Characterizing nontarget species use at bait sites for white-tailed deer

Brent Bowman, Carnivore Ecology Laboratory, Forest and Wildlife Research Center, P. O. Box 9690, Mississippi State University, Mississippi State, MS 39762, USA   *bbowman@msstate.edu*

Jerrold L. Belant, Carnivore Ecology Laboratory, Forest and Wildlife Research Center, P. O. Box   9690, Mississippi State University, Mississippi State, MS 39762, USA

Dean E. Beyer Jr., Michigan Department of Natural Resources, Wildlife Division, 1990 US Highway 41 S., Marquette, MI 49855, USA

Deborah Martel, Carnivore Ecology Laboratory, Forest and Wildlife Research Center, P. O. Box 9690, Mississippi State University, Mississippi State, MS 39762, USA

Abstract: Baiting white-tailed deer (*Odocoileus virginianus*) has evolved into a controversial issue of wildlife management. During August–September 2012, we established a grid of 64 cameras in the Upper Peninsula of Michigan at sites baited with corn that simulated legal bait sites for white-tailed deer to characterize presence, diversity, and frequency of species use. We detected >20 species of wildlife that visited bait sites. We categorized 3,177 of 11,194 images as independent detections (i.e., species detected >1 hour apart). White-tailed deer had the greatest detection rate (47%), but overall detections of nontarget species was slightly greater (53%). Most frequent nontarget species detected were northern raccoons (*Procyon lotor*) and American black bears (*Ursus americanus*). Wildlife officials should consider the potential effects of baiting on species' ecology and the potential for disease transmission that high-use of bait sites by nontarget species present.

Key words: bait sites, camera trap, human–wildlife conflict, nontarget species, white-tailed deer

Animals have the potential for increased interactions and competition at seasonally abundant food sources or during pulsed-resource events (Polis and Strong 1995). For example, scavenging mesopredators and small vertebrates showed increased use of, and multi-species interactions at, carrion sites (DeVault and Rhodes 2002). Brown bears (*Ursus arctos*) formed aggregations to forage on concentrations of migrating salmon (*Oncorhynchus* spp.) in Alaskan streams (Egbert and Stokes 1974). White-tailed deer (*Odocoileus virginianus*) interactions increased in areas containing hard mast (e.g., acorns) during autumn (McShea and Schwede 1993).

Concentrations of anthropogenic foods, including garbage, agricultural crops, introduced fruit-bearing trees, and bait sites, similarly, can attract wildlife (McKinley et al. 2014, Dieter et al. 2014). American black bears (*Ursus americanus*) in an urban area had a greater probability of being seen when apple trees were bearing fruit (Merkle et al. 2013). They also congregated near residential areas and campgrounds to forage on anthropogenic foods (Rogers et al. 1976, Beckmann and Berger 2003*a*). Ring-necked pheasants (*Phasianus*

colchicus) aggregated to corn and sorghum to enhance their survival during winter (Bogenshutz et al. 1995). Also, white-tailed deer congregated to forage on agricultural crops, such as alfalfa (Palmer et al. 1982).

Baiting is a proven technique to attract animals to a specific location for hunting and wildlife research (Dunkley and Cattet 2003). Distribution of food sources can alter species ecology (Beckmann and Berger 2003*b*); for example, changing food availability can alter animals' use of space (Pickford and Reid 1943). Not only can localized abundance of species using the resource increase, but their predators also may increase (Lima 2002). For example, coyotes (*Canis latrans*) aggregated at resource patches where black-tailed jackrabbits (*Lepus californicus*) and desert cottontails (*Sylvilagus audubonii*) were most common (Razo et al. 2012). Distribution of supplemental food resources also can change the extent of spatial overlap among individuals where clumped resources facilitate formation of local aggregations (Wehjte and Gompper 2011). Northern raccoons (*Procyon lotor*) had greater contact rates and a greater chance of disease transmission at clumped resources, such as piles of cracked

corn, than at resources scattered throughout an area (Wright and Gompper 2005). Parasite transmission, such as *Baylisascaris procyonis* from northern raccoons, also has potential to increase at high contact rates (Page et al. 1998). Numerous diseases can be transferred at bait sites and transmitted among individuals using them (Sorenson et al. 2014). Bovine tuberculosis has spread to white-tailed deer from domestic cattle due to clumped resources, such as baiting (Schmitt et al. 2006).

Baiting is commonly used by hunters to attract and harvest game and has become an important issue in wildlife management and conservation (Inslerman et al. 2006). It is allowed in most states within the U.S.A. (Wildlife Society 2007). Considerable controversy among wildlife officials, scientists, government officials, and the public exists regarding regulations on baiting of wildlife (Wildlife Society 2007). Most research regarding wildlife use of bait has emphasized target species (Rudolph et al. 2006); however, only limited research has been conducted quantifying use of bait sites by nontarget species (Lambert and Demarias 2001, Campbell et al. 2013). We conducted a short-term study to estimate establishment patterns of use at a bait site by white-tailed deer and other wildlife species. Our objective was to characterize the presence, species richness, and frequency of nontarget species at bait sites for white-tailed deer. We predicted a greater number of detections of nontarget species than white-tailed deer. We also predicted that mammal detections would vary by time of day, based on species life history, and that bird detections would be greater during the day.
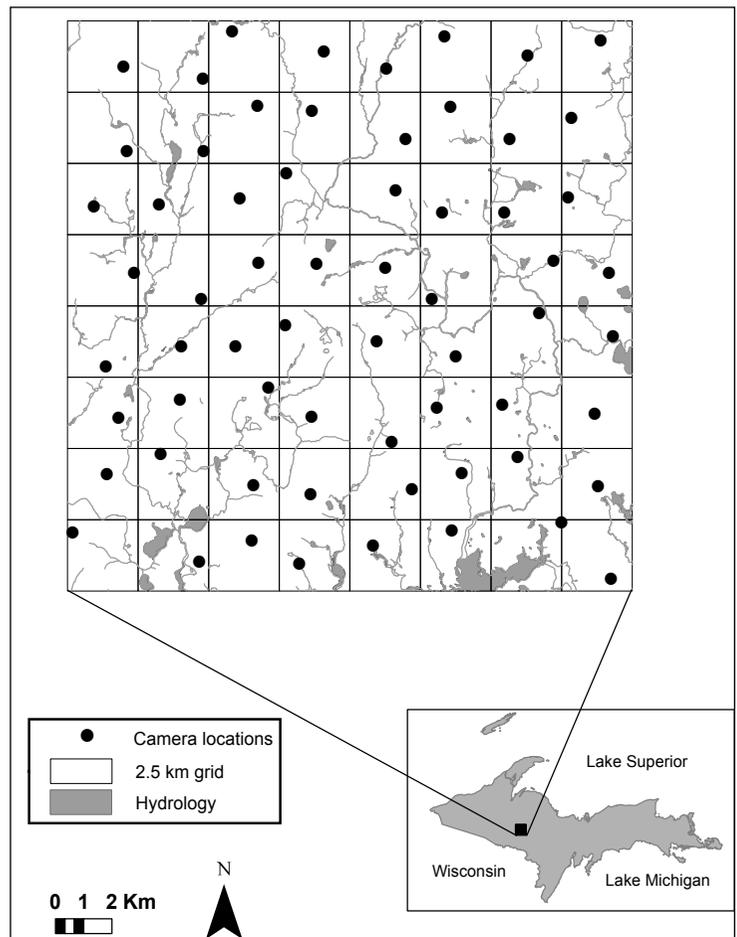

Figure 1. Locations of 64 remote infrared cameras to estimate wildlife use of bait sites for white-tailed deer, Upper Peninsula of Michigan, USA, August–September 2012.

Study area

We conducted this study north of the Michigamme Reservoir in Iron County, Upper Peninsula of Michigan. The general study area boundaries follow State Highway M-95 on the east, US Highway 41/28 on the north, US Highway 141 on the west, and State Highway M-69 on the south (46°13′N, 88°14′W). Soils are predominantly podzolized sandy loams and loamy sands (U.S. Department of Agriculture 1997). Land covers include deciduous forests (38%), woody wetlands (29%), mixed forests (13%), conifer forests (6%), open water (4%), grassland and herbaceous (3%), developed (3%), and other (3%). Dominant tree species include sugar maple (*Acer saccharum*) and trembling aspen (*Populus tremuloides*) in upland deciduous forests, black spruce (*Picea mariana*)

Table 1. Camera trap detections of white-tailed deer and nontarget species at sites baited with corn, Iron County, Michigan, USA, August–September 2012. Total detections (column 2) are images taken throughout the study before the 1-hour time frame. Total independent detections (column 3) are detections >1 hour apart.

Species	Total detections	Total independent detections
White-tailed deer (*Odocoileus virginianus*)	5,597	1,497 (47.12%)
Northern raccoon (*Proycon lotor*)	2,024	758 (23.86%)
American black bear (*Ursus americanus*)	1,385	361 (11.36%)
Eastern chipmunk (*Tamias striatus*)	177	99 (3.12%)
Squirrel (*Sciurus* spp.)	124	88 (2.78%)
Snowshoe hare (*Lepus americanus*)	91	47 (1.48%)
Badger (*Taxidea taxus*)	5	5 (0.16%)
Coyote (*Canis latrans*)	6	5 (0.16%)
Skunk (*Mephitis mephitis*)	4	4 (0.13%)
Short-tailed weasel (*Mustela erminea*)	3	3 (0.09%)
Wolf (*Canis lupus*)	3	1 (0.03%)
Bobcat (*Lynx rufus*)	1	1 (0.03%)
Porcupine (*Hystricomorph hystricidea*)	1	1 (0.03%)
Small mammals	171	97 (3.05%)
Blue jay (*Cyanocitta cristata*)	160	92 (2.90%)
American crow (*Corvus brachyrhynochos*)	188	77 (2.42%)
Ruffed grouse (*Bonasa umbellus*)	16	15 (0.47%)
Wild turkey (*Meleagris gallopavo*)	19	6 (0.19%)
Black-capped chickadee (*Poecile atricapillus*)	6	5 (0.16%)
Sandhill crane (*Grus canadensis*)	12	5 (0.16%)
Unknown birds	13	10 (0.31%)
Total	10,006	3,177

in lowland coniferous forests, and red pine (*Pinus resinosa*) forest in plantations. Average annual snowfall in the study area is about 180 cm, and average annual rainfall is about 69 cm. August temperatures ranges from 11° C to 23° C, with a mean of 17° C; average annual temperature is about 4° C (National Oceanic and Atmospheric Administration 2013).

Methods

The study was conducted from August 20 to September 4, 2012. We first created a non-overlapping 8 m × 8 m grid across the study area, with each grid cell 2.5 km^2 (Figure 1). In each cell, we placed a camera (Bushnell Infrared Trophy Cameras; Bushnell Outdoor Products, Overland Park, Kan.) along an animal trail with recent deer activity (e.g., fecal pellets or tracks) to increase detections. We attached each camera to a tree 70 to 80 cm above ground and programmed them to detect presence every 5 minutes. We programmed cameras to take 1 image with a 5-minute delay and record date and time for each image. We placed 7.5 L of whole-kernel corn (the maximum amount of bait allowed by the Michigan Department of Natural Resources) at each site 6 to 7 meters from the cameras on the first day of the survey; we re-baited sites every 3 days. We removed vegetation between the camera and bait to minimize false detections.

For each image, we recorded the number of detections by species or the lowest species group possible (e.g., small mammals). Images

without species were excluded from the data set. Images of the same species taken >60 minutes apart were considered independent detections (Bernard et al. 2013, Bridges et al. 2014, Gantchoff and Belant 2015). For each camera, we summed the total number of images and independent images by species (i.e., white-tailed deer, raccoons, and black bears; Figure 3) and species groups (i.e., other mammals and birds). We calculated the mean daily number of white-tailed deer and total number of species detected and used regression techniques to access trends, accepting statistical significance at $P < 0.05$. We then calculated the mean number of detections by species or species group by time of day. We categorized images as day if occurring between sunrise to sunset (0650 to 2019 hours) and night as sunset to sunrise (2020 to 0649 hours; SunriseSunset 2013). All means are reported with ±1 standard deviation.

Figure 2. Mean daily number of detections of wildlife at bait sites for white-tailed deer, Upper Peninsula of Michigan, USA, August–September 2012.

Results

We obtained 11,194 images, including 10,006 images of animals comprising 3,177 independent detections of at least 19 species (Table 1). White-tailed deer comprised almost half of independent detections (47%), followed by raccoons (24%) and black bears (11%); however, overall nontarget detections were slightly greater (53%). Mean daily detections for white-tailed deer were greater than for other species (1.67 + 1.0), followed by raccoons (0.76 + 1.0) and black bears (0.40 + 0.7; Figure 2). Mean daily number of species detected increased through day 9 (1.97 + 1.2), then declined thereafter ($P < 0.001$; Figure 4). Similarly, mean daily number of white-tailed deer detections increased through day 8 (2.81 + 2.27), then declined therea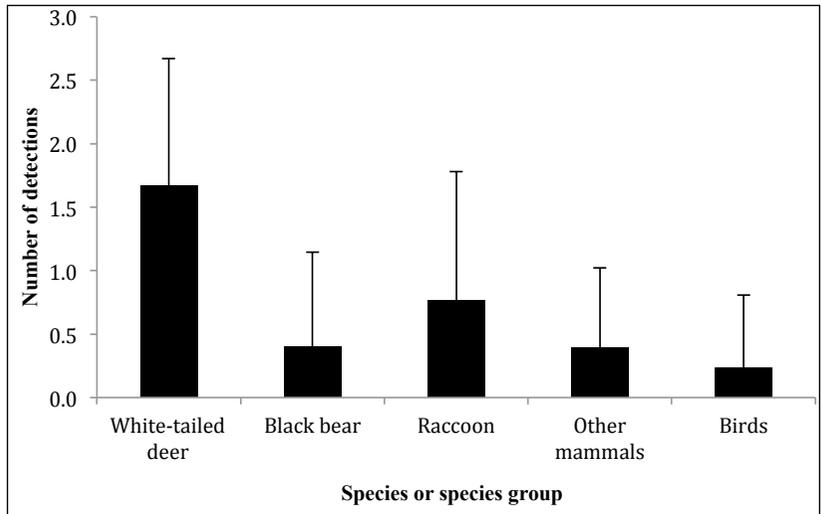fter ($P < 0.001$). White-tailed deer (54%), black bear (55%), and bird (82%) detections where greater during the day, whereas raccoons (77%) and

Figure 3. Black bear detected at a camera trap site for white-tailed deer.

other mammals (62%) detections were greater at night (Figure 5).

Discussion

Our results show that overall use of bait sites by nontarget species (>20 species) was similar to use by white-tailed deer. Of the ≥21 species observed, mammal detections (93 %, 14 species) were substantially greater than bird detections (7%, 7 species), although some bird-use may have gone undetected due to their small body size. Most nontarget mammal species detected at sites were opportunistic omnivores (e.g., bears, raccoons, coyotes [Barden et al. 1995]), or herbivores (e.g., snowshoe hares [*Lepus americanus*], squirrels [*Sciurus* spp.] [O'Donoghue et al. 1997]), undoubtedly a consequence of corn used as bait. We observed an asymptotic increased in the number of species detected and number of white-tailed deer detected per day. The total number of species detected and number of white-tailed deer detections increase through day nine and

Figure 4. Mean daily number of species detected (a) and white-tailed deer detections at bait sites for white-tailed deer baited on day 0, 3, 6, 9, and 12, Upper Peninsula of Michigan, USA, August–September 2012.

day 8, respectively, before declining. Although our study was only 16 days long, Seamans and VerCauteren (2006) also found a decline in white-tailed deer detections at bait sites during week two. As species adapt to using bait, it is likely that the amount of bait consumed by animals arriving at sites immediately following baiting increases, leaving little or no bait remaining for subsequent individuals, which in turn would reduce overall visitation at bait sites (optimal foraging theory [Lozano

1991]). We qualitatively observed increased consumption rates of corn by white-tailed deer immediately following placement through about day nine of the study. Deer-use of sites after bait consumption was low, which explains the observed decreased use of sites after this time.

Species detections by time of day varied and generally supported our predictions and previously described activity patterns, with more detection of white-tailed deer and black bears during the day (Lariviere
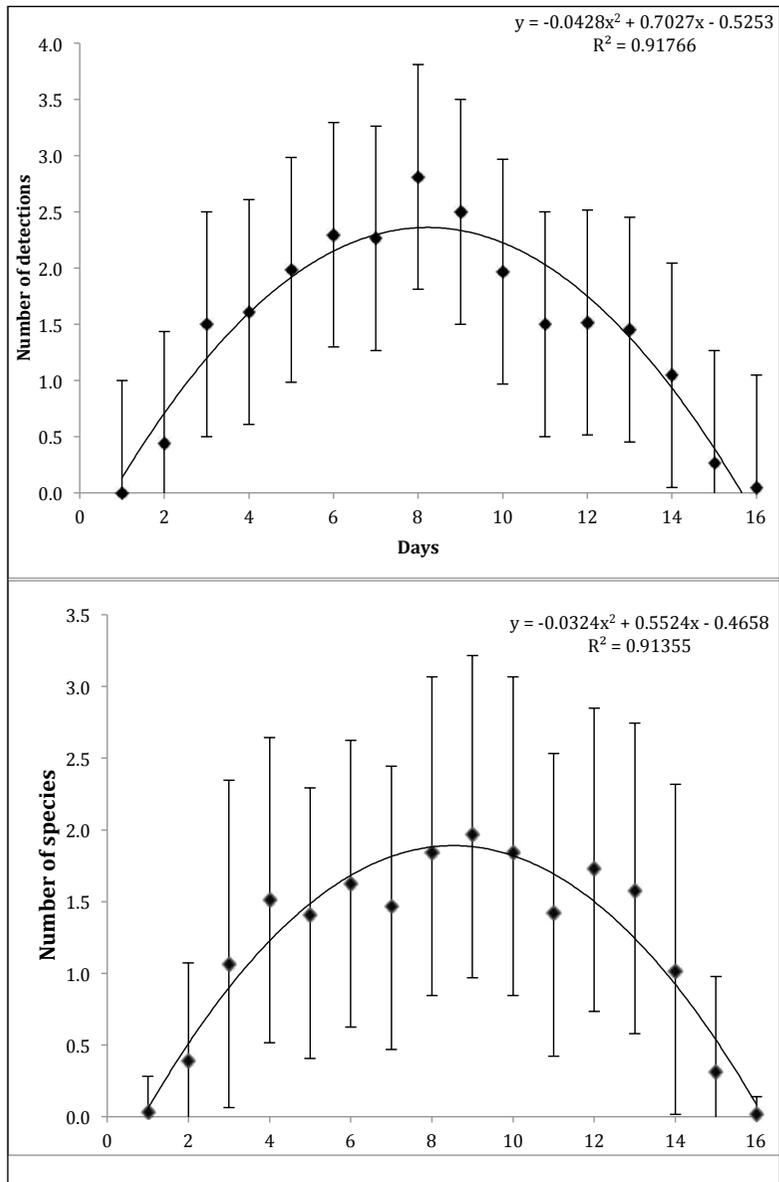
et al. 1994, Kilgo et al. 2008). Our results for predominantly diurnal detections of black bears supports previous studies (e.g., Bridges et al. 2004), and concurs with increased foraging during late summer, though black bears may become more nocturnal during the legal hunting season (Stillfried 2012). Greenwood (1982) documented that nocturnal movements by raccoons were most often associated with locally abundant food, which supports our findings of greater nocturnal use; also, more bird detections during the day are correlated with general foraging behavior (Stouffer and Caccamise 1991, Engels and Sexton 1994).

Figure 5. Percentage of detections during day (white) and night (black) for wildlife at bait sites for white-tailed deer, Upper Peninsula of Michigan, USA, August–September 2012.

Baiting can alter the spatial ecology of deer and nontarget species. Wehjte and Gommper (2011) found that raccoons formed aggregations at clumped food resources, with overlapping space use twice that of raccoons without access to these resources. Increased predator–prey interactions at bait sites are also possible (Wehtje and Gommper 2011). Cooper and Ginnett (2000) found that as species aggregate, nest predators may have a greater chance of finding and destroying nests near feeders. Dunn and Tessaglia (1994) found high rates of bird depredation by sharp-shinned hawks (*Accipiter striatus*) and coopers hawks (*Accipiter cooperii*) at anthropogenic food sources. Competition for clumped resources can also increase aggressive behavior among individuals (Desrochers and Hannon 1989, Orams 2002). Albert and Bowyer (1991) found increased aggression of bears at clumped anthropogenic resources. Zenaida doves (*Zenaida aurita*) also showed high rates of aggression at spatially clumped resources (Goldberg et al. 2001). However, baiting also can produce positive effects. Brittingham and Temple (1988) found that black-capped chickadees (*Parus atricapillus*) gained body mass and increased survival in areas with supplemental feed (Lambert and Demarais 2001). Benson and Chamberlain (2006) found that corn can represent a high proportion of summer and autumn diets of black bears; concentrated anthropogenic foods at bait sites
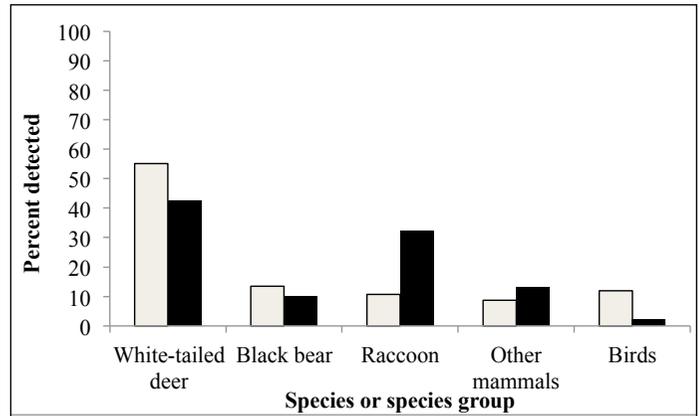
can improve physiological condition in black bears (e.g., Partridge et al. 2001).

Along with altered species ecology, potential for disease transmission can also increase among target and nontarget species at bait sites (Brown and Cooper 2006, Sorenson et al. 2014). Campbell et al. (2013) estimated >5.2 billion contacts among nontarget wildlife species occur annually in Texas, where baiting is a common and legal hunting practice. These authors recommended against maintaining bait sites due to risk of disease transmission. Contact between domestic cattle and white-tailed deer at food resources has resulted in transmission of bovine tuberculosis (Schmitt et al. 2006, Ramsey et al. 2014). When aggregated raccoons interact at bait sites, parasites and rabies can be transferred among individuals (Wright and Gompper 2005). Daoust et al. (2000) documented salmonella at concentrations of black-capped chickadees related to activity at feeders. In addition to direct transmission of diseases, Lambert and Demarais (2001) found that baiting multiple species can cause fecal contamination of bait which poses a health risk.

Management implications

Baiting is used extensively to attract wildlife to areas for hunting and observation (Kilpatrick and Stober 2002). Although there are positive effects of baiting (Robb et al. 2008, Robb and McDonald 2008, Nestler 1949, Benson and Chamberlain 2006), negative effects, including altered species ecology and disease, can also occur after disease transmission. Research

assessing types of bait (Taylor et al. 2013) or techniques to distribute baits to reduce use by nontarget species and potential interactions among individuals and techniques is warranted. Wildlife officials and policy makers should consider the potential positive and negative implications on target and nontarget species ecology of baiting white-tailed deer.

Literature cited

Albert, D. M., and R. T. Bowyer. 1991. Factors related to grizzly bear–human interactions in Denali National Park. Wildlife Society Bulletin 19:339–349.

Barden, M. E., D. Slate, R. T. Calvert, and P. W. Debow. 1995. Strategies to address human–wildlife conflicts with raccoons and black bears in New Hampshire. Proceedings of the Eastern Wildlife Damage Control Conference 6:22–29.

Beckmann, J. P., and J. Berger. 2003*a*. Rapid ecological and behavioral changes in carnivores: the responses of black bears (*Ursus americanus*) to altered food. Journal of Zoology 261:207–212.

Beckmann, J. P., and J. Berger. 2003*b*. Using black bears to test ideal-free distribution models experimentally. Journal of Mammalogy 84:594–606.

Benson, J. F., and M. J. Chamberlain. 2006. Food habits of Louisiana black bears (*Ursus americanus luteolus*) in two subpopulations of the Tensas River Basin. American Midland Naturalist 156:118–127.

Bernard, H., A. H. Ahmad, J. Brodie, A. J. Giordano, M. Lakim, R. Amat, S. K. Pei Hue, L. S. Khee, A. Tuuga, P. T. Malim, D. L. Hasegawa, Y. S. Wai, and W. Sinun. 2013. Camera-trapping survey of mammals in and around Imbak Canyon Conservation Area in Sabah, Malaysian Borneo. Raffles Bulletin of Zoology 61:861–870.

Bogenshutz, T. R., D. E. Hubbard, and A. P. Leif. 1995. Corn and sorghum as a winter food source for ring-necked pheasants. Journal of Wildlife Management 59:776−784.

Bridges, A. S., M. R. Vaughan, and S. Klenzendorf. 2004. Seasonal variation in American black bear (*Ursus americanus*) activity patterns: quantification via remote photography. Wildlife Biology 10:277−284.

Brittingham, M. C., and S. A. Temple. 1988. Impacts of supplemental feeding on survival rates of black-capped chickadees. Ecology 69:581−589.

Brown, R. D., and S. M. Cooper. 2006. The nutritional, ecological, and ethical arguments against baiting and feeding white-tailed deer. Wildlife Society Bulletin 34:519–524.

Campbell, T. A., D. B. Long, and S. A. Shriner. 2013. Wildlife contact rates at artificial feeding sites in Texas. Environmental Management 51:1187–1193.

Cooper, S. M., and T. F. Ginnett. 2000. Potential effects of supplemental feeding of deer on nest predation. Wildlife Society Bulletin 28:660–666.

Daoust, P. Y., D. G. Busby, L. Ferns, J. Goltz, S. McBurney, C. Poppe, and H. Whitney. 2000. Salmonellosis in songbirds in the Canadian Atlantic provinces during winter-summer 1997–1998. Canadian Veterinary Journal 41:54–59.

Desrochems, A., and S. J. Hannon. 1989. Site-related dominance and spacing among winter flocks of black-capped chickadees. Condor 91:317–323.

DeVault, T. L., and O. E. Rhodes Jr. 2002. Identification of vertebrate scavengers of small mammal carcasses in a forested landscape. Acta Theriologica 47:185–192.

Dieter, C. D., C. S. Warner, and C. Ren. 2014. Evaluation of foliar sprays to reduce crop damage by Canada geese. Human–Wildlife Interactions 8:139–149.

Dunkley, L., and M. R. L. Cattet. 2003. A comprehensive review of the ecological and human social effects of artificial feeding and baiting of wildlife. Canadian Cooperative Wildlife Health Centre: Newsletters and Publication 21. Saskatoon, Saskatchewan, Canada.

Dunn, E. H., and D. L. Tessaglia. 1994. Predation of birds at feeders in winter. Journal of Field

Ornithology 65:8–16.

Egbert, A. L., and A. W. Stokes.1974. The social behavior of brown bears on an Alaskan salmon stream. International Conference on Bear Research and Management 3:41–56.

Engels, T. M., and C. W. Sexton. 1994. Negative correlation of blue jays and golden-cheeked warblers near an urbanizing area. Conservation Biology 8:286–290.

Gantchoff, M. G., and J. L. Belant. 2015. Anthropogenic and environmental effects of invasive mammal distribution in northern Patagonia, Argentina. Mammalian Biology 80:54–58.

Goldberg, J. L., J. W. A. Grant, and L. Lefebvre. 2001. Effects of the temporal predictability and spatial clumping of food on the intensity of competitive aggression in the Zenaida dove. Behavioral Ecology 12:490–495.

Greenwood, R. J. 1982. Nocturnal activity and foraging of prairie raccoons (*Procyon lotor*) in North Dakota. American Midland Naturalist 107:238–243.

Inslerman, R. A., D. L. Baker, R. Cumberland, P. Doerr, J. E. Miller, J. E. Kennamer, E. R. Stinson, and S. J. Williamson. 2006. Baiting and supplemental feeding of game wildlife species. Wildlife Society Technical Review 06–1, Washington, D.C., USA.

Kilgo, J. C., R. L. Labisky, and D. E. Fritzen. 2008. Influences of hunting on the behavior of white-tailed deer: implications for conservation of the Florida panther. Conservation Biology 12:1359–1364

Kilpatrick, H. J., and W. A. Stober. 2002. Effects of temporary bait sites on movements of suburban white-tailed deer. Wildlife Society Bulletin 30:760–766.

Lambert, B. C., Jr., and S. Demarais. 2001. Use of supplemental feed for ungulates by nontarget species. Southwestern Naturalist 46:118–121.

Lariviére, S., J. Huot, and C. Samson. 1994. Daily activity patterns of female black bears in a northern mixed-forest environment. Journal of Mammalogy 75:613–620.

Lima, S. L. 2002. Putting predators back into behavioral predator–prey interactions. Trends in Ecology and Evolution 17:70–75.

Lozano, G. A. 1991. Optimal foraging theory: a possible role for parasites. Oikos 60:391–395.

McKinley, B. K., J. L. Belant, and D. R. Etter. 2014. American black bear–apiary conflicts in Michigan. Human–Wildlife Interactions 8:228–234.

McShea, W. J., and G. Schwede. 1993. Variable acorn crops: response of white-tailed deer and other mast consumers. Journal of Mammalogy 74:999–1006.

Merkle, J. A., H. S. Robinson, P. R. Krausman, and P. Alaback, P. 2013. Food availability and foraging near human developments for black bears. Journal of Mammalogy 94:378–385.

National Oceanic and Atmospheric Administration. 2013. National Weather Services, <http://www.crh.noaa.gov/mqt>. Accessed February 12, 2015.

Nestler, R. B. 1949. Supplements to yellow corn for winter maintenance and subsequent reproduction of quail. Journal of Wildlife Management 16:123–126.

O'Donoghue, M., S. Boutin, C. J. Krebs, and E. J. Hofer. 1997. Numerical responses of coyote and lynx to the snowshoe hare cycle. Oikos 80:150–162.

Orams, M. B. 2002. Feeding wildlife as a tourism attraction: a review of issues and impacts. Tourism Management 23:281–293.

Page, L. K., R. K. Swihart, and K. R. Kazacos. 1998. Raccoon latrine structure and its potential role in transmission of *Baylisascaris procyonis* to vertebrates. American Midland Naturalist 140:180–185.

Palmer, W. L., G. M. Kelly, and J. L. George. 1982. Alfalfa losses to white-tailed deer. Wildlife Society Bulletin 10:259–261.

Partridge, S. T., D. L. Nolte, G. J. Ziegltrum, and C. T. Robbins. 2001. Impacts of supplemental feeding on the nutritional ecology of black bears. Journal of Wildlife Management 65:191–199.

Pickford, G. D., and H. E. Reid. 1943. Competition of elk and domestic livestock for summer range forage. Journal of Wildlife Management 7:328–332.

Pollis, G. A., and D. R. Strong. 1995. Food web complexity and community dynamics. American Naturalist 147:813–846.

Ramsey, D. S. L., D. J. O'brien, M. K. Cosgrove, B. A. Rudolph, A. B. Locher, and S. M. Schmitt. 2014. Forecasting eradication of bovine tuberculosis in Michigan white-tailed deer. Journal of Wildlife Management 78:240–254.

Razo, I. A., L. Hernandez, J. W. Laundre, and L. V. Vazquez. 2012. The landscape of fear: habitat use by a predator (*Canis latrans*) and its main prey (*Lepus californicus* and *Sylvila-*

gus audobonii). Canadian Journal of Zoology 90:683–693.

Robb, G. N., and R. A. McDonald. 2008. Winter feeding of birds increases productivity in the subsequent breeding season. Biology 4:220–223.

Robb, G. N., R. A. McDonald, D. E. Chamberlain, and S. Bearhop. 2008. Food for thought: supplementary feeding as a driver of ecological change in avian populations. Frontiers in Ecology and the Environment 6:476–484.

Rogers, L. L., D. W. Kuehn, A. W. Erickson, E. M. Harger, L. J. Verme, and J. J. Ozoga. 1976. Characteristics and management of black bears that feed in garbage dumps, campgrounds or residential areas. International Conference on Bear Research and Management 3:169–175.

Rudolph, B. A., S. J. Riley, G. J. Hickling, B. J. Frawley, M. S. Garner, and S. R. Winterstein. 2006. Regulating hunter baiting for white-tailed deer in Michigan: biological and social considerations. Wildlife Society Bulletin 34:314–321.

Schmitt, S. M., D. J. O'Brien, C. S. Brunning-Fann, and S. D. Fitzgerald. 2006. Bovine tuberculosis in Michigan wildlife and livestock. Annals of the New York Academy of Sciences 969:262–268.

Seamans, T. W., and K. C. VerCauteren. 2006. Evaluation of electrobraid™ fencing as a white-tailed deer barrier. Wildlife Society Bulletin 34:8–15.

Sorenson, A., G. M. van Beest, and R. K. Brook. 2014. Impacts of wildlife baiting and supplemental feeding on infectious disease transmission risk: a synthesis of knowledge. Preventive Veterinary Medicine 113:356–363.

Stillfried, M. 2012. Adjustment of movement behavior of black bears (*Ursus americanus*) related to different risk levels imposed by hunting. Thesis, Free University, Berlin, Germany.

Stouffer, P. C., and D. F. Caccamise. 1991. Roosting and diurnal movements of radio-tagged American crows. Wilson Bulletin 103:387–400.

SunriseSunset. 2013. Homepage, <http://www.sunrisesunset.com/calendar.asp>. Accessed February 12, 2015.

Taylor, B. D., E. K. Lyons, D. Rollins, C. B. Scott, J. E. Huston, and C. A. Taylor. 2013. Consumption of whole cottonseed by white-tailed deer and nontarget species. Human–Wildlife Interactions 7:99–106.

U. S. Department of Agriculture. 2013. Natural Resources Conservation Service, <http://www.nrcs.usda.gov>. Accessed February 12, 2015.

Wehtje, M., and M. E. Gompper. 2011. Effects of an experimentally clumped food resource on raccoon (*Procyon lotor*) home-range use. Wildlife Biology 17:25–32.

Wildlife Society. 2007. Baiting and supplemental feeding of game wildlife species. Wildlife Society, Bethesda, Maryland, USA.

Wright, A. N., and M. E. Gompper. 2005. Altered parasite assemblages in raccoons in response to manipulated resource availability. Oecologia 144:148–156.

BRENT BOWMAN (author photos unavailable) is a research technician in the Department of Wildlife, Fisheries, and Aquaculture with the Carnivore Ecology Laboratory at Mississippi State University. He received his B.S. degree from Mississippi State University. His research interests include carnivore ecology, human–wildlife conflicts, and habitat management.

JERROLD L. BELANT is an associate professor in the Department of Wildlife, Fisheries, and Aquaculture and director of the Carnivore Ecology Laboratory at Mississippi State University. He received his B.S. and M.S. degrees from the University of Wisconsin–Stevens Point and his Ph.D. degree from the University of Alaska–Fairbanks. His research interests include carnivore ecology, resource selection, human–wildlife conflicts, and international conservation.

DEAN E. BEYER JR. is a wildlife research biologist for the Michigan Department of Natural Resources and adjunct professor in the Department of Fisheries and Wildlife, Michigan State University. He received his B.S. degree in wildlife biology from the University of Vermont and his M.S. and Ph.D. degrees in wildlife ecology from Michigan State University. His research interests include population dynamics of large mammals, abundance estimation, and predator–prey interactions.

DEBORAH MARTELL worked as a research associate for the Michigan Predator-Prey Project from May 2012 through May 2014. She earned her B.S.degree in natural resource conservation at the University of British Columbia and worked as a wildlife technician on various projects throughout North America. Her research interests include animal behavior and international conservation.