-tailed deer has a positive relationship with tick abundance (Wilson et al. 1985). High human densities and problems of access in developed areas can make managing deer in these areas difficult (Storm et al. 2007*b*).

LIMITATIONS OF CURRENT CONTROL METHODS

Current nonlethal methods most often used for addressing deer–human conflicts include habitat modification, exclusion, repellents, frightening devices, and public education (Craven and Hygnstrom 1994, DeNicola et al. 2000). All of these methods are effective in reducing deer damage in certain situations, but none directly address overabundance of white-tailed deer because nonlethal methods do not reduce populations. Trap-and-translocate and contraceptive methods are costly, have not been successful at addressing population expansions on a large scale, and do not address immediate needs for population reduction (Jones and Witham 1990, Beringer et al. 2002, Malcolm et al. 2010). Lethal methods are the only effective means to reduce overabundance of white-tailed deer (Doerr et al. 2001) and typically are more cost-effective relative to nonlethal methods. Lethal removal of individual deer by recreational hunters is, and should remain, the primary method for managing populations of white-tailed deer wherever hunting can occur and be compatible with human safety and other resource management needs (Hubbard and Nielsen 2011). The number of hunters, however, is declining across the United States (U.S. Department of Interior and U.S. Department of Commerce 2006) and hunter recruitment has stabilized (Responsive Management/National Shooting Sports Foundation 2008). Thus, the potential for recreational hunting alone to control populations of white-tailed deer in some areas is unrealistic.

In most contexts, managers manipulate the opportunities for recreational hunters to harvest deer to achieve population goals for white-tailed deer. Examples include modification of season lengths and bag limits, restrictions on sex and antler points, equipment (e.g., firearms vs. archery gear), and technique (e.g., bait, dogs, tree-stands [Stedman et al. 2004, Van Deelen et al. 2006, Bhandari et al. 2008]). This paradigm depends critically on the implicit assumption that manipulating harvest opportunity results in a change in harvest or hunter success rates. Recent challenges to this critical assumption include the possibility of compensatory mechanisms that offset additional hunting mortality (Boyce and McDonald 1999); theory and research suggest that hunter willingness to harvest deer may become saturated regardless of opportunity (Van Deelen and Etter 2003, Giles and

Findlay 2004). Hunters may withdraw participation if they perceive management for lower densities as counter to their interests (Diefenbach et al. 1997, Holsman 2000, Ward et al. 2008). For example, since 2001, managers in Wisconsin have used a suite of aggressive regulatory structures (much longer seasons, much higher bag limits), in addition to an earn-a-buck incentive (Van Deelen et al. 2010), in an attempt to achieve a substantial reduction in the population of white-tailed deer. The result has been relatively minor reductions in population levels and resistance from many landowners and hunters (Heberlein 2004, Holsman and Petchenik 2006). Notably, Holsman and Petchenik (2006) found that hunters were very reluctant to exceed their harvest thresholds, defined as the number of deer they were willing to process for their own use, despite additional opportunity. Recognizing the shortcomings of opportunity-based management (Brown et al. 2000, Riley et al. 2003, Stedman et al. 2004), several researchers have called for more research into approaches that provide additional incentives for harvest (Brown et al. 2000, Giles and Findlay 2004, Stedman et al. 2004).

Two incentive-based approaches are venison donation programs, where the incentive is providing meat to non-hunters and food pantries (Hildreth et al. 2011), and earn-a-buck regulations, where authorization to harvest an antlered deer is used as an incentive to first harvest antlerless deer (Van Deelen et al. 2010). Recent efforts with donation programs have met with limited success. Hunters typically are willing to participate in programs such as "Hunters for the Hungry," as long as it does not cost them too much time and money. Support for such programs by state agencies has waned, as private donations and federal funds for the processing of deer and administration of programs have declined (Prouty 2007, Iowa Department of Natural Resources 2009). A new idea, coined the "Deer Exchange Program," functions as a web-based broker for local hunters willing to donate deer to willing recipients, and has shown promise (Hildreth et al. 2011). Similarly, earn-a-buck regulations are effective at increasing harvests of antlerless deer (Van Deelen et al. 2010), but their restrictions on harvests of antlered deer are onerous for recreational hunters (Holsman and Petchenik 2006).

The most common lethal methods used to address overabundance of deer in suburban landscapes include sharp shooting and controlled hunting (DeNicola et al. 2000). Sharp shooting typically is conducted by professional biologists and law enforcement officers after recreational deer seasons close and involves special regulations (e.g., baiting, shooting from vehicles) and equipment (night-vision scopes, spotlights, noise-suppressed rifles) within strictly defined areas. Sharp shooting may be an efficient method but can be expensive for entities (e.g., municipalities, government agencies) to implement, with reported costs $\leq$US$310/deer (DeNicola et al. 2000). Controlled hunting typically occurs within a defined deer season and area using recreational deer hunters (Hubbard and Nielsen 2011). Controlled hunts in suburban areas often have liberal bag limits or numbers of permits allowed, although permits already are quite liberal throughout the United States (VerCauteren and Hygnstrom 2011). Controlled hunting can be an efficient technique for addressing overabundant deer and a means for providing recreational opportunity for hunters, but can also be relatively expensive, ranging from US$86 (Kilpatrick and Walter 1999) to US$200/deer harvested (Deblinger et al. 1995; S. E. Hygnstrom, unpublished data). Hunting is a proven management tool in developed landscapes (Mayer et al. 1995, Kilpatrick and Walter 1999), but several factors limit its effectiveness, including declining numbers of hunters, a "trophy hunting" mentality, limited time and places to hunt, and the lack of willingness to harvest more deer. Furthermore, archery-only harvest may be the only method allowed in some developed landscapes, which has been found to be less efficient than firearms in controlled hunts (Kilpatrick et al. 2002). Therefore, new strategies and tools are needed to regulate deer numbers, especially in developed landscapes (Curtis et al. 2007).

The most cost-effective way to manage overabundant deer is through lethal methods. Current lethal strategies for controlling overabundant deer, however, can be costly or may fall short of management objectives. To allow hunters to profit from harvested deer would create another tool for managing overabundant deer by providing a financial incentive for hunters to harvest deer beyond their personal thresholds.

REGULATED COMMERCIAL DEER HARVEST—ANOTHER TOOL IN THE TOOLBOX

Thogmartin (2006) advocated the use of commercialization for controlling overabundant deer. In addition, Organ et al. (2010) mentioned its potential briefly in the context of the NAMWC. Regulated commercial deer harvesting would require development of an outlet for wild deer products and development of a regulatory structure that sustainably conveys wild deer from the public trust to private ownership and ultimately to commerce. State agencies would have numerous avenues for implementation of a regulated commercial deer-harvest program; here, we describe one potential approach. Under the proposed program, state wildlife agencies would award qualified individuals and business entities a Commercial Deer Harvesters License (CDHL) and allow them to harvest an allotment of deer and to sell any part of or the whole carcass. Ultimately, state wildlife agencies would dictate the terms of a CDHL program and organizations such as the Association of Fish and Wildlife Agencies, National Wildlife Control Operators Association, and Wildlife Damage Management Working Group of The Wildlife Society should be involved in developing guidelines for regulated commercial harvest and exchange of white-tailed deer. We recognize that policy decisions can create unintended consequences (Riley et al. 2002) and although the following is not a complete list, we suggest the following requirements and considerations for a CDHL program to help reduce the likelihood of those consequences:

1. Proof of insurance and willingness to assume liability for harvest and transportation activities,
2. proof of proficiency and training in harvest techniques,

3. proof of proficiency and training in proper handling of meat in the field,
4. proof of hunter education certificate,
5. business plan showing a relationship with a meat-processing facility that has proper food safety oversight,
6. no wildlife violations, and
7. reporting the number of deer harvested, and date, location, sex, age, registration number, and disposition of each deer.

In addition, state wildlife agencies should consider the following for establishment of a CDHL program:

1. Reviewing and amending associated state laws and agency regulations,
2. developing regulations to govern time of year, time of day, harvest limits, registration procedures, background checks, landowner approval, area of harvest, restrictions on harvest methods, and appeals procedures,
3. developing personnel requirements for administration, communication, record keeping, deer population management, and law enforcement, and
4. establishing fees to generate revenue for agencies to cover costs associated with administration, correspondence, training, testing, licensing, deer population management, law enforcement, record keeping, and reporting.

State wildlife agencies overseeing the CDHL should identify locations for implementation, issue a request for applicants, and maintain a list of CDHL holders. If no CDHL holders are needed, then applicants could be put on a waiting list. Entities (e.g., municipalities, airports) would be able to request that the governing state agency review their properties for eligibility for implementing CDHLs. An individual would be expected to purchase a CDHL from the state agency in charge of administering wildlife take permits. The fee should cover the agency's costs of administration, monitoring, and enforcement, although agencies may find that subsidizing these costs is a worthwhile investment in managing otherwise intractable populations of overabundant deer. Once a CDHL is purchased by an individual, the management agency would provide the CDHL holder with an allotment of permits to be used within a defined time limit. The management agency would control where the CDHL holder could harvest deer, perhaps assigning a "duty location," and outline the methods of take permitted in that area. Assigning a bounded area per CDHL holder would be necessary to ensure harvest efficiency to reduce overabundant populations, but also to ensure public safety and protect against over harvest. Regulated commercial harvest of white-tailed deer, which is more closely aligned with culling, should not be restricted by the principles of "fair-chase," which is a key tenant of recreational hunting (Muth and Jamison 2000). Means to optimize harvest, such as baiting, spotlighting, and noise-suppressed firearms, should be considered for maximizing harvest of overabundant populations of white-tailed deer and, if allowed, must be closely regulated to ensure public safety in developed areas.

The CDHL holder would be allowed to sell any part or all of the carcasses that he or she harvests under the CDHL. The most obvious and perhaps marketable part of deer would be venison, but certainly niche markets may be established for hides, antlers, tallow, and other parts. We suspect that wild-sourced venison would be attractive to consumers who prefer to buy meats from animals that can be considered free-range. In addition, local marketing of venison likely would be attractive to consumers who are motivated to support local producers with their food purchases, exemplified by the growth of organizations such as Slow Food USA (Slow Food USA 2010). Further exploration of potential marketing approaches would surely identify additional possibilities. The guidelines set by the U.S. Food and Drug Administration and Department of Agriculture would be useful to consider. Several plausible options exist for selling a harvested deer under a CDHL program, such as directly to individuals, through meat processors or restaurants, and on the open market. The Nebraska Deer Exchange is a program for brokering connections between local hunters and individuals wishing to receive donated deer, which could serve as a model for locating individuals wishing to purchase deer for their consumption (Hildreth et al. 2011). Well-established, regional or even national markets may also be a possibility where CDHL-harvested deer could be sold to a wholesaler who would process the deer and sell venison to grocery stores, restaurants, and individuals, as well as parcel out other marketable parts.

Of course, conflicts between the CDHL system and recreational hunting should be minimized. Seasons for CDHL operations could be established outside of regular hunting seasons in areas that allow public hunting. For areas that do not allow public hunting (refuges, parks, golf courses, urban areas), CDHL operations during the hunting seasons could actually augment hunting on adjacent areas that are hunted by the public, because of harvest-activity-stimulated movement and dispersal of deer.

Benefits of a CDHL

Advantages to implementing a CDHL program are many. First and foremost is the opportunity to reduce overabundant game populations (such as white-tailed deer) by providing an economic incentive for increased harvest pressure. A CDHL program offers an additional tool for use in areas where traditional harvests (e.g., recreational hunting) and nonlethal options have not been sufficient in reducing overabundant populations of white-tailed deer. Furthermore, a CDHL program may be more cost-effective than commonly used sharp shooting and controlled hunting, because entrepreneurs would pay for the opportunity to harvest deer if markets for harvested deer are sufficiently lucrative. Similarly, at least some administrative costs could be recovered through the fees for a CDHL rather than having responsible government agencies hire sharp shooters or incur costs associated with the logistics of controlled hunts.

Commercially harvested deer could provide a source of healthy, natural, green, and locally grown protein (Vantassel 2009) to a larger segment of the population than just hunters and their family and friends. Many health benefits are derived as a result of consuming venison because it is a high-protein, low-fat, and beneficially cholesterol-

balanced food (Hoffman and Wiklund 2006, U.S. Department of Agriculture 2009) that is readily available across much of the eastern and mid-western United States. Opportunities for niche marketing in health food stores, restaurants, and local meat counters, as well as supermarket and chain food stores, likely will broaden markets and instill widespread consumer support for commercially harvested venison. Wild venison could also be publicly discounted and provided to feed the hungry and needy people of this nation beyond what is provided through programs such as "Hunters for the Hungry" (Farmers and Hunters Feeding the Hungry 2007).

Considerable economic benefits may be gained by regulated commercial harvest of deer. The new source of a marketable product could stimulate entrepreneurship in specialized markets of deer harvest, processing, packing, transportation, marketing, sales, and service. Benefits likely will be experienced at multiple economic scales, from local markets to international trade. Commercial markets for free-range game are commonplace across the globe (Bertolini et al. 2005, Brainerd and Kaltenborn 2010). In some nations, the market-driven value of wildlife has actually led to increased protection against illegal harvest and trafficking (Fischer et al. 2005, Johannesen and Skonhoft 2005). In addition, states and local economies would benefit from the taxes and fees resulting from increased economic activity (Conover 1997). A significant and positive economic cascade could occur between CDHL holders, state agencies, private landowners, meat processors, wholesalers, and consumers.

Lastly, the public could become frustrated when overabundant populations of white-tailed deer persistently create conflicts in their communities (e.g., DVCs, property damage, harboring tick-borne diseases) and none of the management options tried are effective. Hunting can be an effective technique for controlling game populations under certain circumstances and commercial harvest may provide additional incentive for entrepreneurs to apply sufficient harvest pressure to alleviate deer–human conflicts. By doing so, the attitude of the public may change from viewing overabundant populations of white-tailed deer as vermin to again seeing them as a valuable natural resource (Vantassel 2008). In addition, more members of the nonhunting public may embrace and support hunting as the valuable tool that it is once they witness the effectiveness, humaneness, and economic benefit of regulated commercial harvest.

Addressing Expected Concerns About Regulated Commercial Harvest

In addition to having professional interests in the scientific management of deer and other wildlife, we are enthusiastic supporters of hunting and strong proponents of the NAMWC. For some, our proposal harkens back to the dark and exploitive time of market-hunting in the history of wildlife in North America, when some species were driven to the brink of extinction (McCabe and McCabe 1984). We advance our argument for regulated commercial harvest of white-tailed deer within the context of the NAMWC. The NAMWC evolved in part, as a response to the excesses of *unregulated* market-hunting prior to the emergence of scientific, professional, and cultural imperatives for conservation, and is characterized by 7 core principles that make it the envy of the world in terms of wildlife conservation (Organ et al. 2010).

Perhaps the core of the NAMWC is its first principle, that wildlife is a natural resource of the public trust. A carefully regulated program of commercial harvest would affirm this principle—each state wildlife agency would continue to manage and regulate white-tailed deer and deer would continue to be a public resource. The second principle dictates the elimination of commercial markets for game. This principle is a direct reaction to the exploitive and unsustainable harvest of wildlife during the market-hunting era. We assert, however, that limited and regulated commercial harvest of overabundant populations of white-tailed deer is consistent with the conservation values that fostered the emergence of the NAMWC. Particularly if this second principle of the NAMWC is expanded to include an understanding that any harvest must serve the goals of contemporary conservation and that commercial harvest should be applied only in circumstances where recreational harvest is not allowed or has not been effective at reducing deer densities to goal levels set by the management agency. With this understanding, restricted use of financial incentives will not result in overexploitation given the regulatory, scientific, monitoring, and enforcement framework currently in place in every state in the United States. Furthermore, commercial markets for certain wildlife already exist and are accepted in clear contradiction (at least superficially) to the second principle—the trapping and selling of furbearers. Furbearer management provides a good example of how a wildlife resource can be managed both commercially and sustainably, particularly because many furbearer species have lower intrinsic growth rates than white-tailed deer and, hence, are relatively more vulnerable to overexploitation.

The third principle addresses the management of wildlife resources using laws and regulations. Laws, regulations, and enforcement have enabled wildlife populations to recover from exploitation and are absolutely necessary to sustainably manage commercial harvests of overabundant deer populations. Commercial harvest of white-tailed deer would be highly regulated. In fact, state laws would need to be amended prior to the implementation of a CDHL program because laws are encoded in every state that prohibits the sale of wildlife. The fourth principle mandates that wildlife be killed only for legitimate purposes. Reducing overabundant deer and addressing the subsequent consequences (e.g., DVCs, damage of personal property, protection of other natural resources such as native vegetation) are legitimate reasons to harvest deer, whether recreationally or commercially. In addition, the generation of food and other products from commercially harvested deer would be nonfrivolous, legitimate use.

The fifth principle recognizes wildlife as an international resource. Although this principle has little to do with our proposed idea of managing overabundant local populations of white-tailed deer, regulated commercial harvest could be

applicable to other overabundant species, including internationally migratory species like snow geese (*Chen caerulescens*) and Canada geese (*Branta canadensis*). Science-based wildlife policy is the sixth principle of the NAMWC. A CDHL program would rely on science and research-based data to not only index or estimate abundance of white-tailed deer prior to implementing commercial harvest, but to generate new information upon which proactive and adaptive management could be based. Further, state agencies may need to improve deer-density indexing methods and increase efforts to accurately index densities in local areas where commercial deer harvest is being implemented. Commercial deer harvesters will likely be much more efficient at killing deer, so improved accurate and timely indexing may be important to reduce the potential for commercial harvest to reduce deer densities below goal densities. The last principle suggests that all people have access to hunting opportunities. A CDHL program would not exclude anyone from hunting opportunity because we advocate CDHL programs only where recreational hunting is inappropriate or does not meet population reduction goals, and conceivably, anyone legally able to hold a deer hunting license would be eligible to apply for a CDHL.

Several practical issues must also be considered in association with regulated commercial harvest. Administration of a CDHL program will be taxing because many state agencies are already understaffed and this will be a new program. Fortunately, administrative frameworks already exist for commercial harvest of publicly owned natural resources (e.g., furbearers, fish, timber) and the processing and handling of meat (e.g., U.S. Department of Agriculture inspections), so agencies will not have to start from scratch when developing these programs. In addition, revenue generated by CDHL programs could be directed back toward agencies and personnel who will administer these programs.

Laws, rules, and regulations associated with CDHL programs must be strictly enforced to protect against overexploitation, graft, and illegal and unethical behavior. New avenues for harvest and use of wild game will spawn opportunities for some people to take advantage of and abuse the system. Creation of legitimate markets may expand black markets for illegal trade of illegally obtained animals. Fortunately, divisions of law enforcement are well established in all of the United States and, although not 100% effective, they provide an effective deterrent to the illegal trade of wildlife. Revenue generated by the sale of CDHLs could be directed toward law enforcement to help bolster efforts.

Markets will have to expand to accommodate this new source of protein. Steady and sufficient supplies of high-quality venison will be necessary to maintain interest by processors, packers, transporters, vendors, marketers, and users. Although sustainable harvest is not one of the goals of this concept, we believe the problem of overabundance of white-tailed deer is sufficiently widespread and long-term that supply will not be a problem. Supply of alternative commodities (e.g., venison) sometimes can drive demand, when prices are sufficiently influenced and competitive with mainstay commodities.

Looking Forward

The dogma against commercial use of wildlife is well established in North America. It may be difficult to mediate a change in attitudes regarding commercial harvest. For the CDHL concept to be successful, it will require adoption from stakeholders and at all administrative and decision-making levels. State laws and regulations that dictate harvest, taking, possession, transport, distribution, sale, and use of wildlife will need to be reviewed and some will have to be changed. Some will argue that we do not have the strength, stamina, or political will necessary to implement such broad, sweeping changes. On the other hand, many wildlife managers will appreciate having an alternative tool for managing overabundant populations of white-tailed deer.

Information, education, and a focus on public relations will be a critical aspect of adoption of regulated commercial harvest. An open dialogue within the wildlife community itself will be essential to avoid the knee-jerk reactions anticipated when regulated commercial harvest is equated with market-hunting (Messmer et al. 2001). Arguably, our most important audience, hunters, may view commercial harvest as a competing entity with recreational hunting because of the use of otherwise restricted tools, lack of fair chase, and potential to over harvest a valued resource. The hunting community must recognize the long-term benefits that regulated commercial harvest can provide in managing populations of white-tailed deer at or near goals. To see resources used under a regulated commercial harvest program increases the value of the animals that hunters cherish. The agricultural community, especially beef, pork, and poultry producers, may be concerned initially about perceived losses in market share to commercially harvested venison in already highly competitive meat markets. The volume of venison harvested under a CDHL program would be insignificant relative to the amount of domestic meat consumed annually on the market (e.g., 2008: 11.8×10^9 kg of beef, carcass wt; U.S. Department of Agriculture 2009). In addition, agricultural producers will benefit by the reduction in crop damage and threats of disease transmission associated with better managed populations of white-tailed deer. Food safety will be of utmost importance to consumers and the exposure of free-ranging animals to contaminants (e.g., heavy metals, pesticides, diseases) largely is unknown until products are tested. Concern about lead in venison surfaced recently and safeguards must be established to ensure that a minimal amount of lead enters the food chain (e.g., nontoxic ammunition, removal of tainted meat, inspection; Grund et al. 2010). Increased inspection of venison would provide an excellent opportunity to collect and examine data on environmental containments. Some people oppose the consumption of meat, killing of animals, and hunting. Regulated commercial harvest may increase their fervor because previous perceptions of hunters as being blood-thirsty killers may be increased if they consider that there may be economic motivation as well. Because their value systems differ from consumptive users, no amount of public relations likely will change their opinions (Sanborn and Schmidt 1995). The focus of much of the public relations effort will need to be on

the vast majority of the public who are nonhunters, not involved, and/or unaware. As stated above, considerable effort will be needed to inform and educate the many and various audiences associated with this issue.

A panel of experts in economics, marketing, communications, public relations, wildlife, and other fields should be created to explore how to develop, communicate, and implement a CDHL concept and to develop markets for commercially harvested deer. Ultimately, we want to implement this concept as an on-the-ground pilot project and develop the concept to the point that any state would be able to implement this idea to efficiently and effectively reduce overabundant game populations and all of the associated negative consequences.

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LITERATURE CITED

Alverson, W. S., D. M. Waller, and S. L. Solheim. 1988. Forests too deer: edge effects in northern Wisconsin. Conservation Biology 2:348–358.

Beringer, J., L. P. Hansen, J. A. Demand, J. Sartwell, M. Wallendorf, and R. Mange. 2002. Efficacy of translocation to control urban deer in Missouri: costs, efficiency, and outcome. Wildlife Society Bulletin 30:767–774.

Bertolini, R., G. Zgrablic, and E. Cuffolo. 2005. Wild game meat: products, market, legislation, and processing controls. Veterinary Research Communications 29:97–100.

Bhandari, P., R. C. Stedman, A. E. Luloff, J. C. Finley, and D. R. Diefenbach. 2008. Effort versus motivation: factors affecting antlered and antlerless deer harvest success in Pennsylvania. Human Dimensions of Wildlife 11:423–436.

Boyce, M. S., and L. L. McDonald. 1999. Relating populations to habitats using resource selection functions. Trends in Ecology and Evolution 14:268–272.

Brainerd, S. M., and B. Kaltenborn. 2010. The Scandinavian model: a different path to wildlife management. The Wildlife Professional 4:52–56.

Brown, T. L., D. J. Decker, S. J. Riley, J. W. Enck, T. B. Lauber, P. D. Curtis, and G. F. Mattfeld. 2000. The future of hunting as a mechanism to control white-tailed deer populations. Wildlife Society Bulletin 28:797–807.

Conover, M. R. 1984. Effectiveness of repellents in reducing deer damage in nurseries. Wildlife Society Bulletin 12:399–404.

Conover, M. R. 1995. What is the urban deer problem and where did it come from? Pages 11–18 *in* J. B. McAninch, editor. Urban deer: a manageable resource? 1993 Symposium of the North Central Section. The Wildlife Society, St. Louis, Missouri, USA.

Conover, M. R. 1997. Monetary and intangible valuation of deer in the United States. Wildlife Society Bulletin 25:298–305.

Côté, S. D., T. P. Rooney, J. P. Tremblay, C. Dussault, and D. M. Waller. 2004. Ecological impacts of deer overabundance. Annual Review of Ecology Evolution and Systematics 35:113–147.

Craven, S. R., and S. E. Hygnstrom. 1994. Deer. Pages 25–40 *in* S. Hygnstrom, R. Timm, and G. Larsen, editors. Prevention and control of wildlife damage. University of Nebraska Press, Lincoln, USA.

Curtis, P. D., G. J. San Julian, and G. F. Mattfeld. 2007. A model of collaborative programming to address wildlife issues: the northeast wildlife damage management research and outreach cooperative. Urban Ecosystems 8:237–243.

Deblinger, R. D., D. W. Rimmer, J. J. Vaske, and G. M. Vecellio. 1995. Efficiency of controlled, limited hunting at the Crane Reservation in Ipswitch, Massachusetts. Pages 75–79 *in* J. B. McAninch, editor. Urban deer: a manageable resource? 1993 Symposium of the North Central Section. The Wildlife Society, St. Louis, Missouri, USA.

DeCalesta, D. S. 1994. Effects of white-tailed deer on songbirds within managed forests in Pennsylvania. Journal of Wildlife Management 58: 711–718.

DeNicola, A. J., D. R. Etter, and T. Almendinger. 2008. Demographics of non-hunted white-tailed deer populations in suburban areas. Human–Wildlife Conflicts 2:102–109.

DeNicola, A. J., K. C. VerCauteren, P. D. Curtis, and S. E. Hygnstrom. 2000. Managing white-tailed deer in suburban environments—a technical guide. Cornell Cooperative Extension, Ithaca, New York, USA.

Diefenbach, D. R., W. L. Palmer, and W. K. Shope. 1997. Attitudes of Pennsylvania sportsmen towards managing white-tailed deer to protect the ecological integrity of forests. Wildlife Society Bulletin 25:244–251.

Doerr, M. L., J. B. McAninch, and E. P. Wiggers. 2001. Comparison of 4 methods to reduce white-tailed deer abundance in an urban community. Wildlife Society Bulletin 29:1105–1113.

Drake, D., J. B. Paulin, P. D. Curtis, D. J. Decker, and G. J. San Julian. 2005. Assessment of negative economic impacts from deer in the northeastern United States. Journal of Extension 43:1RIB5.

Etter, D. R., K. M. Hollis, T. R. Van Deelen, D. R. Ludwig, J. E. Chelsvig, C. L. Anchor, and R. E. Warner. 2002. Survival and movements of white-tailed deer in suburban Chicago, Illinois. Journal of Wildlife Management 66:500–510.

Etter, D. R., T. R. Van Deelen, D. R. Ludwig, K. M. Hollis, J. E. Chelsvig, and R. E. Warner. 2000. Overabundant deer: better management through research. Pages 198–205 *in* M. C. Brittingham, J. Kays, and R. J. McPeake, editors. The Ninth Wildlife Damage Management Conference Proceedings. State College, Pennsylvania, USA.

Farmers and Hunters Feeding the Hungry. 2007. About FHFH. <http://www.fhfh.org/About.asp>. Accessed 23 Jun 2010.

Fischer, C., T. Sterner, and E. Muchapondwa. 2005. Bioeconomic model of community incentives for wildlife management before and after CAMPFIRE. Discussion Paper 05–06, Resources for the Future, Washington, D.C., USA.

Giles, B. G., and C. S. Findlay. 2004. Effectiveness of a selective harvest system in regulating deer populations in Ontario. Journal of Wildlife Management 68:266–277.

Grund, M. D., L. Cornicelli, L. T. Carlson, and E. A. Butler. 2010. Bullet fragmentation and lead deposition in white-tailed deer and domestic sheep. Human–Wildlife Interactions 4:257–265.

Gubanyi, J. A., J. A. Savidge, S. E. Hygnstrom, K. C. VerCauteren, G. W. Garabrandt, and S. P. Korte. 2008. Deer impact on vegetation in natural areas in southeastern Nebraska. Natural Areas Journal 28:121–129.

Harden, C. D., A. Woolf, and J. Rosenberry. 2005. Influence of exurban development on hunting opportunity, hunter distribution, and harvest efficiency of white-tailed deer. Wildlife Society Bulletin 33:233–242.

Healy, W. M. 1997. Influence of deer on the structure and composition of oak forests in central Massachusetts. Pages 249–266 *in* W. J. McShea, H. B. Underwood, and J. H. Rappole, editors. The science of overabundance: deer ecology and population management. Smithsonian Institution Press, Washington, D.C., USA.

Heberlein, T. A. 2004. "Fire in the Sistine Chapel": how Wisconsin responded to chronic wasting disease. Human Dimensions of Wildlife 9:165–179.

Hildreth, A. M., S. E. Hygnstrom, K. M. Hams, and K. C. VerCauteren. 2011. The Nebraska deer exchange: impact of a novel program for donating deer. Wildlife Society Bulletin 35:195–200.

Hoffman, L. C., and E. Wiklund. 2006. Game and venison—meat for the modern consumer. Meat Science 74:197–208.

Holsman, R. H. 2000. Goodwill hunting? Exploring the role of hunters as ecosystem stewards. Wildlife Society Bulletin 28:808–816.

Holsman, R. H., and J. Petchenik. 2006. Predicting deer hunter harvest behavior in Wisconsin's chronic wasting disease eradication zone. Human Dimensions of Wildlife 11:177–189.

Horsley, S. B., S. L. Stout, and D. S. deCalesta. 2003. White-tailed deer impact on the vegetation dynamics of a northern hardwood forest. Ecological Applications 13:98–118.

Hubbard, R. D., and C. K. Nielsen. 2011. Cost–benefit analysis of managed shotgun hunts for suburban white-tailed deer. Human–Wildlife Interactions 5:13–21.

Hygnstrom, S. E., P. D. Skelton, S. J. Josiah, J. M. Gilsdorf, D. R. Virchow, J. A. Brandle, A. K. Jayaprakash, K. M. Eskridge, and K. C. VerCauteren.

2009. White-tailed deer browsing and rubbing preferences for trees and shrubs that produce nontimber products. HortTechnology 19:204–211.
Iowa Department of Natural Resources. 2009. Iowa donated deer. <http://www.iowadnr.gov/other/hush/files/hush_history.pdf>. Accessed 23 Jun 2010.
Jacoby, K. 2001. Crimes against nature: squatters, poachers, thieves, and the hidden history of American conservation. University of California Press, Berkeley, USA.
Johannesen, A. B., and A. Skonhoft. 2005. Tourism, poaching and wildlife conservation: what can integrated conservation and development projects accomplish? Resource and Energy Economics 27:208–226.
Jones, J. M., and J. H. Witham. 1990. Post-translocation survival and movements of metropolitan white-tailed deer. Wildlife Society Bulletin 18:434–441.
Jones, J. M., and J. H. Witham. 1995. Urban deer "problem" solving in northeast Illinois: an overview. Pages 58–65 *in* J. McAninch, editor. Urban deer: a manageable resource? 1993 Symposium of the North Central Section. The Wildlife Society, St. Louis, Missouri, USA.
Kilpatrick, H. J., A. M. LaBonte, and J. T. Seymour. 2002. A shotgun–archery deer hunt in a residential community: evaluation of hunt strategies and effectiveness. Wildlife Society Bulletin 30:478–486.
Kilpatrick, H. J., and W. D. Walter. 1997. Urban deer management: a community vote. Wildlife Society Bulletin 25:388–391.
Kilpatrick, H. J., and W. D. Walter. 1999. A controlled archery deer hunt in a residential community: cost, effectiveness, and deer recovery rates. Wildlife Society Bulletin 27:115–123.
Long, E. S., D. R. Diefenbach, C. S. Rosenberry, B. D. Wallingford, and M. D. Grund. 2005. Forest cover influences dispersal distance of white-tailed deer. Journal of Mammalogy 86:623–629.
Malcolm, K. D., T. R. Van Deelen, D. Drake, D. J. Kesler, and K. C. VerCauteren. 2010. Contraceptive efficacy of a novel intrauterine device (IUD) in white-tailed deer. Animal Reproduction Science 117: 261–265.
Mayer, K. E., J. E. DiDonato, and D. R. McCullough. 1995. California urban deer management: two case studies. Pages 51–57 *in* J. B. McAninch, editor. Urban deer: a manageable resource? 1993 Symposium of the North Central Section. The Wildlife Society, St. Louis, Missouri, USA.
McCabe, R. E., and T. R. McCabe. 1984. Of slings and arrows: an historical retrospective. Pages 19–72 *in* L. K. Halls, editor. White-tailed deer: ecology and management. Stackpole, Harrisburg, Pennsylvania, USA.
McShea, W. J., H. B. Underwood, and J. H. Rappole. 1997. The science of overabundance: deer ecology and population management. Smithsonian Institution Press, Washington, D.C., USA.
Messmer, T. A., D. Reiter, and B. C. West. 2001. Enhancing wildlife sciences' linkage to public policy: lessons from the predator–control pendulum. Wildlife Society Bulletin 29:1253–1259.
Michigan State University. 2010. United States statutes and laws: Lacey act. <http://www.animallaw.info/statutes/stusfd16usca3371.htm>. Accessed 16 Dec 2010.
Muth, R. M., and W. V. Jamison. 2000. On the destiny of deer camps and duck blinds: the rise of the animal rights movement and the future of wildlife conservation. Wildlife Society Bulletin 28:841–851.
Nelson, A. C. 1992. Characterizing exurbia. Journal of Planning Literature 6:350–368.
Nelson, A. C., and T. W. Sanchez. 2005. The effectiveness of urban containment regimes in reducing exurban sprawl. DISP 160:42–47.
Odell, E. A., and R. L. Knight. 2001. Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology 15:1143–1150.
Organ, J. F., S. P. Mahoney, and V. Geist. 2010. Born in the hands of hunters: the North American Model of Wildlife Conservation. The Wildlife Professional 4:22–27.
Patterson, B., and V. Power. 2002. Contributions of forage competition, harvest, and climate fluctuation to changes in population growth of northern white-tailed deer. Oecologia 130:62–71.
Peck, L. J., and J. E. Stahl. 1997. Deer management techniques employed by the Columbus and Franklin County Park District, Ohio. Wildlife Society Bulletin 25:440–442.
Potvin, F., and L. Breton. 2005. From the field: testing 2 aerial survey techniques on deer in fenced enclosures—visual double-counts and thermal infrared sensing. Wildlife Society Bulletin 33:317–325.
Prouty, D. C. 2007. Help us stop hunger program. <http://www.legis.state.ia.us/lsadocs/IssReview/2008/IRDFK001.pdf>. Accessed 23 Jun 2010.
Responsive Management/National Shooting Sports Foundation. 2008. The future of hunting and the shooting sports: research-based recruitment and retention strategies. Produced for the U.S. Fish and Wildlife Service under Grant Agreement CT-M-6-0, Harrisonburg, Virginia, USA.
Riley, S. J., D. J. Decker, L. H. Carpenter, J. F. Organ, W. F. Siemer, G. F. Mattfeld, and G. Parsons. 2002. The essence of wildlife management. Wildlife Society Bulletin 30:585–593.
Riley, S. J., D. J. Decker, J. W. Enck, P. D. Curtis, T. B. Lauber, and T. L. Brown. 2003. Deer populations up, hunter populations down: implications of interdependence of deer and hunter population dynamics on management. Ecoscience 10:455–461.
Rosenberry, C. S., R. A. Lancia, and M. C. Conner. 1999. Population effects of white-tailed deer dispersal. Wildlife Society Bulletin 27:858–864.
Sanborn, W. A., and R. H. Schmidt. 1995. Gender effects on views of wildlife professionals about wildlife management. Wildlife Society Bulletin 23:583–587.
Slow Food USA. 2010. Supporting good, clean, and fair food. <http://www.slowfoodusa.org/index.php>. Accessed 1 Dec 2010.
Stedman, R., D. R. Diefenbach, C. B. Swope, J. C. Finley, A. E. Luloff, H. C. Zinn, G. J. San Julian, and G. A. Wang. 2004. Integrating wildlife and human-dimensions research methods to study hunters. Journal of Wildlife Management 68:762–773.
Storm, D. J., C. K. Nielsen, E. M. Schauber, and A. Woolf. 2007*a*. Space use and survival of white-tailed deer in an exurban landscape. Journal of Wildlife Management 71:1170–1176.
Storm, D. J., C. K. Nielsen, E. M. Schauber, and A. Woolf. 2007*b*. Deer–human conflict and hunter access in an exurban landscape. Human–Wildlife Conflicts 1:53–59.
Swihart, R. K., P. M. Picone, A. J. DeNicola, and L. Cornicelli. 1995. Ecology of urban and suburban white-tailed deer. Pages 35–44 *in* J. B. McAninch, editor. Urban deer: a manageable resource? 1993 Symposium of the North Central Section. The Wildlife Society, St. Louis, Missouri, USA.
Thogmartin, W. 2006. Why not consider the commercialization of deer harvests? BioScience 56:957.
U.S. Department of Agriculture. 2009. U.S. beef and cattle industry. <http://www.ers.usda.gov/news/BSECoverage.htm>. Accessed 30 Dec 2010.
U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Census Bureau. 2006. National survey of fishing, hunting, and wildlife-associated recreation. <http://www.census.gov/prod/2008pubs/fhw06-nat.pdf>. Accessed 30 Dec 2010.
Van Deelen, T. R., B. J. Dhuey, C. N. Jacques, K. R. McCaffery, R. E. Rolley, and K. Warnke. 2010. Effects of earn-a-buck and special antlerless-only seasons on Wisconsin's deer harvests. Journal of Wildlife Management 74:1693–1700.
Van Deelen, T. R., B. Dhuey, K. R. McCaffery, and R. E. Rolley. 2006. Relative effects of baiting and supplemental antlerless seasons on Wisconsin's 2003 deer harvest. Wildlife Society Bulletin 34:322–328.
Van Deelen, T. R., and D. R. Etter. 2003. Effort and functional response of deer hunters. Human Dimensions of Wildlife 8:97–108.
Vantassel, S. M. 2008. Ethics of wildlife control in humanized landscapes: a response. Pages 294–300 *in* R. M. Timm and M. B. Madon, editors. Proceedings of the 23rd Vertebrate Pest Conference. University of California, Davis, USA.
Vantassel, S. M. 2009. Dominion over wildlife? An environmental-theology of human–wildlife relations. Wipf and Stock, Eugene, Oregon, USA.
VerCauteren, K. C., and S. E. Hygnstrom. 1998. Effects of agricultural activities and hunting on home ranges of female white-tailed deer. Journal of Wildlife Management 62:280–285.
VerCauteren, K. C., and S. E. Hygnstrom. 2011. White-tailed deer in the Midwest. Pages 501–535 *in* D. G. Hewitt, editor. Biology and management of white-tailed deer. Taylor and Francis Group, Boca Raton, Florida, USA.
Ward, K. J., R. C. Stedman, A. E. Luloff, J. S. Shortle, and J. C. Finley. 2008. Categorizing deer hunters by typologies useful to game managers: a latent-class model. Society and Natural Resources 21:215–229.
Williamson, S. J. 2000. Feeding wildlife. . .just say no! Wildlife Management Institute, Washington, D.C., USA.

Wilson, M. L., G. H. Adler, and A. Spielman. 1985. Correlation between abundance of deer and that of the deer tick, *Ixodes dammini* (Acari: Ixodidae). Annals of the Entomological Society of America 78:172–176.

Xie, J., H. R. Hill, S. R. Winterstein, H. Campa, R. V. Doepker, T. R. Van Deelen, and J. Liu. 1999. White-tailed deer management options model (DeerMOM): design, quantification, and application. Ecological Modelling 124:121–130.

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