Coyote (*Canis latrans*), 100+ Years in the East: A Literature Review

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What Do We Know? A Literature Review of the Eastern Coyote

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ABSTRACT Coyotes (*Canis latrans*) have expanded into the eastern United States over the last 100 years. Increases in their distribution and abundance have been documented and concerns about their presence in urban areas and their impact on both native wildlife and domestic livestock are growing. These impacts require further investigation and may require changes to management strategies. Two documents, a book and a technical bulletin, provide general overviews of eastern coyote biology. However, these documents are not comprehensive, and are either not readily available or were published >15 years ago. We provide a comprehensive review of the existing literature to illuminate gaps in our knowledge that can be used to direct future research.

KEY WORDS *Canis latrans,* conflict, eastern coyote, range, research needs, review, summary.

Around the turn of the century, coyotes began moving eastward from their historic range (Moore and Parker 1992), and now occur in all eastern states and Canadian provinces (Moore and Parker 1992, Bekoff and Gese 2003). State wildlife agencies continue to report increases in the number of coyotes harvested since colonization, suggesting their numbers have continued to increase, although there is no additional demographic data to support this. As coyote populations have increased in the east, so have conflicts. In 2005, 35,000 cattle and calves worth > $20 million dollars were lost to coyotes in the eastern U.S., 3 times the number of animals lost to coyotes 14 years earlier in 1991 (NASS 1992; 2006). Not only are coyotes impacting domestic livestock as seen in increased depredation reports, but coyotes are also having an impact on native wildlife populations. Coyotes are preying on white-tailed deer (*Odocoileus virginianus*) fawns in summer (Kilgo et al. 2010) and adult deer in the winter (Patterson and Messier 2000). These impacts require further investigation and may require changes to white-tailed deer management strategies. Expanding coyote populations are even posing a threat to the recovery of endangered red wolves (*Canis rufus*) (Adams et al. 2003) and an endangered population of caribou (*Rangifer tarandus)* (Crete and Desrosiers 1995, Boisjoly et al. 2010).

METHODS

We defined the eastern coyote as those residing east of the Mississippi River and east of Canada's Hudson Bay, areas that coyotes did not inhabit prior to European settlement.

We used several search engines to assure a comprehensive review of the literature including: AGRICOLA, BIOSIS, WorldCat, and Wildlife and Ecological Studies Worldwide. Additional references were found by inspecting the literature-cited section of each reference obtained. Due to the limited information available on the eastern coyote, we included theses and dissertations, unpublished manuscripts, and grey literature in the form of reports. To categorize documents and provide an indication of information available on eastern coyotes we assigned keywords to each reference. Keywords were assigned independently of the keywords provided by the author(s). We made no attempt to assess the quality of the research.

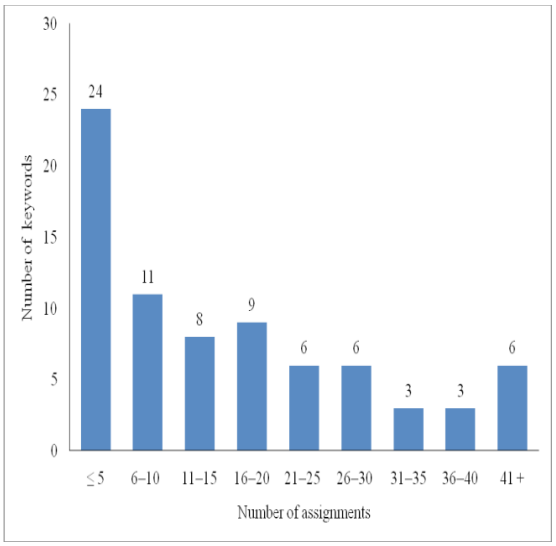

Figure 1. Number of times keywords were assigned to a document.

WHAT DO WE KNOW?

The search process generated >360 documents including books, book chapters, conference proceedings, peer reviewed papers, theses and dissertations. Many (~27%) of these documents are unpublished theses, dissertations, or gray literature. We assigned a total of 76 keywords: 36 ecological terms, 27 geographic terms, 13 key species names to the documents.

Table 1. Keywords assigned to >31 documents

Keyword	Number of "Hits"
Diet	102
Habitat	62
Home Range	60
Morphology	54
Movements	49
Behavior	45
Hybrid	40
Genetics	39
Range	37
Predation	35
Urban	32
Sociality	32

Only a small percentage, (~15%), of keywords were assigned to >31 documents (Figure 1). These keywords were all ecological terms (Table 1). Unfortunately, the results of eastern coyote studies often have high level of uncertainty and a low strength of inference. Even when larger numbers of studies exist on a given topic, sample sizes are small and results are difficult to compare given differences in geography, seasonality, and methodology.

Approximately 32% of keywords were assigned ≤5 times, illuminating the extent to which information on the eastern coyote is deficient (Figure 1). Keywords assigned ≤5 times were most often names of species (e.g., raccoon, *Procyon lotor*) and geographic terms (e.g., Virginia). The number of studies conducted in a given state or province appears to correspond somewhat with the number of years which coyotes have been present in a given geographic area. For example, the mid-Atlantic region, which encompasses areas of the states of Delaware, Maryland, North Carolina, Pennsylvania, Virginia, and West Virginia, was the last area of the eastern continental U.S. to be colonized by coyotes (Parker 1995) and has the fewest number of studies (Figure 2). In contrast, states with large numbers of studies were colonized by coyotes earlier (e.g., Illinois, Tennessee) or have an individual researcher focusing their efforts there (e.g., Maine, Massachusetts).

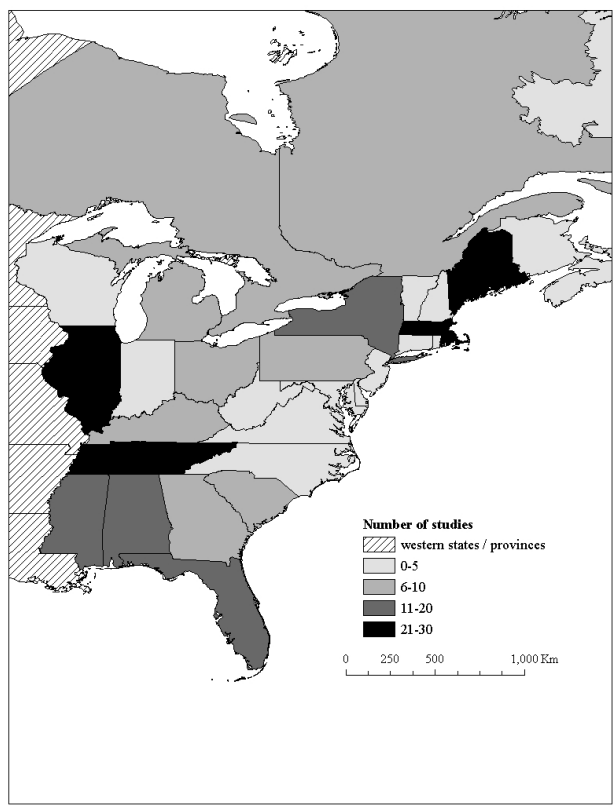

Figure 2. Geographic distribution of eastern coyote studies in U.S. states and Canadian provinces.

CONCLUSION

A review of the literature illuminated deficiencies in the quality and quantity of information in all areas of eastern coyote ecology. This is compounded by the fact that a significant number of documents on eastern coyotes are unpublished or not readily available. We expected to assign several keywords that never appeared in the literature. The lack of these ecological terms (e.g., exotic species), geographical terms (e.g., Delaware, Maryland, and Rhode Island) and key species names (e.g., shorebird) suggest these areas should be priorities of future research. Information about populations, social behavior, home range, and foraging ecology are of particular priority as this information is vital for wildlife managers to understand and address their impacts.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Adams, J.R., B.T. Kelly, and L.P. Waits. 2003. Using fecal DNA sampling and GIS to monitor hybridization between red wolves (*Canis rufus*) and coyotes (*Canis latrans*). Molecular Ecology 12:2175–2186.

Bekoff, M., and E. M. Gese. 2003. Coyote (*Canis latrans*). Pages 467–481 in G. A. Feldhammer, C. Thompson, J. A. Chapman (editors). Wild Mammals of North America: Biology, Management, and Conservation. Second edition. Johns Hopkins University Press, Baltimore, Maryland, USA.

Boisjoly, D., J. Ouellet, and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

Moore, G.C., and G.R. Parker. 1992. Colonization by the eastern coyote (*Canis latrans*). Pages 23–37 *in* A.H. Boyer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

National Agricultural Statistics Service. 1992. Cattle and calves death loss. United States Department of Agriculture, Washington, D.C., USA.

National Agricultural Statistics Service. 2006. Cattle death loss. United States Department of Agriculture. Washington, D.C., USA.

Parker, G.E. 1995. Eastern coyote: the story of its success. Nimbus, Halifax, Nova Scotia, Canada.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

Bibliography of the Eastern Coyote

The following bibliography is the product of the study reported by: L. L. Mastro et al., *What Do We Know? A Literature Review of the Eastern Coyote,* presented at the 14th Wildlife Damage Management Conference, Nebraska, 2012.

We defined the eastern coyote as those residing east of the Mississippi River and east of Canada's Hudson Bay, areas that coyotes did not inhabit prior to European settlement.

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Adams, J. R., B. T. Kelly, and L. P. Waits. 2003. Using fecal DNA sampling and GIS to monitor hybridization between red wolves (*Canis rufus*) and coyotes (*Canis latrans*). Molecular Ecology 12:2175–2186.

GENETICS, HYBRID, RED WOLF

The US Fish and Wildlife Service's (USFWS) Red Wolf Recovery Program recognizes hybridization with coyotes as the primary threat to red wolf recovery. Efforts to curb or stop hybridization are hampered in two ways. First, hybrid individuals are difficult to identify based sorely on morphology. Second, managers need to effectively search 6000 km^2 for the presence of coyotes and hybrids. We develop a non-invasive method to screen large geographic areas for coyotes and hybrids with maternal coyote ancestry by combining mitochondrial DNA sequence analysis of feces (scat) and geographic information systems (GIS) technology. This method was implemented on the Alligator River National Wildlife Refuge (1000 km^2) in northeastern North Carolina. A total of 956 scats were collected in the spring of 2000 and 2001 and global positioning system (GPS) coordinates were recorded. Seventy five percent of the scats were assigned to species and five coyote/hybrid scats were detected. Placement of scat location coordinates on a map of the experimental population area revealed that four of the coyote/hybrid scats were detected within the home ranges of sterilized hybrids. The other coyote/hybrid scat indicated the presence of a previously unknown individual. We suggest this method be expanded to include more of the experimental population area and be optimized for use with nuclear markers to improve detection of hybrid and backcrossed individuals.

Adams, J. R., J. A. Leonard, and L. P. Waits. 2003. Widespread occurrence of a domestic dog mitochondrial DNA haplotype in southeastern U.S. coyotes. Molecular Ecology 12:541–546.

DOG, GENETICS, HYBRID

Sequence analysis of the mitochondrial DNA control region from 112 southeastern US coyotes (*Canis latrans*) revealed 12 individuals with a haplotype closely related to those in domestic dogs. Phylogenetic analysis grouped this new haplotype in the dog/grey wolf (*Canis familiaris*/*Canis lupus*) clade with 98% bootstrap support. These results demonstrate that a male coyote hybridized with a female dog, and female hybrid offspring successfully integrated into the coyote population. The widespread distribution of this haplotype from Florida to West Virginia suggests that the hybridization event occurred long ago before coyotes colonized the southeastern USA. However it could have occurred in the southeastern USA before the main front of coyotes arrived in the area between male coyotes released for sport and a local domestic dog. The introgression of domestic dog genes into the southeastern coyote population does not appear to have substantially affected the coyote's genetic morphological or behavioral integrity. However, our results suggest that, contrary to previous reports, hybrid-

ization can occur between domestic and wild *Canids,* even when the latter is relatively abundant. Therefore, hybridization may be a greater threat to the persistence of wild *Canid* population than previously thought.

Adams, J. R., C. Lucash, L. Schutte, and L. P. Waits. 2007. Locating hybrid individuals in the red wolf (*Canis rufus*) experimental population area using a spatially targeted sampling strategy and fecal DNA genotyping. Molecular Ecology 16:1823–1834.

GENETICS, HYBRID, RED WOLF

Hybridization with coyotes (*Canis latrans*) continues to threaten the recovery of endangered red wolves (*Canis rufus*) in North Carolina and requires the development of new strategies to detect and remove coyotes and hybrids. Here, we combine a spatially targeted fecal collection strategy with a previously published reference genotype data filtering method and a genetic test for coyote ancestry to screen portions of the red wolf experimental population area for the presence of non-red wolf *Canids.* We also test the accuracy of our maximum-likelihood assignment test for identifying hybrid individuals using eight microsatellite loci instead of the original 18 loci and compare its performance of the Bayesian approach implemented in new hybrids. We obtained fecal DNA genotypes for 89 samples, 73 of which were matched to 23 known individuals. The performance of two sampling strategies—comprehensive sweep and opportunistic spot-check was evaluated. The opportunistic spot-check sampling strategy required less effort than the comprehensive sweep sampling strategy but identified fewer individuals. Six hybrids or coyotes were detected and five of these individuals were subsequently captured and removed from the population. The accuracy and power of the genetic test for coyote ancestry is decreased when using eight loci; however, non-red wolf *Canids* are identified with high frequency. This combination of molecular and traditional field-based approaches has great potential for addressing the challenge of hybridization in other species and ecosystems.

Adams, J. R., and L. P. Waits. 2007. An efficient method for screening fecal DNA genotypes and detecting new individuals and hybrids in the red wolf (*Canis rufus*) experimental population area. Conservation Genetics 8:123–131.

GENETICS, HYBRID, RED WOLF

Previously, sequencing of mitochondrial DNA (mtDNA) from non-invasively collected fecal material (scat) has been used to help manage hybridization in the wild red wolf (*Canis rufus*) population. This method is limited by the maternal inheritance of mtDNA and the inability to obtain individual identification. Here, we optimize the use of nuclear DNA microsatellite markers on red wolf scat DNA to distinguish between individuals and detect hybrids. We develop a data filtering method in which scat genotypes are compared to known blood genotypes to reduce the number of PCR amplifications needed. We apply our data filtering method and the more conservative maximum likelihood ratio method (MLR) of Miller et al. (2002 Genetics 160:357–366) to a scat dataset previously screened for hybrids by sequencing of mtDNA. Using seven microsatellite loci, we obtained genotypes for 105 scats, which were matched to 17 individuals. The PCR amplification success rate was 50% and genotyping error rates ranged from 6.6% to 52.1% per locus. Our data filtering method produced comparable results to the MLR method, and decreased the time and cost of analysis by 25%. Analysis of this data set using our data filtering method verified that no hybrid individuals were present in the Alligator River National Wildlife Refuge, North Carolina in 2000. Our results demonstrate that nuclear DNA microsatellite analysis of red wolf scats provides an efficient and accurate approach to screen for new individuals and hybrids.

Agostine, J. C., and G. S. Jones. 1982. Heartworms (*Dirofilaria immitis*) in coyotes (*Canis latrans*) in New England. Journal of Wildlife Diseases 18:343–345.

DISEASE

Aldous, C. M. 1939. Coyotes in Maine. Journal of Mammalogy 20:104–106.

MAINE, RANGE

Alesandrini, J. A. 1983. Winter food habits of coyotes in central Illinois. Thesis, Illinois State University, Normal, USA.

DIET, ILLINOIS

An expanding coyote population in Illinois has caused concern about this predator's effect on other wildlife populations and domestic livestock operations. This study of food habits will add to the existing knowledge of coyotes in Illinois and should facilitate management decisions. Stomach contents of 125 coyotes collected during the winters of 1977–78 and 1978–79 in central Illinois were analyzed. Twenty food items were then listed by "percent occurrence" and "percent volume." Cottontail rabbit, various domestic animals, small rodents and white-tailed deer were the most important winter foods. Coyotes pursue a varied diet, and coyote predation does not appear to have a serious impact on any one coyote species. These results do not support a management program specifically to control the coyote as a predator.

Anderson, T. M., B. M. vonHoldt, S. I. Candille, M. Musiani, C. Greco, D. R. Stahler, D. W. Smith, B. Padhukasahasram, E. Randi, J. A. Leonard, C. D. Bustamante, E. A. Ostrander, H. Tang, R. K. Wayne, and G. S. Barsh. 2009. Molecular and evolutionary history of melanism in North American Gray Wolves. Science 323:1339–1343.

GENETICS, GRAY WOLF

Morphological diversity within closely related species is an essential aspect of evolution and adaptation. Mutations in the Melanocortin 1 receptor (Mc1r) gene contribute to pigmentary diversity in natural populations of fish, birds and many mammals. However, melanism in the gray wolf, Canis lupus, is caused by a different melanocortin pathway component, the K locus, that encodes a beta-defensin protein that acts as an alternative ligand for Mc1r. We show that the melanistic K locus mutation in North American wolves derives from past hybridization with domestic dogs, has risen to high frequency in forested habitats, and exhibits a molecular signature of positive selection. The same mutation also causes melanism in the coyote, *Canis latrans,* and in Italian grey wolves, and hence our results demonstrate how traits selected in domesticated species can influence the morphological diversity in their wild relatives.

Aquadro, C. F. 1975. Electrophoretic determination of blood protein variation between the eastern coyote and dog. Pages 12–19 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

DOG, GENETICS, HYBRID

Preliminary analysis by polyacrylamide gel electrophoresis of serum, plasma, and erythrocyte proteins from the eastern coyote (*Canis latrans* var.) has been compared to that of various domestic dogs (*C. familiaris*). Many proteins appear to be common between the two species but protein bands unique to each are also present. These protein differences may be of value in determining the extent of hybridization between dogs and the western coyote and between wolf (*C. lupus*) and western coyote, either of which may have produced the larger coyote-like Canid of the northeastern United States.

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544

ALABAMA, CONFLICT, DAMAGE, LIVESTOCK, PREDATION, PRODUCER, HUMAN DIMENSIONS

Depredation to crops and livestock by coyotes (Canis latrans) is a subject of much concern to agricultural producers in Alabama. This concern suggested a need for an efficient mechanism for producers experiencing perceived coyote damage to report losses. We tested a combination self-reporting/field verification techniques to determine proportion of coyote damage complaints actually attributable to coyotes, determine species responsible for reported coyote damage, and collect descriptive data on coyote damage were received from June 1992 to September 1993. Two hundred and sixty-three calls (214 livestock, 49 crop) resulted in only 44 field investigations. This technique of self-reporting/field verification did not prove effective as a data collection method to assess coyote dam-

age. Much of the concern among Alabama citizens about coyotes cannot be substantiated when there is opportunity for verification.

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

HABITAT, HOME RANGE, INDIANA, SOCIALITY, TERRITORY

From February 2000 to January 2002, I investigated correlates of landscape fragmentation with coyote (*Canis latrans;* Say, 1823) group size and resulting effects on within-group spatial interaction in west-central Indiana. Twenty-one radio-collared coyotes were assigned to 15 social groups; group territories were then classified as having dispersed (n = 10) or aggregated (n = 5) resource patches. Group size was larger in territories with aggregated patches and was directly correlated to forest area and inversely correlated to corridor area (top-ranked model: group size = $ß_0$ + forest area—corridor area; AIC_c = -2,12, ΔAIC_c = 0.0, ωi = 0.67). Territories with aggregated patches had proportionally more forest (mean = 0.41, SE = 0.02) and less corridor (mean = 0.01, SE = 0.002) habitats than territories with dispersed patches (forest area: mean = 0.11, SE = 0.01; corridor area: mean = 0.03, SE = 0.002). Within-group spatial interaction was not influenced by patch dispersion. I suggest that differences in territory and group sizes relative to patch dispersion reflect the complex combinations of environmental pressures present in human-dominated landscapes and their potential to perturb *Canid* social organization.

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. Journal of Wildlife Management 71:1545–1554.

DISEASE, HOME RANGE, MICHIGAN, MOVEMENTS, WHITE-TAILED DEER

Mycobacterium bovis, the causative agent of bovine tuberculosis (bTB), is endemic in free-ranging white-tailed deer (*Odocoileus virginianus*) in 5 counties (Alcona, Alpena, Montmorency, Oscoda, and Presque Isle) in the northeastern Lower Peninsula of Michigan, USA. The presence of a wildlife reservoir of tuberculosis in Michigan and the incidence of bTB in cattle (*Bos taurus*) resulted in Michigan loosing its bTB accredited-free status. Subsequent wildlife surveillance programs identified relatively high disease prevalence in coyotes (*Canis latrans*), generating interest in their potential to serve as sentinel species to detect bTB prevalence in white-tailed deer. Our goal was to develop an empirical basis for generating hypothesis about the spatial epidemiology of bTB infection in coyotes for future surveillance, management, and modeling efforts. Through variation in coyote home-range size may confound attempts to spatially correlate the incidence of disease in the sentinel and host species at a fine scale, overlap zones (OZs) between adjacent coyote home ranges may be the appropriate sample unit for spatially correlating disease prevalence in coyotes and white-tailed deer. Because overlapping home ranges are generally configured around resource rich (e.g., small mammals and white-tailed deer) timber management patches, the OZ concentrates spatial interaction between adjacent groups in a relatively small area. Furthermore, there is a direct relationship between interaction probabilities and the spatial dispersion of those patches. The latter finding provides a useful metric to incorporate into future efforts to develop spatially explicit models of bTB dynamics. Modeling efforts can then be used as a foundation to predict the epidemiological ramifications of alterations in intensively managed forested landscapes.

Atwood, T. C., and H. P. Weeks Jr. 2002. Facultative dyad formation in adult male coyotes. Northeastern Naturalist 9:353–358.

HABITAT, HOME RANGE, INDIANA, SOCIALITY

As part of a larger study, we investigated the intensity and duration of association between 2 adult male coyotes (*Canis latrans*) in an agrarian landscape in west-central Indiana. Home-range size and overlap and the intensity of association varied with time. Home-range sizes averaged 7.9 ± 1.1 (SE) and 11.8 ± 0.9 km^2, and spatial overlap was substantial. Activity patterns and habitat preferences were similar for the coyotes whether together or apart and there was no evidence of temporal or spatial avoidance. The 2 males were together most frequently during the pup-rearing and dispersal

seasons, suggesting provisioning of pups and vigilance at diurnal resting sites as possible mechanisms for the dyad formation.

Atwood, T. C., and H. P. Weeks Jr. 2002. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. Canadian Journal of Zoology 81:1589–1597.

HABITAT, HOME RANGE, INDIANA, SOCIALITY

No data exist regarding the linkage between the dispersion of critical resources and the spatial distribution of eastern coyotes (*Canis latrans*). From February 2000 to January 2002, we investigated landscape-level correlates of fragmentation with coyote spacing patterns and interaction in west-central Indiana to determine whether habitat fragmentation may influence spatiotemporal home-range overlap. Eleven pairs of coyotes (four male-female, four male-male, three female-female) displayed spatial overlap in portions of their home-range utilization distributions; seven pairs interacted temporally. Percent home range overlap of space sharing pairs averaged 55%. Area of forested habitat within the overlap zone, pair type, and mean squared difference of nearest-neighbor distances between forested patches explained substantial amounts of variation in percent home-range overlap ($R^2 = 0.83$, $P < 0.001$). Extent of temporal interaction differed by pair type, as male-male pairs interacted substantially more than male-female and female-female pairs. Five (two male-male, three male-female) of seven temporally interacting pairs exhibited simultaneous attraction to the overlap zone. The complex combination of environmental pressures present in human-dominated landscapes may facilitate spatiotemporal home-range overlap in coyotes.

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

HABITAT, HOME RANGE, INDIANA, MOVEMENTS, URBAN

Coyotes (*Canis latrans*) are now ubiquitous throughout most of the eastern United States: however, little information exists on how they are able to exploit and thrive in fragmented landscapes. We investigated home ranges, movements, and scale-dependent resource selection of coyotes along a gradient (suburban/exurban/rural) of anthropogenic disturbance. Home-range sizes varied along a suburban-to-rural gradient and were inversely correlated to urbanization ($R^2 = 0.79$, $P < 0.001$). Habitat composition and coyote use of 95% (home range) and 50% (core area) contours were nonrandom. Coyotes used corridor habitat extensively and avoided urban and crop-field habitats. Forested habitat was used extensively for diurnal cover. Rural coyotes traveled greater distances at faster rates than did suburban/exurban coyotes. Diel activity patterns were similar along the gradient, suggesting that coyotes responded similarly to differing levels and types of human activity. Coyotes appeared to assess habitat quality at the landscape scale and exploited small, disjunct resource patches present in developed landscapes. We believe that the availability of foraging habitat and travel corridors is critical to movement of coyotes in areas of high human activity.

Babb, J. G. 1988. Density and home range of the coyote (*Canis latrans*) in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

HOME RANGE, MOVEMENTS, POPULATION DENSITY, TENNESSEE

Density was assessed for a population of coyotes (*Canis latrans*) using leg-hold traps and snares from 6 January to 14 March 1986. The study was conducted in Gibson and Carroll counties, Tennessee. Thirty-four coyotes (18 males, 16 females) were captured, and a minimum density averaged 0.35 coyote per km^2 (0.91 per mi^2). Home range of the coyote was studied in western Tennessee during 1985 to 1987. Using standard radio-telemetry techniques, annual and seasonal home ranges were determined. Annual home ranges averaged 31 km^2 for males and 60 km^2 for females. Home ranges varied across seasons for both sexes; however, females had larger ranges than males during all periods except the breeding season. Long-distance travel of 70 km and 55 km was recorded for 2 individuals.

Babb, J. G., and M. L. Kennedy. 1989. An estimate of minimum density for coyotes in western Tennessee. Journal of Wildlife Management 53:186–188.

POPULATION DENSITY, TENNESSEE

We used leg hold traps and snares to assess the density of a population of coyotes (*Canis latrans*) from 6 January to 14 march 1986. The study was conducted in Gibson and Carroll counties, Tennessee. Thirty-four coyotes (18 M, 16 F) were captured, and a minimum density averaged 0.35 coyote/km^2.

Babb, J. G., and M. L. Kennedy. 1988. Home range of the coyote in western Tennessee. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 42:443–447.

HOME RANGE, MOVEMENTS, TENNESSEE

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Ballard, W. B., H. A. Whitlaw, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1999. Predation and survival of white-tailed deer fawns in north central New Brunswick. Journal of Wildlife Management 63:574–579.

PREDATION, WHITE-TAILED DEER

Identification of mortality sources of white-tailed deer (*Odocoileus virginianus*), particularly predation and survival rates, is important for effective management. We captured, radio collared, and monitored 78 white-tailed deer fawns in north central New Brunswick to determine survival and cause-specific mortality from February 1994 through May 1997. Of 50 fawns captured as neonates, 22 died by 30 November 1994–96. Predation by coyotes (*Canis latrans; n* = 9), black bears (*Ursus americanus; n* = 5), domestic dogs (*Canis familiaris; n* = 3), and bobcats (*Felis rufus; n* = 2) was the largest cause of fawn mortality during summer and autumn. Coyotes were the primary cause of mortality of fawns ≥ 7 months old (11 of 15). Fawn survival was lowest during summer (0.47), increased during autumn (0.86) and early winter (0.95), and then declined during late winter (0.79) and spring (0.81). Our results support the hypothesis that coyotes have replaced gray wolves (*Canis lupus*) in northeastern North America, with survival and mortality rates being comparable between New Brunswick and other areas where wolves and coyotes are sympatric.

Bekoff, M. 1978. Behavioral development in coyotes and eastern coyotes. Pages 97–127 in M. Bekoff, editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

BEHAVIOR, JUVENILE, SOCIALITY

Berentsen, A. R., M. R. Dunbar, S. R. Johnson, S. Robbe-Austerman, L. Martinez, and R. L. Jones. 2011. Active use of coyotes (*Canis latrans*) to detect Bovine Tuberculosis in northeastern Michigan, USA. Veterinary Microbiology: in press.

DISEASE, MICHIGAN

Bovine tuberculosis (bTB) is endemic in white-tailed deer (*Odocoileus virginianus*) in northeastern Michigan, USA, and research suggests transmission to cattle. Prevalence of the disease in deer is estimated at 1.8%, but as prevalence decreases the difficulty of detection increases. Research suggests coyotes (*Canis latrans*) have a higher prevalence of bTB in Michigan than deer and sampling coyotes may be a more efficient surveillance tool to detect presence or spread of the disease. Coyotes possess suitable ecological characteristics to serve as a sentinel species, assuming transmission between coyotes is not significant. The question of whether free-ranging coyotes shed Mycobacterium bovis, the causative agent of bTB, has not been previously addressed. We actively used coyotes as a sentinel to detect bTB in infected and uninfected counties in Michigan's Northeastern Lower Peninsula. We determined whether bTB infection was present through bacteriologic culture of lymph nodes and tissues containing lesions and cultured oral/nasal swabs and feces to establish shedding. Seventeen of 171 coyotes were M. bovis culture positive, one of which was from a

previously uninfected county. All oral, nasal secretions and feces were culture negative suggesting minimal, if any, shedding of M. bovis. Thus, infection of coyotes is likely to occur through ingestion of infected deer carcasses and not from interaction with conspecifics. These findings support previous research suggesting that coyotes are useful sentinels for bTB. The use of coyotes as a sentinel, may allow wildlife managers to detect the spread of bTB into naïve counties. With earlier detection managers may be able to take proactive surveillance measures to detect the disease in deer and reduce the potential risk to domestic livestock and captive deer herds.

Bider, J. R., and P. G. Weil. 1984. Dog, *Canis familiaris,* killed by a coyote, *Canis latrans,* on Montreal Island, Quebec. Canadian Field Naturalist 98:498–499.

DOG, PREDATION, QUEBEC

This is a documentation of the killing of a dog by a single coyote. The dog had been with its owner who was cross-country skiing at dusk. After the kill, the coyote joined two others of its pack, and the dog was partly eaten.

Billodeaux, L. E. 2007. The presence and public perception of coyotes (*Canis latrans*) in suburban and rural areas of western Georgia. Thesis, Auburn University, Auburn, USA.

CONFLICT, GEORGIA, HUMAN DIMENSIONS, MANAGEMENT, URBAN

Coyotes (*Canis latrans*) are animals that have adapted themselves to a variety of habitats throughout the country. Over the past fifty years, coyotes (*Canis latrans*) have expanded their range and established themselves as dominant carnivores throughout the southeastern U.S. in both rural/forested areas and urban/suburban areas. However, since coyotes are relatively new to the Southeast, little research has been conducted on them in habitats in this region. In addition to there being little research on the biology of the species there also has been no research done specifically on how the public in the southeastern states perceive coyotes in their community. If coyotes are becoming more prevalent in suburban areas, human/coyote conflicts may become an issue in the southeast. Understanding how the public feels about this species is important to developing management and education programs.

I sent a mail survey out to residents of the western Georgia area about their wildlife recreation participation, interactions with wildlife, wildlife preferences and beliefs on management of wildlife in their community. I identified factors that may help predict management beliefs. I also identified sections of the public that should be targeted for education programs and certain areas that may need to be addressed in these programs. To investigate the site use and movement patterns of coyotes in western Georgia, I set up digital game cameras on various sites throughout three counties. I recorded and analyzed changes in occupancy at sites, detection, body condition and movement times of coyotes.

My data revealed that coyotes appeared to discriminate little between suburban and rural habitats and during stressful seasons may do better in suburban habitats. Coyotes persisted at all sites during at least one season during the year and overall populations appeared to be healthy. Coyote occupancy in my sites was approximately 30%. This seems to be below the cultural carrying capacity in these counties because in many areas the public was unaware they had coyotes near their homes. I found that the respondents' value of wildlife, and specifically coyotes, was the best predictor of preferences on management methods. Because coyotes were not a highly favored species in these communities, if management did need to occur, majority of respondents supported the use of lethal management methods done by agency personnel to remove animals. If lethal methods are to be used, education on which methods are effective would be needed before implementing.

Bixel, K. D. 1995. Trophic ecology of adult coyotes (*Canis latrans*) in south central Pennsylvania. Thesis, Shippensburg University, Shippensburg, USA.

DIET, PENNSYLVANIA

Coyote (*Canis latrans*) scats collected between May 1994 and April 1995 from south central Pennsylvania

were analyzed to determine the frequency of occurrence and relative volume of prey. In all, 184 scats were analyzed, and the results were compared among seasons. The most frequently occurring food group was plants, averaging 72.9% percent occurrence. Plants were the most important dietary items during summer. Second in overall frequency of occurrence were mammals (68.5%). Annual frequency of occurrence of invertebrates in scats was 51.1%, averaging 67.8% and 52.9% in summer and spring, respectively. Cherries (*Prunus spp.*), occuring in 42.4% of scats were the most important species by frequency of occurrence. Caterpillars and orthopterans were seasonally important foods also. Although predation by coyotes on white-tailed deer (*Odocoileus virginianus*) may occur, the prevalence of both maggots and deer in fall scats suggests that the primary source of deer was probably carrion. Foraging behavior of coyotes in south central Pennsylvania seemed to follow some predictions of optimal foraging models; coyotes selected vegetation and insects in relation to their seasonal abundance and switched to mammalian prey from late fall to early spring.

Bixel, K. D. 1995. Survey of the endoparasites of south central Pennsylvania coyotes using fecal analysis. Journal of the Pennsylvania Academy of Science 69:17–21.

DISEASE, PENNSYLVANIA

Sixteen coyotes (*Canis latrans*) scats on the Letterkenny Army Ordinace Depot in Franklin County, Pennsylvania, collected between June and August 1994, were analyzed for parasite ova using fecal flotation. Five endoparasite species were identified: *Capillaria aerophila, Uncinaria steno* sp., *Capillaria aerophila* was the most common parasite, occurring in 385 of samples. Multiple-species infections were present in 25% of the samples. Climatic condition and food habits may play a role in regulating the endoparasitic fauna of coyotes in south central Pennsylvania.

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

ALABAMA, DIET, KENTUCKY, MISSISSIPPI, POPULATION DENSITY, TENNESSEE, WHITE-TAILED DEER

The summer diet of coyotes (*Canis latrans*) was determined from analysis of 523 scats and 9 stomachs collected on 7 study areas in Mississippi, Alabama, Kentucky, and Tennessee, May 1985—September 1986. The diet was compared between 4 areas with a high white-tailed deer (*Odocoileus virginianus*) density (HDA's), and 3 areas with a low deer density (LDA's). Scat and stomach samples were pooled, and grouped by collection date into pre-fawning, fawning, and post-fawning categories, based on the estimated peak deer fawning dates on each study area. The important foods overall (by frequency of occurrence) were fruit (45.7%), insects (36.5%), rabbit (*Sylvilagus spp.*) (31.6%), deer (30.8%), and rodents (23.5%). Deer occurred more frequently than any other food time on the HDA's, and less frequently than any other major item on the LDA's. Occurrence of deer on the HDA's was 7.1%, 69.7%, and 55.4% for the pre-fawning, fawning, and post-fawning periods, respectively. Deer occurrence on the LDA's for the 32 collection periods was 1.9%, 5.5%, and 7.0%. Most (76.9%) of the deer occurrences were identified as fawns. Rabbits, insects, and fruit occurred more frequently on the LDA's than the HDA's. Coyote siren surveys were conducted on the study areas in the fall-winter following scat/stomach collection. Estimated coyote densities ranged from 0.08–0.21/km^2. The coyote response rate was significantly ($P < 0.05$) higher on the HDA's than the LDA's. Limitation of siren surveys are discussed and recommendations are made concerning future use of the technique.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

ALABAMA, DIET, KENTUCKY, MISSISSIPPI, POPULATION DENSITY, TENNESSEE, WHITE-TAILED DEER

We determined summer diets of coyotes (*Canis latrans*) from analysis of 523 scats and 9 stomachs collected on 7 study areas in Mississippi, Alabama, Kentucky, and Tennessee from May 1985 to September 1986. We compared coyote diets among 4 areas where white-tailed deer (*Odocoileus virginianus*) occurred

in high densities (HDA's) and 3 areas with low deer densities (LDA's) during pre-fawning, fawning, and post-fawning periods on each study area. Important coyote foods (by frequency of occurrence) were fruit (45.7%), insects (36.5%), rabbit (Sylvilagus spp., 31.6%), deer (30.8%), and rodents (23.5%). During fawning, deer were the most frequent ($\bar{x}$ = 74.2%) major food item on the HDA's and the least frequent ($\bar{x}$ = 8.8%) on major food item on the LDA's. Summer use of deer was largely fawns (76.9%) and occurred in peaks corresponding to the local fawn drop. Significantly grater use of fawns occurred during fawning and post-fawning than in pre-fawning on the HDA's. The patterns of food use exemplified the opportunistic feeding behavior of coyotes.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

AGE STRUCTURE, BEHAVIOR, CONFLICT, DAMAGE, DIET, GENETICS, HABITAT, HOME RANGE, JUVENILE, LIVESTOCK, MANAGEMENT, MORPHOLOGY, MOVEMENTS, RANGE, REPRODUCTION, SOCIOLOGY, SURVIVAL, TERRITORY

From the forward: A collection of invited papers presented at a symposium on the Eastern Coyote held in Fredericton, New Brunswick, on 7–9 November 1991. The purpose of the symposium was twofold: (1) to promote dialogue and, concomitantly, understanding of coyotes and their role in the ecosystem of northeastern North America, and (2) summarize and update what is known about the ecology and management of coyotes.

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis, State University of New York at Albany, Albany, USA.

HABITAT, HOME RANGE, NEW YORK, URBAN, SURVIVAL

In the northeast USA, top mammalian predators were extirpated through persecution and habitat loss. The coyote (*Canis latrans*) expanded into the northeast taking advantage of this vacant predator niche. Since 1970, coyotes have been widespread across all of mainland New York, yet no study has examined how well coyotes survive in suburban areas in this region and little is known of their ecological roles or potential to conflict with people. This information is important because in western states coyotes have high survival rates, a high degree of urban association and cause conflict with people. I studied survivorship and correlates of cause-specific mortality of coyotes using radio telemetry. The annual survival rate was 0.20 ± 0.14. There were no differences in survival rates between sexes, age classes, home range location, or capture methods. Collisions with vehicles (n = 7) and shooting (n = 6) accounted for the 2 major mortality factors. Coyotes that were killed by vehicles crossed roads more often than all other coyotes, though they did not have more roads within their home ranges. Coyotes that were shot had a larger mean and maximum open habitat patch size within their home ranges. High exploitation of the local coyote population may cause coyotes to avoid human-developed lands thus reducing the potential for negative interactions with people.

I concurrently studied home range and habitat selection of coyotes in the suburban Albany Pine Brush landscape. Fixed kernel and minimum convex polygon (95%) home ranges (n = 17) averaged 6.81 km^2 and 5.75 km^2, respectively. Habitat analysis revealed that coyotes selected for natural habitat and avoided residential and commercial lands when locating a home range area and moving within the home range. Compositional analysis additionally ranked natural habitat as the most selected habitat at 2 spatial scales of selection (62.3% and 74.5%). Coyotes lived in small home ranges and primarily used the remaining natural lands in the suburban landscape. These results indicate that local coyotes maintain a natural ecological role and under existing conditions do not currently pose a threat to people and pets living adjacent to natural lands.

Boisjoly, D., J. Ouellet, and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

CARIBOU, DIET, HABITAT, QUEBEC

Anthropogenic disturbances can promote establishment and growth of populations in areas where secondary prey can then become threatened. In this study, we investigated habitat selection of eastern coyotes (*Canis latrans*), a relatively new predator in the vicinity of an endangered population of caribou (*Rangifer tarandus caribou*). We hypothesized that coyotes in the boreal forest depend mainly on disturbed habitat, particularly that of anthropogenic origin because these habitats provide increased food accessibility. Coyotes would likely take advantage of moose (*Alces alces*) carcasses, berries, and snowshoe hares (*Lepus americanus*) found in open habitats created by logging. To test these predictions, we described coyote diet and habitat selection at different spatial and temporal levels and then compared resource availability between habitats. To do so, we installed Global Positioning System radio collars on 23 individual coyotes in the Gaspésie Peninsula, eastern Quebec, Canada. Coyotes selected clear cuts of 5–20 years and avoided mature coniferous forests both at the landscape and home range levels. Clear-cuts of 5–20 years were found to contain a high availability of moose carcasses and berries, and vulnerability of snowshoe hares is known to increase in clear-cuts. The importance of these 3 food resources was confirmed by the characteristics of core areas used by coyotes and diet analysis. Moose remains were found at 45% of core areas and coyote diet comprised 51% moose on an annual basis. Anthropogenic disturbances in the boreal forest thus seem to benefit coyotes. Our results indicated that the relationship between coyotes and caribou likely involves spillover predation. This knowledge allows managers to consider spillover predation by coyotes as a possible threat for endangered caribou population when the predator depends mainly on habitat of anthropogenic origin and to suggest methods to alleviate it when developing management plans.

Bollin-Booth, H. A. 2007. Diet analysis of the coyote (*Canis latrans*) in metropolitan park systems of northeast Ohio. Thesis, Cleveland State University, Cleveland, USA.

DIET, OHIO, URBAN

The coyote (*Canis latrans*) is not native to the greater Cleveland area, with the first documented sighting here in the late 1980s. Coyote populations here apparently have been increasing in the past two decades. Its position as a top predator in the local ecological community likely bears important consequences. The impact of the coyote on other, native species (e.g. the white-tailed deer) is largely unknown but may be significant. Its general ecology here is not well known, and concerns about the coyote are likely to increase, especially if its populations continue to grow. Coyotes are known to use a variety of habitats and are able to survive, and even thrive, in habitats with low to high levels of human density. Although formally classified as carnivores, coyotes have a broad diet. Generally considered an opportunistic predator, coyote diets shoe marked regional and seasonal variation, and variation associated with specific habitats and levels of human density, commonly reflecting availability in the area.

The goal of this study was to identify the major items and seasonal differences in the diet of coyotes along an urban-rural gradient within two metropolitan park systems in northeast Ohio: the Cleveland Metroparks and the Cuyahoga Valley National Park. Coyote scat was collected every four to six weeks at selected sites in the parks, and returned to the lab to be dried, autoclaved, and dissected. Major diet components across sites within the park systems were indentified using published keys and comparison to reference collections. Diet components were analyzed seasonally and across sites along the urban-rural gradient.

A total of 1760 prey items were found and identified in the 944 samples dissected. Small mammals (*Microtus, Peromyscus, Blarina,* other shrew and unknown small mammal) were the largest component across sites and seasons, compromising 27% of prey items found in scat samples. White-tailed deer (*Odocoileus virginianus*) was also a large component, compromising 24% of prey items found in scat samples. Vegetation (fruits, other plant) overall was 17%, with higher amounts in fall than any other season. Rabbit (*Sylvilagus floridanus*) and raccoon (*Procyon lotor*) were 8% and 6% respectively, with squirrel and chipmunk (*Sciuus, Tamiasciurus hudsonicus, Tamias striatus*) comprising 4% over overall prey items found. Other prey items comprised the remaining 14% of total prey items, consisting of 10 prey items categories ranging from 2.4% to .06% of the overall prey items found. These 10 categories included bird, insect, woodchuck (*Marmota monax*), muskrat (*Ondatra zibethicus*), oth-

er mammal, dirt/sand, synthetic materials, reptiles/fish, and snail. Coyotes at Cleveland Park Systems have a broad diet that varies across seasons. Analysis detected significant differences (f = 3.87, df = 18, 122, $P < 0.001$) across seasons with regard to the consumption of small mammals, white-tailed deer, vegetation, and raccoon. No statistical difference existed between prey items consumed across sites along urban-rural gradient (f = 0.729, df = 12, 86, $P = 0.278$).

Bourque, A., H. Whitney, and G. Conboy. 2005. Angiostrongylus vasorum infection in a coyote (*Canis latrans*) from Newfoundland and Labrador, Canada. Journal of Wildlife Diseases 41:816–819.

DISEASE, NEWFOUNDLAND AND LABRADOR, SURVIVAL

Tissue samples and feces were collected from a dead, adult female coyote (*Canis latrans*) found at the side of the road in late March 2003 in the Avalon Peninsula region of Newfoundland, Canada. The coyote apparently died of vehicular-related trauma. Samples of lung, brain, heart, liver and kidney were fixed in formalin and submitted for histologic examination. The entire remaining lung and heart also were submitted for examination. The coyote was diagnosed with moderate, multifocal, granulomatous interstitial pneumonia with eosinophilic vasculitis and many intralesional nematode eggs, larvae, and occasional intravascular adult worms. Adult nematodes recovered from the pulmonary arteries were identified as *Angiostrongylus vasorum.* Small foci of granulomatous inflammation, often containing nematode eggs and larvae, were scattered in the brain and kidney. To our knowledge, this is the first report of *A. vasorum* infection in a coyote from the only endemic area of infection in North America.

Bozarth, C. A. 2010. Phylo-geography and non-invasive molecular monitoring of coyote (*Canis latrans*) and gray fox (*Urocyon cinereoargenteus*) in northern Virginia and the eastern United States. Dissertation, George Mason University, Fairfax, USA.

GENETICS, VIRGINIA

Molecular tools allow us to answer ecological questions about some of the most intriguing animals, including North America's native gray fox (*Urocyon cinereoargenteus*) and Northern Virginia's recent colonist, the coyote (*Canis latrans*). This dissertation is divided into four independent chapters, cohered by the common theme of molecular ecology of North American *Canids.* The first chapter details a phylo-geographical study of the gray fox, a widespread, but understudied, *Canid* species. Fossil and historic records indicate that gray foxes were not present in the Northeastern United States until well after the Pleistocene (c. 900AD). To test the hypothesis that gray foxes experienced a post-Pleistocene range expansion, I sequenced a variable portion of the mitochondrial control region from gray fox tissue samples representing the range of all three East coast subspecies. Phylo-geographic analyses indicated no clear pattern of genetic structuring of gray fox haplotypes across most of the Eastern United States. However, when haplotype frequencies were subdivided into a "Northeastern" and a "Southern" region, I detected a strong signal of differentiation between the Northeast and the rest of the Eastern United States. Indicators of molecular diversity and tests for demographic expansion confirmed this division and suggested a recent expansion of gray foxes into the Northeast. My results support the hypothesis that gray foxes first colonized the Northeast during a historic period of hemisphere-wide warming, which coincided with the range expansion of deciduous forest. The second chapter describes a novel method to genetically identify *Canid* species from scat (feces) found in the field. I used a short fragment of the mitochondrial control region that is a different length in kit fox (*Vulpes macrotis*), red fox (*V. vulpes*), gray fox, coyote, and dog (*C. familiaris*) to differentiate their scat without using multiple primer sets, real-time PCR, or restriction enzyme digestion. All *Canid* species included are potentially sympatric at the study site utilized in the following two chapters (Marine Corps Base Quantico, MCBQ and adjacent Prince William Forest Park, PWFP) except the kit fox. I extensively tested this technique using published and novel control region sequences and then applied it to two large scat data sets collected in California and Virginia (at MCBQ/PWFP). In the third chapter, I incorporate haplotype and genotype data obtained non-invasively from coyotes at MCBQ/PWFP into a regional analysis of patterns of coyote colonization across the Eastern United States. Coyotes have undergone a dramatic range expansion across North America since the early 19th century, colonizing east of the Mississippi River in two routes that have converged in

the mid-Atlantic region in the past few decades. Notably, coyotes utilizing the Northern route of expansion show molecular evidence of admixture with the Great Lakes wolf (GLW). The study site at MCBQ/PWFP is located at the heart of the convergence of these two fronts. I screened scats collected at MCBQ/PWFP for species identification, then sequenced a hypervariable fragment of the mitochondrial control region to assign haplotype, and then used six microsatellite loci to identify individuals. I detected seven haplotypes (in 39 individuals), all of which have been previously reported in diverse surrounding geographic localities. Phylo-geographic analyses indicated multiple sources of colonization of Northern Virginia and one common haplotype detected is of GLW origin, indicating the presence of admixed coyote/GLW individuals from the North. In the final chapter, I use the non-invasively collected genotype data to describe population demographics at MCBQ. I describe a population with low relatedness and minimal population genetic structure, reflective of the multiple geographic sources of colonization as described in the previous chapter. To estimate population density and size, I used a new class of spatially explicit capture/recapture models that address two key concerns of large carnivore demographic studies: violation of population closure and potentially sparse data sets. These models incorporate spatial data to eliminate the need for post hoc buffering and also use a Bayesian framework to effectively deal with a small sample size. Collectively, these studies are a significant contribution to the development and usage of non-invasive molecular technology, as well as to our understanding of phylo-geography and population genetics of North American *Canids.*

Brady, J. R., and H. W. Campell. 1983. Distribution of coyotes in Florida. Florida Field Naturalist 11:40–41.

FLORIDA, RANGE

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

CANADA GOOSE, DIET, HABITAT, HOME RANGE, ILLINOIS, OHIO, PREDATION, URBAN

Canada geese (*Branta canadensis*) have become common in many urban areas, often creating nuisance problems for human residents. The presence of urban geese has raised concerns about the spread of diseases, increased erosion, excessive noise, eutrophication of waterways, and general nuisance problems. Goose populations have grown due to an increase in urbanization resulting in an abundance of high quality food (urban grass) and suitable nesting sites, as well as a decrease in some predators. I monitored nest predation in the Chicago suburbs during the 2004 and 2005 nesting seasons using 3 nest monitoring techniques to identify predators: video cameras, plasticine eggs, and sign from nest using a classification tree analysis. Of 58 nests monitored in 2004 and 286 in 2005, only raccoons (*Procyon lotor*) and coyotes (*Canis latrans*) were identified as nest predators. Raccoons were responsible for 22–25% of depredated nests, but were rarely capable of depredating nests that were actively defended by a goose. Coyotes were responsible for 75–78% of all Canada goose nest depredation and were documented killing one adult goose and feeding on several others.

The coyote is a top-level predator that had increased in many metropolitan areas in recent years. To determine if coyotes were actively hunting geese or eggs during the nesting season, I analyzed coyote habitat selection between nesting and pre-nesting or post-nesting seasons. Coyote home ranges (95% Minimum Convex Polygon) were calculated for 19 coyotes to examine third order habitat selection related to goose nest abundance. A 100 m buffer (buffer habitat) was created and centered on each waterway edge and contained 90% of all nests. Coyotes showed selection for habitats during all seasons. Buffer habitat was the top ranked habitat in both pre-nesting and nesting seasons, but dropped to third ranked in post-nesting season. Habitat selection across seasons was compared using a repeated measures MANOVA. Habitat selection between pre-nesting and nesting seasons (P = 0.72) were similar, while between post-nesting and nesting seasons there was a nearly significant difference (P = 0.07). The insignificant change in habitat use across seasons suggests that coyotes did not switch habitat use to take advantage of goose nests. Alternatively, the change in ranking of buffer habitat across seasons suggests that coyotes may have switched habitat use to take advantage of goose nests. The results are not clear as large individual variation between coyotes due to

differences in habitat availably, and social status interferes with the results of the analysis.

Even though I failed to find strong support for coyotes actively hunting goose nests, they nevertheless were the primary nest predator in the area and may influence Canada goose populations. To determine the potential influence of coyotes on the Canada goose population, I created a Canada goose matrix population model that included variables such as coyote predation on adults and nests as well as coyote influence on nest desertion. Using the base population model I calculated the Canada goose population to be increasing with $\lambda = 1.055$. The removal of all coyote influence on the goose population would allow λ to increase to 1.214. Nest predation was the most important factor related to coyotes: the removal of coyote nest predation from the model resulted in a population growth rate 1.157. Modeling results suggest coyotes are serving as a limiting factor for the Canada goose population within the Chicago metropolitan area.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

DIET, HABITAT, HOME RANGE, MOVEMENTS, NEW YORK, SOCIALITY, TERRITORY, WHITE-TAILED DEER.

Coyote (*Canis latrans*) food habits, habitat use, and sociality were studied in the central Adirondack Mountains of New York from 1986–1989. Coyote foods varied seasonally. White-tailed deer (*Odocoileus virginianus*) was the most common food item, occurring in 66% of scats and accounting for 49% of total scat volume. Deer occurred in 94% (82% volume) of winter scats, 76% (55% volume) of spring scats, 64% (45% volume) of summer scats and 28% (18% volume) of fall scats. Fruits, insects, and grass occurred in 10–30% of scats overall, but accounted for a small percent volume. Fruits were more important summer and fall than other seasons. Food habits of coyotes have changed from previous studies conducted in the same area in 1956–61 and 1975–80. Deer comprised a smaller portion of the diet during 1956–61 and a greater proportion of the diet from 1975–80 than during this study. Coyotes preyed on deer primarily during the winter and spring. Fawns represented approximately 33% of the deer consumed during June. Coyotes killed deer in significantly ($P < 0.01$) better physical condition, based on marrow fat, than those in general deer population. Deer consumption rates by coyotes ranged from 0.59–0.95 kg deer/coyote/day during winter. Smaller coyote groups had higher per capita consumption rates. A model of coyote-deer interactions suggests that coyotes had little impact on the deer herd during 1956–61 when deer numbers were high and coyote predation rates were low. During 1975–80, when coyote predation was high and deer numbers had declined to low levels, coyote predation appears to have been capable of depressing deer population levels. However, from 1986–89 coyote predation apparently had limited impact on deer numbers. Coyotes occupy large home ranges in the central Adirondacks averaging 112.8 km^2. However, home ranges based on biological seasons (breeding, gestation, pup-rearing, dispersal) averaged only 38 km^2. Coyotes were active during all times of the day, averaging 24.4 km of movement per day. Coyotes used habitats in significantly different proportions than available, selecting small pole stage conifer stands and avoiding large pole stage conifer stands. Seasonal habitat use reflected the availability of habitats within the seasonal home ranges. Based on snow tracking study, coyotes preferred open habitats such as beaver meadows and frozen lakes during winter. They also preferred habitats with dense under- and mid-stories. Habitat preference appears to reflect food acquisition and reproductive requirements. Coyotes in the central Adirondacks tend to travel and hunt primarily in packs (≥3) during winter and as singles during summer, although individual group members maintain a common home range.

Pack members apparently assist with the rearing of offspring. Coyotes exhibit large home range overlap but coyote groups exhibit minimal territory overlap based on seasonal ranges. Core areas also had minimal overlap. This social system appears to be related to the acquisition of food. Pack structure allows profitable exploitation of large prey enhancing pup production and survival by benefiting gestation females and food provisioning of pups.

Bruning-Fann, C. S., S. M. Schmitt, S. D. Fitzgerald, J. B. Payeur, D. L. Whipple, T. M. Cooley, T. Carision, and P. Friedrich. 1998. Mycobacterium bovis in coyotes from Michigan. Journal of Wildlife Diseases 34:632–636.

DISEASE, MICHIGAN

During a survey for tuberculosis in wild carnivores and omnivores, *Mycobacterium bovis* was cultured from pooled lymph nodes of three adult female coyotes (*Canis latrans*) harvested by hunters in Michigan (USA). No gross or histologic lesions suggestive of tuberculosis were seen in these animals. One coyote was taken from Montmorency county and two coyotes from Alcona county located in the northeastern portion of Michigan's Lower Peninsula were free-ranging white-tailed deer (*Odocoileus virginianus*) have been found infected with bovine tuberculosis. It is thought that these coyotes became infected with *M. bovis* through the consumption of tuberculosis deer. Other species included in the survey were the opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), bobcat (*Felis rufus*), and badger (*Taxidea taxus*).

Buck, W. S. 1999. Citizen research of Chicago coyote: diet, population indexing, and the effects of research participation. Thesis, University of Minnesota, St. Paul, USA.

DIET, URBAN

Caturano, S. L. 1983. Habitat and home range use by coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

HABITAT, HOME RANGE, MAINE

Seven radio-collared coyotes (*Canis latrans*), representing 3 social groups, were monitored in eastern Maine from October 1979 to April 1981. Changes were observed in home range size and shape and in habitat use throughout the coyote's annual reproductive cycle. At least 50% of the relocations for each adult animal were found in a core area representing <25% of its total home range. Coyotes used softwood and mixed wood cover year-round more than expected or in proportion to its availability within their home ranges. Hardwoods and non-forested heaths (bogs) and barrens were used less than expected, except during the summer when blueberry (*Vaccinium augustifolim*) barrens were utilized heavily. Scat analysis showed that snowshoe hare (*Lepus americanus*) was a staple food source throughout the year. White-tailed deer (*Odocoileus virginianus*) was also commonly found in winter and spring while a shift in diet to small mammals and fruit occurred in the summer and early fall.

Cepek, J. D. 2000. Population monitoring and diet analysis of coyotes in the Cuyahoga Valley National Recreation Area, Ohio. Thesis, Cleveland State University, Cleveland, USA.

DIET, OHIO

Cepek, J. D. 2004. Diet composition of coyotes in the Cuyahoga Valley National Park, Ohio. Ohio Journal of Science. 104:60–64.

DIET, OHIO

The diet and food habits of coyotes (*Canis latrans*) in Ohio's Cuyahoga Valley National Park (CVNP) were examined by analyzing 50 scat samples collected during coyote population surveys between February 1998–March 1999. The Cuyahoga Valley National Park, a 13,770-hectare public use park surrounded by residential communities, is located between Cleveland and Akron, OH. The park had over 3 million visitors in 1999, and is suffering from the pressures of increased urbanization in surrounding areas. Coyotes were first documented in the CVNP during the 1980s, and since then public interactions with coyotes have increased. The coyote is the top predator in the CVNP, yet little is known about its diet in this area. Meadow vole (*Microtus pennsylvanicus*) was the predominant food item found in 28% of scats collected, Eastern cottontail (*Sylvilagus floridanus*) and white-tailed deer (*Odocoileus virginianus*) occurred in 20% of scats. Raccoon (*Procyon lotor*) was found in 18% of scats. Also identified were beetle (*Coleoptera*), muskrat (*Ondatra zibethicus*), grasshopper (*Caelifera*), woodpecker (*Picoides sp.*), seeds (*Panicum sp.*), and beech nuts (*Fagus grandifolia*) in coyote diet. It is important to note that though white-tailed deer occurred frequently in coyote diet, further investigation indicates that they are mainly scavenged as carrion.

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

BOBCAT, DIET, GRAY FOX, HOME RANGE, MISSISSIPPI, RACCOON, TURKEY

Throughout the southeastern United States, mammalian carnivore populations continue to evolve through dynamic ecological processes. My objectives were to summarize parameters for bobcats, coyotes gray fox, raccoon, and opossum, subsequently relating these parameters to wild turkey depredation on the Tallahala Wildlife Management Area, Georgia-Pacific Corporation, and surrounding private lands during 1989–97. Dietary analysis indicated that bobcats were carnivorous throughout the annual cycle, whereas coyotes were seasonally omnivorous. Survival rates were high for all species compared to previous studies. Cause-specific mortality patterns indicated that incidental harvest and disease were the primary mortality agents for bobcats, coyotes, gray fox, and raccoon. My findings suggest that radio marking opossums negatively affected survival. Male bobcats and raccoons maintained larger home ranges and core areas than females; whereas female coyote home ranges were larger than males and gray fox spatial use patterns were similar between sexes. Bobcats, coyotes, and gray fox appeared to partition habitats elected at the core area level, displaying differing selection across seasons among the species. Bobcats used 0–8 year-old pine stands and gray fox selected mature pine stands. Coyotes used a variety of habitats at all spatial scales, whereas raccoon consistently selected mature pine and hardwood habitats. Movement and activity patterns within species differed across the diel period, with greatest movement and activity occurring during crepuscular and nocturnal periods. Intraspecific spatial relationships and interactions differed by species, bobcats exhibited territoriality at the core area level, but raccoons did not. Coyotes and gray fox formed intraspecific pair bonds, but exhibited territoriality between groups and/or pairs. Bobcats and coyotes appeared to use avoidance mechanisms, as did coyotes and gray fox.

Habitat selection by wild turkey hens during prenesting and nesting was a function of several factors, most notably vegetation characteristics within forested stands. My findings suggest that maintaining a large proportion of the landscape in mature habitats is important. Mature pine and mixed pine-hardwood stands were important for roosting sites. The proximity of a creek or water source appeared important in determining roost site selection. Examining utilization distributions between raccoons and wild turkey hens during nesting periods indicated extensive overlap in used areas. Habitat-specific instances of utilization overlap are discussed and species-specific management recommendations regarding habitat selection are provided.

Chamberlain, M. J., and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:204–219.

BOBCAT, DIET, MISSISSIPPI

Bobcat (*Lynx rufus*) and coyotes (*Canis latrans*) are sympatric in many areas; however, this sympathy has evolved relatively recently in the southeastern United States with coyote range expansion. Where the 2 species are sympatric, habitat selection and diets of bobcats and coyotes may overlap. Knowledge of seasonal variation in prey selection is required to assess interspecific competition and understand factors facilitating co-existence between sympatric species, yet long-term (>5 years) information on sympatric diets is unavailable. We collected and analyzed 1,183 scats (591 bobcat, 592 coyote) from 1991–1997 in central Mississippi. Diet was assessed using frequency information and frequency-based correction factors to determine seasonal prey consumption. Coyote diets were dominated by white-tailed deer (*Odocoileus virginianus*), rabbits (*Sylvilagus spp.*), and fruits; whereas, bobcats consumed primarily rabbits and rodents. Deer comprised a large percentage of biomass consumed annually by both species, but was consistently higher for coyotes. Dietary overlap between the 2 carnivores varied seasonally, with lowest overlap during fall/winter. Our data suggests that bobcats may prey on mice in proportion to their availability. Coyote diets were more diverse than bobcats and, coupled with overlap estimates, suggest low interspecific competition between these sympatric species.

Chamberlain, M. J., and B. D. Leopold. 2001. Survival and cause specific mortality of adult coyotes (*Canis latrans*) in central Mississippi. American Midland Naturalist 145:414–418.

MISSISSIPPI, SURVIVAL

We examined survival and cause-specific mortality of 37 adult coyotes using radio telemetry in central Mississippi during 1993–1997. Annual survival did not differ between sexes or across years, but did among seasons. Mean survival probabilities (sexes combined) were greater during pup rearing (0.98) than breeding (0.84) or winter (0.89). Harvest by sport hunters was the most prevalent of known mortalities. Our findings indicate that southeastern coyotes have greater survival probabilities than population sin other regions due to lower harvest levels.

Chamberlain, M. J., and B. D. Leopold. 2005. Overlap in space use among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*). American Midland Naturalist 153:171–179.

BOBCAT, GRAY FOX, HOME RANGE, MISSISSIPPI

Sympatry among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*) is relatively recent in the southeastern United States given recent expansion of coyote range. Interspecific relationships among *Canids* and felids have been documented in northern latitudes. However, interactions among these three species at southern latitudes are poorly understood. We examined overlap in space use of sympatric bobcats (n = 47), coyotes (n = 37) and gray foxes (n = 27) in central Mississippi during 1993–1997. Home ranges of all three species overlapped extensively. However, gray foxes maintained core use areas that did not overlap substantially with those of bobcats and coyotes. Home range and core area overlap were similar across seasons among all species. Our findings indicate that these three species readily share space, but gray foxes apparently maintain core areas in areas void of concentrated bobcat and coyote use.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

HOME RANGE, MISSISSIPPI, MOVEMENTS, SOCIALITY, TERRITORY

Recently, coyotes (*Canis latrans*) have expanded their range to include most areas of the southeastern United States. However, most research on coyotes has been conducted in western and northern regions of North America. We radio-monitored 38 adult coyotes from 1993 to 1997 in central Mississippi. Home-range sizes (P = 0.681) and core area (area of concentrated use) sizes (P = 0.736) were similar across seasons, but females maintained larger home ranges (P = 0.006) and core areas (P < 0.001) than males. Male-male, female-female, and male-female home-range overlap was greatest during whelping and pup rearing. Except for mated pairs, core-area overlap was negligible across all seasons for adults maintaining neighboring home ranges. Coyote habitat selection varied across spatial scales, though selection was similar between males and females at all scales. Coyote movement rates differed (P < 0.001) temporally, being highest during nocturnal periods. Overall, the highest movement rates for the monitored population were observed for females during summer. Two males and 2 females were suspected of forming pair bonds and frequently traveled together within shared home ranges, as did 2 adult males. Our date indicate that interactions among individual adults are influenced by sex, as most confirmed instances of direct contact occurred between pairs or suspected social groups. In our study area, neighboring adult coyotes exhibited territoriality at the core-area level.

Chambers, R. E. 1987. Status of the coyote in the northeastern United States. Third Eastern Wildlife Damage Control Conference 3:318–319.

MANAGEMENT, POPULATION DENSITY, RANGE

This report represents a summary of information derived from responses to mail questionnaires from the state wildlife agencies in 16 northern states extending from Maine to Minnesota with minor modifications by the author where experience deemed it feasible. Coyotes-historically present in prairie regions of Minnesota, Wisconsin, Illinois, Indiana and Michigan-have extended their range eastward to the Atlantic Ocean and are now present throughout most of the northeastern states with the exception of Delaware

and the major metropolitan areas of Philadelphia and New York City. Of the eastern states only New York has suggested that their population may have arisen from original stock. Some range expansion continues in Wisconsin, Pennsylvania, Massachusetts and New Jersey. Estimated statewide populations are highest in Minnesota (40,000), Michigan (25,000), Wisconsin (14,000) and Illinois (12,500) where highest densities are 100/100 mi^2. Highest densities in the eastern portion of the region are in Maine (55/100 mi^2), New York (40/100 mi^2) and Vermont (10 family units/ 100 mi) with the highest numbers in Maine (12,000) and New York (10,000).

Chambers, R. E. 1987. Diets of Adirondack coyotes and red foxes in the central Adirondacks. Transactions of the North Eastern Section of the Wildlife Society 44:90.

DIET, RED FOX, NEW YORK

Diets of eastern coyotes (*Canis latrans,* var.) and red foxes (*Vulpes vulpes*) were based on scat collections along 35 km of roads, trails and a railroad track which traversed a 225 km^2 extensively forest region of the interior Adirondacks. Scat collections were made at regular seasonal intervals from 1975 to 1980. Results were contrasted with those obtained from the same region for coyotes from 1956–61 and red foxes in 1948. Significant changes occurred in the diets of Adirondack coyotes and red foxes between the 1950's and the 1970's. Coyote diets were dominated by white-tailed deer (73–89%) in all seasons from 1975–80 in spite of a much lower deer population during that period. A significant, but unquantified, amount of predation by coyotes on deer appeared to contribute to the increased consumption of deer. Snowshoe hare consumption by coyotes was much lower from 1975–1980 than from 1956–1961. A variety of wildlife-including foxes, ravens and eagles frequently scavenged the carcasses of coyote-killed deer. Red fox diets included less deer in winter, but larger amounts of deer in summer and fall from 1975–80 than in 1948. Red fox diets included less deer in winter, but larger amounts of deer in summer and fall from 1975–80 than in 1948. Red fox diets included a much larger amount of snowshoe hare in all seasons and lesser amounts of small mammals in spring, summer and fall from 1975–80 than in 1948. Breeding population of ravens have reestablished themselves in the Adirondacks and have increased significantly in parallel with increased coyote numbers and an apparent increase in predation on deer by coyotes.

Chambers, R. E. 1992. Reproduction of coyotes in their northeastern range. Pages 39–52 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

REPRODUCTION

Chambers, R. E. 2000. A howling success: the eastern coyote. New York State Conservationist 55:1 19–21.

DIET, GENETICS, RANGE

Chambers, S. M. 2010. A perspective on the genetic composition of eastern Coyotes. Northeastern Naturalist 17:205–210.

GENETICS, HYBRID, TAXONOMY

Way et al. (2010) define a "coywolf" population in the northeastern United States and eastern Canada that originated through hybridization between *Canis lycaon* (Eastern wolf) and *Canis latrans* (coyote), but they maintain that it is now genetically uniform and only minimally influenced by either parental species. An alternative interpretation of available data is that this northeastern coyote population is genetically diverse, substantially more coyote than eastern wolf in its genetic composition, and part of a larger population of coyotes that interbreeds with a hybrid coyote/eastern wolf population in southern Ontario and western coyotes in western New York and Pennsylvania.

Chubbs, T. E., and F. R. Phillips. 2002. First record of an eastern coyote, *Canis latrans,* in Labrador. Canadian Field Naturalist 116:127–129.

RANGE, NEWFOUNDLAND AND LABRADOR

An adult male Eastern Coyote, *Canis latrans,* trapped on 14 January 1995 along the Churchill River, is the

first record for Labrador. This record is approximately 600 km northeast of the previously accepted range limit in eastern Canada.

Chubbs, T. E., and F. R. Phillips. 2005. Evidence of range expansion of eastern coyotes, *Canis latrans,* in Labrador. Canadian Field Naturalist 119:381–384.

RANGE, NEWFOUNDLAND AND LABRADOR

Eastern coyotes were first documented in central Labrador in 1995 and have recently been recorded in costal Labrador and at three additional locations in central and western Labrador. Here we document additional records indicating range expansion and the possibility of an established population. We also examine the future management of the species in Labrador and its possible effect on this northern ecosystem.

Cox, J. J. 1997. Detection of hybridization events between the coyote, *Canis latrans,* and the domestic dog, *Canis familiaris,* using two polymorphic microsatellite loci and cranial morphometric analysis. Thesis, Morehead State University, Morehead, USA.

DOG, GENETICS, HYBRIDIZATION

Cranial morphometric and genetic DNA microsatellite analyses were utilized to determine the taxonomic status of the coyote in Kentucky, and to detect any potential hybridization events between coyotes, *Canis latrans,* and domestic dogs, *Canis familiaris.* Cranial morphometric analysis involved the employment of 19 linear cranial measurements, previously found to be discriminatory between wild and domestic *Canids,* in a discriminant function analysis utilizing Mahalanobis D2 values. One hundred and seventy-four *Canid* skulls from the United States and Canada were analyzed and subsequently used to classify 65 unknown *Canids* from Kentucky. Discriminant function analysis indicated hybridization between coyotes and domestic dogs to be 7–11%. However, only one of 28 (3.5%) wild samples indicated hybridization, thus reflecting a possible overestimation of hybridization that may incurred by a potential bias of hybrid sample retention found in institutional collections.

Tissue samples from 55 Kentucky *Canids* (31 coyotes and 24 domestic dogs) were obtained and DNA samples were isolated from *Canid* tissues and amplified using the polymerase chain reaction. Genetic analysis involved the examination of two microsatellite loci (263 and 377), previously determined to be polymorphic. Alleles were subsequently analyzed using polyacrylamide gel electrophoresis. Resultant genetic data indicate a high degree of polymorphisim and interspecific overlap of alleles between the two *Canid* species at locus 263, thus indicating a lack of utility of this locus for hybridization studies. Analysis of locus 377 revealed distinctive alleles occurring at high frequencies that show species specificity, therefore, indicating this locus' potential utility for hybridization assessment. At locus 377, four coyote-like *Canids* shared allele L with domestic dogs, however, hybridization was not confirmed by morphological data. Therefore, based on morphological and genetic data, the Kentucky *Canids* analyzed in this study are best described as *Canis latrans,* the coyote.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

DIET, ELK, HABITAT, KENTUCKY, SOCIALITY, WHITE-TAILED DEER

Elk were translocated to Kentucky from 1997–2001 as part of an effort to establish a free-ranging population within a 14-county area in the southeastern portion of the state. I monitored 104 elk released at Redbird Wildlife Management Area in the Daniel Boone National Forest from February 2000 to August 2002, documented factors that influenced their population dynamics, and examined their ecological relations with two species, the white-tailed deer, a smaller herbivore and potential competitor, and the coyote, a medium-sized *Canid* and potential predator of *Cervids* that colonized Kentucky within the past 50 years.

Reintroduced elk had annual survival rates that exceeded 75% despite the fact that 47% died 2.5 years post-release primarily from capture-related cause, meningeal worm infection, and automobile collisions. Although 5 elk dispersed distances that exceeded 70 km, elk were located on average 13.5 km from the

release site and showed release site fidelity similar to those released in an area with extensive grassy openings. Elk monitored at 3 release sites that included Redbird WMA had home ranges that ranged from 9–276 km^2. Where available, elk selected reclaimed mine habitat over others during diurnal hours, otherwise they preferred early successional forest. During crepuscular and nocturnal hours, elk used reclaimed mines and low elevation clearings. Because elk and white-tailed deer exhibited similar temporal and spatial resource use patterns, resource and parasite-mediated competition between them in some areas of the Cumberland Plateau may occur.

Coyotes in Kentucky were larger than their western counterparts and had spatial patterns that indicated they were socially organized around a male-female dyad. Coyote diet varied with the landscape they inhabited; those in forest primarily consumed medium-large mammals, and those on reclaimed mines relied more on small rodents, plants, and insects. At both study sites, coyotes consumed deer during the spring during fawning season and during the fall deer hunting season. Coyotes at Redbird scavenged a majority of the elk that died from capture myopathy up to 6 weeks post-release. Although coyotes in Kentucky will continue to opportunistically prey on *Cervid* neonates and scavenge their carcasses, it is likely they will not significantly slow elk population growth.

Cox, J. J., L. Meade, D. C. Yancy, and D. S. Maehr. 2001. The taxonomic status of wild *Canids* in Kentucky. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 55:408–417.

DOG, HYBRID, KENTUCKY, TAXONOMY

We assessed taxonomic status of wild *Canids* in Kentucky using 13 cranial measurements on 143 known *Canid* skulls in a multivariate statistical procedure to classify 56 unknown *Canids* skulls from Kentucky. Discriminant function analyses revealed complete separation of *Canid* taxa between coyotes and dogs, although coyote-dog hybrids had significant overlap with coyotes. Hybridization between coyotes and dogs in Kentucky occurred in less than 10% of unidentified *Canids.* Our findings suggest that wild *Canids* in Kentucky are best classified as coyotes, *Canis latrans.*

Crawford, B. A. 1992. Coyotes in Great Smoky Mountains National Park: evaluation of methods to monitor relative abundance, movement ecology, and habitat use. Thesis, University of Tennessee, Knoxville, USA.

HABITAT, HOME RANGE, MOVEMENTS, TENNESSEE

Scent stations, passive hair-snaggers and howl surveys were evaluated as possible survey methods for monitoring relative abundance of coyotes (*Canis latrans*) in Great Smoky Mountains National Park (GSMNP) from January 1990 to April 1991. Scent stations (n = 198), passive hair-snaggers (n = 70), and howl surveys (n = 197) produced one (0.5%), zero (0.0%), and 35 (17.8%) coyote responses, respectively. Scent stations and hair-snaggers proved ineffective for monitoring coyotes at current population levels. Howl surveys elicited responses from approximately 21 coyotes at 12 locations indicating the feasibility of designing and implementing a standardized survey to monitor the relative abundance of coyotes over time or from area to area. Howl surveys indicated that Cades Cove has about twice the density of coyotes as other areas surveyed in GSMNP. Preliminary estimates from three indices of relative abundance ranged from 1 coyote/12.9 km^2 to 1 coyote/39.7 km^2. Wildlife managers and researchers must accept a wide margin of error if surveys of relative abundance are used for coyotes and other wide ranging carnivores in the southern Appalachians. Six coyotes were captured, radio-collared and monitored by radio telemetry in GSMNP from March 1990 to March 1991 to determine seasonal and composite movement ecology. A year of movement data was collected for 3 subadult male coyotes. Average annual home range for coyotes (n = 3) with more than 100 locations was 122.9 km^2 (range 25.4 km^2 to 230 km^2) using the modified minimum area polygon method of analysis. Largest seasonal movements (56.1 km^2 and 152.44 km^2) were during the pup rearing season. However, these two yearling males were unmated and probably ranged more than mated males during this season. Greatest dispersal distance recorded was 46.7 km and greatest recorded distance moved in 24 hours was 33.5 km.

A chi-square test indicated that two coyotes apparently more frequently selected open areas, mixed hardwood, oak/pine, and pine cover types when active. However, one coyote did not appear to select one cover type

when active or inactive. Most coyote locations were in pine (38.9%), xeric oak (24.5%), and treeless (16.1%) areas. Chi-square tests indicated that no seasonal preference was detected for two coyotes. However, one coyote apparently more frequently selected mixed hardwood cover type during the breeding season and oak/pine and pine forest types during the gestation period. Coyotes 2 and 3 were active and located more times than expected in flat areas and resting on northern, southern, and western aspects. Coyote 4 used all aspects equally when active and inactive. A high percentage of locations (95%, 89%, and 83%) for coyotes 2, 3 and 4, respectively, were below 700 m. The high percentages of locations in lower elevations may be attributed to the cove landscapes surrounding GSMNP and the selection of these coves by coyotes 2 and 4 outside of GSMNP.

Crawford, B. A., M. R. Pelton, and K. G. Johnson. 1993. Techniques to monitor relative abundance of coyotes in east Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies 47:62–70.

POPULATION DENSITY, TENNESSEE

Scent stations, passive hair-snaggers and howl surveys were evaluated as possible survey methods for monitoring relative abundance of coyotes (*Canis latrans*) in Great Smoky Mountains National Park (GSMNP) prior to the reintroduction of red wolves (*Canis rufus*) from January 1990 to April 1991. Scent station nights (n = 198), passive hair-snaggers (n = 70), and howl surveys (n = 197) produced 1 (0.5%), 0 (0.0%), and 35 (17.8%) coyote responses, respectively. Scent stations and hair-snaggers proved ineffective for monitoring coyotes at current population levels. Howl surveys elicited responses from approximately 21 coyotes at 12 locations indicating the feasibility of designing and implementing a standardized survey to monitor the relative abundance of coyotes over time or from area to area. Twenty-seven responses were elicited from coyotes in the Cades Cove section of GSMNP for a coyote index of 22.9% and 8 responses from coyotes outside Cades Cove for a coyote index of 10.1%. Preliminary estimates from 2 indices of relative coyote abundance ranged from 1/13.2 km^2 to 1/39.7 km^2. Wildlife managers and researchers must accept a wide margin of error if surveys of relative abundance are used for coyotes and other wide ranging carnivores in the southern Appalachians.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

CARIBOU, PREDATION, QUEBEC, RANGE

The autumn calf:cow ratio of a remnant caribou herd in Gaspesie Park, Quebec, declined from ~ 20–30 calves per 100 females in 1984–1985 to only four in 1987, after coyotes colonized the area. Twenty adult female caribou were radio-tagged in November of the same year, and examination of blood samples and vaginal swabs did not detect diseases likely to affect fecundity. The following spring 13 of 19 (68%) radio-collared caribou were observed to be followed by a calf at the time of parturition, but only one neonate survived until the following autumn. In 1989 and 1990, 25 radio-tagged calves were monitored and 16 of them died in the course of the summer. Likely cause of death was determined for 11 cases and suggested that coyotes were responsible for 7 deaths, black bears for 3 and golden eagle for 1. The mortality rate of neonates was higher for the caribou group inhabiting the eastern portion of the park than for the other group that used the centre of the park. Calves surviving until autumn exhibited low mortality during their first winter of live: 8 of 9 survived this season during three winters. Between 1987 and 1992, annual survival of adults exceeded 0.90 on average; most deaths occurred during the harsh winter of 1990–1991, and coyote predation was possible in a maximum of two of six cases. Predators were reduced in the park and surroundings between 1990 and 1992 in order to improve calf survival. Recruitment was sufficient to replace mortality after 1988 for the caribou group occupying the centre of the park, but it remained at about 10 calves:100 females until 1992 for the group inhabiting the eastern part of the park, at which time calf survival finally improved.

Crête, M., and S. Larivière. 2003. Estimating the costs of locomotion in snow for coyotes. Canadian Journal of Zoology 81:1808–1814.

MORPHOLOGY

Carnivores living in areas of deep snow face additional energy expenditures during winter owing to increased locomotory costs. Such costs may vary in function of snow depth and hardness (sinking depth of animal) and travel speed. We estimated energetic costs of locomotion through snow in wild coyotes (*Canis latrans*) using three coyote-sized domestic dogs (*Canis familiaris*) to develop regression models predicting hear rate (as surrogate for energy expenditure) in relation to sinking depth and travel speed. In the absence of snow, heat rates for dogs increased linearly with travel speed (R^2 = 0.24), whereas when snow was present, track sinking depth affected heat rate substantially more than did travel speed. To assess whether our results with domestic dogs could help explain the behavior of wild coyotes, we snow-tracked coyotes in southeastern Quebec, Canada, during two winters. During a normal harsh winter, coyotes relied on artificially packed snow (snowmobile and animal trails) more than during a mild winter. Coyotes typically exerted a fine-scale selection for snow depth and hardness that effectively reduced their sinking depth by ~2 cm. We estimated that travelling over snow increased coyote heat rate by 4%–6% in comparison with locomotion on hard surfaces, whereas fine-scale selection saved a similar amount of extra energy. We hypothesize that the use of snow packed by anthropogenic activities, especially snowmobile trails, may not only facilitate coyote movements in deep snow environments but also allow occupation of marginal habitats such as forested areas of northeastern North America.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

AGE STRUCTURE, DIET, POPULATION DENSITY, POPULATION DYNAMICS, QUEBEC, SURVIVAL

The coyote (*Canis latrans*) was first reported on the Gaspe Peninsula in the mid 1970s and became common in the following decade. White-tailed deer (*Odocoileus virginianus*), a major prey of coyote in the Northeast in winter, increased in numbers between the late 1970's and the mid 1980's at a rate of increase (λ) 1.21, due in part to mild winters. Deer harvest crashed between 1986 and 1991, during a series of harsh winters, and coyotes were suspected to have precipitated the decline. We studied coyote demography between 1988 and 1993—most intensively during the last 3 years. The age structure of coyotes captured in 1990–1991 was skewed to older animals, suggesting that survival was high during the colonization stage. Annual survival rate of 14 adult coyotes averaged 50% between 1991 and 1993. Most deaths were human-caused. Coyote fecundity was low on the Gaspe Peninsula and its maximum λ probably ranged between 1.68–2.02. Given the survival rate observed in 1991–1993 and low fecundity, the coyote population was probably on the decline, with an estimated rate of 70%. Summer feeding habits were compared between 1988, when coyote density was apparently increasing and 1991 when it was decreasing. Marmot (*Marmota monax*), white-tailed deer and herbs decreased in importance as coyote food between the 2 years, and were replaced by snowshoe hare (*Lepus americanus*), moose (*Alces alces*) and other mammals. Fruits made up more than 60% of the diet in July and August. Few winter samples collected contained hare, moose and porcupine (*Erithizon drosuium*) hairs, while in contrast, coyotes frequently a deer-wintering area are almost exclusively deer. We pose the hypothesis that the increased coyote mortality in recent years was related to the rarity of deer in winter that forced coyotes to risk exploiting food sources associated with humans, such as trappers' baits. We also hypothesize that the low fecundity of coyotes was attributable to difficulties in obtaining enough food in summer. The boreal forest of southeastern Quebec may be a poor habitat for coyotes but we believe that coyotes can subsist on the peninsula because some source habitats remain available.

Crête, M., J.-P. Ouellet, J.-P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

HABITAT, HOME RANGE, MOVEMENTS, QUEBEC, SURVIVAL

We compared rural and forest coyotes in northeastern North America under the hypothesis that the forest landscape represents a marginal habitat for this species. We predicted that forest coyotes would have larger home ranges and higher rates of mortality and/

or emigration than rural coyotes. We also predicted that coyotes would select for open habitats in both landscapes throughout the year, and would not follow white-tailed deer in their migration to wintering areas. Forest (n = 14) and rural (n = 10) coyotes foraged over 89 and 27 km^2, respectively, during the trapping season (18 October—1 March), and over 111 and 48 km^2 during the rest of the year. Annual survival rate did not vary significantly (P = 0.34) between adult forest and rural coyotes, averaging 74% and 60%, respectively; pups died at a higher rate in both landscapes (P < 0.01). All monitored coyotes died from anthropogenic factors, mostly from trapping. Forest coyotes exhibited a tendency to disperse and to make forays into the rural landscape where some died. We detected no selection for open habitats irrespective of season or landscape, nor did coyotes show a strong preference for deer wintering areas. However, coyotes with deer wintering areas in their home ranges intensified their use of these areas when deer concentrated in them between December and April. We conclude that the forest landscape of northeastern North America possess a low carrying capacity for coyotes even in the absence of wolves. We also conclude that eastern coyotes cannot replace gray wolves in this biome, and we speculate on the consequences of the arrival of this new predator for the conservation of other meso-carnivores.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

DIET, HABITAT, HOME RANGE, KENTUCKY, MOVEMENTS, RED FOX

In Kentucky, no studies have been undertaken concerning interspecific relationships of red foxes and coyotes occurring in sympatry. The objectives of this study were to provide comparative information concerning home range size, spatial arrangements, habitat use, activity patterns, and winter food habits of red foxes and coyotes in northwest Madison County, central Kentucky.

Eight radio-collared red foxes and three radio-collared coyotes were located via radio-telemetry for 12–18 months from January 1987 to June 1988. Composite 95% home ranges for coyotes (x = 179 ha, n = 761 locations) was 5X that of red foxes (x = 314 ha, n = 596 locations). Spatial separation of red foxes and coyotes was most prominent during the pup rearing season and least prominent during dispersal, breeding and gestation seasons. Red foxes avoided the central portion of an established adult coyote group's home range, whereas several red fox home ranges were completely overlapped by an unattached juvenile coyote during the breeding and gestation seasons. Coyotes tended to use the interspecific overlap areas as much as or greater than expected, and red foxes tended to avoid the area or use it as expected.

Habitat selection was almost identical in types and proportions between the two species, but varied significantly between the species during each of the four seasons. Red foxes used hay fields and edge significantly more than coyotes during the pup rearing season, while coyotes used deciduous forest more than foxes. Coyotes used hay fields more and edge less than red foxes during the breeding season. During the gestation season red foxes used conifers more than coyotes. Habitat was not used in proportion to its availability by either species. Deciduous forest and pastures were the 2nd and 3rd most used habitat types for both species, with coyotes using deciduous forests more than expected and pastures less than expected. Although red foxes did not use habitat in proportion to its availability, no particular habitat type was used different than expected according to Bonferroni confidence intervals.

Activity patterns, as determined by distance moved per one-hour tracking interval, were similar during the night for coyotes and red foxes, with coyotes moving significantly greater distances during the day. The percentage of active radio-locations indicated that red foxes and coyotes were active at similar times with both species being primarily active at night.

Winter food habits as determined from the stomachs of red foxes (n = 83) and coyotes (n = 66) were similar between the two species, with a Horn's Similarity Index value of 0.81. Coyotes consumed a small variety of relatively large prey items, each item occurring at high frequencies in the stomachs, whereas red foxes ingested a large variety of small prey items, each occurring at lower frequencies in stomachs. The major species identified in the winter diets of red foxes and

coyotes were small mammals (*Crictidae, Soricidae, Zapodidae*) (76% of red foxes, 57% of coyotes) and cottontail rabbit (*Sylvilagus floridanus*) (18% of red foxes, 22% of coyotes). Cattle (*Bos bos*) were a major diet item for coyotes but not for red foxes (28% and 8%, respectively).

Crossett III, R. L., and C. L. Elliott. 1991. Winter food habits of red foxes and coyotes in central Kentucky. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies 45:97–103.

DIET, KENTUCKY, RED FOX

Carcasses of 60 coyotes (*Canis latrans*) and 72 red foxes (*Vulpes vulpes*) were collected from November 1986 to February 1987 in the Bluegrass and Knobs region of central Kentucky. Stomach content analysis revealed that diets were similar between the 2 species, with a Horn's index overlap = 0.81. Coyotes consumed a small variety of relatively large prey items (i.e., items occurred at high frequencies in the stomachs); whereas red foxes ingested a large variety of small prey items. Major dietary items were small mammals (76% of red fox diets, 57% of coyote's) and cottontail rabbit (18% of red fox's, 22% of coyote's). Cattle were a major diet item for coyotes but not for red foxes (28% and 8%, respectively).

Cunningham, V. C., and R. D. Dunford. 1970. Recent coyote record from Florida. Quarterly Journal of the Florida Academy of Sciences 33:279–280.

FLORIDA, RANGE

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

CONFLICT, HUMAN DIMENSIONS, NEW YORK, RESEARCH NEEDS, URBAN

Several factors may be responsible for increasing predator abundance in suburbia. These include an enhanced forage base associate with residential sprawl, and protection of predator species that were once persecuted and suppressed by hunters, trappers, and landowners. In the northeast, anecdotal reports of coyotes (*Canis latrans*) killing pets in backyards are on the rise. The bulk of coyote complaints, concerns, and questions received from the public state wildlife agencies are from areas with high human populations. Scant research exists on coyote behavioral ecology in human-altered landscapes. Biologists and managers need to understand changes in the social structure and territorial behavior of coyotes. It is important to know when a predator is active and where it forages, especially in relation to human activity. The emerging picture of suburban coyotes is that they move quickly over long distances through human-dominated landscapes, foraging opportunistically. Data concerning birth rates and survivorship are needed to model future population growth. Reliable and cost-effective census techniques are currently lacking. The impact of growing and more visible coyote populations on deer abundance is a concern in some areas. Studying coyotes in residential area swill provide baseline data for public education program to reduce human behaviors that may increase coyote conflicts.

Cypher, B. L. 1993. Food item use by three sympatric *Canids* in southern Illinois. Transactions of the Illinois State Academy of Science 86:139–144.

DIET, GRAY FOX, ILLINOIS, RED FOX

I investigated use of food resources among coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), and gray foxes (*Urocyon cinereoargenteus*) in southern Illinois. All three species used similar food items; coyote and red fox diets were most similar while coyote and gray fox diets were least similar. Gray fox diets also exhibited greater diversity and omnivory. The high overlap among species results in the potential for resource competition. Competition with coyotes may have reduced red fox abundance in southern Illinois. Despite competition for food resources, gray foxes appear able to coexist with coyotes possibly through habitat segregation and avoidance of antagonistic encounters by climbing trees.

Cypher, B. L. 1993. Food item use by coyote pups at Crab Orchard National Wildlife Refuge, Illinois. Transactions of the Illinois State Academy of Science 86:133–137.

DIET, ILLINOIS, JUVENILE

Use of food items by coyote (*Canis latrans*) pups at a den site in Crab Orchard National Wildlife Refuge, Illinois, was examined in June 1986. Fawn white-tailed deer (*Odocoileus virginianus*) was the most frequently occurring item (85.9%) in pup scats. In contrast, small mammal was the most frequently occurring item (58.1%) in adult coyote scats, but was found in only one pup scat. Additionally, adults used a greater diversity of food items. Adult coyotes appear to selectively bring food items to pups. Fawns probably constituted an energetically efficient item for feeding pups due to relatively large size, digestibility and availability.

Cypher, B. L., A. Woolf, and D. C. Yancy. 1993. Summer food habits of coyotes at Union County Conservation Area, Illinois. Transactions of the Illinois State Academy of Science 86:145–152.

DIET, ILLINOIS

Summer food item use by coyotes (*Canis latrans*) was investigated at Union County Conservation Area (UCCA), Illinois, during 1984–86 to determine if item use differed among years and months, and to determine whether coyote food habits in this bottomland habitat differed from those in nearby upland habitats. Item use differed among years ($P < 0.01$) and months $P < 0.01$). Small rodents (primary *Microtines*), birds, June beetles (*Phyllophaga spp.*), white-tailed deer fawns (*Odocoileus virginianus*), and rabbits (*Sylvilagus spp.*) were the most frequently occurring items in coyote scats. Use of rabbits and fleshy fruits was relatively low and consumption of birds and muskrats (*Ondatra zibethecus*) was high compared to nearby upland habitats. Patterns of food item use by coyotes likely reflect annual, monthly, and habitat-specific item availability.

Daine, K. 1989. Cranial variations and skull suture obliterations as related to age in the coyote (*Canis latrans*). Thesis, Eastern Illinois University, Charleston, USA.

AGE STRUCTURE, ILLINOIS, MORPHOLOGY

Three criteria, skull size, development of the postorbital process, and cranial suture obliteration were examined to evaluate their effectiveness as possible age indicators in the coyote (*Canis latrans*). Two collections of coyote skulls were evaluated. The first was 130 skulls of known age, from Utah, which were used to compare the above characteristics to the age of the animal. The second was 151 Illinois Department of Conservation (DOC) skulls of unknown age, which were used in conjunction with the known observer and inter-observer subjectivity in the classification of suture obliterations.

Cranial measurements revealed male skulls where significantly larger ($P < 0.05$), than females. Skull sizes differed significantly between the two populations, with Illinois male skulls being larger ($P < 0.05$), than Utah males in all measurements, and Illinois females being larger ($P < 0.05$), than Utah females only in mastoid width. Known age females did not differ significantly with age, but three measurements were found significantly different ($P < 0.05$), in known age males with respect to age. The postorbital process in the know age coyote skulls revealed some change in shape from rounded to pointed. The rounded condition was only observed in some animals under 6 years of age. Therefore, no specific age estimations could be made from this criterion. Examination of 19 cranial sutures in the known age skulls revealed only six with age related patterns of closure. Due to the varying degree of closure found in these six sutures, the skulls could only be placed in very broad age classes, rendering the value of suture obliteration unsatisfactory in determining the age of coyotes. The subjectivity encountered in this study was found higher among different workers than between multiple observations by one worker.

Davidson, W. R., M. J. Appel, G. L. Doster, O. E. Baker, and J. F. Brown. 1992. Diseases and parasites from commercial sources selling to fox-chasing enclosures. Journal of Wildlife Disease 28:581–589.

DISEASE, RED FOX, GRAY FOX

Fifty-six red fox (*Vulpes vulpes*), 18 gray foxes (*Urocyon cinereoargenteus*), and 13 coyotes (*Canis latrans*) obtained by the South Carolina Wildlife and Marine Resources Department during an investigation of suspected illegal wildlife translocation were examined for diseases and parasites. Red foxes and coyotes were confiscated from an animal dealer based in Ohio, and

gray foxes were purchased from an animal dealer in Indiana. Emphasis was placed on detection of pathogens representing potential health risks to native wildlife, domestic animals, or humans. All animals were negative for rabies; however, 15 gray foxes were incubating canine distemper at necropsy. Serologic tests disclosed antibodies to canine Parvovirus, canine distemper virus, canine adenovirus, canine coronavirus, canine herpesvirus, and canine parainfluenza virus in one or more host species. Twenty-three species of parasites (two protozoans, three trematodes, four cestodes, eleven nematodes, and three arthropods) were found, including species with substantial pathogenic capabilities. *Echinococcus multilocularis,* a recognized human pathogen not enzootic in the southeastern Untied States, was found in red foxes. Based on this information we conclude that the increasingly common practice of wild *Canid* translocation for stocking fox chasing enclosures poses potential heath risks to indigenous wildlife, domestic animals, and humans, and, therefore, is biologically hazardous.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

BEHAVIOR, CONFLICT, DAMAGE, LIVESTOCK, MANAGEMENT, MICHIGAN

Several forms of nonlethal management exist, but field testing is problematic, and few such techniques have been tested on free-ranging wolves (*Canis lupus*) or other predators. We tested fladry in the eastern Upper Peninsula of Michigan during the summers of 2004 and 2005 on treatment farms and control farms. Wolf visitation inside pastures, compared to those outside pastures, was less on fladry-protected farms ($U = 45$, $n = 7$, $P = 0.004$); whereas, we found no difference in wolf visitation inside and outside of pastures on control farms ($U = 30$, $n = 7$, $P = 0.24$). We found no difference in coyote (*Canis latrans*) visitation inside and outside of pastures on both treatment ($U = 29.5$, $n = 7$, $P = 0.26$) and control farms ($U = 31.5$, $n = 7$, $P = 0.19$). In our study, fladry deterred wolves from using livestock areas. Fladry was not effective for coyotes. Fladry may provide livestock owners and management agencies a temporarily effective, nonlethal management tool for reducing wolf-caused depredation of livestock; however, labor and equipment costs can be substantial.

Debow, T. M., W. D. Webster, and P. W. Sumner. 1998. Range expansion of the coyote, *Canis latrans* (Carnivora: *Canid*ae), into North Carolina; with comments on some management implications. Journal of the Elisha Mitchell Scientific Society 114:113–118.

RANGE, NORTH CAROLINA

The coyote, *Canis latrans* Say, has recently expanded its geographic distribution eastward across the lower Mississippi River Valley and into the southeastern United States. This investigation documents its movement into North Carolina. Records indicate that the coyote fully occupies the state, although it has not reached its carrying capacity in many parts of North Carolina. Its range expansion in North Carolina has been rapid because it entered the state from several directions and because of deliberate and accidental releases.

Decker, T. A., W. M. Healy, and S. A. Williams. 1992. Survival of white-tailed deer fawns in western Massachusetts. Northeast Wildlife 49:28–35.

WHITE-TAILED DEER, MASSACHUSETTS, PREDATION

We studied the survival of white-tailed deer (*Odocoileus virginianus*) fawns to improve population models and to evaluate effects of predation on the deer heard in western Massachusetts. We radio-tracked 37 fawns over a 3-year period. Overall fawn survival rate to 180-days of age was 0.76. Mortality of 7 fawns was due to coyotes (*Canis latrans*) (2), bobcats (*Felis rufus*) (1), domestic dogs (1), unidentified predators (1), poaching (1), and disease (1). Cause specific mortality rates ranged from 0.027 to 0.058 and did not differ significantly among causes. Observed survival rates agreed with those calculated using a population model based on harvest data. Survival rates suggest that predation on fawns is having little effect on this herd.

Dennis, D. L. 2010. Genetic analysis of dispersal and population dynamics of the southeastern coyote (*Canis latrans*). Thesis, Auburn University, Auburn, USA.

GENETICS, MOVEMENTS, POPULATION DYNAMICS

Two different types of genetic analyses, phylogeography and population genetics, were completed on coyotes (*Canis latrans*) across the Central Plains, Midwestern, and Southeastern United States. The first goal of this study was to infer historical dispersal patterns out of the presumed historical ranges of the Great Plains into the eastern U. S. Phylogeographic analyses using the control region of the mitochondrial genome, including a maximum likelihood tree and median-joining network, in addition to genetic diversity and differentiation indices were employed. The second goal of this study was to assess population structure of coyotes in order to identify possible management units of coyotes in Alabama. We examined patterns of gene flow of coyotes both within a 100 km radius of the Auburn/Opelika Metropolitan Statistical Area and across an urban to rural gradient created in ArcGIS using microsatellite DNA markers.

Dibello, F. J., S. M. Arthur, and W. B. Krohn. 1990. Food habits of sympatric coyotes, *Canis latrans,* red fox, *Vulpes vulpes,* and bobcats, *Lynx rufus,* in Maine. Canadian Field Naturalist 104:403–408.

BOBCAT, DIET, RED FOX, MAINE

We studied food habits of coyotes (*Canis latrans*), red foxes (*Vulpes vulpes*), and bobcats (*Lynx rufus*), by determining percent occurrence of prey remains in scats collected in two regions of Maine during 1979–1983. Snowshoe hare (*Lepus americanus*) was a major food of all three predators. White-tailed deer (*Odocoileus virginianus*) was commonly eaten by coyotes and bobcats in winter, and use of deer corresponded with winter severity. Mice (*Peromyscus spp.* and *Napaeozapus insignis*), voles (*Clethrionomys gapperi* and *Microtus pennsylvanicus*), and shrews (*Blarina brevicauda* and *Sorex spp.*) were more common in red fox scats and absent from bobcat scats. The prevalence of hare in all three diets suggests that inter-specific competition might occur, especially when hares are scarce. Such competition is likely to be most severe for bobcats, because they showed the greatest reliance on a single food (hares).

Dice, L. R. 1942. A family of dog-coyote hybrids. Journal of Mammalogy:186–192.

DOG, HYBRID

Dumond, M., and M. A. Villard. 2000. Demography and body condition of coyotes (*Canis latrans*) in eastern New Brunswick. Canadian Journal of Zoology 78:399–406.

AGE STRUCTURE, MORPHOLOGY, NEW BRUNSWICK, SEX RATIO

We documented the demography and body condition of coyotes (*Canis latrans*), using 77 carcasses collected in late fall and winter (1995–1996 and 1996–1997) during an increase in snowshoe hare (*Lepus americanus*) density in eastern New Brunswick. We compared body condition at the beginning (November–January) and end of winter (February–March) in relation to breeding status. Physical characteristics of coyotes were similar to those reported elsewhere in the northeastern portion of its range. The sex ratio did not differ significantly from 1:1. The population was unusually old (5.6 ± 0.4 years of age (mean ± SE)). The parturition rate was low (40.9% in adult females), and placental scars were present only in females >5 years old (6.6 ± 0.6 scars per female). There was no significant decrease in the body condition of adult females over the winter but the body mass of those females with placental scars tended to decrease over the winter (P = 0.012). Also during November-January, reproductive females (with placental scars) were significantly heavier (P = 0.007) than non-reproductive adult females (without placental scars). Our results suggest that in the coyote populations in eastern New Brunswick, breeding status and reproductive costs should be taken into account in future studies of demography and body condition. Also, the low level of coyote exploitation by humans may be responsible for the old age structure of the population and the low parturition rate. The exploitation level should be considered when analyzing coyote socio-demographic data.

Dumond, M., M. A. Villard, and E. Tremblay. 2001. Does coyote diet vary seasonally between a protected and an unprotected forest landscape? Ecoscience 8:301–310.

DIET, HABITAT, HUMAN DIMENSIONS, NEW BRUNSWICK

In forested areas of the northern portion of their range, coyote (*Canis latrans*) populations are thought to depend mainly on areas disturbed by humans. Within a forested landscape, we analyzed scat contents to study seasonal variations in coyote diet, from January to December 1996, between a protected area (Kouchibouguac National Park, New Brunswick, n = 311) and an adjacent unprotected area (n = 364). Coyote diet changed significantly between May-July and August-September in both areas, and between October-December and January-April in the protected area. From January to July, the proportion of snowshoe hare (*Lepus americanus*) in coyote diet was significantly higher in the unprotected area than in the protected area, but no other items differed between areas. Diet also differed between the two areas during August-December. In the protected area, the proportion of mammals in the diet was significantly lower, while the proportions of fruits and insects were significantly higher. Diet diversity was maximum during August-September in both areas. During January-April, diet diversity was higher in the protected area. Our results suggest that during winter, human-induced habitat alterations increase snowshoe hare vulnerability to coyotes and thus favor coyote populations. However, during summer, human persecution seems to reduce the daylight activity of coyotes and limits their use of open habitats, thereby limiting their consumption of fruits and insects. We suggest that the levels and type of human disturbance could have important implications for coyote foraging behavior and might be a confounding factor for temporal or spatial comparisons of coyote diet.

Draheim, M. 2007. Who's afraid of the big, bad coyote?: a survey of messaging and existing attitudes in the national capital region. Thesis, George Mason University, Fairfax, USA.

HUMAN DIMENSIONS, URBAN

Coyotes are relatively recent arrivals to the Washington, D.C. metropolitan area. In an effort to understand and obtain baseline data about existing attitudes, a survey was conducted in 2006. Most respondents had neutral attitudes towards coyotes, which might be in part due to low levels of awareness about their presence in the area. Of particular interest, pet owners seemed to have more extreme attitudes, either positively or negatively, towards coyotes, and women tended to have more negative attitudes towards coyotes. Wildlife managers and others interested in preventing and reducing human-coyote conflict should capitalize on the current situation and develop outreach programs that will teach people how to live near coyotes as well as engender positive attitudes towards them. The survey also looked at the effect that small pieces of information in various categories (coyote behavior and ecology, human-coyote interactions, and images of coyotes) had on attitudes. Statements about coyote behavior, especially those that emphasized the social aspects of their lives, proved to be the most effective in increasing positive attitudes. Amongst other findings, statements about attempts to eradicate coyotes were viewed negatively and some traditional images associated with coyotes (especially coyote howling) were also viewed negatively. This information will be useful to wildlife managers and others interested in designing outreach materials.

Draheim, M. M., L. L. Rockwood, G. Guagnano, E. C. M. Parsons. 2011. The impact of information on students' beliefs and attitudes toward coyotes. Human Dimensions of Wildlife 16:67–72.

HUMAN DIMENSIONS, URBAN

Providing information to the public about a species can impact the public's attitudes toward that species. Overall, providing information in any of four categories of information about coyotes positively influenced attitudes toward coytes using six attitudinal measurements ($P < .01$). Behavior statements most positively influenced attitudes, followed by images of coyotes, statements about humans and coyotes, and statements about coyote ecology. How well specific pieces of information were received is also discussed.

Dunatchik, D. D. 1967. The helminth parasites of Michigan coyotes. Thesis, University of Michigan, Ann Arbor, USA.

DISEASE, MICHIGAN

Eastman, S. A. 2000. Home ranges and diseases of coyotes (*Canis latrans*) in northwestern New Jersey and northeastern Pennsylvania. Thesis, East Stroudsburg University, East Stroudsburg, USA.

DISEASE, HOME RANGE, NEW JERSEY, PENNSYLVANIA

In Warren County, New Jersey, 4 radio-collared coyotes (*Canis latrans*), two males and two females, were tracked for a 12 month period to determine home ranges. Using 95% minimum convex polygon, the home ranges for the two males were 13.5 km^2 and 9.9 km^2. the two females had home ranges of 6.4 km^2 and 10.4 km^2. Twenty-two road-killed and trapped coyotes from the entire state of New Jersey and Northampton County, Pennsylvania, were examined for sarcoptic mange, heartworm (*Dirofilaria immitis*), and tapeworm. Forty-three percent of the coyotes from New Jersey had sarcoptic mange, 42% had tapeworm, and 23% had heartworm. None of the Pennsylvania coyotes had heartworm, and 25% had tapeworm. Pennsylvania coyotes were not examined for sarcoptic mange.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

BOBCATS, DIET, HABITAT USE, HOME RANGE, GRAY FOX, MISSISSIPPI, MOVEMENTS

Little is known about ecological relationships among sympatric bobcats, coyotes and gray fox. Therefore, 22 bobcats (9 males and 13 females), 19 coyotes (11 males and 8 females), and 8 gray fox (3 males and 5 females) were radio-monitored from July 1993–July 1995 to investigate movement and activity patterns, home range, habitat use, diet and interaction on Tallahala Wildlife Management Area, Bienville National Forest, Mississippi. Findings of this study present wildlife managers with a better understanding of how these sympatric predators interact and coexist.

Motion-sensitive transmitters were used to determine activity patterns of predators. Although some statistical differences were detected, activity patterns of these predators were similar throughout the diel period. Predators were most active during crepuscular and night periods. On average, bobcats were more active ($\bar{x}$ = 0.57% of locations) than coyotes ($\bar{x}$ = 0.51), and coyotes were more active than gray fox ($\bar{x}$ = 0.44).

Movement rates were determined by dividing the straight-line distance by the time interval between consecutive locations. Movement patterns of these predators were similar throughout the diel period with greatest movement rates occurring during crepuscular and night periods, and lowest during mid-day. On average, coyotes moved at a greater rate ($\bar{x}$ = 0.45 km/hr) than bobcats ($\bar{x}$ = 0.34 km/hr), and bobcats moved at a greater rate than gray fox ($\bar{x}$ = 0.20 km/hr). Mean movement rate for all predators was highest during winter. Abiotic factors did not significantly affect predator movement ($P > 0.05$).

Male bobcat home ranges ($\bar{x}$ = 674 ha) were larger than female ($\bar{x}$ = 427 ha). Female coyote home ranges ($\bar{x}$ = 1,122 ha) were larger than male ($\bar{x}$ = 744 ha). No differences were observed between male gray fox home ranges ($\bar{x}$ = 124 ha) and female ranges ($\bar{x}$ = 163 ha). Considerable intra- and interspecific home range overlap was observed throughout this study. Habitat use patterns were similar among these predators. Early successional habitats were preferred by all species. However, some habitat partitioning was observed among species.

Mammals, particularly cottonrat, mice, rabbit, and white-tailed deer, were important food items for bobcats and coyotes. However, percentage occurrence of cottonrats and mice was higher in bobcat diets than coyote. Conversely, percentage occurrence of white-tailed deer was higher in coyote diets than bobcat.

No positive dynamic interaction was observed between any sympatric species. Additionally, no dynamic interaction was observed between bobcats. However, positive dynamic interaction was observed among radio-monitored coyotes and gray fox.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of *Canids* from Missouri. Journal of Mammalogy 58:17–24.

DOG, GRAY WOLF, MORPHOLOGY, RED WOLF, TAXONOMY

Skulls of 30 dogs (*Canis familiaris*), 29 coyotes (*Canis latrans*), 18 gray wolves (*Canis lupus*), 27 red wolves (*Canis rufus*), and 20 *Canids* of doubtful taxonomic position were measured in 14 dimensions. Multivariate analysis showed complete separation of coyote, dog, gray wolf, and red wolf. Several unknowns fell within the parameters; others fell between and indicate hybridization. Apparent infusion of red wolf genes into the coyote population was occurring in the 1940's and 1950's as the red wolf was being exterminated in Missouri. Five of seven animals with red wolf genes were either black or associated with black animals.

Engelhardt, D. B. 1986. Analysis of red fox and coyote home range use in relation to artificial scent marks. Thesis, University of Maine, Orono, USA.

HOME RANGE, MAINE, RED FOX

The range expansion of coyotes (*Canis latrans*) into Maine caused concern among biologists and trappers about the possibility of negative effects on the red fox (*Vulpes vulpes*) population. Researchers in Maine and elsewhere found evidence of spatial segregation between the two species, suggesting avoidance of coyote-occupied areas by red foxes. Scent marking has been associated with territorial maintenance in both species. The purpose of this study was to determine whether scent (urine) marking is the cue that stimulates avoidance of coyotes by red foxes.

A series of 7 experimental scent-mark trials was conducted. In the first phase of each trial the home range of a radiocollared red fox or coyote was determined by intensive telemetry. In phase 2, water was distributed throughout the home range to test whether human presence would interfere with the subject's movements. In phase 3, artificial scent marks of coyote or red fox urine were place din the home range.

The telemetry data for each trial were analyzed to test the general null hypothesis that home range use did not change among phases. First, a clustering program assigned each location to a particular region in the home range. (Regions refer to intensively-used core areas and extensively-used foraging areas). The area, center of activity, and usage of each region were then compared among phases. Following rejection of the general null hypothesis, a specific hypothesis was tested comparing the observed home range changes with those expected for a particular reaction to the experimental scent.

Home range use changed significantly in all 7 completed trails. Regional centers of activity changed location in at least 78.2% of all between-phase comparisons, and usage of the regions was dependent upon treatment. However, the changes could only be correlated with presence of the scent in 2 trials where adult male conspecific urine was applied to the home range of a female yearling subject. In 4 trials where coyote urine was applied to red fox home ranges, the home range changes could not be attributed to presence of the scent. In conclusion, coyote scent marks alone are insufficient to stimulate an avoidance reaction by red foxes.

Any area of suitable habitat not being intensively used by coyotes can probably be used by red foxes. Red foxes can also use smaller areas of habitat than coyotes. Although some fox habitat probably was removed by coyotes when they colonized the state (perhaps reducing statewide fox densities), there seems to be enough remaining to support a healthy red fox population.

Epstein, M. B., G. A. Feldhamer, R. L. Joyner, R. J. Hamilton, and W. G. Moore. 1985. Home range and mortality of white-tailed deer fawns in coastal South Carolina. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 39:373–379.

DIET, SOUTH CAROLINA, WHITE-TAILED DEER

During the summers of 1981 and 1982, 48 white-tailed deer (*Odocoileus virginianus*) fawns were captured and radio-collared on the Cat and South Island portions of the Tom Yawkey Wildlife Center, Georgetown, South Carolina. Significantly (χ^2 = 4.10, P < 0.05) more male fawns were captured than females. Telemetry and visual locations (n = 731, range = 18 to 224) were taken on 11 fawns. All fawns utilized open inter-tidal marsh/marsh edge habitat. Home range and activity of individual fawns were highly variable. Mortality of radio-collared fawns was 84.4% (38 of 45). Marking activities were directly responsible for

the death of 3 fawns. Of the 45 fawns included in the mortality analysis 89.5% died within 1 month of age. High fawn mortality may regulate or stabilize the size of the South Island deer population.

Fener, H. M., J. R. Ginsberg, E. W. Sanderson, and M. E. Gompper. 2005. Chronology of range expansion of the coyote, *Canis latrans,* in New York. Canadian Field Naturalist 119:1–5.

NEW YORK, RANGE

Coyotes (*Canis latrans*) were historically restricted to central North America. In less than two centuries, however, coyotes have colonized most of the continent, including much of northeast North America. Better understanding causes and proximate mechanisms of this expansion requires a detailed understanding of how coyotes colonized area son a fine scale. We examined the establishment of coyotes in the state of New York by collecting and analyzing reports of their first occurrence throughout the state over the past century, and creating a detailed map of range expansion. Coyotes first entered New York from the north, circled the Adirondack region prior to colonizing it, and then expanded southward and westward at ca. 78–90 km/decade. The revealed pattern lends little support to the hypothesis that the range expansion is attributable to translocations and releases, or that the coyotes were historically present in the region and only recent expanded in numbers. Rather, the data suggest a correlative relationship between anthropogenic land use and coyote range expansion.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

CONFLICT, DAMAGE, GEORGIA, LIVESTOCK, MORPHOLOGY, POPULATION DENSITY

Coyotes (*Canis latrans*) are known to have caused damage to the agriculture industry of Georgia since 1958. Since that year that threat has grown as the population increased. To determine the magnitude of the coyote problem a study was begun in 1975. The objectives of this study were to determine coyote population and distribution, physical characteristics and damage activity in Georgia.

In 1975–1975, coyote surveys were run throughout Georgia using tape-recorded howls to establish the distribution and relative density of this species. Minimum densities based on howling responses ranged from one coyote/60.9 km^2 in the Upper Coastal Plain to one coyote/333.3 km^2 in the Lower Coastal Plain. No coyotes were located from the Piedmont northward.

Weights, standard body and skull measurements were obtained from 27 coyotes in an effort to determine the form of Georgia coyotes. Males were significantly larger and heavier than females. The coyotes collected in Georgia were consistently lighter and smaller than coyotes reported from eastern Texas. An attempt to classify the skulls to the subspecies level was not feasible because of lack of comparative information. The analysis of skulls did not show that specimens from Georgia seem more properly referable to coyotes, although some dental characteristics indicated a relationship to dogs.

One hundred and forty-four County Extension Offices replied to a coyote damage questionnaire. Only 16 reported coyote damage in their counties. Analysis of the replies indicated that coyote damage was increasing. In general, damage was concentrated in south central Georgia and most was judged light to insignificant. Pigs and cattle were the livestock most frequently damaged and watermelons were the most damaged crop. The economic value of coyote damage is estimated to be $50,000 annually.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

AGE STRUCTURE, DISEASE, DIET, HABITAT, HOME RANGE, INDIANA, JUVENILE, MANAGEMENT, MOVEMENTS, POPULATION DYNAMICS, SEX RATIO

This coyote study centered in southern Tippecanoe County, Indiana, was made from June 1977 to May 1980. Four juvenile coyotes monitored by telemetry in cropland in fall and winter were found in standing corn fields a disproportionately high 71.7% of the time prior to and during corn harvest. The use of soybean fields was negligible. After corn harvest coyotes moved to edges of woods, bare fields, old fields,

and ditches. A yearling monitored in June 1978 was found often in maturing wheat, but appeared to be moving to corn, as that crop grew high enough to provide cover. Security was thought to be more important that food-getting in coyotes' use of corn. Home ranges were from 12.2–28.3 km^2 (minimum area method). Hunters shot three radio-collared coyotes during or after dispersal 33, 133, and 160 km from the coyotes' original range.

The remains of small rodents, swine (probably carrion), and eastern cottontails were the most important foods found in coyote stomachs and scats. Coyotes also regularly ate passerines, grass, summer fruits, and fall grasshoppers.

Age structure and reproductive assessment indicated a declining coyote population in northwestern Indiana, the result of three severe winters (1979–77, 1977–78, 1978–79) and subsequent decline in prey availability. The sex ratio was nearly even.

Coyotes had comparatively high helminth parasite infections. Heartworms were found in 13.2% of coyotes examined reflecting a high prevalence in local domestic dogs. Although coyotes may serve more importantly in Indiana as a means of spreading the parasite via dispersal. A relatively low 5.4% of coyotes examined had distemper virus antibody titers. This density-dependent disease may be more prevalent when coyotes are more abundant than they were during this study.

Management recommendations include continuing public coyote hunting and trapping, prevention of livestock depredation, rapid removal of individual livestock predators, and public education concerning predator ecology and humane treatment. Annual coyote harvest-per-effort surveys would be valuable.

Foster, G. W., M. B. Main, J. M. Kinsella, L. M. Dixon, S. P. Terrell, and D. J. Forrester. 2003. Parasitic helminthes and arthropods of coyotes (*Canis latrans*) from central Florida, U.S.A. Comparative Parasitology 70:162–166.

DISEASE, FLORIDA

Twenty-six coyotes (*Canis latrans*) collected in Florida, USA, were examined for parasites. Nine species of helminths (1 trematode, 1 cestode, 6 nematodes, and 1 acanthocephalan), 1 species of biting louse, and 2 species of ticks were identified. *Dirofilaria immitis* (43%), *Ancylostoma caninum* (33%), *Physaloptera rara* (29%), and *Taenia pisiformis* (24%) were the most prevalent helminths. *Macracanthorhynchus ingens* is reported from coyotes for the first time, and *Spirocera lupi* is reported in coyotes from Florida for the first time. Ectoparasites collected included the biting louse, *Trichodectes canis,* and the ticks *Amblyomma maculatum* and *Dermacentor variabilis.* A coyote infected with 66 *D. immitis* had evidence of chronic pulmonary arthritis and medical hypertrophy of pulmonary arterioles.

Fredrickson, R. J., and P. W. Hedrick. 2006. Dynamics of hybridization and introgression in red wolves and coyotes. Conservation Biology 20:1272–1283.

HYBRID, RED WOLF

Hybridization and introgression are significant causes of endangerment in many taxa and are considered the greatest biological threats to the reintroduced population of red wolves (*Canis rufus*) in North Carolina (USA). Little is known, however, about these processes in red wolves and coyotes (*C. latrans*). We used individual-based simulations to examine the process in red wolves and coyotes. We used individual-based simulations to examine the process of hybridization and introgression between these species. Under the range of circumstances we considered, red wolves in colonizing and established populations were quickly extirpated, persisted near the carrying capacity, or had intermediate outcomes. Sensitivity analyses suggested that the probabilities of quasi extinction and persistence of red wolves near the carrying capacity were most affected by the strength of two reproductive barriers: red wolf challenges and assortative mating between red wolves and coyotes. Because model parameters for these barriers may be difficult to estimate, we also sought to identify other predictors of red wolf population fate. The proportion of pure red wolves in the population was a strong predictor of the future probabilities of red wolf quasi extinction and persistence. Finally, we examined whether sterilization can be effective in minimizing introgression while allowing the reintroduced red wolf

population to grow. Our results suggest sterilization can be an effective short-term strategy to reduce the likelihood of extirpation in colonizing populations of red wolves. Whether red wolf numbers are increased by sterilization depends on the level of sterilization effort and the acting reproductive barriers. Our results provide an outline of the conditions likely required for successful reestablishment and long-term maintenance of populations of wild red wolves in the presence of coyotes. Our modeling approach may prove generally useful in providing insight into situations involving complex species interactions when data are few.

Freeman, R. S., A. Adorjan, and D. H. Pimlott. 1961. Cestodes of wolves, coyotes, and coyote-dog hybrids in Ontario. Canadian Journal of Zoology 39:527–532.

DISEASE, ONTARIO

Echinococcus granulosus, Taenia hydatigena, and *T. krabbei* were the most common cestodes encountered in timber wolves of Ontario, with *T. pisiformis, T. laticollis,* and *T. crassiceps* being less common. *Taenia pisiformis* was the only common cestode of coyotes, although *T. hydatigena, T. laticollis, E. granulosus,* and *Mesocestoides sp.* were recovered. No *Multiceps sp.* was found. In Ontario, propagation of *T. pisiformis* apparently depends mainly on coyotes, whereas *E. granulosus, T. hydatigena,* and *T. krabbei* depend on wolves. *E. granulosus* was approximately twice as common in wolves from areas where moose are more common than deer, and conversely *T. hydatigena* and *T. krabbei* were approximately twice as common in wolves from areas where deer are more common than moose.

Gabor, T. M. 1993. An assessment of the feeding ecology of coyotes in western Tennessee. Thesis, Memphis State University, Memphis, USA.

DIET, TENNESSEE

Food habits of the coyote (*Canis latrans*) were studied from scats collected on the Ames Plantation in western Tennessee. From July 1990 through March 1992, 330 scats were collected and examined for content. Over all seasons, wild animals constituted the major portion of the coyote's diet. Vegetation also occurred in high frequency throughout the year, and fruits and insects were utilized extensively during seasons of availability. Little use of economically valuable species, such as livestock and game birds, was evident. Significant statistical variation occurred among seasons for medium mammal, larger mammal, insect, and fruit; variation in frequency of occurrence of food examined across habitats was not significant. The use of insects by coyotes correlated to insect density, but use of small mammal species did not correspond to population abundance. Variation in the use of roadways (as corridors) among seasons and habitats was not significant on the small geographic area studied. Statistical relationships among food types were examined, and 16 of 36 possible correlations were significant (14 negative). Distance that coyote scats were located from a known food source was investigated.

Gammons, D. J. 2004. Early fall coyote foods in Campbell and Bath Counties, Virginia. Banisteria 23:45–47.

DIET, VIRGINIA

The diet of coyotes (*Canis latrans*) was studied on two sites in Virginia from September to October 2002. Plant material, particularly persimmon (*Diospyros virginiana*), was found in the majority of scats examined, which supports the model of coyotes as opportunistic omnivores. Given the adaptive nature of coyotes, longer-term studies are needed to fully understand their impact on the biota as their range expansion continues.

Gaskin, P. N. 1975. A multivariate analysis of skull characteristics of New York coyotes. Pages 5–11 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

HYBRID, MORPHOLOGY, TAXONOMY, NEW YORK

A multivariate statistical analysis using canonical variates was used to compare wild *Canids* from New York to target populations of known *Canids* for identification. The conclusions are not dissimilar to those of recent workers on New England *Canids,* viz., that these animals are predominantly coyote and probably have some dog and wolf genes as well. Eastern coyotes (*Canis latrans* var.) appeared in New York as early as

1934. Several *Canid* specimens overlapped the wolf target. These *Canids* averaged 19.1 kg; the mean body measurements were 1,333.5: 374.7: 211.6; and 127.0 mm. Skull characteristics and the possible origin of these *Canids* are discussed.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

BEHAVIOR, DIET, HOME RANGE, URBAN, SURVIVAL

Coyotes (*Canis latrans*) have become common in many metropolitan areas across the United States. Recent research has focused on the urban ecology of coyotes to better our understanding of how they exist in urbanized landscapes. I summarize findings from a variety of ecological studies of coyotes in or near metropolitan areas, and focus on three areas of coyote ecology: survival rates, home range/activity, and food habits. Most studies have reported relatively high survival rates (annual S = 0.62–0.74), with vehicle collisions often a common cause of mortality. Size of coyote home ranges (mean home range sizes among urban studies ranged 5–13 km^2) generally exhibit a negative trend with urbanization when compared to rural studies, but this is complicated by a trend within urban landscapes in which coyote home ranges tend to increase with fragmentation and development. Studies have consistently reported a decrease in diurnal activity with human use areas. Although coyotes in some areas avoid human use areas, they are nevertheless frequently in close proximity to people. Coyote food habits in urbanized areas are similar to rural areas, in which mammalian prey and vegetation (i.e., fruit) comprise most of the diet; however, there is a trend toward more anthropogenic items from more developed areas. The relatively small home-range sizes and high survival rates suggest coyotes are successful in adjusting to an urbanized landscape.

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

HABITAT, HOME RANGE, ILLINOIS, URBAN, TRANSIENT

An understanding of how top mammalian carnivores respond to urbanization is important for conservation and management of human-wildlife conflicts. Coyotes (*Canis latrans*) have recently become more prevalent in many metropolitan areas; however, their apparent success is poorly understood. We estimated home-range size and selection of land-use types for coyotes in a heavily urbanized landscape, with a particular focus on responses of coyotes to those parts of the urban landscape with high levels of human development or activity. Mean (± SE) annual home ranges of transient coyotes ($\bar{x}$ = 26.80 ± 2.95 km^2) were larger than those of resident coyotes ($\bar{x}$ = 4.95 ± 0.34 km^2), and home-range size for resident coyotes did not vary among seasons or between age and sex classes. Although most home ranges were associated with natural patches of habitat, there was considerable variation among coyotes, with some home ranges entirely lacking patches of natural habitat. Within home ranges, coyotes typically avoided land-use types associated with human activity (i.e., Residential, Urban Grass, and Urban Land) regardless of coyote characteristics, seasons, and activity periods. Few coyotes were nuisances, and conflicts occurred when coyotes were sick or exposed to wildlife feeding by humans. We found little evidence that coyotes were attracted to areas associated with human activity, despite at times having home ranges located in heavily developed areas.

Gehrt, S. D., and S. Prange. 2006. Interference competition between coyotes and raccoons: a test of the mesopredator release hypothesis. Behavioral Ecology 18:204–214.

HOME RANGE, ILLINOIS, PREDATION, RACCOON

Some predator species appear to conform to the mesopredator release hypothesis (MRH), in which larger predators help limit populations of smaller predators. This hypothesis has been used to explain the possible relationship between coyotes, mesopredators, and resultant cascades involving non-predators. However, relationships between coyotes and non-*Canid* mesopredators are poorly understood, and predictions from the MRH have rarely been rigorously tested. We monitored sympatric raccoon and coyote populations to assess 2 predictions derived from the MRH: coyote predation is an important cause of mortality in raccoon populations or raccoons avoid areas used by coyotes. Between March 2000 and September 2001,

we recorded 3553 locations for 27 radio-collared raccoons and 1393 locations for 13 coyotes captured on the Max McGraw Wildlife Foundation in Illinois, USA. No raccoon mortality from coyote predation was observed during the study, and raccoon survival was .0.7 each season. All raccoon 95% home ranges exhibited overlap with 95% coyote home ranges in each season. The mean proportion of raccoon locations within 95% coyote home ranges did not vary by sex but did vary by season. Raccoon overlap of coyote core areas varied considerably among individuals within seasons, ranging from 0% to 83%. However, 45% of raccoons had 10% overlap with coyote core areas, whereas only 14% of raccoons exhibited .50% overlap. Mean overlap with core areas did not vary by season or sex. For those raccoons with home ranges overlapping coyote core areas, mean proportion of observed raccoon locations within coyote core areas was generally greater than the mean proportion of random locations. Scent-station experiments failed to document raccoon avoidance of specific sites that had been marked with coyote urine. We did not find support for a mortality prediction or avoidance prediction to support MRH with regard to raccoons and coyotes. These results suggest that relationships among mammalian predators may not be simply dictated by body size, particularly for species outside the Canidae.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

BEHAVIOR, CONFLICT, DAMAGE, DIET, LIVESTOCK, ONTARIO, PREDATION,

The feeding habits, hunting behavior, and livestock depredations of the eastern coyote (*Canis latrans* thamnos) were studied on Manitoulin Island for two years, from summer 1975 to spring 1977. The methods of study included: scat analysis, winter tracking, the examination of kills in the field, and the analysis of municipal and provincial bounty records and reports.

The frequency with which 738 scats analyzed contained the following food times were: snowshoe hare (*Lepus americanus*) 49 percent, white-tailed deer (*Odocoileus virginianus*) 31 percent, mice (*Cricetidae spp.*) 18 percent, insects and other invertebrates 9 percent, berries 6 percent, birds 5 percent, and livestock 1 percent.

Scats containing mammalian remains occurred frequently, ranging from 87 percent in the summer and fall to 100 percent in the winter. Forty-six percent of the winter scats contained white-tailed deer remains. Coyotes from the more heavily forested western zone of the Island relied more on deer as food than did those from the eastern zone, an area that had relatively more land in agriculture. Scats with snowshoe hare remains occurred more frequently in the eastern zone than in the western zone. Scats with deer fawn remains were common in the summer (15 percent). Meadow vole (*Microtus pennsylvanicus*) was the most frequently occurring species of mouse in the scats. Most of the coyotes that were tracked hunted along in December and January and in pairs in February and March. The increase in pair hunting coincided with the coyote mating season on the Island. Coyotes used the shoreline intensively as travel lanes between hunting areas.

On Manitoulin Island, coyotes may have fed on deer carrion regularly during the winter. Coyotes killed sheep by attacking the throat region, sheep killed by coyotes were only partially consumed, and coyotes did not return for subsequent feedings. The sheep depredation problem was the most severe from July to September.

Bounty records indicated that most island coyotes were taken in townships with relatively low occurrences of livestock depredations, and with knowledgeable trappers.

Snares set by "extension trappers in livestock problem areas" had a greater success rate (4.9 coyotes per 1000 snare nights) than did steal leg-hold traps (1.7 coyotes per 1000 trap nights).

The large amount of open area around most farms with livestock depredation problems made trapping and snaring difficult. Although costs were high, the trapping and snaring of coyotes in livestock problem areas were the only selective control measures used to attempt to remove sheep killing coyotes from the population on the island. One inland bounty system lacks the selectivity necessary in the control of

livestock-killing coyotes and is aimed at reducing the entire coyote population level on the island. A regeneration of funds from bounty monies into a more intensive snaring and trapping program might alleviate livestock depredation problems more than the bounty currently is doing.

Georges, S. 1976. A range extension of the coyote in Quebec. Canadian Field Naturalist 90:78–79.

RANGE, QUEBEC

Gier, H. T., S. M. Kruckenberg, and R. J. Marler. 1978. Parasites and diseases of coyotes. Pages 37–72 in Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

DISEASE

Glatz, R. G. 1975. The status of the coyote in Connecticut. Pages 33–40 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

CONNECTICUT, MORPHOLOGY, RANGE, TAXONOMY

Nineteen skulls of coyote-like *Canids* from Connecticut were analyzed by the technique developed by Lawrence and Bossert (1967). Seventeen of these skulls were found to be mostly of coyote ancestry. The coyotes are distributed throughout the state except for the southwestern corner. Most of the reports have come from the northwestern and northeastern areas of the state where the land use is primarily agriculture.

Goff, G. R. 1979. Analysis and evaluation of three indices of eastern coyote abundance. Thesis, College of Environmental Science and Forestry, Syracuse, USA.

POPULATION DENSITY

The use of the vocalization, scent station, and winter track count indices as measures of relative eastern coyote (*Canis latrans* var.) abundance were investigated. The vocalization index was based on howling response rates to electronic police siren wails or taped wolf howls. The scent station index was based on the visitation rate of coyotes to stations of sifted soil that used a scent lure as an attractant. The winter track count index was based on coyote crossings along truck trails.

The following environmental variables were analyzed for their effect upon index values: (1) barometric pressure and trends, (2) temperature trend, (3) relative humidity, (4) lunar phase and trend, (5) photo period, (6) snow condition, and (7) habitat.

Taped wolf howls elicited a higher response rate (15.6%) than the electronic siren (5.7%) over the same time span. Late summer surveys received the highest response rates. Howling response rates were positively correlated with barometric pressure, temperature, relative humidity and length of photoperiod. Scent station visitation rates were not significantly correlated with any of the environmental variables. Track count index values were positively correlated with lunar cycle, negatively correlated with depth of snow, and were influenced by quarterly lunar phase. No significant relationship was found, for any of the three indices, between values obtained within prim white-tailed deer (*Odocoileus virginianus*) habitat and values obtained outside such habitat. More intensive study is advised before final assessment of the effects of environmental variables on these indices.

Daily survey values for each of the three indices varied considerably due to an apparent sparse and highly mobile population. The coyotes' use of roadways as travel lanes strongly biased scent station and track count indices. Further refinement based on social and behavioral characteristics of the eastern coyote is needed before the indices can be sued in an efficient manner.

Gompper, M. E. 2002. The ecology of northeast coyotes: current knowledge and priorities for future research. Wildlife Conservation Society, Bronx, NY, Working Paper 17:1–47.

RANGE, RESEARCH NEEDS, SUMMARY

When Europeans first settled North America, wolves and puma dominated the large-predator community of the eastern deciduous forests. The coyote was a resident of the Great Plains and western North America

and was unknown to settlers of the east. These days, puma are virtually extirpated east of the Mississippi, and aside from a handful of red wolves reintroduced in the southeastern United States and possibly an occasional transient gray wolf in the Northeast, wolves are also effectively absent. In contrast, coyotes are now found from Nova Scotia to Florida and exist at high enough population densities in virtually every region to have become an important component of the ecological community. Therefore a solid understanding of coyote ecology is necessary for conservation planning at many levels. This paper summarizes what is known of the ecology of coyotes in northeastern North America (including New England, New York and Canada east of the Ontario-Quebec border), and identifies areas of research requiring immediate attention. While much is known regarding coyote natural history and ecology in this region, there are also major gaps in our knowledge base. In particular, four aspects of ecology are suggested as priorities for future research: the demographics and growth rates of the northeastern coyote populations, the role of northeastern coyotes in structuring communities, the important parasites and diseases of northeastern coyotes, and the impact of wolf-coyote hybridization on the population genetics and ecology of northeastern coyotes. A focus on these research areas will allow for informed management decisions in the face of an array of conservation priorities in the Northeast.

Gompper, M. E. 2002. Top Carnivores in the suburbs? Ecological and conservation issues raised by colonization of northeastern North America by coyotes. BioScience 52:185–190.

CONFLICT, HUMAN DIMENSIONS, RANGE, URBAN

Gompper, M. E., R. M. Goodman, R. W. Kays, J. C. Ray, C. V. Fiorello and S. E. Wade. 2003. A survey of the parasites of coyotes (*Canis latrans*) in New York based on fecal analysis. Journal of Wildlife Diseases 39:712–717.

DISEASE, NEW YORK

Coyotes (*Canis latrans*) have colonized northeastern North America only within the past 10–80 yr. We examined feces of coyotes in 2000–01 at three sites in New York (USA) to survey parasites in the region. Two cestodes, nine nematodes, five protozoa, one trematode, and two arthropods were identified from 145 coyote fecal samples. Parasite component community diversity was higher (n = 16 species) in southern New York than in middle and northern sites (nine species each) and intra-community species richness was greater in southern New York than at the other sites. These differences may reflect the variable diets of coyotes, as well as recent colonization of the region and the mixing of component communities from expanding coyote populations.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and M. G. Joselyn. 2003. Temporal habitat partitioning and spatial use of coyotes and red foxes in east-central Illinois. Journal of Wildlife Management 67:90–103.

HABITAT, HOME RANGE, ILLINOIS, RED FOX

Coyote (*Canis latrans*) populations have increased across eastern North America over the past few decades. In Illinois, red fox (*Vulpes vulpes*) populations have synchronously declined, suggesting that coyotes may be displacing red foxes. We examined winter (Jan–Feb) and summer (Jul–Aug) habitat use of sympatric coyotes and red foxes in east-central Illinois, including a distinct urban fox population relatively free of interactions with coyotes. We radio marked 28 coyotes, 16 rural foxes, and 19 urban foxes and systematically collected over 10,500 locations to infer habitat use. Compositional analysis at 3 levels (home range, location, resting) corresponded to 2 spatial scales of habitat use (study area and within home-range use). We used covariate analysis of regression models to examine interspecific differences in habitat use. Using Akaike's Information Criterion (AIC), optimal models included season, sex, and species of the covariate as sources of variation. Habitat partitioning was apparent at all levels of analysis during both seasons, diverging greatly during winter. Coyotes selected and rural foxes avoided cover-rich habitats (grassland, waterways, no-till corn). Rural foxes selected human-associated habitats (active and abandoned farmsteads and rural residential areas), which coyotes generally avoided. Habitat use and home range selection by urban foxes were more seasonally stable than by rural foxes, but urban foxes selected residential areas more during winter than during summer. Home ranges of both coyotes and rural foxes increased substantially during winter. Rural fox home ranges were nearly 4

times larger than those of urban foxes during winter. Our study demonstrates that coyotes and sympatric red foxes partition habitat seasonally in response to a highly disturbed agricultural landscape. Farmland red foxes may avoid habitats used by sympatric coyotes, relying on human-associated habitats (farmsteads and urban areas) as refugia.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and P. C. Mankin. 2007. Survival and cause-specific mortality of red foxes in agricultural and urban areas of Illinois. Journal of Wildlife Management 71:1862–1873.

BEHAVIOR, ILLINOIS, RED FOX, URBAN

Range expansion and population increase by coyotes (*Canis latrans*), reduced hunting and trapping, and intensified agricultural practices in the Midwest have altered red fox (*Vulpes vulpes*) mortality, although relative impacts of these factors are unknown. We examined mortality causes and survival of red foxes in urban and rural agricultural areas of Illinois, using radio telemetry data from 335 foxes (Nov 1996 to May 2002). We used Akaike's Information Criterion to evaluate six survival models for foxes reflecting 1) environmental effects, 2) intrinsic effects, 3) temporal effects, 4) behavioral effects, 5) social effects, and 6) a global model. Environmental and intrinsic models of survival were optimal for adult foxes. Adult foxes with low (0–20%) and high (80–100%) percentages of row crops in their home ranges had higher survival than adults with moderate percentages (40–70%). Heavier adults at capture also survived better. A global model (all covariates) was optimal for juvenile foxes. Higher juvenile survival associated with larger litters, lower body fat, and reduced dispersal time. Yearly survival ranged from 0.18 for rural male juveniles to 0.44 for rural female adults. Adult survival rates (0.35) were 11% higher than juvenile survival rates (0.24). Yearly survival varied for urban foxes due to cyclic outbreaks of sarcoptic mange (Sarcoptes scabei). Thus, summer survival (May–Sep) of urban juveniles ranged from 0.10 (mange present) to 0.83 (no mange recorded). Mange was the most common (45% of all fatalities) source of mortality for urban foxes, followed by road kill (31%). We recorded only 4 mange fatalities (2%) for rural foxes. Rural foxes experienced low hunting mortality (7%) and equivalent road kill and coyote predation fatalities (40% each). Sources of mortality for Midwestern foxes have dramatically changed since the 1970s when hunting was the major cause of mortality. Coyote predation has effectively replaced hunting mortality, and cyclic patterns of mange outbreaks in urban fox populations might indicate a dynamic source or sink relationship to surrounding rural fox populations. Absent mange, urban areas might provide refugia for red foxes where coyote populations persist at high densities in rural areas. Managers of sympatric urban and rural wildlife populations must understand survival dynamics influencing the population at the landscape level.

Gregory, D. G. 1998. Heartworm and lungworms in Illinois *Canids* and their possible effect on coyote condition and reproduction. Thesis, Eastern Illinois University, Charleston, USA.

DISEASE, ILLINOIS, MORPHOLOGY

This study focuses on the prevalence of heartworm and lungworm in Illinois' *Canid* species, and the effect that they may have on condition (body weight, kidney fat, marrow fat) and reproductive (placental scars) on coyote populations. A total of 1,150 coyotes (*Canis latrans*), 2,269 domestic dogs, 47 red foxes (*Vulpes vulpes*), and 2 gray foxes (*Urocyon cinereoargenteus*) were examined. Prevalence of heartworms (*Dirofilaria immitis*) averaged 17.85 in coyotes, 3.0% in domestic dogs, 2.0% in red foxes, and 0% in gray foxes. Domestic dogs not receiving any type of prophylactic treatment had a higher prevalence (12.5%) of heartworms than dogs on a prophylactic program (0.3%). Heartworm prevalence varied regionally throughout the state in both coyotes and domestic dogs reflecting a lower prevalence in the northern regions of the states and a higher prevalence in the south.

Of the 341 coyotes examined for lungworms, 52 (15.2%) were infected with *Capillaria aerophila,* 10 (2.9%) with *Fillaroides sp.*, 8 (2.3%) with *Paragonimus kellicotti,* and 2 (0.6%) with *Crenosoma vulpis.* A stomach parasite, *Physaloptera rara,* was also recovered from 58 (17%) coyotes. Fifteen red foxes were examined for the presence of lung parasites, of which, 11 (73.3%) were infected with *Capillaria aerophila,* 1 (1.1%) was infected with *Crenosoma vulpis,* and 1 (1.1%) with *Physaloptera rara.*

Heartworm and/or a lungworm infection did not appear to significantly impact the condition or reproduction of coyotes since no significant differences were observed in the body weight, fat reserves, or number of placental scars of uninfected and infected individuals.

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

EASTERN WOLF, GENETICS, GRAY WOLF, ILLINOIS, RED WOLF

Recent genetic data indicate that the eastern wolf is not a subspecies of the gray wolf (*Canis lupus*), but is a North American wolf more similar to the red wolf (*C. rufus*) and closely related to the coyote (*C. latrans*). The eastern wolf has been proposed as a separate species, *C. lycaon.* The largest protected area containing this wolf is Algonquin Provincial Park in Ontario, Canada, which is bounded to the south by areas containing the Tweed wolf or eastern coyote, a hybrid of the western coyote and eastern wolf. We assessed the relationships of animals in the park by using DNA profiles that comprised the genotype from 17 autosomal and 4 Y-linked microsatellite loci and the mitochondrial DNA control region. These profiles were used to establish maternity, paternity, and kin relationships for 102 wolves that were studied from 24 packs over a 12-year period. Genetic data do not support the hypothesis that a pack comprises an unrelated breeding pair and their offspring. There is evidence of frequent pack splitting, pack fusion, and adoption. Some unrelated individuals in the packs were identified as immigrants into the park. We found high levels of genetic structuring between the Tweed wolves to the southeast and the Algonquin Park wolves (RST = 0.114). Lower levels of genetic differentiation with animals to the north and west (RST = 0.057 and RST = 0.036) and high genetic diversity suggest that park animals are not an island population but the southern part of a larger metapopulation of *C. lycaon.*

Grogan, M. E. 1996. Feeding strategies of the coyote (*Canis latrans*) in western Tennessee. Thesis, University of Memphis, Memphis, USA.

DIET, TENNESSEE

The feeding strategies of the coyote (*Canis latrans*) were studied from scats collected at three localities in western Tennessee. From the fall of 1993 through the summer of 1995, 2,004 scats were collected and examined for content. Seasonal and annual food habits were determined for each locality. The association between frequency of occurrence of selected food items (rodents, rabbits, and deer fawns) in scats and their relative abundance in the habitat, as well as the frequency of occurrence of white-tailed deer remains in scats relative to the availability of rabbits and rodents were assessed. Coyote diets varied seasonally, annually, and spatially, but most differences involved a change in frequency of occurrence of prey species within major groups rather than changes in entire groups of prey. Overall, wild mammals constituted the major portion of the coyote's diet. Fruits, insects, and agricultural crops were important seasonal foods. Rabbit and rodent abundance in the habitat were not correlated with the frequency of occurrence of these food items in scats. Additionally, deer remains in scats and relative abundance of rabbits and rodents were not correlated. Results indicated that areas with high deer density may experience greater fawn predation than areas with lower density. A low occurrence of deer, livestock, and bird (game and nongame) remains in scats suggests that coyotes are not a primary limiting factor to these animals in western Tennessee. Appropriate animal husbandry practices appear to reduce predation in livestock.

Hamilton Jr., W. J. 1974. Food habits of the coyote in the Adirondacks. New York Fish and Game Journal 21:177–181.

DIET, NEW YORK

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, Maine, USA.

HOME RANGE, JUVENILE, MAINE, MOVEMENTS, RED FOX, SURVIVAL

Coyote (*Canis latrans*) dispersal, mortality, den-

ning ecology, and spatial relationships with red foxes (*Vulpes vulpes*) were studied in Maine during 1981–1984. Sixty-five juvenile (< 1 year) coyotes, 8 adult (> 2 years) coyotes, and 11 adult (>1 year) red foxes were captured and ear-tagged. Forty-seven juvenile coyotes, 8 adult coyotes and 11 adult red foxes were equipped with radio collars.

Coyote pups began to move short distances from dens at 6–8 weeks of age. The radius and rate of pup movements increased with age. Large increases from September to October in pup home range sizes (+194%) and movement rates (+59%) were associated with the breakup of the family group and onset of dispersal. Movements of pups stabilized by late fall; neither their rates of travel nor their home range sizes were different from those of adults by early winter. Pre-dispersal home range sizes were not different between 8 juvenile males (x = 43.0 km^2) and 6 juvenile females (x = 45.0 km^2).

Dispersal of juvenile coyotes began during late September of their first year. Peaks in onset of dispersal occurred during October–November and during February–March. No dispersals were initiated during late December–January. Timing of dispersal coincided with periods of highest inter-family strife. Eighty-six percent of pups (n = 36) dispersed during their first year of life; 100% departed prior to 1.5 years of age. Most coyotes completed dispersal between 1 and 2 years of age.

Minimum distances dispersed averaged 94 km for 11 juvenile female coyotes and 113 km for 9 juvenile males; distances averaged 98 km for 7 coyotes monitored until completion of dispersal. There were no differences ($P > 0.01$) between sexes in the proportion, timing, or distance of dispersal. Coyotes homed along their initial baring of dispersal ($P < 0.025$), thus they maximized distances from natal areas. Water barriers deflected movements of dispersing coyotes and resulted in concentrations of dispersers adjacent to water features.

Delayed dispersal and pack formation have previously been associated with coyote populations subsisting on large food items. Predominant first year dispersal and lack of pack formation by coyotes in Maine, despite high use of white-tailed deer (*Odocoileus virginianus*), suggests that low food densities preclude delayed dispersal and pack formation in this population.

Mortality was documented for 57% of tagged juvenile coyotes and indicated that human causes were responsible for 92% of documented deaths. Tag recovery rates were higher ($P > 0.01$) for coyotes aged 0.5–1.5 years than for those older than 1.5 years. Based on telemetry data, annual survival rates of pups from 6–58 weeks of age were 0.59. Survival was lower among juvenile females (0.39) than among juvenile males (0.93), suggesting that females were more susceptible to human caused mortality. Sixty percent of pup mortality rate was attributable to human causes. Annual survival rate from 0.5–1.5 years was lower for dispersers (0.47) than for residents (0.74).

Annual home ranges of 6 adult red foxes averaged 14.7 km^2. Fox home ranges were equated to the 46.4 km^2 mean home range for 8 adult coyotes by the relationship: metabolic home range size = km^2 / kg body weight 0.87. Seventy-eight percent of the difference in mean home range size between coyotes and foxes was attributable to greater metabolic requirements of coyotes.

No fox captures (n = 11) occurred within core portions of coyote territories despite more intensive trapping effort in core portions. Home ranges of foxes were situated outside of coyote territories and along boundaries between adjacent coyote groups. Fox home ranges were associated with water features; however, no use by foxes of lakeshores or riparian zones within coyote territories was observed. Interspecific territoriality between coyotes and red foxes likely resulted from interference competition and avoidance of coyote territories by red foxes. The presence of resident coyotes limits the available habitat for red foxes in Maine. Smaller spatial requirements enable foxes to persist in boundary areas and prevent their complete displacement from regions occupied by coyotes.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

HOME RANGE, JUVENILE, REPRODUCTION, MAINE, MOVEMENTS

Denning ecology, family associations and movements

of 16 (4 adult, 12 juvenile) coyotes (*Canis latrans*) from 4 family groups were studies in eastern Maine from May 1981 through April 1982. Pups from 6 to 24 weeks of age were equipped with ratio collars with compressible foam inserts. Monitoring of collared animals resulted in 2,760 radio locations.

Coyote families used several dens when pups were <10 weeks of age. Den entrances (n = 7) were all oriented towards the south. Two pair of adult coyotes relocated their pups to new den sites on 9 occasions. The mean distance between den sites was 1.3 km. Pups 10–25 weeks old centered their activity around rendezvous sites.

Radio fixes of adult coyotes were <500 m from den entrances 55% of the time during nursing (May) and 54% during weaning (June and July). For 2 females with pups, distances traveled between consecutive independent relocations increased from nursing to weaning and from weaning to pup independence (August–April). Percent use of overall home ranges by females increased 16% during nursing, to 63% during weaning, and 76% during pup independence.

For pups, home range sizes, mean distances traveled between independent relocations, and distances from den and rendezvous sites increased with age.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

DIET, HOME RANGE, MAINE, RANGE, SOCIALITY

The social organization of coyotes (*Canis latrans*) recently established (since 1920) in northeastern North America may differ from populations with in the historic (pre-1900) range because of their recent colonization into previously unoccupied habitats, larger body size, questionable taxonomic status, and greater use of large prey. Thus, this study summarizes and compares available information on movements, social behaviors, and foraging ecology of recently established and historic populations. Results from telemetry studies conducted within the coyote's historic range (pre-1900) are compared with published theories on social organization in the species. Environmental factors (e.g., size and abundance of the prey base, human exploitation rates) that may contribute to differences in foraging ecology, dispersal patterns, and group sizes among coyote populations are discussed.

Harrison, D. J. 1992. Dispersal characteristics of juvenile coyotes in Maine. Journal of Wildlife Management 56:128–138.

JUVENILE, MAINE, MOVEMENTS

Despite the coyote's (*Canis latrans*) ecological and economic importance, knowledge of dispersal and its effects on coyote population dynamics and social organization are fragmentary. Hence, I investigated the dispersal of 47 radio-collared juvenile coyotes from 2 Maine study sites during 1981–84. Dispersal of juvenile coyotes began during late September of their first year. Peaks in onset of dispersal occurred during October-November and during February-March. No dispersals were initiated during late December-January. Eighty-six percent of pups (n = 36) dispersed during their first year of life; 100% departed prior to 1.5 years of age. Annual survival rate from 0.5 to 1.5 years was lower for dispersers (0.47) than for residents (0.74). Coyotes traveled along their initial bearing of dispersal, thus maximizing distances from natal areas. Water barriers deflected movements of dispersing coyotes and resulted in concentrations of dispersers adjacent to water features. Minimum distances dispersed averaged 94 km for 11 juvenile female coyotes and 113 km for 9 juvenile males. There were no differences (P > 0.18) between sexes in the first-year dispersal rate or in the proportion, age, or distance of dispersal. Low food densities may preclude delayed dispersal and pack formation in this population. Juvenile dispersal probably confounds attempts to manage coyote populations intensively in localized areas.

Harrison, D. J., J. A. Bissonette, and J. A. Sherburne. 1989. Spatial relationships between coyotes and red foxes in eastern Maine. Journal of Wildlife Management 53:181–185.

MAINE, TERRITORY, RED FOX

We studied area use and spatial relationships among sympatric coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*) in eastern Maine during 1981–84. Foxes established home ranges outside of coyote territories or in boundary areas between adjacent coyote groups. Fox home ranges were associated with lakeshores or riparian zones, but foxes did not use these habitats within coyote territories. Foxes were never captured (>7,000 trap nights) within core portions of coyote territories. The presence of resident coyotes appears to limit the available habitat for red foxes in eastern Maine. Smaller spatial requirements enable foxes to persist in boundary areas between coyote territories and may prevent their complete displacement from regions occupied by coyotes.

Harrison, D. J., and T. B. Chapin. 1997. An assessment of potential habitat for eastern timber wolves in the northeastern United States and connectivity with occupied habitat in southeastern Canada. Wildlife Conservation Society, Bronx, NY, Working Paper 7.

EASTERN WOLF, HABITAT

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

BEHAVIOR, HOME RANGE, JUVENILE, MAINE, MOVEMENTS, REPRODUCTION

Den attendance, movements, and home range of eight adult coyotes (*Canis latrans*) attending pups were investigated during 1981–1983 in eastern Maine. Coyote families used several dens during pup rearing, and dens were frequently relocated following human disturbance. Six den entrances were oriented 120–236' from north. Two coyote families abandoned dens when pups were 8–10 weeks of age. Males and females shared in the duties of pup raising, and both frequently attended pups. Movement rates and home ranges of adult coyotes increased from the nursing to weaning periods, but movements and home ranges of adults were greatest after pups became independent. Movements suggested that males centered their activities near den sites during the nursing period to supply food for mates and protection for pups. Females were more restricted than males during pup rearing because of nursing responsibilities.

Harrison, D. J., and J. A. Harrison. 1984. Foods of adult Maine coyotes and their known-aged pups. Journal of Wildlife Management 48:922–926.

DIET, MAINE, JUVENILE

Information about food habits of adult coyotes (*Canis latrans*) and their known- aged pups provides insight into foraging strategies of adult coyotes during pup rearing. In this paper, we compare the food habits of pup and adult coyotes during several stages of pup development, and assess the reproductive status of adult coyotes preying on white-tailed deer (*Odocoileus virginianus*). This was part of a long-term study of furbearer ecology conducted by the Maine Cooperative Wildlife Research Unit, in cooperation with the Maine Department of Inland Fisheries and Wildlife.

Harrison, D. J., J. A. Harrison, and M. O'Donoghue. 1991. Predispersal movements of coyote in eastern Maine. Journal of Mammalogy 72:756–763.

MAINE, MOVEMENTS, JUVENILE

We documented the progression of movements from den and rendezvous sites, and the monthly changes in predispersal movement rates and home-range areas for coyote (*Canis latrans*) pups in eastern Maine during 1981–1984. Pups began to move short distances from dens at 6–8 weeks of age. The radius and rate of pup movements increased linearly with age. Large increases from September to October in sizes of home ranges and movement rates of pups were associated with the disbanding of the family group and onset of dispersal. Home-range areas and movement rates of late-dispersing juveniles were similar to those of their parents, and likely resulted from interfamily territoriality. Exploratory movements outside of the natal home range were uncommon before dispersal. Further, no sex-specific differences in predispersal movement patterns were observed. Recent data refuting the hypothesis of sex-specific dispersal in coyotes are consistent with the predispersal movement patterns presented herein.

Hedrick, P. W., R. N. Lee, and D. Garrigan. 2002. Major histocompatibiltiy complex variation in red wolves: evidence for common ancestry with coyotes and balancing selection. Molecular Ecology 11:1905–1913.

GENETICS, RED WOLF

We examined variation at a class II major histocompatibility complex (MHC) gene (DRB1) in the captive red wolf population and samples of coyotes from Texas and North Carolina. We found 4 alleles in the 48 red wolves, 8 alleles in the 10 coyotes from Texas and 15 alleles in the 29 coyotes from North Carolina. Two of the four alleles found in red wolves, Caru-2 and Caru-4, were found in both the Texas and North Carolina coyote samples. Allele Caru-1, previously found in gray wolves, was also found in the North Carolina sample. The most frequent red wolf allele, Caru-3, was not found in any of the coyote samples. However, an allele found in both the Texas and North Carolina coyote samples is only one nucleotide (one amino acid) different from this red wolf allele. Overall, it appears from examination of this MHC gene that red wolves are more closely related to coyotes than to gray wolves. There were a number of different types of evidence supporting the action of balancing selection in red wolves. Namely, there was: (i) an excess of heterozygotes compared with expectations; (ii) a higher rate of non-synonymous than synonymous substitution for the functionally important antigen-binding site positions; (iii) an eight times higher average heterozygosity of individual amino acids at the positions identified as part of the antigen binding site than those not associated with it; (iv) the amino acid divergence of four red wolf alleles was greater than that expected from a simulation of genetic drift; and (v) the distribution of alleles, and the distributions of amino acids at many positions were more even than expected from neutrality. Examination of the level and pattern of linkage disequilibria between pairs of sites suggest that the heterozygosity, substitution and frequencies at individual amino acids are not highly dependent upon each other.

Hennessy, C. A. 2007. Mating strategies and pack structure of coyotes in an urban landscape: a genetic investigation. Thesis, Ohio State University, Columbus, USA.

GENETICS, OHIO, URBAN, SOCIALITY

Coyotes (*Canis latrans*) have come to inhabit many types of ecosystems, including urban and suburban systems, and yet certain aspects of coyote behavioral ecology remain unclear. Because these predators have found suitable habitat in residential areas, there is a powerful motivation to fully understand coyote behavior and social systems. As mating strategy form the basis of social systems, the onus is on scientists to determine the basis of this carnivore's success in the suburban and urban areas of North America. Mating systems of coyotes have been extensively studied by observation, and the results have led researchers to conclude that mated pairs are monogamous. Also, observational studies of coyote packs have led researchers to conclude that packs consist of close family members. However, recent genetic investigations of wildlife mating systems have revealed that conclusions based on observations can be misleading. As the coyote is a cryptic, nocturnal species, a genetic investigation may be the most straightforward way to determine the nature of relationships of parents and offspring, mates, and pack members.

Coyotes have been classified as "obligate monogamists," meaning that a dedicated mate is necessary for reproduction. This is due in part to the high demands that pups place on their parents. In addition to monogamy, coyotes reportedly engage in den sharing, where two females contribute pups to a "double-litter." These observations are based on abnormally large litter sizes, den attendance by nursing females, and by size differences among pups.

Coyotes share territories in pack-like groups, which are assumed to comprise family members. This assumption is based on observed retention of offspring from one year to the next. The grown offspring often serve as all parents to their younger siblings. However, there are also reports of seemingly unrelated coyotes joining established packs, which contradict the theory that packs are family groups.

I investigated 19 coyote litters and 201 offspring and found one double-litter and one instance of polygyny. The two mated pairs that contributed to the double-litter did not interbreed. The evidence strongly suggests that the majority of coyotes in this population are monogamous. I investigated the relatedness of coyote packs, and found instances of unrelated members in a pack. Out of 116 relationships between 62 pack members across 26 pack years, I detected 13 coyotes that were related at levels lower than expected for fam-

ily members. I also investigated home range overlap with relatedness and found a weak relationship. Some animals that share high overlap are unrelated, and some animals that are highly related share small percentages of overlap.

The results of this study verify the findings of previous observation-based studies. However, as the coyote is a highly adaptable mammal with plastic behaviors, it is unknown whether these same results would be verified by studies of coyotes in more natural areas.

Hill, H. L., and M. Bekoff. 1977. The variability of some motor components of social play and agnostic behavior in infant eastern coyotes. Animal Behavior 25:907–909.

BEHAVIOR, JUVENILE, SOCIALITY

The duration and stereotypy (in terms of duration of three actions, stand-overs (SO), general bites (GB), and scruff-bites (SB), were measured during social play and agnostic interactions in infant eastern coyotes (*Canis latrans*). The rate of biting was also calculated. We found: (1) SO's and GB's lasted a significantly shorter time during play; (2) when performed during playful interactions, all three acts showed more stereotypy; (3) there was no significant difference between the rates of occurrence of biting during the two situations. A discussion of the 'exaggerated' nature of play behavior is presented, particularly concerning the form of the motor actions that are used during this activity.

Hill, E. P., P. W. Sumner, and J. B. Wooding. 1987. Human influences on range expansion of coyotes in the southeast. Wildlife Society Bulletin 15:521–524.

ALABAMA, HUMAN DIMENSIONS, MISSISSIPPI, RANGE

The coyote (*Canis latrans*) has increased dramatically in the southeastern United States since 1972, and its influences on wildlife and domestic animals present new dimensions and challenges to wildlife managers and commodity producers. Of historical importance and basic to management strategies is an understanding of how populations became established and spread. We summarize present distribution of coyotes in the Southeast and discuss the role of humans in range expansion.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

DIET, MAINE, MORPHOLOGY, PREDATION, REPRODUCTION, TAXONOMY

Carcasses of 107 wild *Canids* were autopsied in the laboratory. The mean weight of adult males and females, respectively, was 15.9 and 14.5 kg; mean total lengths were 1,233 and 1,193 mm and skull lengths were 205 and 195 mm. Pelage was of 4 general phases similar to those described for northeastern coyotes (*C. latrans thamnos*) and eastern wolves (*C. lupus lycaon*), and was distinct from dogs (*C. familiaris*), especially in the banding pattern of the guard hairs.

Females examined did not bear young until the 2nd year. The average number of distinct and indistinct uterine scars for 5 adult females indicated an average litter size of 7 with a potential implantation of 9.3 eggs. Young appeared to be born about mid-April and reached near-adult weight and body proportions by January. Pup survival to 12 mo was estimated to be 4–7%.

Seventy adult skulls from Maine and 44 from Quebec were analyzed taxonomically using the linear discriminate formation. Of all the Maine samples including several skulls previously examined, 67 were identified or confirmed as eastern coyotes and 3 as dogs. The taxonomic position of the Maine coyote sample represented a shift from both western coyotes and wolves in a trend first reported by B. Lawrence and W. Bossert in 1969. Quebec coyotes exhibited a noticeable dichotomy, some being more coyote-like than the Maine specimens, others very similar to the Maine specimens. The Maine population seems to represent the purification of a wild hybridized form as it has moved eastward away from all pure wild Canis. The occurrence of domestic dog genes in the Maine coyote population was not apparent.

Stomach and scat analysis indicated an opportunistic feeding habit, with snowshoe hare (*Lepus americanus*) and white-tailed deer (*Odocoileus virginianus*) important in wilderness regions in winter. There were no observations of predation on moose (*Alces alces*) and beaver (*Castor Canadensis*). Coyotes demonstrated a 15–48% success rate killing deer, preying primarily on fawns in early winter and adults over 4 yr old in late winter. Predation increased in late winter and early spring with 50% of the deer kills located in March. Carrion was revisited by coyotes often in winter, parts of deer carcasses lasting 2–3 mo; in spring carcasses lasted less than 1 wk. Food consumption rates in captivity were 0.72 kg/coyote/day of meat; in 1 case the wild 3.7–5.6 kg/coyote/day or 0.11–0.16 kg meat/day/kg of coyote.

The Maine coyote is considered intermediate to wolves and western coyotes in nearly all respects including niche and systematics, probably the result of hybridization with *C. lupus lycaon* (Algonquin or Tweed type) in southern Ontario and Quebec.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 in M. Bekoff, editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

DIET, HABITAT, MORPHOLOGY, RANGE, REPRODUCTION

Knowledge of the eastern coyote (*Canis latrans* var.) is limited by the comparatively recent occurrence and recognition of the animal and by the somewhat adolescent phase of the investigations in toto. This is not to say that investigations to date have not been fruitful, for indeed they have shown that (1) the coyote as a species has or is occupying most of the former wolf (*Canis lupus lycaon*) range in the east; (2) traditional wild *Canids* isolating mechanisms are apparently being broken down; (3) the eastern coyote has a unique taxonomic position among the *Canis* species; (4) growth and behavior of the eastern form are different than that of previously classified *Canis latrans;* and (5) the feeding strategy of the coyote may be expanding from the traditional role as an opportunistic scavenger and the predator of small mammals to more frequently include larger prey where it is available. It is the purpose of this chapter to bring together current theories and assessments of the status of the eastern coyote as a basis for future investigations and impending management decisions.

Hilton, H. 1992. Coyotes in Maine: a case study. Pages 183–194 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

CONFLICT, HUMAN DIMENSIONS, MANAGEMENT, MAINE

Coyotes became established in Maine in the 1970's and 1980's, exerting an influence on the development and implementation of various wildlife regularly, management, and control initiatives for furbearers and deer (*Odocoileus virginianus*), and threatening the fiscal and management integrity of the Maine Department of Inland Fisheries and Wildlife (MDIFW). This paper reviews the regulatory and management experience of the MDIFW with regard to coyotes, and the programs that were developed in response to wildlife management and political mandates.

Hilton, H., and N. P. Kutscha. 1978. Distinguishing characteristics of the hairs of eastern coyote, domestic dog, red fox and bobcat in Maine. American Midland Naturalist 100:223–227.

MORPHOLOGY, MAINE

Hairs from 32 coyotes (*Canis latrans*), 15 domestic dogs (*Canis familiaris*), eight red foxes (*Vulpes vulpes*) and five bobcats (*Lynx rufus*) taken in Maine were examined to determine the essential distinguishing characteristics. Although several characteristics were strongly overlapping, hairs can often be distinguished by number, order and color of the bands, the cross-sectional translucence and shape, and the cuticular scale pattern.

Hilton, H., and V. B. Richens. 1975. Coyote food habits and prey relationships in Maine. Pages 74–82 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

DIET, MAINE

The food habits of Maine coyotes (*Canis latrans* var.) were studied in the remote St. John-Allagash Wilderness of western Aroostook County, and compared to other data obtained statewide. The diet of Maine coyotes appears to vary with availability and abundance of food at different seasons and in different regions. In settled areas coyotes eat a great variety of items including refuse, fruit, unretrieved hunter-killed deer and domestic stock remains. In remote unsettled areas coyotes appear to scavenge less and become more predatory, depending more heavily on deer (*Odocoileus virginianus*), hare (*Lepus americanus*), and other wild animals. Food habits were determined by snow tracking, examination of scats, and stomach content analysis.

Hoerath, J. D. 1990. Influences of coyotes on game animals as monitored by fecal analysis. Thesis, Auburn University, Auburn, USA.

ALABAMA, DIET

Coyote (*Canis latrans*) diet was assessed from 292 scats collected biweekly from a site in the upper coastal plain of western Alabama from June 1988 through November 1989. Diet was recorded by both frequency of occurrence and by relative percent volume. The 4 most common food groups and annual percent occurrence were: rodent (65.5), white-tailed deer (37.9), lagomorphs (37.3), and fruit (16.7). These items also ranked in the same order by relative percent volume. Rodents occurred most frequently in each season, yet were significantly higher in spring. Lagomorphs and fruits occurred significantly higher in summer, from spring, and were also both important fall food items. White-tailed deer fawns occurred more frequently than any single item in the fall and were the third most important single year-round item by percent volume. Marked deer carcasses were a minor winter diet component, but were found in 14% of all winter carnivore scats collected. Gallinaceous game bird species were not identified as important diet components from scat analysis, and results from 2 dummy nest trials were inconclusive, though these trials had high loss rates. It does not appear from this study that coyotes are adversely impacting game bird species and that they are acting beneficially toward the white-tailed deer population by helping to control it through predation on fawns.

Hoerath, J. D., and M. K. Causey. 1991. Seasonal diets of coyotes in western central Alabama. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies. 45:91–96.

ALABAMA, DIET

Year-round diet of coyotes (*Canis latrans*) was assessed from 292 fecal samples using frequency of occurrence of prey types and relative percent volume of both prey types. By both measures, the most important food item for each season was rodents, except in the fall when volume of white-tailed deer (*Odocoileus virginianus*) in scats exceeded the volume of rodents. In most cases the 2 methods ranked prey groups identically. Five of the 7 differences between adjacent seasons identified by frequency of occurrence were corroborated by differences in volume. *Lagomorphs* also were important, and their remains occurred in >16% of each season's samples. Coyotes utilized rodents, lagomorphs, white-tailed deer, and fruit most often, consistent with other southeastern studies of coyote food habits, although the composite annual average for white-tailed deer (37.6%) exceed all reported levels from southeastern studies. Identifiable remains of eastern wild turkey (*Meleagris gallopavo*) and northern bobwhite (*Colinus virginianus*) were detected in 3 coyote scats during the study period.

Holzman, S., M. J. Conroy, and W. R. Davidson. 1992. Diseases, parasites and survival of coyotes in south-central Georgia. Journal of Wildlife Diseases 28:572–580.

DISEASE, GEORGIA, SURVIVAL

Serologic testing, radio-telemetry and post-mortem diagnostic evaluations were used to investigate survival and causes of mortality among 17 coyotes (*Canis latrans*) in south-central Georgia (USA). Prevalence of canine heartworm (*Dirofilaria immitis*) microfilariae was lower (P = 0.057) among fall-captured (22%) than among winter-captured (75%) coyotes. Prevalence of heartworm was higher among adults than juveniles in the fall, but no significant difference was detected between animals captured in winter. Antibodies were found against canine parvovirus (65%), canine parainfluenza virus (59%), infectious canine hepatitis virus (41%), and *Toxoplasma gondii* (18%). Antibodies were not found to *Brucella canis,* canine coronavirus, five serovars of *Leptospira interrogans,* or canine distemper virus. Seroprevalence of canine parvovirus was lower (P = 0.009) among fall-captured animals (33%) than winter-captured animals (100%). The Kaplan-Meier estimate of annual survival was 0.500 for all animals. Juvenile survival did not differ (P = 0.79) from adult survival, but male survival (S = 0.217) was lower (P = 0.11) than female survival (S = 0.804). Two of nine (22%) mortalities were human-caused, one was due to concurrent canine parvovirus and canine distemper virus infections, one animal died of trauma, two were considered natural mortalities of unknown cause, and no cause of death could be determined for the remaining three animals. Natural mortality may be significant for coyotes in south-central Georgia, although there was no apparent link between exposure to pathogens and the animals' subsequent fate in our small sample.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

GEORGIA, HABITAT, HOME RANGE, MOVEMENTS, SURVIVAL, TRANSIENT

Most previous studies of coyotes (*Canis latrans*) have been conducted in western North America, and inferences about their ecology probably are not relevant to the southeastern U.S. Consequently, we radio tracked 12 coyotes from September 1987 through December 1988 to study movement and habitat use in south-central Georgia. Home ranges averaged 12.4, and 10.1 km2 for the 95% harmonic contour and 95% minimum convex polygon methods, respectively. Home range size was smallest during the gestation season. Nocturnal movement rates were greater (P = 0.0001) than diurnal rates. Both diurnal and nocturnal movement rates were greater (P < 0.02) for adults than juveniles, but were not different (P > 0.2) between the sexes. There was an interaction (P < 0.04) between age and meteorological season for diurnal and nocturnal movement rates. Adults had greater movement rates during the warm season, whereas juveniles had greater movement rates during the cool season. Home ranges contained proportionately more (P < 0.04) open areas than were available in the study areas. Coyotes did not select specific habitats during the day, but at night preferred (P = 0.09) brushy areas and young pine plantations. There was greater (P = 0.03) use of mature pine plantations during warm versus cool seasons. Adults used old fields more (P = 0.09) than juveniles and mature pine plantations less (P = 0.06) than juveniles. Relatively few transient coyotes in this population suggest that local control might be an effective management technique.

Houben, J. M. 2004. Status and management of coyote depredations in the eastern United States. Sheep and Goat Research Journal 19:16–22.

DAMAGE, LIVESTOCK, PREDATION

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the Vertebrate Pest Conference 21:70–74.

CONFLICT, DAMAGE, GUARD ANIMAL, HUMAN DIMENSIONS, LIVESTOCK, PREDATION, PRODUCER, WEST VIRGINIA

The West Virginia Integrated Predation Management Program was created in 1996 due to increasing livestock losses to coyotes and the inability of producers to solve the problem themselves. The eastern coyote arrived in West Virginia in the early to mid-1980s. by the early 1990's, coyote depredations were recognized as a serious threat to West Virginia's livestock industries. At a June 26, 1995 public meeting in Riverton,

West Virginia, livestock producers expressed to their state delegates and senators their concerns and frustrations with their inability to control coyote predation on sheep. This meeting provided the impetus for the creation of the West Virginia Integrated Predation management Program as carried out by the USDA APHIS Wildlife Services (WS). Wildlife Services predator management specialists in West Virginia integrated and apply or assist the producer in applying an combination of non-lethal and lethal alternatives to minimize coyote predation on sheep, goats, and calves. Wildlife Services has provided predation control workshops, on-site recommendations, and a guard dog cost-share program to encourage producers to implement non-lethal methods on their farms. Lethal control strategies directed at depredating coyotes have been either preventative or corrective. WS has initiated preventative control prior to the onset of actual depredations in areas where historic losses due to coyote depredation have been documented and where there has been an imminent threat of loss of livestock. Corrective control by WS was directed at depredating coyotes in response to ongoing losses with the goal of removing the offending coyote(s). In this paper, we discuss the development and success of the West Virginia Integrated Predation Management Program to protect livestock.

Houben, J. M., and J. R. Mason. 2004. Weight and age of coyotes captured in Virginia, USA. Proceedings of Vertebrate Pest Conference 21:75–76.

AGE STRUCTURE, MORPHOLOGY, VIRGINIA

We recorded the weight and age of 70 coyotes collected during depredation control efforts in western Virginia. Mean masses for adult male and female coyotes were 16.2 and 13.4 kg, respectively. Juvenile male and female coyotes weighed 14.0 and 13.0 kg, respectively. Regardless of sex, mean mass was greatest between November and January and comparable to that reported for coyotes throughout the eastern United States. Cementum aging indicated that 71% of the coyotes captured were greater than 1 year of age. Numerical trends suggest that age and sex may influence vulnerability to capture.

Howard, W. E. 1949. A means to distinguish skulls of coyotes and domestic dogs. Journal of Mammalogy 30:169–171.

MORPHOLOGY, TAXONOMY

Howze, M. B. 2009. Predator removal and white-tailed deer recruitment in southwestern Georgia. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:17–20.

GEORGIA, MANAGEMENT, PREDATION, WHITE-TAILED DEER

We assessed the efficacy of predator removal as a tool for increasing white-tailed deer (*Odocoileus virginianus*) recruitment at the Joseph W. Jones Ecological Research Center in southwestern Georgia, an area with a low-density (2–6 deer/km^2) deer herd. We partitioned our 11,736-ha study area into predator removal (approximately 4,200 ha) and non-predator removal (approximately 2,800 ha) zones with a 4,500-ha buffer between them. We removed 23 coyotes (*Canis latrans*) and 3 bobcats (*Lynx rufus*) from the removal zone between January and August 2008. Most of these (14 coyotes and 1 bobcat) were removed during the fawning period (June—August 2008). Pre-hunting season camera surveys conducted during September 2008 indicated a difference in fawn: doe ratios between the two zones (0.68 in the removal zone; 0.07 in the non-removal zone). Post-hunting season surveys conducted during February suggested a fawn: doe ratio of 0.97 in the removal zone and 0.45 in the non-removal zone. Our study provides further evidence that predator management may be an effective tool for increasing fawn recruitment in low-density deer herds.

Huegel, C. N. 1979. Winter ecology of coyotes in northern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

DIET, WISCONSIN

Coyote (*Canis latrans*) winter feeding behavior was studied in forested habitat in northern Wisconsin from 14 February–1 April 1976 and 13 December

1976–19 March 1977. Information on food habits and foraging activities were obtained by following the snow trails of 3 radio-collared coyotes 280 km and unmarked coyotes 124 km. White-tailed deer (*Odocoileus virginianus*) carrion provided 63% and 29% of the total biomass consumed by a radioed juvenile female and juvenile male, respectively, in 1976–77. Snowshoe hare (*Lepus americanus*) comprised 83% of a radioed adult male's diet until 15 February in 1976–77 and deer that he killed comprised 84% of his diet after 15 February. Consumption rates were highest for the adult male and lowest for the juvenile female. Although deer provided a substantial portion of the winter diet of coyotes in our study, predation was not judged to be a significant factor influencing deer populations.

Huegel, C. N., and O. J. Ronstad. 1985. Winter foraging patterns and consumption rates of northern Wisconsin coyotes. American Midland Naturalist 113:203–207.

DIET, WISCONSIN

Observations were made of the foraging activities and consumption rates of three radio-collared coyotes (*Canis latrans*) during the winters of 1976–1977 in the Chequamegon National Forest of northern Wisconsin. Carrion, mostly white-tailed deer (*Odocoileus virginianus*), comprised 43% and 69% of the winter diet of a juvenile male and a juvenile female coyote, respectively. An adult male coyote killed 88% of his winter diet. Snowshoe hare (*Lepus americanus*) comprised nearly 83% of his diet prior to 15 February. After 15 February, 84% of his diet consisted of deer which he killed. Snow conditions and an increase in coyote sociality may have influenced coyote predation of deer. The three coyotes consumed 10–12% of their body weight per day during most of the winter.

Huot, J., M.-L. Poulle, and M. Crête. 1995. Evaluation of several indices for assessment of coyote (*Canis latrans*) body composition. Canadian Journal of Zoology 73:1620–1624.

MORPHOLOGY

The body composition of 27 coyotes (*Canis latrans*) of different ages and both sexes was determined on the basis of chemical analyses of homogenized samples of viscera, carcass, and skin. Regression analyses were used to identify the best indices for estimating fat (lipid reserves), protein, and water body contents. A combined index based on the kidney fat index and the percentage of femur marrow fat was the best indicator of fat reserves. Body mass (whole or skinned carcass) and eviscerated carcass mass were the best predictors of total body protein and total body water contents. A combination of indices is proposed to provide postmortem or in vivo estimates of coyote body composition.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

HOME RANGE, HABITAT, GRAY FOX, MOVEMENTS, RED FOX, VERMONT

Using radio telemetry, I investigated home ranges, habitat use, and activity patterns of 11 red foxes (*Vulpes vulpes*) and seven gray foxes (*Urocyon cinereoargenteus*) in an agricultural region of Vermont. In addition, I examined the spatial relationships of foxes with sympatric eastern coyotes (*Canis latrans* var.) from a concurrent study to investigate the impact of coyotes, which have recently expanded their range into the Northeast, on other canine predators in the region.

I obtained 551 radiolocations for both fox species between September 1985 and December 1986. Red fox and gray fox harmonic mean home ranges averaged 2.02 km^2 and 4.43 km^2, respectively, but home range size did not differ between the 2 species (P = 0.84), primarily because of variability within species. Red fox home ranges were considerably smaller than those reported in the literature. Red foxes were found most frequently in open portions of the study area but used habitat in proportion to its occurrence. Gray foxes were found primarily in hardwood-forested sections and avoided open habitats. Both fox species were most active at night but gray foxes were more active than red fox during crepuscular periods.

Red fox and coyote home ranges were largely mutually exclusive, but home-range overlap of gray foxes and coyotes ranged from 0 to 88 percent. Although interspecific aggression was observed on occasion, both red and gray foxes seemed to coexist with coyotes by employing tow different avoidance strategies. The two fox species maintained similar separation distances from coyotes and distances from coyote harmonic mean home range centers that did not differ. Red fox home ranges were located in boundary areas between coyote group home ranges, thereby maintaining spatial separation from coyotes. Gray foxes overlapped coyotes to a greater degree on a spatial basis, but avoided coyote core activity areas and avoided coyotes on a temporal basis, probably through behavioral means.

Inslerman, R. A. 1991. Public involvement in coyote management decisions. Proceedings of the Eastern Wildlife Damage Control Conference 5:196–197.

HUMAN DIMENSIONS, MANAGEMENT, NEW YORK

In 1990, the Legislature passed a bill that would have allowed year-round hunting of coyotes (Cams latrans) in New York's Northern Zone, as opposed to the current system of open and closed hunting seasons established annually by Department of Environmental Conservation (DEC) regulation. The bill generated such controversy that it was withdrawn pending a study by DEC. The objectives of the study were to: (1) assess the role of the coyote in northern New York in relation to people, wildlife, and livestock; (2) provide adequate opportunity for citizens to express their opinions concerning coyotes; and (3) prepare a status report with coyote information and management recommendations. The study consisted of: (1) a review and analysis of available scientific literature; (2) consultations with leading coyote researchers and wildlife damage management specialists; (3) a survey of DEC field staff and Cornell Cooperative Extension (CCE) agents in northern New York; and (4) the active solicitation and analysis of both written and verbal public opinion.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

ALABAMA, BEHAVIOR, HABITAT, HOME RANGE, URBAN

Throughout the past several decades, coyotes (*Canis latrans*) have become common inhabitants of urban areas in the southeastern United States. Because their southward expansion is recent, there is a lack of information on movements of urban coyotes in this part of the country. I examined seasonal variation in size of home range, activity patterns, and habitats selected along an urban-rural gradient in east-central Alabama during 2007–2009. I created an urban-rural gradient based on amount of urban land cover in individual home ranges. Urban association in individual home ranges was 2–45%. Linear models suggested that composite and seasonal variation in size of home range decreased as use of urban habitats increased during all reproductive seasons. Mixed logistic-regression models indicated that coyotes across the gradient were active at similar times during all seasons, except for diurnal hours during pup rearing, when coyotes were less active in areas with more urbanization. Coyotes along the gradient avoided areas of high-, medium-, and low-intensity urbanization. Coyotes with more urban association selected for hardwood and successional areas as well as habitats close to roads and water sources. Coyotes with less urban association select for pine habitats, while those with more urban association selected against these areas. Information presented in this study will allow biologists and resource managers to gain an understanding of movements of coyotes in urban areas, and will be helpful in predicting and mitigating potential human-coyote interactions in the Southeast.

Jean, Y., and J.-M. Bergeron. 1984. Productivity of coyotes (*Canis latrans*) from southern Québec. Canadian Journal of Zoology 62:2240–2243.

AGE STRUCTURE, REPRODUCTION, QUEBEC

A sample of coyotes harvested in the Eastern Townships of southern Quebec indicates that 84% of the

sample compromised females under 3 years old. The examination of mature follicles, corpora lutea and corpora albicantia, indicated that the ovulation rates ranged from 6.6 to 8.0, and the mean ovulation frequency was of 57%. The mean litter size was estimated at 7.1 with 46% of the females producing pups. The mean population productivity was of 316 pups per 100 females annually, occurring with rates found in other North American populations. Results suggest that a strong harvesting pressure could be at the origin of the large litter size, of the age structure that favors young animals, as well as the high turnover rate in the population.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

DAMAGE, DIET, HUMAN DIMENSIONS, ILLINOIS, LIVESTOCK

The seasonal occurrence of food items in the diet of west-central Illinois coyotes (*Canis latrans*) during December 1979–August 1981 was studied. Emphasis was on swine (*Sus scrofa*) and white-tailed deer (*Odocoileus virginianus*) fawn utilization in an area assumed to harbor high populations of both. Based on a mail survey of swine producers from Adams and Pike counties, the magnitude of swine losses to coyotes was estimated, and relationships between swine husbandry practices and losses to coyotes were evaluated. One hundred and sixty stomach and 11 large intestine contents were examined for winter food habits and 69 scats for summer food habits. Mammals that occurred most frequently during all seasons were cottontail rabbits (*Sylvilagus floridanus*) (33.7%–76.9% occurrence), rodents (36.7%–51.0%) and swine (30.0%–39.1%). The fairly constant percent occurrence of swine remains suggested regular availability to coyotes. Plant material appeared in all seasons with a high frequency of occurrence (>50% occurrence), but quantity was usually small. White-tailed deer appeared in all seasons; but, only two scats in August 1981 yielded evidence of fawns. The small number of scats collected during fawning and the inability to distinguish between fawns and adults after the former shed their spotted pelage may have caused underestimation of coyote utilization of fawns.

Only 12.6 percent of the swine producers surveyed returned usable questionnaires; however, these 85 responses were used to indicate trends in husbandry techniques and potential management problems. Improper disposal of swine carcasses and inefficient enclosures appeared foremost problems correlated (significant at 0.05 level) with losses to coyotes. However, only five percent of all reported swine losses were attributed to coyotes.

Jones, E. J. 1987. Coyote damage in the southeastern United States. Proceedings of the Eastern Wildlife Damage Control Conference 3:320.

DAMAGE, CONFLICT, HUMAN DIMENSIONS

Judy, B. A. 2010. Assessment of habitat use by eastern coyote (*Canis latrans*) along an urban-parkland gradient. Thesis, Cleveland State University, Cleveland, USA.

HABITAT, OHIO, URBAN

This study used coyote howl surveys combined with GIS to locate local coyote (*Canis latrans*) populations, determine the habitats where coyotes occur and estimate coyote group sizes in Bedford, North Chagrin and West Creek Reservations within the Cleveland Metroparks, Ohio. The CMP were established in 1917 and are the oldest park districts in the state of Ohio. There are 8,500 hectares (21,000 acres) of land in 16 reservations and in 2008 approximately 43,000,000 people visited the Cleveland Metroparks. Bedford, North Chagrin and West Creek Reservations have a mixture of park, forest, woodlots, residential neighborhoods, industrial areas, commercial property, open water, streams and wetlands. Coyotes have become the "top terrestrial predator" in northeastern North America and these animals are choosing to live in urban areas where humans are present and few natural habitats are available. Very little is known about the ecology and behavior of these elusive *Canids* around residential neighborhoods. I examined where coyotes actually lived along park boundaries.

I performed howl surveys in Bedford, North Chagrin, and West Creek Reservations. Data were collected to determine coyote location, estimation of coyote group sizes and what types of habitats coyotes responded from. Overall, coyotes were heard 16.9% of the time when howl surveys were performed. Bedford Reservation had a minimum of 13 coyotes during winter months and 11 coyotes during the summer. It is believed that three coyote groups (Bedford, Cuyahoga Valley National Park and Walton vii Hills) were present around Bedford Reservation. North Chagrin Reservation had at least five coyotes during the winter and four coyotes in the summer months. West Creek Reservation had three coyotes respond to surveys in the winter and five coyotes replied during summer surveys. North Chagrin and West Creek Reservation each had one coyote group. Bedford Reservation coyote groups had similar responses during all three seasons (dispersal, breeding and pup-rearing). North Chagrin coyotes responded the most during the dispersal and pup-rearing seasons. West Creek Reservation had peak coyote responses during the breeding and pup-rearing seasons. For all three reservations, coyotes responded from natural areas more than from urban areas (Bedford 65%, North Chagrin 79%, and West Creek 83%). Statistics showed that Bedford coyotes responded more than West Creek coyotes. More coyotes responded during the dispersal season than during the pup-rearing season. Coyote response rates increased the closer howl surveys were performed to sunset and/or later at night (closer to midnight). Coyotes also responded more to howl surveys when temperatures were low and the moon was visible.

Overall, howl surveys allowed for inexpensive monitoring of coyotes over large areas in urban-park environments. Coupled with GIS, these surveys identified where coyotes lived and the habitats they used, and therefore these methods provide the tools to inform the public better about how they may coexist with coyotes.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

EASTERN WOLF, GENETICS, HYBRID, MORPHOLOGY, RANGE, TAXONOMY

The dramatic expansion of the geographical range of coyotes over the last 90 years is partly explained by changes to the landscape and local extinctions of wolves, but hybridization may also have facilitated their movement. We present mtDNA sequence data from 686 eastern coyotes and measurements of 196 skulls related to their two-front colonization pattern. We find evidence for hybridization with Great Lakes wolves only along the northern front, which is correlated with larger skull size, increased sexual dimorphism and a five times faster colonization rate than the southern front. Northeastern haplotype diversity is low, suggesting that this population was founded by very few females moving across the Saint Lawrence River. This northern front then spread south and west, eventually coming in contact with an expanding front of non-hybrid coyotes in western New York and Pennsylvania. We suggest that hybridization with wolves in Canada introduced adaptive variation that contributed to larger size, which in turn allowed eastern coyotes to better hunt deer, allowing a more rapid colonization of new areas than coyotes without introgressed wolf genes. Thus, hybridization is a conduit by which genetic variation from an extirpated species has been reintroduced into northeastern USA, enabling northeastern coyotes to occupy a portion of the niche left vacant by wolves.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon et al. 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

EASTERN WOLF, GENETICS, HYBRID, MORPHOLOGY, RANGE, TAXONOMY

Kays, R. W., M. E. Gompper, and J. C. Ray. 2008. Landscape ecology of eastern coyotes based on large-scale estimates of abundance. Ecological Applications 18:1014–1027.

HABITAT, NEW YORK, POPULATION DENSITY

Since their range expansion into eastern North America in the mid-1900s, coyotes (*Canis latrans*) have be-

come the region's top predator. Although widespread across the region, coyote adaptation to eastern forests and use of the broader landscape are not well understood. We studied the distribution and abundance of coyotes by collecting coyote feces from 54 sites across a diversity of landscapes in and around the Adirondacks of northern New York. We then genotyped feces with microsatellites and found a close correlation between the number of detected individuals and the total number of scats at a site. We created habitat models predicting coyote abundance using multi-scale vegetation and landscape data and ranked them with an information-theoretic model selection approach. These models allow us to reject the hypothesis that eastern forests are unsuitable habitat for coyotes as their abundance was positively correlated with forest cover and negatively correlated with measures of rural non-forest landscapes. However, measures of vegetation structure turned out to be better predictors of coyote abundance than generalized "forest vs. open" classification. The best supported models included those measures indicative of disturbed forest, especially more open canopies found in logged forests, and included natural edge habitats along watercourses. These forest types are more productive than mature forests and presumably host more prey for coyotes. A second model with only variables that could be mapped across the region highlighted the lower density of coyotes in areas with high human settlement, as well as positive relationships with variables such as snowfall and lakes that may relate to increased numbers and vulnerability of deer. The resulting map predicts coyote density to be highest along the southwestern edge of the Adirondack State Park, including Tug Hill, and lowest in the mature forests and more rural areas of the central and eastern Adirondacks. Together, these results support the need for a nuanced view of how eastern coyotes use forested habitats.

Keener, V. 1981. Gastrointestinal cestodes and nematodes of coyotes from southeastern Illinois. Thesis, Eastern Illinois University, Charleston, USA.

DISEASE, ILLINOIS

Gastrointestinal tracts of 45 coyotes, *Canis latrans,* from southeastern Illinois were examined for cestodes and nematodes. The following parasites and incidences (%) were observed: *Taenia spp.* (71.1); *Physaloptera sp.* (53.3); *Ancylostoma sp.* (20.0); *Ascarididae* (11.1); *Thelazia sp.* (2.2); *Trichuris sp.* (2.2); *Uncinaria sp.* (2.2). *Ancylostoma sp.* occurred significantly more often in juveniles than adults. Parasites averaged low numbers per coyote, and no ulceration or blood in the tracts was seen.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

BEHAVIOR, HABITAT, HOME RANGE, NEW YORK, SURVIVAL

Coyote home ranges, habitat use and mortality were studied in two sites in northern New York. Road densities were 1.51 km/km^2 and 1.02 km/km^2 in the Eastern Study Site (ESS, 193 km^2) and Western Study Site (WSS, 299 km^2) respectively. Agriculture comprised 44.1 percent of the land use in the ESS and 16.5 percent of the WSS. Daytime locations (n = 565) were obtained for 19 radio-collared coyotes. Non-denning season ranges averaged 18.9 and 14.4 km^2 for male and female coyotes respectively. Deaths were caused by hunters using trained hounds (n = 6), trapping (n = 3), incidental shooting (n = 3), vehicle collisions (n = 2) and natural causes (n = 2). Coyotes preferred forested habitats and avoided agricultural and urban areas during daylight hours. Coyotes excluded primary roads from 95 percent minimum convex polygon home ranges. Secondary roads were avoided in core use areas and activity centers.

Kennedy, M. L., P. L. Leberg, and G. D. Baumgardner. 1986. Morphologic variation in the coyote, *Canis latrans,* in the southern United States. Southwestern Naturalist 31:139–148.

MORPHOLOGY

Morphologic variation in the coyote, *Canis latrans,* from the southern United States was examined using univariate and multivariate statistical analyses. The taxon was sexually dimorphic with male skulls larger

for 20 of 21 characters assessed. Fourteen male and 12 female measurements showed significant interlocality variation. A matrix of correlation among characters was compounded, and the first three principal components were extracted. These accounted for 87.9% of the total phonetic variance in the character set of males of 94.1% among females. Three-dimensional projection of localities onto principal components showed that, for both males and females, larger individuals occurred in more eastern localities (male-eastern Texas, Louisiana, and Mississippi; female-Louisiana, Tennessee, Arkansas, Mississippi, and eastern Texas) and smaller animals occupied western localities (western Texas, Oklahoma, and Missouri). In general, coyotes were most similar to those in nearby geographic areas. Large size for both sexes was positively correlated with high actual evapotranspiration

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Kennedy, M. L., S. G. Mech, B. Tran, J. W. Grubaugh, and R. F. Lance. 2003. An assessment of geographic variation in sexual size dimorphism in the coyote (*Canis latrans*). Mammalia 67:411–417.

MORPHOLOGY

Geographic variation in sexual size dimorphism was assessed for the coyote (*Canis latrans*) across nine localities in the central and eastern United States. Twenty skull measurements from 587 (308 male; 279 female) adult specimens were used in the assessment. Males were found to be larger than females for all characters except least zygomatic process—jugal height in Texas and skull height at palatine in Michigan. Mean values for the degree of sexual dimorphism across localities ranged from 1.0 to 8.0%. Most mean values ranged from 4.0 to 6.0%. There was no significant interaction between sex and locality. Therefore, there was no difference in the degree of sexual dimorphism across localities. Measurements for males were significantly correlated with those of males across sites for each character. Distance matrices representing the morphometric distance among sites for each sex were highly correlated (r = 0.990). Female coyotes appeared to be scaled-down models of males. Results were interpreted to support the bioenergetic hypothesis as an explanation for sexual size dimorphism in *C. latrans* but also were discussed in light of the resource partitioning and sexual selection hypothesis.

Kick, T. J., G. F. Hubert, Jr., and R. D. Andrews. 1984. Heartworms (*Dirofilaria immitis*) in coyotes (*Canis latrans*) in Illinois. Transactions of Illinois Academy of Sciences 77:127–134.

DISEASE, ILLINOIS, SEX RATIO

Dirofilaria immitis was found in 103 of 472 (21.8%) coyotes (*Canis latrans*) collected from fur buyers and trappers in 28 Illinois counties during 1977 through 1980. The overall prevalence rate was 9.4% in the northern one-half of the state compared with 23.8% in the southern one-half. In southeastern Illinois were 28.0% of all coyotes examined were infected, the prevalence rate for juveniles were significantly lower than that of adults. Infection levels ranged from 1 to 52 heartworms per animal and averaged 9.6. In general the mean number of worms per infection in adults was higher than in juveniles. Ten of 29 (34.5%) coyotes from Clay and Richland counties had single sex heartworm infections. The parasite sex ratio was 1.11:1, female to male. The finding of *D. immitis* in coyotes represents a new host record for the state.

King, A. W., and A. M. Bohning. 1984. The incidence of heartworm, *Dirofilaria immitis* (Filarioidea), in the wild *Canids* of northeast Arkansas. Southwestern Naturalist 29:89–92.

ARKANSAS, DISEASE

Adult canine heartworms (*Dirofilaria immitis*) were found in the hearts of 127 of 193 (65.8%) coyotes (*Canis latrans*), 1 of 26 (3.8%) red foxes (*Vulpes vulpes*), and 3 of 163 (1.8%) gray foxes (*Urocyon cinereoargenteus*) collected from fur buyers of northeast Arkansas. Coyote infections were clearly heavier than fox infections. *D. immitis* microfilariae were observed in worms taken from coyotes and the red fox but not from gray foxes. Coyotes were considered an integral element of *D. immitis* epizootiology in northeast Arkansas; red foxes and gray foxes are not.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

DIET, PREDATION, SOUTH CAROLINA, WHITE-TAILED DEER

The coyote (*Canis latrans*) is a recent addition to the fauna of eastern North America, and in many areas coyote populations have been established for only a decade or two. Although coyotes are known predators of white-tailed deer (*Odocoileus virginianus*) in their historic range, effects this new predator may have on eastern deer population have received little attention. We speculated that in the southeastern United States, coyotes may be affecting deer recruitment, and we present 5 lines of evidence that suggest this possibility. First, the statewide deer population in South Carolina has declined coincident with the establishment and increase in the coyote population. Second, data sets from the Savannah River Site (SRS) in South Carolina indicate a new mortality source affecting the deer population concurrent with the increase in coyotes. Third, an index of deer recruitment at SRS declined during the period of increase in coyotes. Fourth, food habits data from SRS indicate that fawns are an important food item for coyotes during summer. Finally, recent research from Alabama documented significant coyote predation on fawns there. Although this evidence does not establish cause and effect between coyotes and observed declines in deer recruitment, we argue that additional research should proactively address this topic in the region. We identified several important questions on the nature of the deer-coyote relationship in the East.

Kolenosky, G. B. 1971. Hybridization between wolf and coyote. Journal of Mammalogy 52:446–449.

EASTERN WOLF, HYBRID

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

GENETICS, EASTERN WOLF, GRAY WOLF, HYBRID, TAXONOMY

Eastern North American wolves have long been recognized as morphologically distinct from both coyotes and gray wolves. This has led to questions regarding their origins and taxonomic status. Eastern wolves are mainly viewed as: (1) a smaller subspecies of gray wolf (*Canis lupus lycaon*), potentially the result of historical hybridization between gray wolves (*C. lupus*) and red wolves (*C. rufus*), (2) a hybrid, the result of gray wolf (*C. lupus*) and coyote (*C. latrans*) interbreeding, or (3) a distinct species, *C. lycaon,* closely related to the red wolf (*C. rufus*). Although debate persists, recent molecular studies suggest that the eastern wolf is not a gray wolf subspecies, nor the result of gray wolf/ coyote hybridization. Eastern wolves were more likely a distinct species, *C. lycaon,* prior to the eastward spread of coyotes in the late 1800s. However, contemporary interbreeding exists between *C. lycaon* to both *C. lupus* and *C. latrans* over much of its present range complicating its present taxonomic characterization. While hybridization may be reducing the taxonomic distinctiveness of *C. lycaon,* it should not necessarily be viewed as negative influence. Hybridization may be enhancing the adaptive potential of eastern wolves, allowing them to more effectively exploit available resources in rapidly changing environments.

Land, E. D., D. S. Maehr, J. C. Roof, and J. W. McCown. 1993. Mortality patterns of female white-tailed deer in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:176–184.

DIET, FLORIDA, PREDATION, WHITE-TAILED DEER

Eleven of 66 radio-collared white-tailed deer (*Odocoileus virginianus*) in southwest Florida were killed by bobcats (*Felis rufus*) and 4 by Florida panthers (*Felis concolor coryi*). Average doe home range size was 194 ha, and 2 bucks ranged from 454–1,560 ha. There were no differences (P = 0.336) in doe survival rates among seasons. The average annual survival rate for does was 0.813 (95% CI—0.68, 0.94) and 64% of the annual mortality was attributable to predation. Average neonate mortality rate was 37.8% ± 16.1 and appeared to increase with surface water levels. Human

hunting activities had little impact on the number of radio-collared does, and the population was stable with a net reproductive rate (R_0) of 0.96.

Lapierre, L. E. 1985. Fall and winter food habits of the eastern coyote *Canis latrans* in southeastern New Brunswick. Proceedings of Nova Scotia Institute of Science 35:71–74.

DIET, NEW BRUNSWICK

Food habits of coyotes in southeastern New Brunswick were investigated during the fall and winter trapping seasons from 1979 to 1982. Based on analyses of 128 specimens, snowshoe hare, white-tailed deer and rodents accounted for 37.5, 27.9 and 27.3% of stomach contents respectively. These data indicate that the coyote shares a common food base with the red fox and the bobcat in the study area.

Lariviére, S., and M. Crête. 1993. The size of eastern coyotes a comment. Journal of Mammalogy 74:1072–1074.

GENETICS, MORPHOLOGY

Thurber and Peterson (1991, Journal of Mammalogy, 72:750–755) analyzed data on body mass of North American coyotes, and speculated that the larger size of eastern coyotes was most likely attributed to a phenotypic response to enhanced food supply. We argue that data on food habits, cranial morphometrics, body mass in captivity, and behavior suggest rather that this larger size of eastern coyotes is due to genetic factors and represents an adaptation to a larger prey, namely, white-tailed deer.

Lavigne, G. R. 1992. Sex/age composition and physical condition of deer killed by coyotes during winter in Maine. Pages 141–160 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

MAINE, PREDATION, WHITE-TAILED DEER

Eight hundred and sixty-three coyote (*Canis latrans*) killed deer (*Odocoileus virginianus*) were examined in a statewide winter mortality study in Maine from 1977–78 to 1988–89. When possible, the sex and age of coyote-kills were determined, and a femur was extracted to assess physical condition. Annual sample size was positively related to winter severity, while mean femur marrow fat (FMF) among coyote-killed deer was inversely related. Coyotes killed significantly more doe fawns and old deer of both sexes, but killed buck fawns, mature bucks and does in the same proportion as they occurred in the wintering heard. Mean FMF values of coyote-killed deer were inversely related. Coyotes killed significantly more doe fawns and old deer of both sexes, but killed buck fawns, mature bucks and does in the same proportion as they occurred in the wintering herd. Mean FMF values of coyote-killed deer declined monthly from December through April. Mature does consistently had the highest mean FMF levels' fawns were lowest, while yearling does and bucks older than fawn were intermediate. During all months except April, FMF levels among coyote-kills did to differ from road kills. The physical condition of coyote-killed deer was classified as good, marginal, or malnourished, based on relative FMF levels. Depending upon sex/age class, 50–70 percent of deer killed by coyotes contained high FMF levels indicative of good physical condition. Correspondingly, only 10–23 percent of coyote-killed deer were considered malnourished, and 20–47 percent were in marginal condition. Hence, most deer killed by coyotes in winter during this study would likely have survived to contribute to future reproduction and/or harvest. When the deer population is held in balance with carrying capacity, most predation on deer by coyotes during winter in Maine must be considered additive with other traumatic losses such as hunting, illegal kills, road-kills etc. Consequently, deer managers in Maine must account for these losses in relation to prevailing habitat quality and herd recruitment when determining an allowable harvest.

Lawrence, B., and W. H. Bossert. 1969. The cranial evidence for hybridization in New England canis. Breviora 330:1–13.

DOG, HYBRID, MORPHOLOGY, TAXONOMY

Using the technique of linear discrimination to compare known dog-coyote hybrids, it is shown that skulls of these animals have a mean discrimination function value almost exactly between those of the two parent stocks. Apply this same technique to the *Canids* which are presently invading the empty predator niche in New England, it is shown that this population differs from the known hybrids. They are predominantly coyote and evidence is given showing that they probably have some dog and wolf genes as well. The New England animals are an extreme expression of a trend already apparent in *Canis latrans* thammus from Minnesota. The high degree of variability demonstrated is evidence that the shift away from coyote is the result of hybridization rather than of a rapid evolution to fit a new niche.

Lee III, R. M. 1986. Food habits of the Coyote (*Canis latrans*) in Tennessee. Thesis, Memphis State University, Memphis, USA.

DIET, TENNESSEE

During 1981–1984, food habits of the coyote, *Canis latrans,* were studied in Tennessee. Digestive tracts of 262 animals were examined for food times, and data were assessed in relation to sex, age, seasonal, and annual variation. Additionally, spatial variation in food utilization was investigated using univariate and multivariate statistical procedures. Fourteen food items were recorded. Foods with highest percent occurrence were rodent, persimmon, rabbit, and deer. There were no significant differences between sexes for foods eaten, and only persimmon varied significantly among age classes. Significant seasonal variation was found for rodent, insect, reptile and amphibian, opossum, and persimmon. Livestock, insect, and grass varied significantly across years. Little spatial variation in food utilization was detected, and examination of environmental data with percent occurrence of food items revealed no significant association.

Lee III, R. M., and M. L. Kennedy. 1986. Food habits of the coyote in Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies. 40:364–372.

DIET, TENNESSEE

During 1981–1984, digestive tracts of 262 coyotes (*Canis latrans*) from Tennessee were examined for food items, and data were assessed in relation to sex, age, seasonal, annual, and spatial variation. Foods with highest percent occurrence were rodent, persimmon (Diospyros Virginia), rabbit (Sylvilagus spp.), and white-tailed deer (*Odocoileus virginianus*). There were no differences between sexes and for foods eaten, and only persimmon varied significantly among age classes. Seasonal variation was found for rodent, insect, reptile and amphibian, opossum (*Didelphis virginiana*), and persimmon. Livestock, insect, and grass varied across years. Little spatial variation in food use was detected, and examination of environmental data with percent occurrence of food items revealed no associations.

Lehman, N., A. Eisenhawer, K. Hansen, L. D. Mech, R. O. Peterson, P. J. P. Gogan, and R. K. Wayne. 1991. Introgression of coyote mitochondrial DNA into sympatric North American gray wolf populations. Evolution 45:104–119

GENETICS, GRAY WOLF, HYBRID

Mitochondrial DNA (mtDNA) genotypes of gray wolves and coyotes from localities throughout North America were determined using restriction fragment length polymorphisms. Of the 13 genotypes found among the wolves, 7 are clearly of coyote origin, indicating that genetic transfer of coyote mtDNA into wolf populations has occurred through hybridization. The transfer of mtDNA appears unidirectional from coyotes into wolves because no coyotes sampled have a wolf-derived mtDNA genotype. Wolves possessing coyote-derived genotypes are confined to a contiguous geographic region in Minnesota, Ontario, and Quebec, and the frequency of coyote- type mtDNA in these wolf populations is high (>500 %). The ecological history of the hybrid zone suggests that hybridization is taking place in regions where coyotes have only recently become abundant following conversion

of forests to farmlands. Dispersing male wolves unable to find conspecific mates may be pairing with female coyotes in deforested areas bordering wolf territories. Our results demonstrate that closely related species of mobile terrestrial vertebrates have the potential for extensive genetic exchange when ecological conditions change suddenly.

Lehman, N., and R. K. Wayne. 1991. Analysis of coyote mitochondrial DNA genotype frequencies: estimation of the effective number of alleles. Genetics 128:405–416.

GENETICS

A restriction-site survey of 327 coyotes (*Canis latrans*) from most parts of their North American range reveals 32 mitochondrial DNA (mtDNA) genotypes. The genotypes are not strongly partitioned in space, suggesting that there is high gene flow among coyote subpopulations. Consequently, each new geographic location added to the study has a decreasing probability of containing a mtDNA genotype that had not been previously discovered T. his being the case, by using Monte Carlo sampling experiments, we can estimate the total number of genotypes that would be found if all possible localities were surveyed. The estimate of total genotypic variability agrees qualitatively with estimates based on theoretical considerations of the expected number of alleles in a stable population. We also predict effective population sizes from genotype data. The accuracy of these estimates is thought to be dependent on the fact that coyotes are not highly genetically structured, a situation which may apply to highly mobile species.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

BEHAVIOR, BOBCAT, GRAY WOLF, MOVEMENTS, RED FOX

The recent expansion of coyotes (*Canis latrans*) into many regions of North America has generated substantial interest on the interactions between coyotes and coexisting predators. A review of recent literature on this subject indicates that sympatric carnivores partition prey according to body size. Convergence on limited food resources is less likely in southern latitudes where prey populations are more diverse. In northern regions, interference competition has resulted in an apparent dominance hierarchy among *Canids.* Gray wolves (*C. lupus*) are dominant over coyotes, and red foxes (*Vulpes vulpes*) are subordinate to coyotes. Relations between coyotes and felids are more varied. Coyotes and lynx (*Felis lynx*) are spatially segregated as a result of differing morphological adaptations to snow. Interference competition occurs between cougars (*F. concolor*) and coyotes in northern latitudes. Interference competition between coyotes and bobcats (*F. rufus*) is apparently restricted to female and juvenile bobcats because of their small body sixe. However, exploitation competition among all sex/age classes of these 2 species may be more influential in determining the composition of their local populations, especially in northern latitudes where prey diversity is limited and bobcats are under climactic stress. The ecological relations between coyotes and *Ursids* and *Mustelids* have not been investigated. In addition, the secondary effects of expanding coyote populations on carnivore community structure are essentially unknown and warrant investigation. Although a considerable amount of information has been obtained on carnivore interactions, many of the conclusions are based on correlations or inference. Future investigations should incorporate some experimental manipulations of coexisting species, such as selective removals or modification of resource abundance to test theories of competition between coyotes and sympatric carnivores.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

BEHAIVIOR, BOBCAT, DIET, HABITAT, HOME RANGE, MOVEMENTS, MAINE

Resource partitioning between bobcats (*Felis rufus*) and coyotes (*Canis latrans*) was investigated in eastern Maine during 1979–1984, when colonizing popula-

tions of coyotes were rapidly expanding. A total of 2615 radio locations of 10 resident bobcats and 6 resident coyotes were used to investigate activity patterns, spatial relationships, and habitat use. The daily distribution of activity by both species was similar during all seasons, and neighboring bobcat–coyote home ranges overlapped. Simultaneous locations of eight sympatric bobcat–coyote pairs (≥10% home range overlap) indicated an apparent lack of attraction or avoidance between neighboring heterospecifics. Bobcats preferred hardwood stands during all seasons ($P < 0.05$), and occupied softwood-dominated stands less than expected ($P < 0.05$) during autumn and winter. Coyote habitat use was less consistent, and indices of habitat-use overlap with bobcats varied from 0.60 during autumn to 1.00 during winter. Seasonal indices of diet diversity, based on the examination of 1495 feces, indicated that bobcats were more specialized than coyotes. Coyotes became omnivorous during summer and autumn, while bobcats remained strict carnivores during all seasons. Indices of diet overlap were higher during winter (0.76) and spring (0.72) than during summer (0.49) and autumn (0.49). The numbers of bobcats and coyotes trapped in eastern Maine during 1977–1986 were negatively correlated (r =—0.75, $P < 0.02$), suggesting a population response to exploitation competition between these two carnivores.

Litvaitis, J. A., and W. M. Mautz. 1980. Food and energy use by captive coyotes. Journal of Wildlife Management 44:56–61.

DIET, MORPHOLOGY

Four eastern coyotes (*Canis latrans* var.) were fed white-tailed deer (*Odocoileus virginianus*), snowshoe hare (*Lepus americanus*), and laboratory mice (*Mus musculus*) to determine their digestion of dry matter, nutrients, and partitioning of dietary gross energy. Dry matter digestibility of the deer diet (96.8%) was higher ($P < 0.05$) than of the hare (81.5%) or mouse (83.2%) diets. The digestible energy value of deer (5.69 kcal/g dry matter) differed ($P < 0.05$) from the other diets, and metabolizable energy values of the deer and mouse diets (4.99, 5.07 kcal/g dry matter) were greater ($P < 0.05$) than that of the hare diet (4.01 kcal/g dry matter). The prey required to fulfill the minimum energy demands at the metabolizable level of a 12.9-kg coyote was estimated to be 8 deer, 105 hares, or 4,800 mice per year.

Linzey, D. W. 1971. Animal harvested in south Alabama probably coyote-red wolf hybrid. Alabama Conservation, December issue:6–7.

ALABAMA, HYBRID, RED WOLF

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

AGE STRUCTURE, ILLINOIS, MORPHOLOGY, REPRODUCTION, SEX RATIO, SURVIVAL

This study examines the age structure, sex ratio, age-specific reproduction, and physical condition of coyote (*Canis latrans*) populations throughout the state. Since 1994, a total of 1,173 coyotes have been collected. Overall sex ratios did not differ from 1:1, however males comprised 54% of hunted coyotes. Age structure differed significantly among the 3 regions of Illinois. Juveniles made up 60% of the north and central regions, but only 45% of the southern region. The annual mortality rate estimated from the harvested sample ranged between 40–50% for ages 0.5 to 6.5 years old. The average number of placental scars per breeding female was 4.9, with 57% of the females breeding. Mean whole body weights differed between the sexes with males averaging 13.9 kg and females weighing 12.1 kg. Mean body length was found to be 121.9 cm for males and 117.3 cm for females. Kidney fat indexes were highest in juvenile and adult females (both 56%) and lowest in yearlings (41% for females and 40% for males). However, bone marrow lipids showed no significant differences between sex-age classes. Male % marrow lipids averaged 86.2% and females averaged 88.2%. Ovulating females had significantly higher skinned body weights than non-ovulating females among juveniles and yearlings. This study demonstrates that Illinois' coyotes are generally in good physical condition with high fat reserves and reproductive rates inspire of high population densities. However, reproductive rates (as indicated by placental scars) are lower than they were 20 years ago, when the population was rapidly expanding in Illinois.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

AGE STRUCTURE, HYBRID, MASSACHUSETTS, MORPHOLOGY, MOVEMENTS, POPULATION DENSITY, SEX RATIO, VERMONT

The purpose of this investigation was to gather information on the physical characteristics, population size, and movement of eastern coyotes, and to compare this data with that from western coyotes and wolves. Eighty-seven specimens were collected throughout Massachusetts and Vermont between 1972 and 1977. The sex ratio was found to be 57 males: 30 females and may have been biased due to trapping. By use of the technique of counting cementum annuli, 73 percent of 63 specimens were aged as two years or less. Puberty appears to occur during the second winter for females and litters averaged 6.4 pups. The population was estimated to be in the low hundreds in western Massachusetts in 1974, 1975, and 1976. Three juveniles were radio-tagged in Vermont; one male died shortly after it was released, a second male and a female dispersed 38 km and 91 km, respectively, from their point of release. Phenotypic characters and behaviors studied were intermediate between those of western coyotes and wolves. A single species classification could eliminate some of the confusion that now exists in the systematics of North American Canis.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox microhabitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

BOBCAT, GRAY FOX, HABITAT, HOME RANGE, MISSISSIPPI

Home range sizes differed among the 3 predator species. Female coyote 95% convex polygon home ranges ($\bar{x}$ = 2865 ha) were significantly larger ($P < 0.001$) than all sex/species groups. No differences ($P > 0.05$) were found among male bobcats ($\bar{x}$ =1515 ha), male coyotes ($\bar{x}$ = 1124 ha), female bobcats ($\bar{x}$ =901 ha), female gray foxes ($\bar{x}$ =395 ha), or male gray foxes ($\bar{x}$ = 297 ha) for 95% convex polygon home ranges. Home range size of bobcats, coyotes, and gray foxes on TWMA were similar to sizes found in other studies.

Microhabitat use also differed among the 3 predator species. Female bobcats preferred pine regeneration stands and male bobcats preferred pine regeneration and hardwood sawtimber stands within home ranges on TWMA. Coyotes were not as habitat selective as bobcats, as a variety of stands were used within home ranges. No differences were found between male and female gray fox microhabitat use, both had highest use of pine sawtimber stands within home ranges. Pine sawtimber was used less than available within home ranges by bobcats and coyotes.

Microhabitat use among bobcats, coyotes, and gray foxes found no differences relative to one another, but may vary from random microhabitat variables when predators are pooled. Cross-validation was unable to differentiate among bobcat, coyote, and gray fox variables; however, when pooled, predators used different microhabitats than those occurring randomly.

Locations and home range sizes of predators on TWMA appear to be a function of prey availability. Predators were fond in habitats where prey densities were highest. It is hypothesized that gray foxes may have been excluded from "better" habitat by bobcats and/or coyotes.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

BOBCAT, GRAY FOX, HUMAN DIMENSIONS, MISSISSIPPI, POPULATION DYNAMICS

Predator populations and conflicts of predators with humans have steadily increased in the past few decades. Numerous claims have been made that lack of trapping has resulted in increases in predator populations, but with little documentation. Demonstrating predator population increases is difficult, but necessary, if management of predators is to be justified to the public. Since 1980 the Mississippi Department of Wildlife, Fisheries and Parks has conducted a statewide hunter survey. Information from the survey has

been used in gathering statewide game harvest estimates and may be useful for monitoring population trends. Based on this survey, coyotes have experienced a 7.5-fold increase since 1980, while bobcat (*Lynx rufus*) and red fox (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*) populations have changed little during 1980–1995. Releases of coyotes (*Canis latrans*) by man and extirpation of native predators in the Southeast may be responsible for range expansion of coyotes.

Lund, R. C. 1975. Status of the eastern coyote in New Jersey. Pages 41–47 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

RANGE, NEW JERSEY

The first coyote (*Canis latrans* var.) was reported from New Jersey in December 1958. Since then eight additional specimens have been collected, the most recent in January 1975. An account of each specimen and reported sightings is presented and current distribution and future management plans discussed.

Lydeard, C. 1986. Morphologic assessment of recently founded population of the coyote, *Canis latrans,* in Tennessee. Thesis, Memphis State University, Memphis, USA.

MORPHOLOGY, TAXONOMY, TENNESSEE

Recently founded populations of the coyote (*Canis latrans*) in Tennessee were assessed morphologically using multivariate statistical procedures. Five pelage and 20 cranial measurements were used in the examination. Results verified *C.1. frustror* and *C.1. thamnos* as valid subspecies and indicated the presence of both taxa in Tennessee. These findings suggested a multiple origin for coyote populations in the newly colonized area. However, since *C.1. frustror* was the predominant subspecies in the state, it appeared that Tennessee coyotes have a greater affinity with *C.1. frustror* than *C.1. thamnos.* Spatial variation existed among the populations sampled that included specimens from newly colonized areas in Tennessee and established portions of the range. The study provided little evidence to suggest a discrete morphological size as the founder of the newly established populations or the disperser into Tennessee.

Lydeard, C., and M. L. Kennedy. 1988. Morphologic assessment of recently founded populations of the coyote, *Canis latrans,* in Tennessee. Journal of Mammalogy 69:773–781.

MORPHOLOGY, TAXONOMY, TENNESSEE

Recently founded populations of the coyote (*Canis latrans*) in Tennessee were assessed morphologically using multivariate-statistical procedures. Five pelage and 20 cranial measurements were used in the examination. Results supported *C. 1. frustror* and *C. 1. thamnos* as valid subspecies and indicated the presence of both taxa in Tennessee. These findings suggested a multiple origin for coyote populations in the newly colonized area. Because *C. 1. frustror* was the predominant subspecies in the state, it appeared that Tennessee coyotes have a greater affinity with *C. 1. frustror* than with *C. 1. thamnos.* Spatial variation existed among the populations sampled in newly colonized areas of Tennessee and established portions of the range. Yet, these results provided little evidence to suggest a discrete morphologic size as the founder of the newly established populations or the disperser into Tennessee.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic dogs in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519

ALABAMA, DOG, GEORGIA, HYBRID, MISSISSIPPI, MORPHOLOGY, TAXOMONMY, TENNESSEE

To assess the taxonomic status of coyotes (*Canis latrans*) and domestic dogs (*C. familiaris*) in the southeastern United States, 380 skulls of unknown *Canids* were compared to known skulls of these taxa. Twenty-four cranial characters were employed in a discriminant function analysis to separate statistically unknown *Canids* as to coyote or dog. Hybridization between taxa was minimal. Our results indicate that the predomi-

nant wild *Canid* occurring in the southeastern United States is coyote. The method of distinguishing coyotes from dogs based on a ratio of 2 skull features (length of the upper molar tooth row divided by palatal width between the upper first premolars) appears to be useful for separating these taxa.

MacKenzie, S. H. 1988. Genetic variation in nine northern subspecies of the coyote, *Canis latrans.* Thesis, University of Tennessee, Knoxville, USA.

GENETICS, TAXONOMY

The range of *Canis latrans* extends from Alaska, south to Central America, and from California east to Nova Scotia. Within this area there are 20 described subspecies. Many of their current distributions were defined without consideration of gene flow. In this study, populations from nine different, contiguous northern subspecies of coyote were analyzed for allozyme variability, and genetic isolation. This was accomplished by comparing muscle tissue proteins electrophoretically on starch gels. A survey of 22 enzyme systems, consisting of 44 loci, was conducted on from 1 to 3 populations from each subspecies. Results of the study revealed that in most cases, the genetic similarity among populations of coyotes examined does not correspond to the subspecific designations described in the literature. Values of heterozygosity were consistent with that of other mammals and in contrast to some theoretical statements, this study presents another example of a large mammal that has average heterozygosity.

MacKinnon, C. M., A. C. Kennedy, and D. W. Colpitts. 2007. Details of eastern coyote, *Canis latrans,* predation on great black-backed gull, *Larus marinus,* eggs on Boot Island National Wildlife Area, Nova Scotia. Canadian Field Naturalist 121:426–428.

DIET, GREATER BLACK-BACKED GULL, NOVA SCOTIA, PREDATION

We detail field observations of eastern coyote eating great black-backed gull eggs for the first time in the literature. Photographic evidence of the remaining egg shells allowed us to identify the coyote as the predator.

Maehr, D. S., R. T. McBride, and J. J. Mullahey. 1996. Status of coyotes in south Florida. Florida Field Naturalist 24:101–107.

RANGE, FLORIDA

A late spring 1995 survey for coyotes in south Florida revealed an established population in the region from southern Polk County to southern Hendry County that has the potential to compete with native carnivores and become an economic burden on farmers and ranchers.

Maher, M. 2002. Aging coyotes using dental characteristics. Thesis, Eastern Illinois University, Charleston, USA.

AGE STRUCTURE, ILLINOIS, MORPHOLOGY

The accepted methods of age determination in the coyote (*Canis latrans*) are either highly subjective and unquantifiable or expensive and require the extraction of the canine tooth. Since neither of these methods are ideal, their limitations have impeded research on this species. Therefore, it was my objective to (1) develop and test the accuracy and precision of a descriptive key based on tooth wear patterns on the lower canine tooth, (2) develop and test the reliability of multiple regression models for aging coyotes using measurements from extracted teeth, and (3) suggest criteria for improving the consistency of results using these techniques.

From a sample of 996 teeth collected from coyotes that had been previously aged by counting cementum annuli, a subsample of 303 teeth were carefully examined for characteristic tooth wear patterns. These characteristics were used to develop an illustrated tooth wear key that could be used to assign coyotes to 1 of 7 age classes; 0.5, 1.5, 2.5, 3.5, 4.5, 5.5, and $\geq$ 6.5 years. Using the illustrated key, I estimated the age of a subset of 203 of these teeth. I correctly aged 138 of the 203 (68%) teeth and of the remaining 65 teeth 58 (89%) were aged within one year. My estimated ages were highly correlated to the assigned ages (r = 0.883). Four other readers using the key and composite estimated the age of 20 teeth. The four readers had

a mean coefficient of variation (CV) of 27.9, ranging from 10.8–35.6. The most accurate reader aged 16 of 20 (80%) teeth correctly and the least accurate 10 of 50 (50%). Older individuals tended to be under aged.

Mahan, B. R., and E. C. Mahan. 2007. Demographics of coyotes (*Canis latrans*) during the late 1970s and 1990s in southwestern Illinois. Transactions of the Illinois State Academy of Science 100:251–257.

AGE STRUCTURE, ILLINOIS, REPRODUCTION, SEX RATIO

We collected sex, age and reproductive data from 100 coyotes harvested by fur takers during the late 1970s and another 200 in the late-1990s from southwestern Illinois. The two samples had nearly identical male-female sex ratios (0.89:1 and 0.87:1, respectively), and neither differed significantly from parity. The percentage of juveniles (> 1 year of age) for the 1970s sample (69%) differed significantly from that of the 1990s sample (46%). The high percentages of juveniles in southwestern Illinois during the late-1970s affected breeding rates. Among adults (> 1 year of age) females, breeding rates were 53% and 72% for the 1970s and 1990s samples, respectively. The mean number of placental scars (PS) per breeding female of the 1970s sample (4.0) was lower, but did not differ significantly from that of the 1990s sample (4.9). The number of coyotes in southwestern Illinois, as elsewhere in the state, increased during the late-1970s. Twenty years later, the coyote population in this area of the state and statewide had stabilized. During both time periods, the mean PS counts in this region of the state were lower than those reported for coyotes in more northern latitudes of Illinois.

Main, M. B., S. F. Coates, and G. M. Allen. 2000. Coyote distribution in Florida extends southward. Florida Field Naturalist 28:201–203.

RANGE, FLORIDA

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

CONFLICT, DAMAGE, FLORIDA, HUMAN DIMENSIONS, LIVESTOCK, MANAGEMENT, PREDATION, PRODUCER

The rapid expansion and increase of coyotes (*Canis latrans*) throughout Florida during the last several decades has increased concerns over potential loss of livestock among Florida cattlemen. We surveyed Florida beef cattle producers during 1998 to ascertain their perceptions of coyotes in Florida. We distributed surveys through the Florida Cattleman and Livestock Journal and during the 1998 Florida Cattlemen's association Annual Convention (Marco Island, FL). Fifty-six surveys, 25 from northern counties and 31 from southern counties, were completed. The number of producers from both north and south Florida reporting loss of calves to coyote predation increased 7-fold from 1992 through 1997. Peak periods of livestock damage by coyotes were reported during November though April in both regions, which corresponded with cattle parturition and mating and pup rearing by coyotes. The number of cattlemen employing coyote control measures, and the total hours devoted to coyote control, steadily increased from 1992 (3 producers and 5 hours, respectively) through 1997 (31 producers and 843 hours, respectively). The predominant methods of coyote control were firearms (73%) and trapping (27%). The number of coyotes reported killed by ranchers increased from 13 during 1992, to 100 during 1997. Forty one percent of cattlemen surveyed reported seeing coyotes as solitary individuals, and 54% reported seeing coyotes in small groups of 2–4. Ninety-eight percent of producers surveyed perceived the number of coyotes in Florida to be increasing, and 69% felt that coyotes were causing a decline in wildlife on their ranches. Ninety-eight percent of the cattlemen surveyed indicated that there was a need for research on coyotes in Florida.

Main, M. B., P. B. Walsh, K. M. Portier, and S. F. Coates. 1999. Monitoring the expanding range of coyotes in Florida: results of the 1997–8 statewide scent station surveys. Florida Field Naturalist 27:150–162.

FLORIDA, RANGE

The distribution of the coyote (*Canis latrans*) has expanded throughout much of peninsular Florida during recent decades. Neither the rate of this expansion nor the implications of increasing numbers of coyotes to native wildlife are known. This study represents the first attempt to document and quantify coyote distribution in Florida and the effects of examining coyote populations on three native predators—gray fox (*Urocyon cinereoargenteus*), bobcat (*Felis rufus*), and raccoon (*Procyon lotor*). During February-March 1997 and 1998 we documented the presence of coyotes in 14 of 19 counties surveyed (n = 830 scent stations) and recorded a mean coyote visitation rate of 3.3% among the 622 scent stations monitored during both years. Visitation rates by coyotes did not differ between years, nor did visits by coyotes influence visits to scent stations by fox, bobcats, or raccoons. The low numbers of coyotes detected at scent stations indicate coyote populations remain low or that our survey methods were not sensitive enough to detect changes between years.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

DIET, BEHAVIOR, BOBCAT, HABITAT, HOME RANGE, MAINE, MOVEMENTS, RED FOX, TERRITORY

Interspecific relationships among coyotes (*Canis latrans*), bobcats (*Lynx rufus*), and red foxes (*Vulpes vulpes*) were examined in western Maine between 1979–82. Habitat selection, spatial relationships, and activity patterns were determined through radio-telemetry of 9 coyotes, 10 bobcats, and 4 foxes. Similarity in niche parameters between pairs of furbearer species was compared using overlap indices.

During winter, radio-collared bobcats and coyotes selected forest stands of predominantly coniferous overstory, while radioed foxes avoided this type and selected hardwood dominated stands. Snowtracking of both radio-collared and other individuals indicated that bobcats and foxes used stands characterized by softwood regeneration more than did coyotes. Coyotes and foxes used roads and open areas extensively for travel and demarcation of territory boundaries whereas bobcats made little use of these areas. Overlap indices for the 3 species indicated least dietary overlap was between coyotes and foxes during all seasons except summer, when bobcats and foxes had the least similar diet.

Interference competition was inferred from spatial segregation between coyotes and foxes on the study area. There was no evidence that competitive relationships existed between bobcats and red foxes. Although coyote and bobcat use of food and habitat overlapped, no supporting data for interference competition was obtained for these species.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

DIET, BEHAVIOR, BOBCAT, HABITAT, HOME RANGE, MAINE, MOVEMENTS, RED FOX, TERRITORY

Interspecific relationships among coyotes (*Canis latrans*), bobcats (*Felis rufus*), and red foxes (*Vulpes vulpes*) were examined in western Maine between 1979 and 1982. During winter, radio-collared bobcats (n = 10) and coyotes (n = 9) selected forest stands of predominantly coniferous overstory, whereas radioed foxes (n= 4) avoided this type and selected hardwood-dominated stands. Habitat selection during all seasons was least similar between coyotes and foxes. Home ranges of bobcats overlapped those of coyotes both spatially and temporally. Fox home ranges abutted but did not overlap coyote home ranges. Simultaneously monitored coyotes, bobcats, and foxes occupying adjacent or overlapping ranges maintained random separation distances ($P > 0.05$). Coyotes, bobcats, and foxes exhibited variable activity patterns. Snowshoe hares (*Lepus americanus*) were abundant and were 1st or 2nd in frequency of occurrence during all seasons for all species. White-tailed deer (*Odocoileus virginianus*) also ranked 1st or 2nd in frequency of occurrence in three of 4 seasons for coyotes and bobcats, but occurred in <15% of seasonal fox diets. Small mammals (*Cricetidae, Soricidae,* and *Zapodidae*) occurred frequently in the fox diet but occurred rarely in bobcat and coy-

ote diets. Interference competition was inferred from spatial segregation between coyotes and foxes on the study area. There was no evidence that competitive relationships existed between bobcats and red foxes. Although coyote and bobcat use of food and habitat overlapped, no supporting data for interference competition was obtained for these species.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Proceedings of the Eastern Wildlife Damage Control Conference 3:260–268.

CONFLICT, DAMAGE, HUMAN DIMENSIONS, LIVESTOCK, NEW YORK, PREDATION, PRODUCER

A questionnaire survey was used in 1985 to obtain data on predation and losses from New York sheep growers. Surveys were returned by 685 growers, which was a 40% return rate. The average grower managed 160 acres, including 24 acres of pasture, kept 160 sheep and received 12% of the total family income from sheep farming. Sheep predation occurred on 44% of the farms and dogs were considered the most harmful predator by 88% of the growers with losses. Growers with sheep losses had significantly larger flocks, more acreage in pasture, larger farms and depended more heavily on sheep farming for income than growers without losses ($P < 0.05$). Growers who has reduced their pasture acreage and were planning further reductions had significantly higher losses than growers whose acreage had remained constant or increased and were planning to add more pasture ($P < 0.001$). Growers who had reduced their flock size also had significantly higher losses than those who had increased their flocks ($P < 0.05$). Finally, individuals who would reduce or sell their flock if predation continued had significantly higher losses than growers who planned to use lethal predator control methods to combat future predation ($P > 0.05$).

McCarley, H. 1962. The taxonomic status of wild canis (*Canid*ae) in the south central United States. Southwestern Naturalist 7:227–235.

RED WOLF, TAXONOMY

The relationship based on skull morphology of populations known as *Canis latrans* and *C. niger* in Arkansas, Louisiana, Oklahoma and Texas is considered. Available evidence indicates that *C. niger* has become extinct except in isolated areas of Louisiana. Elsewhere, *C. latrans* has replaced *C. niger* as a primary predator. Probable previous hybridization between *C. latrans* and *C. niger* is discussed.

McDonald, P. T. 2006. Habitat affiliations of sympatric carnivores in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

BOBCAT, HABITAT, ILLINOIS, RED FOX

This study incorporated the Penrose distance statistic, multivariate statistics, carnivore sighting data, and land cover data within a GIS to create habitat models for sympatric red foxes, coyotes, and bobcats in southern Illinois. Habitat variables were quantified for 1-km^2 buffered areas around carnivore sighting locations. Only one variable differed between coyote-red fox and coyote-bobcat pairings, demonstrating significant overlap in these two species-groups. However, five variables differed between red foxes and bobcats, indicating considerable differences in habitat affiliation between these species. Model validation by independent sighting locations determined model fit was good, with 64% and 65% of the validation points for red foxes and bobcats, respectively, falling within the top 50% of Penrose distance values. Red foxes were affiliated with mixtures of agriculture and grassland cover, while bobcats were associated with a combination of grassland, wetland, and forest cover. This study provides insight into habitat partitioning and overlap among sympatric carnivores.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild *Canis* populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

DOG, EASTERN WOLF, HYBRID, MORPHOLOGY, PENNSYLVANIA

Pennsylvania coyote-like wild *Canids* were compared with western coyotes (*Canis latrans*), domestic dogs (*C. familiaris*), gray wolves from the Great Lakes region and southeastern Canada (*C. lupus lycaon,* including boreal and Algonquin types), coyote x dog hybrids, four coyote x wolf hybrids, and coyote-like *Canis* from other parts of the Great Lakes region and the northeastern United States. Skull and tooth characteristics were compared visually and by linear and multiple discriminant analysis. Relative size, pelage, rear dewclaws, timing of the reproductive cycle, and age at puberty were also considered. Nine of 76 skulls of Pennsylvania *Canis* were identified as probable F1 coyote x dog hybrids, the rest as coyotes. The coyotes averaged smaller than wolves but larger than coyote sin the West. The typical Pennsylvania coyote is larger and more dog- and/or wolf-like than those in samples from upper Michigan and northern Wisconsin; Illinois; and lower Michigan, Indiana, and Ohio. They are comparable in average size to coyotes in New York, New England, and southern Ontario, but the trend toward dog and wolf is less pronounced.

Apparently only Algonquin wolves have hybridized with coyotes in Quebec and Ontario. Evidence that dog as well as wolf genes have introgressed into eastern coyote populations includes the occurrence of pelage atypical of western coyotes and Algonquin wolves, intergradation in skull type between assumed wild F1 coyote x dog hybrids and coyotes, and rear dewclaws on some individuals in Pennsylvania, New York, and Ontario.

Pennsylvania coyotes have a reproductive cycle similar to that of western coyotes. Some males are capable of breeding by early December. Five females killed between 1 and 11/2 years of age had not been pregnant, indicating Pennsylvania coyotes are similar to New England coyotes, which do not breed until their second winter.

Coyotes occurred in Pennsylvania in the late Pleistocene, but only wolves were present when white settlement began. Free-ranging coyotes had begun to appear by the time that wolves were extirpated at the turn of the century. Probably they had been imported from the west and later escaped or were released from captivity. By the late 1930s wild coyotes were scattered across the northern half of the state. Some may have originated in southern Ontario, crossing the Niagara River and southwestern New York. Others may have come from Ohio. In the 1950s eastern type coyotes began to spread into southern Pennsylvania, and today they occasionally appear in Maryland and West Virginia.

Only 13 to 15 coyote-like *Canis* are known to have been killed annually in Pennsylvania between 1974 and 1987, but it is difficult to estimate the number in the state. In New York, an estimated 3000 were taken in 1975–76. The reasons for the difference in numbers may be related to the abundance of deer and deer hunters in Pennsylvania and a lack of "refuges" comparable to the Adirondack Preserve. Snowshoe hares are uncommon in Pennsylvania, possibly because they cannot compete with deer. Although hares are a major food of coyotes in states to the North, no remains were identified in the stomachs of 28 Pennsylvania *Canis.*

McKenna, S. 1985. Cranial morphometry of eastern coyotes (*Canis latrans var*). Thesis, Tennessee Technological University, Cookeville, USA.

MORPHOLOGY, TAXONOMY, TENNESSEE

The purpose of this study was to present base-line morphological data and identify structural complexes in eastern coyote (*Canis latrans* var.) skulls. The major objectives of the study were to investigate variation in the skull and mandible and to identify groups of variables related by functional and/or developmental processes.

Skulls of 58 adult coyotes were examined. There were 28 cranial and nine mandibular measurements taken on each skull. Sample statistics were calculated for males and females, and correlation coefficients were obtained for all possible pairs of measurements.

The results of this study indicate that there is a basic three-dimensional skull form common to all eastern coyotes. This form is under genetic control and is independent of functional demands. Once this basic form is established, the skull can be modified by functional demands that determine its final form.

Mengel, R. M. 1971. A study of dog-coyote hybrids and implications concerning hybridization in Canis. Journal of Mammalogy 52:316–336.

DOG, GENETICS, HYBRID

A female, mongrel, black and white, 25-pound terrier dog bred to a captive male Kansas coyote gave birth on 20 April 1954 to six F1 hybrid "coy-dogs." From 1956 through 1961 these produced four litters of F2 hybrids. Five of the F1 generation resembled melanistic, short-legged coyotes; the sixth was similarly colored but shaggy like the mother. The F2 generation was more varied, dog-like to somewhat coyote-like animals. Behavior varied, but all of the animals were intermediate, with some coyote- like traits, including howling. They were aggressive among themselves and had a dominance hierarchy in males and probably in females, with males dominating females. They displayed no submissive behavior adequate to inhibit a dominant individual from attacking an inferior. No trace of male parental care (which is strong in coyotes and absent in dogs) was noted in the coy-dogs. The generally small size of the F2 litters (mean 2.25, range 1 to 3) and their small number in relation to the possible number, suggests some decrease in fecundity but might also have resulted from crowding or other suboptimal conditions inducing prenatal mortality. There was a rather high incidence of dental anomaly among the hybrids. Both sexes of the hybrids, as in the comparatively few comparable studies, displayed a late autumnal, annual mating season (in this case in December), differing from that of coyotes, which breed in late winter (mainly February). The literature of dog-coyote hybridism is summarized and the implications of the peculiar reproductive timing of hybrids are discussed with respect to the possibility of hybridization in the wild leading (a) to the establishment of hybrid swarms of coy-dogs and intermediate individuals; (b) to the introgression of dog genes into coyote populations; and (c) to the probable source of the extremely large size and remarkably great variation of a population of wild, coyote-like animals recently established in New England. It is concluded that the phase shift in the breeding season of F1 hybrids, requiring the young of animals presumably less fit than coyotes to be reared in midwinter and in the absence of male parental care should form an effective, if not absolute, block to the development of hybrid swarms and to the introgression of dog genes into the coyote gene pool. Application of discriminant functions analysis-here applied also to various hybrids-to a series of wild Kansas coyotes (which are as much exposed to dogs as any coyotes) shows that these specimens have none of the unusual variability characterizing the New England population. It is therefore concluded that the variability and large size of the New England *Canis* result from the introgression of wolf genes, probably in Ontario, into coyote stock. Recent proof that these species can in fact hybridize is cited. Also, two captive-reared coyote-wolf hybrids, long ago reported but later widely over- looked, seem likely in fact to represent this cross if judged by discriminant functions analysis and by their small size.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

BEHAVIOR, HOME RANGE, JUVENILE, SOCIALITY, TERRITORY

We studied the social organization of forest-living coyotes (*Canis latrans*) for 20 months. The four breeding groups in our study area were territorial. The size and shape of their territories remained unchanged despite the sudden and profound change in prey distribution in December as white-tailed deer (*Odocoileus virginianus*) congregated yearly in a winter yard. Solitary adults lived on overlapping areas that ignored the breeding groups' territories. Some juveniles lived on their parents' territory but were not always associated with them. During the winter (November–April) 35% of the coyotes were in packs of three to five animals, 28% in pairs, and 37% solitary. Animals that were usually solitary almost never congregated to form temporary groups, and members of pairs were almost always together. We conclude that territoriality is essential to insure pup survival by increasing the foraging efficiency of parents that must feed sedentary pups. We suggest that individual and immediate advantage is sufficient to explain the late dispersal of pups resulting in the formation of packs. We therefore question the traditional view that larger group size in coyotes and other social carnivores living in extended families evolved to increase foraging efficiency.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an anti-predator strategy. Canadian Journal of Zoology 63:785–789.

BEHAVIOR, PREDATION, SOCIALITY, TERRITORY, WHITE-TAILED DEER

This study shows that white-tailed deer (*Odocoileus virginianus*) reduce their vulnerability to coyote (*Canis latrans*) predation by congregating in a traditional wintering area (yard). Distribution of deer and coyotes were monitored within a 36-km^2 yard (-630 deer) and the surrounding area. Coyote pairs and packs preferentially used areas of low deer density where only 12% of the deer wintered; 18 of 23 deer killed by coyotes were located in these areas. We postulate that the greater number of runways in high deer density areas enhanced escape from coyotes. By congregating in a yard during winter months, deer also benefited from a lower coyote: deer ratio. Territorial behavior kept the coyotes from concentrating in the yard. We consider yarding behavior to be an anti-predator strategy in addition to an energy-conserving strategy.

Messier, F., C. Barrette, and J. Huot. 1986. Coyote predation on a white-tailed deer population in southern Quebec. Canadian Journal of Zoology 64:1134–1136.

PREDATION, WHITE-TAILED DEER

Coyote predation on white-tailed deer was studied in a 155-km^2 forested area, including a 36-km^2 deer wintering area. Deer hair constituted about 80% of coyote scat volume from January to April, 50% from May to July, and 20% from August—December. Deer consumed in summer were primarily fawns, likely killed by coyotes. Snowshoe hare represented an important prey item from May to December. In winter, coyotes preyed primarily on fawns and older deer, but not necessarily individuals in poorer physiological condition. We conclude that coyotes may have an impact on deer numbers in southern Quebec.

Miller, C. R., J. R. Adams, and L. P. Waits. 2003. Pedigree-biased assignment tests for reversing coyote (*Canis latrans*) introgression into the wild red wolf (*Canis rufus*) population. Molecular Ecology 12:3287–3301.

GENETICS, HYBRID, RED WOLF

The principal threat to the persistence of the endangered red wolf (*Canis rufus*) in the wild is hybridization with the coyote (*Canis latrans*). To facilitate identification and removal of hybrids, assignment tests are developed which use genotype data to estimate identity as coyote, or full red wolf. The tests use genotypes from the red wolves that founded the surviving population and the resulting pedigree, rather than a contemporary red wolf sample. The tests are evaluated by analyzing both captive red wolves at 18 microsatellite loci, and data simulated under a highly parameterized, biologically reasonable model. The accuracy of assignment rates are generally high, with over 95% of known red wolves identified correctly. There are, however, tradeoffs between ambiguous assignments and mis-assignments, and between misidentifying red wolves as hybrids and hybrids as red wolves. These result in a compromise between limiting introgression and avoiding demographic losses. The management priorities and level of introgression determine the combination of test and removal strategy that best balances these tradeoffs. Ultimately, we conclude that the use of the assignment tests has the capacity to arrest and reverse introgression. To our knowledge, the presented approach is novel in that it accounts for genetic drift when the genotypes under analysis are temporally separated from the reference populations to which they are being assigned. These methods may be valuable in cases where reference databases for small populations have aged substantially, pedigree information is available or data are generated from historical samples.

Miller, D. L., J. Schrecengost, J. Kilgo, S. Ray, and K. V. Miller. 2007. Ruptured aortic aneurysm in a coyote (*Canis latrans*) from South Carolina. Journal of Zoo and Wildlife Medicine 38:492–494

DISEASE, SURVIVAL

A radio-collared adult female coyote (*Canis latrans*) from South Carolina was found dead with no appar-

ent signs of trauma or struggle. Necropsy revealed a ruptured aortic aneurysm within the thoracic cavity as well as severe heartworm infection, with parasites present in the caudal vena cava. Histologically, inflammatory cell infiltrates were frequent in the aneurysm and consisted of eosinophils, neurtrophils, lymphocytes, plasma cells, and macrophages. Bacteria, fungi, and parasites were not found in the aneurysm. Death was due to exsanguination. This represents a first report of an aneurysm in a coyote.

Monson, R. A., W. B. Stone, and B. L. Weber. 1973. Heartworms in foxes and wild *Canis* in New York. New York Fish and Game Journal 20:48–53.

DISEASE, NEW YORK

Examination of the hearts of 811 wild carnivores in New York revealed infections with the heartworm (Dirofilaria immitis) in two of 551 red foxes and two of 51 wild *Canis.* This is believed to be the first report of this parasite in the wild *Canis.* Adult female worms in both wild *Canis* and red foxes are capable of producing microfilariae. The hearts from 179 gray foxes were examined without finding evidence of heartworm infection.

Moore, G. C., and J. S. Millar. 1984. A comparative study of colonizing and longer established eastern coyote populations. Journal of Wildlife Management 48:691–699.

AGE STRUCTURE, NEW HAMPSHIRE, SEX RATIO

Samples of coyotes (*Canis latrans* var.) from New Brunswick, Nova Scotia, and New Hampshire showed that the sex ratios favored males (72:39), age ratios favored adults (10:17), and reproductive rates were low in colonizing populations. These trends were generally opposite to what was expected based on the majority of empirical and theoretical studies. The predominance of males in colonizing populations may be attributed to greater movement of males into vacant regions. The relatively high proportion of adults in colonizing populations may result from movement of adults into vacant areas or a low reproductive rate. Eastern coyotes may not exhibit traits characteristic of colonizing animals because they have a long generation time relative to organisms typically regarded as colonizers.

Moore, G. C., and J. S. Millar. 1986. Food habits and average weights of a fall-winter sample of eastern coyotes, *Canis latrans.* Canadian Field Naturalist 100:105–106.

DIET, MORPHOLOGY, NEW BRUNSWICK, NOVA SCOTIA

Analysis of stomach contents of a sample of coyotes (*Canis latrans*) from New Brunswick and Nova Scotia suggests an opportunistic feeding behavior and unspecialized diet. Average weights are comparable to other samples of eastern coyotes but are consistently higher than those reported for western coyotes.

Moore, G. C., and G. R. Parker. 1992. Colonization by the eastern coyote (*Canis latrans*). Pages 23–38 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

RANGE

We describe the colonization of eastern North America by the coyote (*Canis latrans*) following the influence of European settlement, with particular attention to the appearance, population growth and possible genetic derivation of the eastern coyote.

Moore, W. J., and J. C. Williamson. 1975. Food habits and morphometry of coyotes in Ontario's Prince Edward County. Pages 68–73 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

DIET, MORPHOLOGY, ONTARIO

During the three-year period 1967–1969, 42 adult coyotes (*Canis latrans*) were collected in Ontario's

Prince Edward County between October and March and stomachs were examined for contents. Ten (23.8 per cent) of the stomachs were empty. Remains of cottontail rabbit (*Sylvilagus floridanus*) occurred in 65.5 per cent of meadow voles (*Microtus pennsylvanicus*) occurred in 28.1 per cent. Total weights of 17 males averaged 16.7 kg while 22 females averaged 14.1 kg. Total lengths of 17 males averaged 130.9 cm and 21 females averaged 124.9 cm. There was a significant difference ($P < 0.05$) between means for males and females for total weight, total length, ear length, and hind foot length.

Morey, P. S., E. M. Gese, and S. Gehrt. 2007. Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. American Midland Naturalist 158:147–161.

DIET, HABITAT, ILLINOIS, URBAN

Coyotes (*Canis latrans*) are an opportunistic predator that have adapted to many human-modified environments. Conflicts between coyotes and humans are an increasing concern for managers in urban areas. We examined the spatial and temporal utilization and availability of natural and human-associated food for coyotes in the Chicago metropolitan area, Illinois, USA. We collected 1429 coyote scats from May 2000 to December 2002, and conducted prey surveys in 2002, in 4 sites that varied in their degree of urban development. Dominant food items included small rodents, white-tailed deer (*Odocoileus virginianus*), fruit, eastern cottontail (*Sylvilagus floridanus*) and birds. Their availability and occurrence in scats varied among sites and seasons. The occurrence of human-associated food items, which was only found in significant amounts in the most developed site, varied seasonally (2–25%). Because coyotes in less-developed areas have lower dietary diversity, these coyotes may have to venture into developed areas when there is a decline in the abundance of major prey species for that specific area.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

BEHAVIOR, CONFLICT, DIET, HABITAT, ILLINOIS, URBAN

We examined the potential conflict between coyotes and humans by studying coyote landscape utilization and diet in the Chicago metropolitan area, Illinois. Coyotes in developed areas traveled more through urban land than coyotes in less-developed areas. However, coyotes in developed areas that utilized urban land avoided nocturnal periods with high human activity, thus reducing their conflict potential with humans. The occurrence and availability of food items varied spatially and temporally. The conflict potential with humans was probably greater in developed areas where coyotes used more human-associated food sources. Because coyotes in less-developed areas relied heavily on fewer food items, a drop in abundance in a single prey species may force them into developed areas. Coyote management in urban areas will vary spatially and temporally. Habitat manipulation and public education may reduce human-coyote conflicts. Coyotes may reduce other human-wildlife conflicts by preying on deer, geese, and rodents.

Morton, L. D. 1989. Winter ecology of the eastern coyote (*Canis latrans*) in Fundy National Park. Thesis, University of New Brunswick, Fredericton, Canada.

DIET, HABITAT, HOME RANGE, MOVEMENTS, NEW BRUNSWICK

The coyote is expanding its range from Maine and Quebec to New Brunswick during the early 1970s. This study focused on the winter ecology of the coyotes in Fundy National Park, Southeastern New Brunswick in 1984 and 1985. The winter diet of coyotes consisted primarily of white-tailed deer and snowshoe hair. Predation probably accounted for most of the deer fed upon by coyotes. Home range estimates from radio telemetry for 1 adult female, 2 juvenile females, and 2 juvenile males were 23.4 km^2, 13.8 km^2 and 21.6 km^2 respectively. Later dispersal of the juveniles suggests that those estimates may best describe the home ranges of the respective parent pairs. Peak activity, as inferred from radio signals, occurred at dusk and dawn. Coyotes usually rested during the early morning hours. Estimated daily distances traveled were less when calculated from straight-line measurements between 1st relocations of consecutive days (1.79 km)

compared to measurements from periods of intensive 24-hour monitoring (6.41 km). increased mean daily distance traveled by the adult female from 1.9 km in December to 3.35 km^2 in January was thought to be related to mate searching. Coyote used hardwood cover types significantly more than would be expected relative to availability and roads were extensively used as travel corridors. Other habitats were used in proportion to availability.

Mosnier, A., D. Boisjoly, R. Courtois, J-P. Ouellet. 2006. Extensive predator space use can limit the efficacy of a control program. Journal of Wildlife Management 72:483–491.

CARIBOU, HOME RANGE, QUEBEC

Reduced to small isolated groups by anthropogenic habitat losses or habitat modifications, populations of many endangered species are sensitive to additive sources of mortality, such as predation. Predator control is often one of the first measures considered when predators threaten survival of a population. Unfortunately, predator ecology is often overlooked because relevant data are difficult to obtain. For example, the endangered Gaspésie caribou (*Rangifer tarandus caribou*) has benefited from 2 periods of predator control that targeted black bears (*Ursus americanus*) and coyotes (*Canis latrans*) in an attempt to reduce predation on caribou calves. Despite a high trapping effort, the number of predators removed has remained stable over time. To assess impact of predator movements on efficacy of a control program, we studied space use of 24 black bears and 16 coyotes over 3 years in and around the Gaspésie Conservation Park, Quebec, Canada, using Global Positioning System radio-collars. Annual home ranges of black bears averaged 260 km^2 and 10 individuals frequented area used by caribou. Annual home ranges of resident coyotes averaged 121 km^2, whereas dispersing coyotes covered >2,600 km^2. Coyotes were generally located at lower altitudes than caribou. However, because coyotes undertook long-distance excursions, they overlapped areas used by caribou. Simulations based on observed patterns showed that 314 bears and 102 coyotes potentially shared part of their home range with areas used by female caribou during the calving period. Despite low densities of both predator species, extensive movement and use of nonexclusive territories seem to allow predators to rapidly occupy removal areas, demonstrating the need for recurrent predator removals. Our results underscore the necessity of considering complementary and alternative solutions to predator control to assure long-term protection of endangered species.

Muntz, E. M., and B. R. Paterson. 2004. Evidence for the use of vocalization to coordinate the killing of a white-tailed deer, *Odocoileus virginianus,* by coyotes, *Canis latrans.* Canadian Field Naturalist 118:278–280.

BEHAVIOR, NOVA SCOTIA, PREDATION, SOCIALITY

Among the social *Canids,* howling is largely accepted as playing a role in territory maintenance. However, its role in communication within packs, such as announcing departures from den and rendezvous sites and coordinating reunions or movements, remains largely speculative. We report an observation where a radio-collared adult male coyote (*Canis latrans*) and his mate seemed to summon two other coyotes (presumed to be their offspring) from ~700 m away to join in the successful pursuit of an adult male white-tailed deer (*Odocoileus virginianus*). Our observation suggests that coyotes can use vocalization as an effective means of coordinating social activities such as the hunting of large prey.

Nelson, T. A., D. G. Gregory, and J. R. Laursen. 2003. Canine heartworms in coyotes in Illinois. Journal of Wildlife Diseases 39:593–599.

DISEASE, ILLINOIS, MORPHOLOGY, REPRODUCTION

Canine heartworm (*Dirofilaria immitis*) disease affects wild *Canids* and may be a factor impacting the health and population dynamics of coyotes (*Canis latrans*). Coyotes may serve also as a potential reservoir for transmission of these parasites to domestic dogs. We investigated 920 coyotes harvested by hunters and trappers throughout Illinois (USA) from 1995–1997. The objectives of the study were to: 1) survey the regional prevalence and intensity of heartworms in coyotes in Illinois, 2) determine whether heartworm intensity

correlates with physical condition, particularly body weight and winter fat levels, and 3) evaluate the relationship between heartworm infections and the reproductive success of females. Prevalence of heartworms statewide was 16.0%. Prevalence was significantly higher in males (17.7%) than in females (14.1%; $P = 0.04$) and was higher in the older age-classes ($P < 0.0001$). The regional prevalence of heartworms increased from northern to southern Illinois. Intensity ranged from 1 to 111 with a mean of 8.7 (SD = 13.2) worms. Intensities did not differ significantly between sexes ($P = 0.53$) or among age-classes ($P = 0.84$). Most infected coyotes had low intensity infections, 78.2% carried < 12 heartworms, 11.6% had 12–24 worms, and 10.2% were infected with > 24 worms. Body weights were not correlated with the presence of heartworms, nor were levels of kidney fat and marrow fat. However, reproductive success was lower in infected females. The percent of yearling females that bred was lower among infected females, as was the number of offspring produced by adults > or = 3.5 yr old. Our study demonstrates that heavy infections adversely affect fur quality and reduce fecundity of some females, but these effects are small and few coyotes (4.1%) had enough worms to trigger them. Coyote populations have increased in Illinois during the past 20 yr, but prevalence and intensity of heartworm disease appears to have changed little in that period. We conclude that heartworm disease is only a minor factor influencing coyote population dynamics in Illinois.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

AGE STRUCTURE, ILLINOIS, MORPHOLOGY, REPRODUCTION, SEX RATIO

The rapid growth of coyote (*Canis latrans*) populations in Illinois since 1980 prompted a need for current demographic data to be used in population models for management. From 1994 to 1997 we examined 977 coyotes harvested by hunters and trappers throughout the state and compiled data on age structure, sex ratios, reproductive rates and physical condition. Statewide, 55% of harvested coyotes were juveniles, 20% were yearlings and 25% adults. The sex ratio did not differ from unity among juveniles and yearlings, but was skewed towards males in the adult class. The number of harvested animals decreased by 45–60% between successive classes from 0.5 through 2.5 y old, then by 30–40% through 9.5 y old. Statewide, 57% of females bred and breeders averaged 4.9 placental scars. Males were larger than females, averaging 14.1 and 12.1 kg whole body mass, respectively. Kidney fat reserves were highest in juveniles and adult females and lowest in yearlings. Femur marrow fat was generally high and did not differ among age-classes. Ovulating females were heavier than non-ovulators among juveniles and yearlings. We found that coyotes in Illinois are in good physical condition with high winter fat reserves and reproductive rates. However, reproductive rates are lower than they were in 1978–1979 when the population was rapidly expanding in the state.

Nelson, T. A., and A. Woolf. 1987. Mortality of white-tailed deer fawns in southern Illinois. Journal of Wildlife Management 51:326–329.

ILLINOIS, PREDATION, WHITE-TAILED DEER

During the summers of 1980–82 the extent, causes, and timing of white-tailed deer (*Odocoileus virginianus*) fawn mortality were investigated on Crab Orchard National Wildlife Refuge (CONWR), southern Illinois. Summer mortality rates for 54 radio-collared fawns averaged 30%. Coyotes (*Canis latrans*) and domestic dogs accounted for 69% of natural mortalities. Most fawns lost to *Canis* were 27–47 days old.

Niebauer, T. J. 1974. Coyote food habits in northwestern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

DIET, WISCONSIN

Food habits of coyotes (*Canis latrans*) in northwestern Wisconsin were investigated between June 1971 and October 1973. Snowshoe hares (*Lepus americanus*), white-tailed deer (*Odocoileus virginianus*), and rodents accounted for 21.5, 21.3, and 14.5 percent, respectively, of the annual diet based on analysis of 3353 scats and 208 stomachs. Wild fruits were common in summer and fall, with wild sarsaparilla (*Aralia*

nudicaulis) the most frequently occurring food item in summer scats. The importance of wild fruits as a buffer to predation is discussed. The occurrence of deer in June scats, coincident with the fawning season, was the highest of any month. Estimated utilization of fawns was between 12 and 28 percent of the peak summer population following a "mild" winter and less than 9 percent following a "severe" winter. No relationship between coyote and prey density changes was apparent. Availability appears to be influenced by density independent factors affecting the vulnerability of certain prey, and thus alternate foods buffer each other and eliminate any permanent relationships between northwestern Wisconsin coyotes and the principal prey.

Nowak. R. M. 1978. Evolution and taxonomy of coyotes and related Canis. Pages 3–16 in M. Bekoff, editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

TAXONOMY

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

EASTERN WOLF, GRAY WOLF, HYBRID, MORPHOLOGY, RED WOLF

Assessment was made of all available cranial specimens of wild Canis dating since the Blancan and prior to A.D. 1918 in the region east of the Great Plains and south of the Prairie Peninsula, Lakes Erie and Ontario, and the St. Lawrence River. The small wolf *C. priscolatrans* (= *C. edwardii*) of the early Irvingtonian seems unrelated to the modern red wolf (*C. rufus*), but gave rise to a lineage including the larger *C. armbrusteri* and culminating in *C. dirus* of the late Rancholabrean. A small wolf, possibly a descendant of the Eurasian *C. mosbachensis,* did not reappear in the east until near the end of the Rancholabrean. At the same time, the coyote (*C. latrans*) disappeared from the east, not to return until the small wolf was extirpated in the 20th century. Fragmentary remains of the small wolf, dating from around 10,000 and 2,000–200 ybp, show continuity with 14 complete, mostly modern, eastern skulls. Multivariate analysis indicates those 14 represent a well-defined species, *C. rufus,* distinct from large series of the western gray wolf (*C. lupus*) and coyote. There is no evidence that the red wolf originated as a hybrid of the latter two species, though early specimens from central Texas suggest it began to inter- breed with *C. latrans* by about 1900. Three long-recognized red wolf subspecies appear valid: *C. r. floridanus,* Maine to Florida; *C. r. gregoryi,* south-central United States; and *C. r. rufus,* central and coastal Texas, southern Louisiana, and probably now represented in the captive/reintroduced populations. The subspecies *C. lupus lycaon* of southeastern Ontario and southern Quebec is statistically intermediate to *C. rufus* and western *C. lupus,* and may have resulted from natural hybridization of those two species. Such could explain how the red and gray wolf differ so sharply where their ranges meet in the west but morphologically approach one another in the east.

Nowak, R. M., and N. E. Federoff. 1998. Validity of the red wolf: response to Roy et al. Conservation Biology 12:722–725.

GENETICS, GRAY WOLF, HYBRID, RED WOLF

O'Connell Jr., A. F., D. J. Harrison, B. Connery, and K. B. Anderson. 1992. Food use by an insular population of coyotes. Northeast Wildlife 49:36–42.

DIET, MAINE

Coyote (*Canis latrans*) food use was studied on Mount Desert Island (MDI), Maine, and compared with the diet of a nearby mainland population. The most common coyote foods on MDI were white-tailed deer (*Odocoileus virginianus*), raccoons (*Procyon lotor*), small mammals (*Cricetidae, Soricidae, Zapodidae*) and fruits; where as fruits, snowshoe hare (*Lepus americanus*), deer and small mammals were most commonly used on the mainland. Compared to the mainland, coyotes exhibited greater dietary diversity on MDI despite lower faunal diversity. Raccoon remains occurred in 8.0%, 18.4%, 38.9%, and 47.5% of coyote scats from MDI examined during summer, winter, spring and autumn, respectively. In contrast, raccoons oc-

curred in <1% of coyote scats from the mainland site, and have not been identified as a significant food item in other portions of the coyote's range. Consumption of raccoons on MDI may have been a result of low relative abundance of more preferred foods, and illustrates the potential for coyotes to expand their niche breadth in response to insular environments.

Oehler, J. D., and J. A. Litvaitis. 1996. The role of spatial scale in understanding responses of medium-sized carnivores to forest fragmentation. Canadian Journal of Zoology 74:2070–2079.

HABITAT

Increased predation has been suggested as a proximate factor causing the decline of vertebrate diversity in many human-altered landscapes. Previous studies on this topic have provided conflicting results, perhaps as a consequence of the limited spatial scale used in these investigations. We incorporated a multi-scaled approach (using site, plot (1.44 km^2), and landscape (54 km^2)) to investigate the distribution of activity of medium-sized carnivores relative to habitat edges and the numeric responses of these predators to habitat diversity. Among the taxa surveyed, raccoons (*Procyon lotor*) did not show an affinity for habitat edges at any spatial scale. However, raccoons were more abundant in landscapes characterized by a diversity of cover types. Free-ranging domestic dogs (*Canis familiaris*) and cats (*Felis domesticus*) did not respond to the proximity of habitat edges in summer but showed a strong affinity for edge habitats (especially those associated with human dwellings) during winter. Wild *Canids* (*Vulpes vulpes* and *Canis latrans*) also selected sites in close proximity to edges in winter and were more abundant in diverse landscapes. Although human-dominated habitats (agricultural areas, grass—brushland, and developed sites) represented only 7–27 % of the three landscapes studied, populations of generalist predators (raccoons and wild *Canids*) increased as landscapes became more diverse. As a result, even moderate levels of habitat fragmentation may elevate predation rates and subsequently alter the composition of prey communities.

Okoniewski, J. C. 1980. Vocal response of eastern coyotes to an electronic siren and human howling. Thesis, State University of New York, Syracuse, USA.

BEHAVIOR, NEW YORK, SOCIALITY

In the quest for a method of estimating coyote (*Canis latrans*) abundance, elicited coyote vocalizations have received considerable attention. The following article is a contribution to this research effort. During the collection of data for this article, the mortality of an adult eastern coyote (*C. latrans* var.) in an agnostic encounter with three conspecifics was documented. An account of this event, one heretofore unreported in the literature, follows the feature article.

Okoniewski, J. C., and R. E. Chambers. 1984. Coyote vocal response to an electronic siren and human howling. Journal of Wildlife Management 48:217–222.

BEHAVIOR, NEW YORK

Okoniewski, J. C., and W. B. Stone. 1983. Causes of morbidity and mortality in coyotes in New York. New York Fish and Game Journal 30:224–227.

NEW YORK, SURVIVAL

Owens, K. M. 2006. Seasonal dietary composition of the eastern coyote (*Canis latrans*) on the Berry College campus in Northwestern Georgia. Thesis, University of Tennessee at Chattanooga, Chattanooga, USA.

DIET, GEORGIA

Coyotes (*Canis latrans*) have progressively colonized eastern North America following wolf extirpation and the clearing of forested landscapes. The coyote has expanded its geographic range into Georgia during the past 50 years, and its impact as the top predator its potentially influencing community dynamics via competition and/or predation. Few studies have examined coyote food habits in the southeastern United States. Our objective was to determine prey items consumed

by free-ranging coyotes living on Berry College lands in northwestern Georgia.

One hundred and twenty-seven coyote scats were collected from May 2005 through August 2006 along seven major service roads that transected the 28.55-mi^2 study area, and 270 prey items were identified. The four most frequently occurring prey items were *Muridae* rodents (26.3%), eastern cottontail rabbits (15.2%), white-tailed deer (13.7%), and eastern gray squirrels (10%). Fawn remains were slightly more frequent in coyote scats that adult deer (7.8% vs. 5.9%). Mammal remains (71.2%) comprised the largest prey category, followed by vegetation (10.7%), arthropods (7.4%), birds (3.3%), and reptiles (1.5%).

Significant seasonal fluctuations of prey items/prey classes were found ($P < 0.0001$). Rodents (predominantly the Family *Muridae*) were most common in spring, vegetation (predominantly persimmons) occurred most frequently in fall, and arthropod consumption (predominantly grasshoppers) was constant throughout the year, except during winter months. Prey classes *Artiodactyla* and *Lagomorpha* were consumed year round, although fawns were an important prey item only in spring and summer months and eastern cottontails were most popular in winter.

Owens, R. D. 1987. Coyote control techniques and their applications in the eastern United States. Proceedings of the Eastern Wildlife Damage Control Conference 3:323–324.

MANAGEMENT

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

BEHAVIOR, DIET, MICHIGAN, MOVEMENTS, SOCIALITY

An ecological study of the coyote on Beaver Island, in northern Lake Michigan, was undertaken to evaluate the relationship of coyotes with other island wildlife, and to investigate the behavior and food habits of coyotes subjected to such partial isolation as provided by the island conditions.

Daily activities of coyotes in winter were studied by following their trails in the snow for 314 miles, and by interpreting animal sign along the trails. Fourteen coyotes were trapped, tagged, and released to obtain supplementary information on their movements. Two hundred and seventy-four coyote feces, representing all seasons, were collected and analyzed.

The winter hunting activities of coyotes were commonly nocturnal. A majority of the trailed coyotes traveled alone; no groups of three or more coyotes were noted to hunt cooperatively. Their movements followed nearly straight lined travel from one feeding area to another, but were not habitual in following a fixed pattern. Ranges of coyotes on the island overlapped. Trailed coyotes hunted for prey most frequently in mixed hardwood-conifer cover. Their beds were most often detected in dense coniferous vegetation. Northern parts of Beaver Island, which provide a habitat interspersed with open grassland, appeared to be favored by coyotes, rather than the densely vegetated southern parts.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

BEHAVIOR, DIET, MICHIGAN, MOVEMENTS, SOCIALITY

Winter habits of the coyote (*Canis latrans*) were investigated on Beaver Island, in northern Lake Michigan, and the vicinity of Shingleton in Michigan's Upper Peninsula during the period 1956–65. Information on movements, general behavior, and feeding habits were obtained by tracking coyotes for 827 miles in snow, and by examining 92 scats collected along their trials. White-tailed deer (*Odocoileus virginianus*) carrion constituted the coyote's primary winter food in both areas. Coyotes actually killed few deer, and usually brought down only the smallest and weakest animals. Although certain other abundant prey species were available, coyotes were relatively unsuccessful in capturing them. The influence of this predator in controlling game populations in wither appears to be negligible.

Ozoga, J. J., and E. M. Harger. 1966. Occurrence of albino and melanistic coyotes in Michigan. Journal of Mammalogy 47:339–340.

MICHIGAN, MORPHOLOGY

Page, M. S. 2010. Spatial ecology of eastern coyotes (*Canis latrans*) in the anthropogenic landscape of Cape Cod, Massachusetts. Thesis, University of Massachusetts, Amherst, USA.

HABITAT, URBAN, MASSACHUSETTS

Historically, coyotes were associated with the western United States. During their expansion eastward, coyotes have become more tolerant of humans and have been able to live in varying degrees of urbanization. One main question ecologists around the country are asking is how coyotes are surviving in anthropogenic environments. To aid in answering this question, I have compared coyote land use preference generally and specifically during coyote breeding season, winter and summer, human tourist seasons, and day and night. I also compared coyote land cover preference for deciduous and evergreen cover types during natural seasons. I found that, in general, there was a high variation of preference between and within land use categories. More broadly however, they prefer natural areas to non-natural areas. They used natural and non-natural land use types equally in winter and summer, and during tourist and off-tourist seasons with increased variation in preference during seasons with higher human activity. They had a higher preference for non-natural land use types at night. There is no difference in coyote preference for deciduous or evergreen cover types during the seasons.

Paradiso, J. L. 1966. Recent records of coyotes, *Canis latrans,* from the southeastern United States. Southwest Naturalist 11:500–501.

ALABAMA, MISSISSIPPI, RANGE

Parker, G. R. 1986. The seasonal diets of coyotes, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 100:74–77.

DIET, NEW BRUNSWICK

Coyote (*Canis latrans*) scats were collected from a wilderness area of northern New Brunswick from May 1983 through 1984. Snowshoe hare (*Lepus americanus*) was the most important food item in all seasons. White-tailed deer (*Odocoileus virginianus*) was fed upon in winter and early spring but was of minor importance in summer. Groundhog (*Marmota monax*) was an important food in May and June and raspberries in mid to late summer. Songbirds and small mammals were of minor importance throughout the year. The dependency of coyotes upon hares and deer in northern wilderness regions is discussed.

Parker, G. E. 1995. Eastern coyote: the story of its success. Nimbus, Halifax, Nova Scotia, Canada.

SUMMARY

Parker, G. R. and J. W. Maxwell. 1989. Seasonal movements and winter ecology of the coyote, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 103:1–11.

HABITAT, HOME RANGE, MOVEMENTS, NEW BRUNSWICK, REPRODUCTION

Changes in the seasonal ranges and the winter ecology of coyotes (*Canis latrans*) were studied in a forested area of northern New Brunswick from May 1983 through June 1984. The size of an adult female's range varied from 9.5 km^2 when tending pups at the den site to 41.3 km^2 in winter. Inter-seasonal minimum daily cruising distances (MDCD) corresponded to inter-seasonal changes in range size. In winter, however, when range size remained stable from January through March, relative MDCD values increased from 3.8 km through 6.0 km. In winter, coyotes traveled through mature conifer forest stands and along frozen streams and stream edges rather than through more open, mature, deciduous-dominated habitat. Coyotes preyed

on snowshoe hares (*Lepus americanus*) in January and early February but switched to white-tailed deer (*Odocoileus virginianus*) in mid-February and early March.

Parker, T. S. 1999. Food habits of the coyote (*Canis latrans*) in urban and suburban areas of western Tennessee. Thesis, University of Memphis, Memphis, USA.

DIET, URBAN, TENNESSEE

From January 1997 through February 1998, 675 scats of coyotes (*Canis latrans*) collected in urban and suburban areas of Memphis, Tennessee, were examined for food items. Data were assessed by season (those of the calendar year) and site (two urban; three suburban) using univariate and multivariate biometric routines. Foods with greatest percent occurrence were as follows: winter 1: rodent (*Rodentia,* 46.4), rabbit (*Sylvilagus spp.*, 18.8); spring, rodent (58.7), insect (*Melanoplus spp.,* 17.3), rabbit (12.7); summer, persimmon (*Diospyros virginiana,* 66.1), insect (20.1), rodent (15.5) fall, persimmon (83.9), rodent (13.3), insect (11.1); and winter II, rodent (45.1), rabbit (17.6). Major food items (rodents, rabbits, insects, persimmon) varied by season but were found to occur at similar frequencies in the coyote's diet across sites. In general, foods recorded in the urban and suburban areas studied were similar to those reported to occur in the diet of coyotes in surrounding rural areas. White-tailed deer (*Odocoileus virginianus*), livestock (*Bovidae*), and pets (cat, *Felis domesticus;* dog, *Canis familiaris*) were among the economically important food items identified during the study. However, these foods occurred in small percentages. It appears that the opportunistic feeding habits of the coyote have not been lost in animals that utilize urbanized areas. Because of temporal and spatial variation in food habits of coyotes, long-term studies are recommended to more clearly understand the natural history of this species in urban-suburban habitats.

Parks, M. B. 1979. Physical and behavioral development of captive eastern coyote pups. Thesis, University of Maine, Orono, USA.

BEHAVIOR, JUVENILES, MAINE, SOCIALITY

The growth and behavior of 2 male and 3 female eastern coyote pups (*Canis latrans* var.) were documented from birth to 8 mo. Litter hierarchy formation was examined, and relationships between the pups' physical and behavioral characteristics and their hierarchy ranks were established. Pups averaged 276 g at birth (range 263–310) and females were initially slightly larger than males. Males surpassed females in growth rates at 5 wk, in total length at 6 wk and in weight at 9 wk. Critical periods in development were: neonatal 0–12 d; transition 13–18 d; socialization 19 d-6 wk; juvenile >6 wk. A total of 33.433 interactions between pups were recorded; 78 observed behaviors were grouped into 11 categories and graphed over time. Categories that contributed more than 10% to the total interactions were: play 39.9%, approach 18.6%, chase/run 10.2%, and agnostic (comprised of both offensive and defensive actions) 12.6%. Dominance hierarchy formation began on d 20. Females established a linear hierarchy on d 22, but males did not compete for ranks until wk 7. A female retained the litter alpha position through wk 17, while males held both the alpha and beta ranks after wk 20. Of the 8 hierarchy changes noted during the course of the study, 5 involved the formation or dissolution of tied ranks. Peaks in agnostic behaviors reflected both hierarchy formation and subsequent role shifts. Play was not seen until d 27, 1 full week after the first major fight. Generally, as the frequency of play activities increased, agonism declined. The general increase of agonistic behaviors after wk 18 and the sharp increase after wk 30 may have reflected behaviors that normally lead to pup dispersal in the wild. Physical correlates of dominance rank were clearer than were behavioral correlates. Weight was the physical variable most closely associated with hierarchy rank. These pups closely resembled western-coyotes (*C. latrans*) in all phases of their development. Neither physical nor behavioral data strongly suggested that they were intermediate to western coyotes and wolves (*C. lupus*).

Patterson, B. R., L. K. Benjamin, and F. Messier. 1998. Prey switching and feeding habits of eastern coyotes in relation to snowshoe hare and white-tailed deer densities. Canadian Journal of Zoology 76:1885–1879.

DIET, SNOWSHOE HARE, WHITE-TAILED DEER

We investigated the influence of white-tailed deer (*Odocoileus virginianus*) and snowshoe hare (*Lepus americanus*) availability on the feeding habits of coyotes (*Canis latrans*) in Nova Scotia from 1992 to 1997. We hypothesized that coyotes would switch from deer to hare as hare abundance increased. Based on the analysis of 2443 scats, deer and hare were the dominant food items. Other important food items included small mammals, and fruits during late summer. In areas where they were readily available, coyotes fed predominantly on hare during winter, with the use of deer declining as hare density increased. However, the functional response was not proportional to the changes in the relative densities of deer or hare. This was particularly evident at low deer densities, where coyotes continued to feed largely on deer, even in the presence of high hare densities. The consumption of deer fawns during June and July exceeded that of hare in all areas, despite high hare densities in some areas. Overall, high use of deer appeared to have been associated with increased vulnerability due to winter severity or, in the case of young fawns, inability to escape. During mild winters, we suspect that coyotes are forced to focus their hunting efforts on prey other than deer, regardless of density, owing to low vulnerability of deer. When severe winter conditions occur, coyotes switch to feeding mainly on deer.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

DIET, MORPHOLOGY, SNOWSHOE HARE, SOCIALITY, WHITE-TAILED DEER

In northeastern North America, coyotes (*Canis latrans*) contend with lower prey diversity and abundance relative to their western counterparts (Harrison 1992; Parker 1995; Patterson et al. 1998). We used urinalysis to determine if the local distribution and abundance of white-tailed deer (*Odocoileus virginianus*) and snowshoe hare (*Lepus americanus*) had a measurable effect on the nutritional condition of eastern coyotes during winter. We analyzed 567 urine specimens collected from coyotes belonging to 8 territorial family groups, whose territories contained different densities of deer and hare. Mean urinary urea nitrogen (UN) : creatinine (C) ratios were correlated positively with relative hare density (rs = 0.75, P = 0.004) but negatively with deer density (rs =–0.71, P = 0.009). Coyote-group size did not have a significant influence on mean UN:C (rs = 0.42, P = 0.17). Coyotes utilizing hare as a primary food source maintained consistently high UN:C values throughout the winter, whereas those using proportionally more deer as a primary food source exhibited lower and more variable UN:C values during the breeding season. Winter densities of deer and hare were inversely related (rs = -0.63, P = 0.027), further suggesting that the UN:C value was primarily a function of hare density. The analysis of urine voided in snow is useful for determining the relative time since last feeding for carnivores. However, inferring relative nutritional condition from time since last feeding may be inappropriate for cases in which carnivores exploit prey of different sizes.

Patterson, B. R., S. Bondrup-Nielsen, and F. Messier. 1999. Activity patterns and daily movements of the eastern coyote, *Canis latrans,* in Nova Scotia. Canadian Field Naturalist 113:251–257.

BEHAVIOR, MOVEMENTS, NOVA SCOTIA

We studied the daily activity patterns and movements of 36 radio-collared coyotes (*Canis latrans*) in Nova Scotia from January 1993 through August 1996. Coyotes exhibited several periods of activity and rest throughout the day. Mean length of active rest periods was 136 ± 93 (± SD), and 164 ± 131 min, respectively. The mean duration of active and rest periods were not significantly different with respect to time of day, season, or coyote reproductive status. Annually, coyotes traveled an average of 20.2 = 8.9 km per 24-hour period with the greatest distances being traveled by breeding males during the pup rearing season (24.9 ± 9.2 km) and the least by all coyotes (pooled) during winter (14.3 ± 5.9 km).

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

BEHAVIOR, NOVA SCOTIA, PREDATION, SNOWSHOE HARE, WHITE-TAILED DEER

Predation affects the dynamics of many ungulate species. Until recently, little attention has been give to understanding the underlying process and relationships in predator-prey systems. We examined factors affecting killing rates of white-tailed deer (*Odocoileus virginianus*) by coyotes (*Canis latrans*) in Nova Scotia, Canada. Snowshoe hare (*Lepus americanus*) and deer abundance, distribution and relative vulnerability of deer, and coyote group size all significantly influenced killing rates of deer by coyotes in winter. Groups of coyotes initiated proportionately more chases than single coyotes but chase success differed little among groups of 1–4 coyotes. Snow depth had a positive influence on success of pursuits. More kills were observed in areas of low deer density relative to areas with high deer densities. The mean distance of deer kills to recent clear cuts was significantly shorter than expected in an area where deer yarded during winter, but not in an area where deer did not aggregate during winter. Predator-prey ratios may not be a reliable indicator of predation rates of deer by coyotes because factors such as relative abundance and vulnerability of alternate prey, winter severity, and coyote social behavior also influence killing rates.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

DIET, MOVEMENTS, POPULATION DENSITY, REPRODUCTION, SOCIALITY, TERRITORY

We studied the influence of prey size and abundance on social organization and space use by eastern coyotes (*Canis latrans*) in 2 areas of Nova Scotia, Canada. Breeding pairs formed the nucleus of coyote social groups, and these often traveled with 1–3 other coyotes during winter. Increased use of white-tailed deer (*Odocoileus virginianus*) was insufficient to ex- plain group size and cohesiveness by eastern coyotes. Winter-traveling group size was similar for family groups using deer (X = 2.6) or snowshoe hares (X = 2.7) as a primary prey in winter. Estimated densities of coyotes in winter were 4.3–13.9 coyotes/100 km^2. Coyotes used the same general areas during winter and summer and from year to year. However, territory sizes decreased with increasing densities of deer (partial r^2 = 0.21, P = 0.043) and hares (partial r^2 = 0.40, P = 0.007). During winter, coyotes used areas of high deer density in proportion to their availability, but in some instances, they used areas that contained few or no deer proportionately more than expected, probably because deep snow and few trails increased vulnerability of deer in these areas. Territoriality seemed to prevent coyotes from concentrating in deer wintering areas and kept the coyote: deer ratio relatively low (<1:25).

Patterson, B. R., and F. Messier. 2003. Age and condition of deer killed by coyotes in Nova Scotia. Canadian Journal of Zoology 81:1894–1898.

PREDATION, WHITE-TAILED DEER

Coyote (*Canis latrans*) predation is a major source of mortality for white-tailed deer (*Odocoileus virginianus*) in many areas of northeastern North America. However, if coyotes primarily remove deer that would have died of other causes in the absence of predation (compensatory mortality), the impact of predation would be minimal regardless of the number of deer removed. We examined the carcasses of 102 white-tailed deer consumed by coyotes during winter in southwestern Nova Scotia (Queens County) and on Cape Breton Island from 1992 to 1997. Sixty-nine deer were victims of predation, five died of other natural causes, two were killed in coyote snares, two were killed on the road, two were shot and not recovered during the autumn hunting season, and one was shot and abandoned in early winter. The causes of death of the remaining 21 deer could not be determined. Fawns were overrepresented in the sample of coyote-killed deer on Cape Breton Island, but the age distribution of deer killed by coyotes in Queens County did not differ significantly from that of local road-killed deer. Femur marrow fat reserves of deer killed by coyotes appeared to be as good as or better than those of road-killed

deer in the vicinity of each study area. During winter, coyotes often killed deer in situations where deer were disadvantaged either by deep snow or by poor footing on frozen lakes. This may help explain the general lack of selection of weaker animals. Our data are consistent with the idea that mortality due to coyote predation was largely additive to mortality due to other factors. However, manipulative experiments are needed to verify this conclusion.

Pekins, P. J. 1992. Winter diet and bioenergetics of eastern coyotes: a review. Pages 87–100 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

DIET, HABITAT, MORPHOLOGY, MOVEMENT

The winter bioenergetics of the eastern coyote (*Canis latrans*) was examined through the analysis of its food habits, food consumption rate, activity, prey assimilation efficiency, and energy requirement. The diet of eastern coyotes in contiguous forests was primarily snowshoe hare (*Lepus americanus*) and white-tailed deer (*Odocoileus virginianus*), and was less diverse than diets from mixed-forest agricultural habitats. The use of deer and hare was related to prey density, deer and coyote mobility, coyote sociality and group size, travel and activity patterns of coyotes, and time of the winter. Deer and hare are both highly digestible, but deer is probably of higher value because indigestible parts are presumably avoided. The basal metabolic rate (BMR) is higher than predicted by allometry, but thermoregulation costs are likely insignificant for the energy budget. Estimates of the field metabolic rate (FMR) ranged from 1.1–3.4 x BMR, and were highest based on food consumption data from the wild, and lowest based on activity and movement data. The use of doubly labeled water is suggested for the direct measurement of the FMR of free-ranging animals to further understand the winter bioenergetics of eastern coyotes.

Peppers, J. A. 1994. Genetic variation in the coyote, *Canis latrans*. Thesis, Memphis State University, Memphis, USA.

GENETICS

Using starch-gel electrophoresis to analyze protein variation, levels of heterozygosity, and interlocality genetic variation were studied in the coyote, *Canis latrans.* Specimens (n =235) were collected from Arkansas, Kansas, Oklahoma, Tennessee, and Texas. Samples from Tennessee were sub-grouped into eastern, middle, and western localities. Of 34 loci examined, 25 were monomorphic; seven of nine polymorphic loci were used in analyses of genetic parameters. Heterozygosity ranged from 0.7% for Oklahoma to 4.6% for middle Tennessee (with a mean of 3.3%); however, differences among localities were not significant (one-way analysis of variance). With the exception of Oklahoma, significant deviations from Hardy-Weinberg equilibrium occurred at all localities. Wrights F-statistic indicated an overall significant degree of population differentiation. Rogers' genetic similarity values ranged 0.624 to 0.932. The matrix of all pairwise comparisons showed a pattern of relationships, which could reflect an eastward expansion of the coyote's range. It appears that coyotes gradually extend their distribution eastward over a period of 25–30 years while retaining many natural-history trait characteristic of the taxon in former parts of the species' range.

Perkins, P. J., and W. W. Mautz. 1990. Energy requirements of eastern coyotes. Canadian Journal of Zoology 68:656–659

DIET, MAINE, MORPHOLOGY

We used indirect respiration calorimetry to measure seasonal metabolism and lower critical temperatures (T_{LC}) of eastern coyotes (*Canis latrans* var.). The yearly mean basal metabolic rate was 10.6 L $O_2 \cdot kg^{-1} \cdot$ jour $^{-1}$. No difference was found among seasonal BMRs. The T_{LC} values were 10,0, and 5°C during summer, autumn, and spring, respectively. Metabolism increased linearly below the T_{LC} values. Normal temperatures in New Hampshire were well within the seasonal thermoneutral zones of eastern coyotes. The average daily

energy requirements of free-ranging eastern coyotes during winter were estimated as 163.5 kcal · kg^{-1} (3 x BMR). A 15-kg coyote required three snowshoe hares (*Lepus americanus*) every 2 days to satisfy these energy needs. In northern forested habitats, where hare and white-tailed deer (*Odocoileus virginianus*) may represent the primary prey species, interrelationships of the energy requirements of eastern coyotes with coyote breeding activity, sociality, and snow conditions may favor predation of white-tailed deer during late winter, particularly if hare availability is low.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

BEHAVIOR, DIET, HABITAT, HOME RANGE, JUVENILE, MOVEMENTS, SOCIALITY, TRANSIENT, VERMONT

I studied the home ranges, activities, habitat use, and food habits of 29 radio-collared coyotes (*Canis latrans* var.) representing 11 different social groups in the Champlain Valley region of Vermont. Between July, 1984 and December, 1986, 1870 radio-locations were obtained. Home ranges averaged 18.67 km^2 and 17.1 km^2 for non-juvenile males and females, respectively. Home ranges were smaller during the pup-rearing period (April 15-July 15) than at other times of the year. Home ranges of adjacent social groups partially overlapped; however, smaller core activity areas were found to be mutually exclusive.

Delayed dispersal was observed for 2 juveniles and was suspected for 5 resident sub-adults. Five radio-collared coyotes did not have established home ranges; 2 of these wandered over large portions of the study area for more than 6 months.

The study animals were most active at night and rested during the day. They preferred hardwood forests during winter and spring and farmland during summer and fall. Scat analysis showed that coyotes consumed rodents, cottontail rabbits (*Sylvilagus floridanus*), livestock carrion, and fruit. White-tailed deer (*Odocoileus virginianus*) were important in the diet in late spring and early summer, but relatively unimportant during the rest of the year.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

HABITAT, HOME RANGE, JUVENILE, MOVEMENTS, SOCIALITY, VERMONT

We studied home ranges, activities, and habitat use of 29 radio-collared coyotes (*Canis latrans*) representing 11 different social groups in the Champlain Valley of Vermont. Between July 1984 and December 1986, 1,870 radio-locations were obtained. Home ranges averaged 18.7 ± 4.6 (SE) km^2 and 17.1 ± 3.2 km^2 for adult males and females, respectively. All members of individual family groups shared the same home range. Home ranges were smaller during the pup-rearing period (15 Apr–15 Jul) than at other times of the year. Home ranges of adjacent social groups showed limited overlap, but smaller core activity areas were mutually exclusive. Study animals preferred hardwood forests during winter and spring, and farmland during summer and fall.

Peterson, L. M. 1995. Effectiveness of using a Trailmaster™ infrared sensor for monitoring activity of captive coyotes. Thesis, Western Illinois University, Macomb, USA.

BEHAVIOR

This study tested the reliability of using Trailmaster™ 500 (TM) infrared (IR) sensors to measure the diel and seasonal activity of two captive coyotes. Observations over 21 days, reported the location of coyotes as being either inside or outside the IR sensing beam and their behavior as either moving or stationary. Observational and TM data were compared minute by minute to interpret the IR sensor's performance into 1 of 4 possible TM response options: correct detection, false alarm, correct rejection, or miss.

Results obtained with the TM sensor were reliable; however, data collected using different sensitivity settings should not be pooled. Both the TM sensor and the observer logged the same events; e.g. a coyote inside the IR beam. Similarly, both the TM sensor and the observer did not log an event when coyotes were

outside the IR beam. TM more often correctly detected moving coyotes, indicating the importance of a moving target for detection.

One limitation of the TM sensor was that it did not provide real time data collection, rather logged only one event per minute. Once an event was logged, the TM sensor could not record additional coyote movement in or out of the beam until the next minute sample. Therefore, if a second coyote interrupted the beam, the sensor could not log this second event. Similarly, if a coyote left the beam during the minute sample, this event could not be logged. This limitation led to an artificial high number of false alarms.

Receiver Operating Characteristics (ROC) curves, derived from Signal Detection Theory, determined that the TM sensor was a conservative, rather than a liberal detector, e.g. the sensor erred by underestimating, rather than overestimating the number of events.

Graphs generated from TM data indicated a transition in coyote behavior among seasons. The coyotes were active between 0800 h and 1400 h (probably associated with feeding times), but diel activity varied among seasons. During fall and winter, they exhibited short, distinct activity periods that coincided with daylight. During spring and summer, they were active over a longer number of hours per day, but had less distinctive periods of activity.

Data from a TM sensor positioned to record activities of the viewing public indicated that their presence did not influence the activity of the captive coyotes. The diel and seasonal activity patterns of these captive coyotes were different from that typical of wild coyotes. This perhaps was influenced by scheduled feedings, confinement, and no interactions with wild coyotes. Results from this captive study have applications for future use of TM sensors in studying diel and seasonal activity of wild animals.

Peterson, R. O., and J. M. Thurber. 1993. The size of eastern coyotes: a rebuttal. Journal of Mammalogy 74:1075–1076.

GENETICS, MORPHOLOGY

Lariviere and Crete (1993, Journal of Mammalogy, 74:1072–1074) raised several objections to the hypothesis of Thurber and Peterson (1991, Journal of Mammalogy, 72:750–755) that the larger body size of eastern coyotes, especially those in New Hampshire, is attributable simply to enhanced nutrition. All of the evidence presented in defense of genetic distinctiveness of coyotes in the east is indirect, and can be explained without recourse to a genetic argument. Relevant hypotheses should be re-evaluated after more detailed studies of genetic characteristics of coyotes have been completed using new approaches that are now available.

Phillip, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

ALABAMA, CONFLICT, DAMAGE, HUMAN DIMENSIONS, LIVESTOCK, PRODUCER

Philipp, M. C., and J. B. Armstrong. 1993. Perceptions knowledge of Alabama fruit and vegetable producers towards coyotes. Proceedings of the Eastern Wildlife Damage Control Conference 6:175–181.

ALABAMA, CONFLICT, DAMAGE, HUMAN DIMENSIONS, PRODUCERS

Members of the Alabama Fruit and Vegetable Producers Association (AFVP) were surveyed in 1992–1993 to assess their attitudes and knowledge of coyotes and the amount of perceived damage caused by coyotes. A mail-back questionnaire was developed and pilot tested. The revised questionnaire was sent to all members (n = 84) of the AFVP; individuals whose main income is the production of fruits and vegetables. Seventy-seven percent (n = 61) of those surveyed returned completed questionnaires. Tests for non-response bias were conducted and results showed no significant difference. Attitudes were assessed using a Likert scale where 1 = respondents favoring maximum protection of coyotes and 5 = maximum control of coyotes. Data

analysis suggests that attitudes of fruit and vegetable producers towards coyotes are neither maximum protection nor maximum control (x = 3.61). However, their attitudes do lean toward the maximum control side of the scale. In addition, knowledge about coyotes and perceived threat by coyotes did not affect producer's attitudes (x^2 = 261.12, P = 0.54; x^2 = 904.50, P = 0.37, respectively), however, those with coyote damage more strongly favored control.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

ALABAMA, CONFLICT, DAMAGE, HUMAN DIMENSIONS, LIVESTOCK, PRODUCERS

During the last 20 years, coyote populations in the Southeast have increased. Information about livestock producers' perceptions towards coyotes and about economic and actual damage caused by coyotes in the Southeast was needed. We mailed questionnaires to 825 members of the Alabama Cattleman's Association (ACA) and to 189 members of the Alabama Lamb, Wool, and Mohair Association (LWMA) to evaluate knowledge and attitudes of Alabama cattle, sheep and goat producers towards coyotes; and determine real or perceived economic losses caused by coyotes. Of the 1,014 livestock producers surveyed, 52 were unaccounted for, 5 respondents returned non-useable questionnaires, and 129 of the remaining 181 LWMA producers and 544 of the remaining 776 ACA producers surveyed returned usable questionnaires. Ten percent (n = 28) of the non-respondents were contacted and no non-response bias was found. Average attitudinal scores were 3.87 (ACA) and 3.86 (LWMA) and were higher (i.e., favored coyote control) for respondents with coyote damage than for those without coyote damage. Agricultural producers in Alabama lacked basic knowledge about coyotes, with mean knowledge scores of 0.37 for ACA respondents and 0.36 for LWMA respondents on a scale where 1 was a perfect score. There were several items which producers believed had been damaged by coyotes in Alabama: calves, sheep, watermelon, cows, goats, horses, domestic fowl, corn, and dogs. This diversity may be attributed to the diverse number of agricultural products generated within the state and the opportunistic feeding style of the coyote. Although relatively few respondents reported coyote damage (n = 192) and average economic losses were not high (max. $\bar{x}$ = $994, min. $\bar{x}$ = $100, total $141,340), there appeared to be an intolerance to any losses associated with coyote depredation.

Piccolo, B. P., T. R. Van Deelen, K. Hollis-Etter, D. R. Etter, R. E. Warner, and C. Anchor. 2010. Behavior and survival of white-tailed deer neonates in two suburban forest preserves. Canadian Journal of Zoology 88:487–495.

ILLINOIS, PREDATION, URBAN, WHITE-TAILED DEER

Neonatal survival influences growth of unhunted populations of suburban white-tailed deer (*Odocoileus virginianus* (Zimmerman, 1780)). Understanding the interaction of habitat and survival may inform conservation efforts and studies of life history of *Cervids* at high density. We chose two forest preserves representative of forests in suburban Chicago. We radio-marked 56 neonates (1999–2001) to investigate mortality and habitat use. Through 1 July, 21 of 29 (72%) neonates and 6 of 22 (27%) died mostly because of predation by coyotes (*Canis latrans* Say, 1823). Akaike's information criterion suggested that optimal mark–recapture models of survival contained covariates reflecting differences by preserve and timing chosen to coincide with behavioral change from hiding to accompanying the doe. Survival was lower during early parturition (0.26–0.78) relative to the latter part (0.90–0.96). Early fawns (hiders) at one site had lower survival (0.26–0.29) than fawns at the other (0.78). Lower survival associated with larger home ranges, greater movement, and reduced understory cover, suggesting that hiding cover may mediate fawn survival in the presence of predators. Our study demonstrates spatial heterogeneity in population biology of suburban deer and suggests that site-specific differences may influence neonate survival in the face of coyote predation.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

BEHAVIOR, HABITAT, HOME RANGE, MOVEMENTS, NEW YORK, SURVIVAL

Twenty-three eastern coyotes (*Canis latrans* var.) were captured and ear tagged in northwestern New York during the late summer and fall of 1970, 1971 and 1973. Four of these were radio-marked and provided preliminary data on home range size and composition and activity patterns. Home range varied from 4.5 km^2 for a male pup to 76.6 km^2 for a yearling male. Use of most cover types within their home range by the coyotes was random except that the yearling male was found to favor mature forests and avoid conifer plantations, and the male pup favored successional forest. The daily activity pattern of all coyotes consisted of peaks at dawn and from dusk until midnight with a mid-day peak for the male pup.

Data on movements were also obtained for ten of the 23 coyotes upon recovery or recapture. Six were shot, two trapped, and one was recaptured. The collar of another was found without clue as to the fate of the animal. Two dispersal movements of grater than 160 km were recorded.

Wild, coyote-like *Canids,* hereafter referred to as eastern coyotes, (*Canis latrans* var.) (Lawrence and Bossert 1969, Silver and Silver 1969) are a relatively recent addition to New York's fauna. Eastern coyote numbers have greatly increased since 1940, and the animals now occur over much of the state (Severinghaus 1974). This species has received little scientific attention; therefore, their exact niche, taxonomic position and life history are unknown.

This paper reports on one phase of some preliminary investigations into the ecology of the eastern coyote, which will be expanded into a study of the partial relationships, population dynamics and ecology of the species. Specifically, the objective of this study were to determine: 1) the feasibility of monitoring movements of eastern coyotes by use of conventional radio-tracking systems , 2) the daily activity period, 3) the summer and fall home range characteristics of several coyotes including composition and utilization size and other movements.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

DIET, HABITAT, HOME RANGE, MOVEMENTS, NEW YORK

From intro: This study investigated the spatial and trophic aspects of the eastern coyote's niche in northern New York. Knowledge of coyote spatial relationships is essential to the eventual understanding of coyote population dynamics and population regulation wile knowledge of coyote feeding patterns permits evaluating the ecological effect of coyotes on other species. Activity patterns and their relationship to environmental variables provide additional information about potential prey and prey vulnerability under differing environmental conditions. Specific objectives of this study were as follows: (1) determine the feasibility of monitoring movements of eastern coyotes by use of conventional radio-tracking systems. (2) describe the summer and fall activity patterns of several northern New York coyotes in relation to selected environmental variables (3) determine the daily activity periods of several coyotes (4) determine the summer and fall food habits of northern New York coyotes (5) determine the summer and fall home range characteristics of several northern New York coyotes including habitat utilization, home range area, and movement.

Poulle, M.-L., M. Crête, and J. Hout. 1995. Seasonal variation in body mass and composition of eastern coyotes. Canadian Journal of Zoology 73:1625–1633.

MORPHOLOGY

Fat and protein reserves were estimated from body mass and the kidney and femur fat index for 135 coyotes (*Canis latrans*) of different ages and both sexes. These coyotes were collected in southeastern Quebec during five trapping periods between summer 1990 and autumn 1991. Coyotes were 27–28% heavier dur-

ing autumn-winter than during summer: 16.0 versus 12.5 kg for males and 14.0 versus 11.0 kg for females. This mass gain consisted of 0.6–0.7 kg of protein and 1.5–2.0 kg of fat (water accounted for the balance). The mean fat percentage varied widely among individuals but did not differ according to sex or age. It varied according to trapping period and almost doubled from summer to autumn (10 versus 18%), did not change significantly from late October to late March, but then decreased from winter to summer. It appears that fat deposits accumulated by coyotes during autumn were not used progressively during the winter. However, they allowed the coyotes to survive during brief periods of food shortage. Furthermore, spring and summer seemed to be periods of relative food scarcity for coyotes, because they lost 16–17% of their protein mass from late winter to summer. Only 41% of the 39 females old enough to reproduce ovulated, but no relationship was apparent between this low fertility rate and the body composition of the females.

Prange, S., and S. D. Gehrt. 2007. Response of skunks to a simulated increase in coyote activity. Journal of Mammalogy 88:1040–1049.

ILLINOIS, SKUNK

An implicit assumption of the mesopredator release hypothesis (MRH) is that competition is occurring between the larger and smaller predator. When significant competition exists, the MRH predicts that larger species should affect population size, through direct predation or the elicitation of avoidance behavior, of smaller predators. However, there have been few manipulations designed to test these predictions, particularly regarding avoidance. To test whether striped skunks (*Mephitis mephitis*) avoid coyotes (*Canis latrans*), we intensively monitored 21 radio-collared skunks in a natural area in northeastern Illinois. We identified 2 spatially distinct groups and recorded 1,943 locations from September to November 2003. For each group, testing periods consisted of 4 weeks (2 weeks pretreatment, 1 week treatment, and 1 week post-treatment). We simulated coyote activity during the treatment week by playing taped recordings of coyote howls at 1-h intervals at 5 locations. Additionally, we liberally applied coyote urine to several areas within 20 randomly selected 100 × 100-m grid cells, and used the grid to classify cells as urine-treated, howling-treated, or control. We determined changes in home-range size and location, and intensity of cell use in response to treatment. We found no differences in home-range size related to treatment ($P \geq 0.248$). Although weekly differences in home-range drift approached significance when individuals from both tests were pooled ($P = 0.071$), drift was highly correlated with mean weekly low temperatures ($P = 0.004$). Use of howling- and urine-treated cells did not vary among weeks ($P \geq 0.307$), nor did proportions of locations within howling circles with assumed effective broadcast radii of 50–200 m ($P \geq 0.851$). Examination of our data did not support the prediction that skunks avoid areas of coyote activity on our study site.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

BEHAVIOR, DIET, GUARD ANIMAL, HABITAT, HOME RANGE, ILLINOIS, JUVENILE, LIVESTOCK, POUPULATION DENSITY, PREDATION, REPRODUCTION, SURVIVAL

Thirty-nine coyotes (*Canis latrans*) were captured and fitted with radio transmitters at the Dixon Springs Agricultural Center (DSAC, the center) in Pope and Johnson counties in southeastern Illinois July 1981–June 1985. Home ranges for 14 adult females and 4 adult males with 25 or more radio-locations averaged 24.1 km^2 and 38.3 km^2, respectively. Pasture-deciduous forest edges were used as resting areas throughout the year. Wooded areas were used most during denning, pastures for nocturnal foraging throughout the year, and croplands only during summer. Pups were restricted to forested areas during denning season, while a shift to cornfields occurred in summer. By late summer and early fall, juvenile use of habitats was similar to adults.

Based on capture efforts, coyote density on the DSAC was estimated between 1 coyote/2 km^2 and 1 coyote/11.7 km^2. Scent-post surveys, trapping success rates, harvest estimates, and visible coyote signs indicated the population may be slightly declining. Humans accounted for 83% of coyote deaths; mortality rates ranged from 0.65 in 1981 to 0.94 in 1985.

Though only 3 collared females were confirmed to have whelped, 50% of females were estimated to have given birth, a greater reproductive rate than previously reported in Illinois, indicative of higher exploitation on the SCAC. Whelping was believed to occur late March to late May; 25–50% of pups may reach adulthood. Most den sites were in rock outcroppings in deciduous woods. Abandonment of a den site appeared to occur after 3 months and females left pups for extended periods of time after 4 months. Dispersal probably occurs mid October-January.

Voles (*Microtus ochrogaster* and *M. pinetorum*) and rabbit (*Sylvilagus floridanus*) were the most important food items throughout the year. Persimmons (*Diospyros virginiana*) were important seasonally. Coyotes were identified with 246 sheep mortalities 1974–1985 causing an estimated loss of $21,444.00. Most losses occurred from June to September when sheep were in pasture; fields with access to a barn experienced fewest losses. Sheep mortalities due to predators were reduced from 59 in 1983 to 0 in 1985 with acquisition of an Akbash guard dog.

Pringle, L. P. 1960. Notes on coyotes in southern New England. Journal of Mammalogy 41:278.

CONNECTICUT, MASSACHUSETTS, RANGE, VERMONT

Rand, A. L. 1945. Mammals of the Ottawa district. Canadian Field Naturalist 59:111–132.

ONTARIO, RANGE

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

DIET, HABITAT, ILLINOIS, RED FOX, SMALL MAMMALS

Predators may forage in a variety of ways, such as specializing on particular prey species, switching to alternative prey, or by varying spatial activity patterns. The latter two modes can occur in a heterogeneous landscape. The effects of fluctuating prey numbers on the activity patterns and diet selection of two terrestrial predators, the coyote (*Canis latrans*) and red fox (*Vulpes vulpes*), were investigated. The study site was located in northern Illinois, at Fermi National accelerator Laboratory (Fermilab), and included sampling in seven different habitats of a heterogeneous landscape. Availability of small mammalian prey was assessed by monthly mark-recapture sampling conducted along three 200-m transects in each of the seven locations. Availability of squirrels (*Sciurus spp.*), eastern cottontail rabbits (*Sylvilagus floridanus*), and Ring-necked pheasants (*Phasianus colchicus*) was assessed by monthly visual counts along the same transects. Spatial activity pattern of *C. latrans* were determined from scent station lines parallel to the small mammal trapping transects. Scats collected along standardized routes were analyzed for number and occurrence of prey items. During 1994, there were significant differences in prey availability over time between the seven locations. Dietary analyses indicated that both red fox and coyote switched between alternative prey, albeit with a strong preference for *Microtus.* A concurrent study on small mammal population dynamics, conducted in one of the seven habitats, showed experimentally that the preferential selection of voles depressed prey populations. Except for *Microtus,* overall prey availability did not affect coyote activity patterns across Fermilab. This lack of correlation was due, in part, to habitat selection by coyotes, primarily, the avoidance of wooded areas. Coyotes did, however, respond to abundant patches of *Peromyscus,* through spatial and temporal alterations in activity patterns.

Randa, L. A., and J. A. Yunger. 2004. The influence of prey availability and vegetation characteristics on scent station visitation rates of coyotes, *Canis latrans,* in a heterogeneous environment. Canadian Field Naturalist 118:341–353.

DIET, HABITAT, ILLINOIS, SMALL MAMMALS

We investigated the effects of local prey fluctuations and habitat variables on the scent station visitation rates of the coyote (*Canis latrans*) in northern Illinois within a heterogeneous environment. Availability of

small mammalian prey was assessed by monthly mark-recapture sampling and visual counts conducted along three, 192-m transects in each of seven habitats that ranged from grassland to wooded sites. Habitat metrics, which included foliage density, ground cover, and canopy cover, were also collected for the same seven habitats. Visitation rates of coyotes were determined from scent station lines parallel to the small mammal trapping transects. A multiple regression analysis indicated that coyote visitation rates across the study site were influenced positively by vole (*Microtus spp.*) abundance and negatively by canopy cover. When coyote visitation rates were regressed on vole abundance for only the habitats in which voles occurred, the relationship was not significant. This may be attributed to the general avoidance of wooded areas by coyotes. Coyotes did, however, respond to experimentally induced abundant patches of *Peromyscus.* These findings suggest coyotes selectively use grassland habitats within a heterogeneous environment and may modify their use according to prey availability.

Reich, D. E., R. K. Wayne, and D. B. Goldstein. 1999. Genetic evidence for a recent origin by hybridization of red wolves. Molecular Ecology 8:139–144.

GENETICS, HYBRID, RED WOLF

Genetic data suggests that red wolves (*Canis rufus*) resulted from a hybridization between coyotes (*C. latrans*) and grey wolves (*C. lupus*). The date of the hybridization, however, is uncertain. According to one hypothesis, the two species came into contact as coyotes increased their geographical range in conjunction with the advance of European settlers and as grey wolves were extirpated from the American south. Alternatively, the red wolves could have originated tens of thousands of years ago as a result of climate and habitat changes that disturbed the ecology of the two parent species. To obtain an upper limit on the date of hybridization that would help to distinguish the two scenarios, we compared microsatellite allele length distributions from red wolves, coyotes and gray wolves. Subject to the assumptions of our analysis, we conclude that the red wolves originated as a result of hybridizations that occurred during the past 12,800 years, and probably during the past 2,500 years.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

DIET, RANGE, MAINE, MORPHOLOGY, TAXONOMY

Eastern coyote (*Canis latrans* var.) may have appeared in Maine as early as 1936; their range now includes most of eight western counties and eastward extensions into central and northwestern Maine. Ninety coyotes, killed in 1968–73, were examined and new distribution records are given. Skull and tooth characteristics of Maine coyotes tended to be intermediate to those of dogs and western coyotes. Adult males averaged 15.8 kg and females 13.7 kg; the mean body measurements were 1251: 363 : 209 and 116 mm for males and 1179 : 343 : 197 and 113 mm for females. Carrion, snowshoe hare (*Lepus americanus*), small mammals, and miscellaneous items composed most of the stomach contents of 51 coyotes killed in the fall and early winter. Identification of Maine *Canids* is discussed.

Richer, M-C., M. Crête, J-P. Ouellet, L. P. Pirest, and J. Huot. 2002. The low performance of forest versus rural coyotes in northeastern North America: Inequality between presence and availability of prey. Ecoscience 9:44–54.

DIET, HABITAT, POPULATION DENSITY, URBAN

Coyotes, which originate from central and southwestern North America, recently extended their range into forests of the Northeast. Forest coyotes occur in lower densities, have lower body reserves, and consume more fruits during summer than their counterparts occupying adjacent rural landscapes. We hypothesized that the forest landscape offered less animal prey to coyotes during summer than did the rural landscape. Coyote densities were higher in the rural landscape (2.7 animals 10 km^2) than in the forest landscape (0.5 animals 10 km^2) during the summer of 1997. During the summers of 1996 and 1997, coyotes in both landscapes fed mainly on wild berries (> 45% of dry matter intake), small mammals (> 10%), and snowshoe hare (> 10%). The biomass of the most abundant animal prey, snowshoe hares, was greater in the forest land-

scape (1.24 and 1.53 kg ha^{-1} in 1996 and 1997, respectively) than in the rural landscape (0.46 and 0.40 kg ha^{-1} in corresponding years). The biomass of the other major animal prey (small mammals), was comparable in both landscapes but irrupted during the second summer (0.09 and 0.50 kg ha^{-1} in 1996 and 1997, respectively). The biomass of fruits remained relatively constant in the rural landscape during the summers of 1996 and 1997 (~ 6 kg ha^{-1}), but it tripled in the forest landscape during the second year (1.69 kg ha^{-1} in 1996 versus 5.30 kg ha^{-1} in 1997). Contrary to our prediction, the availability of animal prey in the forest landscape exceeded that in the rural landscape. Our results illustrate that the presence of prey does not correspond to its availability to predators. Coyotes appear poorly adapted for hunting in dense forest vegetation during summer and compensate for shortage of animal prey by consuming more berries.

Robinson, K. J. 2010. Scat identification and dietary trends of coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes vulpes*) in a mid-Atlantic ecosystem. Thesis, George Mason University, Fairfax, USA.

DIET, VIRGINIA

Rosatte, R. C. 2002. Long distance movement of a coyote, *Canis latrans,* and red fox, *Vulpes vulpes,* in Ontario: implications for disease spread. Canadian Field Naturalist 116:129–131.

DISEASE, MOVEMENTS, ONTARIO

During a rabies control program in southern Ontario, raccoons (*Procyon lotor*), striped skunks (Mephitis mephitis), red fox (*Vulpes vulpes*), and coyotes (*Canis latrans*) were live-captured, vaccinated, ear-tagged, and released at point of capture. One of eight coyotes captured and released during 1995 in Niagara Falls, Ontario, dispersed 320 km to Coatsworth, Ontario. Additionally, 1 of 23 foxes, captured and released in Scarborough, Ontario, during 1994, moved 170 km to Rossmore, Ontario. Although such a long distance movements are probably rare in Ontario they may play a critical role in the dissemination of infectious diseases such as rabies.

Roth, J. D., D. L. Murray, and T. D. Steury. 2008. Spatial dynamics of sympatric *Canids:* modeling the impact of coyotes on red wolf recovery. Ecological Modeling 214:391–403.

HYBRID, MANAGEMENT, RED WOLF

Interspecific competition can have a substantial impact on sympatric carnivore populations and may threaten reintroduction attempts of threatened or endangered species. Coyotes (*Canis latrans*) are the primary threat to recovery of red wolves (*C. rufus*) in the wild, through hybridization and loss of the red wolf genotype and habitat occupancy that reduces space available for wolf occupation. We built a stochastic simulation model (using data collected from a recovering red wolf population in northeastern North Carolina as well as from the literature) to examine spatial dynamics of sympatric red wolves and coyotes (independent of habitat influences) and to elucidate the potential role of coyotes on wolf recovery and reintroduction success. Survival of juvenile and adult wolves had the greatest impact on wolf population size and likelihood of extinction. Introducing coyotes to the model had a substantial negative impact on wolf numbers, and the model was highly sensitive to the estimates of the competitive impact of coyotes on red wolves, through declines in wolf productivity. We simulated coyote management from either removal (lower coyote survival) or surgical sterilization (lower coyote reproductive rates) and found that both management strategies increased viability of red wolf populations, especially during initial colonization. Our results suggest that coyotes can inhibit red wolf reintroduction success through competitive interactions, but that management of coyote populations can improve the probability of successful wolf recovery. Additional information on spatial dynamics and dietary overlap between coyotes and wolves in the recovery area is needed to further elucidate the current and potential competitive impact of coyotes on red wolf populations.

Roy, M. S., E. Geffen, D. Smith, E. A. Ostrander, and R. K. Wayne. 1994. Patterns of differentiation and hybridization in North American wolf-like *Canids,* revealed by analysis of microsatellite loci. Molecular Biology and Evolution 11:553–570.

GENETICS, HYBRID

Genetic divergence and gene flow among closely related populations are difficult to measure because mutation rates of most nuclear loci are so low that new mutations have not had sufficient time to appear and become fixed. Microsatellite loci are repeat arrays of simple sequences that have high mutation rates and are abundant in the eukaryotic genome. Large population samples can be screened for variation by using the polymerase chain reaction and polyacrylamide gel electrophoresis to separate alleles. We analyzed 10 microsatellite loci to quantify genetic differentiation and hybridization in three species of North American wolf-like *Canids.* We expected to find a pattern of genetic differentiation by distance to exist among wolf-like *Canid* populations, because of the finite dispersal distances of individuals. Moreover, we predicted that, because wolf-like *Canids* are highly mobile, hybrid zones may be more extensive and show substantial changes in allele frequency, relative to non-hybridizing populations. We demonstrate that wolves and coyotes do not show a pattern of genetic differentiation by distance. Genetic subdivision in coyotes, as measured by theta and Gst, is not significantly different from zero, reflecting persistent gene flow among newly established populations. However, gray wolves show significant subdivision that may be either due to drift in past ice age refugia populations or a result of other causes. Finally, in areas where gray wolves and coyotes hybridize, allele frequencies of gray wolves are affected, but those of coyotes are not. Past hybridization between the two species in the south-central United States may account for the origin of the red wolf.

Roy, M. S., E. Geffen, D. Smith, and R. K. Wayne. 1996. Molecular genetics of pre-1940 red wolves. Conservation Biology 10:1413–1424.

GENETICS, GRAY WOLF, HYBRID, RED WOLF

Conservation of the endangered red wolf *(Canis rufus)* has become a controversial issue because its genetic and morphological composition has been altered by hybridization with coyotes *(C. latrans)* and possibly gray wolves *(C. lupus)* making its evolutionary origins difficult to ascertain. The evolutionary hypothesis based on morphological data is that the red wolf had an Early Pleistocene origin and was the predecessor of both modern coyotes and gray wolves. After 1940 red wolves hybridized with coyotes as the species vanished from the wild. In contrast to this ancient origin-recent introgression hypothesis, molecular data are more consistent with an origin through hybridization between gray wolves and coyotes. Interspecific hybridization may have occurred repeatedly over time prior to European settlement in the south-central United States or may have been induced recently by anthropogenic changes. We review recent molecular evidence and present new results from the analysis of mitochondrial and nuclear DNA markers in pre-1940 populations of red wolves. Our results are inconsistent with an ancient origin of the red wolf and support the hybridization model. We discuss possible hybridization scenarios and reasons for the red wolf reintroduction program to be concerned with the effects of genetic introgression from coyotes.

Rutledge, L. Y., C. J. Garroway, K. M. Loveless, and B. R. Patterson. 2010. Genetic differentiation of eastern wolves in Algonquin Park despite bridging gene flow between coyotes and gray wolves. Heredity 64:1–12.

GENETICS, GRAY WOLF, HYBRID

Distinguishing genetically differentiated populations within hybrid zones and determining the mechanisms by which introgression occurs are crucial for setting effective conservation policy. Extensive hybridization among grey wolves (*Canis lupus*), eastern wolves (*C. lycaon*) and coyotes (*C. latrans*) in eastern North America has blurred species distinctions, creating a Canis hybrid swarm. Using complementary genetic markers, we tested the hypotheses that eastern wolves have acted as a conduit of sex-biased gene flow between grey wolves and coyotes, and that eastern wolves in Algonquin Provincial Park (APP) have differentiated following a history of introgression. Mitochondrial, Y chromosome and autosomal microsatellite genetic data provided genotypes for 217 *Canids* from three geographic regions in Ontario, Canada: northeastern Ontario, APP and southern Ontario. Coyote mitochondrial DNA (mtDNA) haplotypes were common across regions but coyote-specific Y chromosome haplotypes were absent; grey wolf mtDNA was absent

from southern regions, whereas grey wolf Y chromosome haplotypes were present in all three regions. Genetic structuring analyses revealed three distinct clusters within a genetic cline, suggesting some gene flow among species. In APP, however, 78.4% of all breeders and 11 of 15 known breeding pairs had assignment probability of QX0.8 to the Algonquin cluster, and the proportion of eastern wolf Y chromosome haplotypes in APP breeding males was higher than expected from random mating within the park (P00.02). The data indicate that Algonquin wolves remain genetically distinct despite providing a sex-biased genetic bridge between coyotes and grey wolves. We speculate that ongoing hybridization within the park is limited by pre-mating reproductive barriers.

Ryon, J. 1986. Den digging and pup care in captive coyotes (*Canis latrans*). Canadian Journal of Zoology 64:1582–1585.

BEHAVIOR, JUVENILE, REPRODUCTION, SOCIALITY

Captive coyotes were studied for den digging and use (n = 10) and pup care activities (n = 4 adults and 2 yearlings). Method of construction and configuration of dens is described. Pup care activities of individual pack members are documented, including: den tending, ano-genital grooming, nursing, feeding solid food, transferring pups between dens, and alarm barking. It is suggested that endogenous factors be considered in addition to environmental causes for the phenomenon of multiple den use and frequent transferal of pups that may have evolved as a method of decreasing the risks of pup predation.

Saalfeld, S. T., and S. S. Ditchkoff. 2006. Survival of neonatal white-tailed deer in an exurban population. Journal of Wildlife Management 71:940–944.

ALABAMA, DIET, PREDATION, WHITE-TAILED DEER

As humans continue to move further from the urban epicenter and expand into suburban and exurban areas, problems involving coexistence of wildlife and human populations will become increasingly common. Wildlife biologists will be tasked with reducing wildlife-human conflicts, and their effectiveness will be a function of their understanding of the biology and life-history characteristics of wildlife populations residing in areas with high human density. In this study, we examined causes and timing of deaths of neonatal white-tailed deer (*Odocoileus virginianus*) in an exurban area of Alabama in 2004 and 2005, estimated survival rates, and determined factors that influenced survival for the initial 8 weeks of life. We found 67% mortality, with the leading causes being predation by coyotes (*Canis latrans;* 41.7%) and starvation due to abandonment (25%). These results suggest that coyote predation may be a significant source of natural mortality in exurban areas. Contrary to our original expectations, vehicle collisions were not an important cause of mortality.

Samson, C., and M. Crete. 1997. Summer food habits and population density of coyotes, *Canis latrans,* in boreal forests of southeastern Quebec. Canadian Field Naturalist 111:227–233.

DIET, HABITAT, POPULATION DENSITY, QUEBEC

The coyote (*Canis latrans*) arrived on the Gaspe Peninsula in the mid 1970s. The population increased through 1990 followed by a general decline. We compared summer food habits of the coyote in 1988 and 1991 in central Gaspe Peninsula, a forest area dominated by conifers. We analyzed 231 scats in 1988 and 435 scats in 1991 to determine coyote food habits. In 1991, we also marked seven coyotes with radio-collars and a radioactive isotope (^{65}Zn) to estimate population density in the study area. The density estimate of 0.2–0.3 coyote/10 km^2 (± 35–36%) was among the lowest ever recorded. Woodchuck (*Marmota monax*) and white-tailed deer (*Odocoileus virginianus*) dominated the diet in May-June 1988 but were replaced by moose (*Alces alces*), snowshoe hares (*Lepus americanus*) and beavers (*Castor canadensis*) in 1991. Berries were preferred in mid-summer and compromised 56% and 80% of the volume of scats in August of 1988 and 1991, respectively. The use of small mammals remained relatively constant during both years; i.e., 9–19% of scat volume. Results are related to levels of prey abundance on the Gaspe Peninsula.

Santana, E. M. 2010. Food habits and anthropogenic supplementation in the diet of coyotes (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

ALABAMA, DIET, HABITAT, URBAN

Coyotes are recent colonists of the Southeast and have broadened their niche to include exploitation of urban areas. The aim of my study was to examine diet of coyotes inhabiting areas of differential development by humans and assess prevalence of anthropogenic feeding to detect a possible shift in dietary trends. In urban, exurban, and rural areas of east-central Alabama, 159 fecal samples were collected and examined to reconstruct the diet. Consumption of anthropogenic food did not vary significantly along an urban-rural gradient. Foods consumed were similar among habitats; coyotes consumed food items that were available. There was greater consumption of white-tailed deer (*Odocoileus virginianus*) in urban and rural areas than exurban areas, more feeding on insects in exurban areas than either urban or rural areas, and more consumption of vegetative matter in urban areas than in exurban or rural areas. While results of this study can provide insight to guide decisions about managing populations of urban-exurban coyotes in the Southeast, further research should be conducted in a diversity of developed areas to assist wildlife managers in evaluating strategies for managing populations of urban-exurban coyotes.

Schmitz, O. J., and G. B. Kolenosky. 1985. Hybridization between wolf and coyote in captivity. Journal of Mammalogy 66:402–405.

EASTERN WOLF, HYBRID

Schmitz, O. J., and G. B. Kolenosky. 1985. Wolves and coyotes in Ontario: morphological relationships and origins. Canadian Journal of Zoology 63:1130–1137.

EASTERN WOLF, MORPHOLOGY, ONTARIO, RANGE

Morphologically distinct groups of Canis in Ontario were identified using multivariate analyses on 6 body and 21 cranial characters. Three groups of wolves and three groups of coyotes were identified. Wolves in Ontario appeared to exhibit variation. Large wolves were found in the boreal forest region of northern Ontario, intermediate-sized wolves were found in central Ontario, and a small form existed in southern Ontario. Coyotes in Ontario also varied geographically in size. Coyotes in southeastern and central Ontario resembled coyote-wolf hybrids

Schmitz, O. J., and D. M. Lavigne. 1987. Factors affecting body size in sympatric Ontario Canis. Journal of Mammalogy 68:92–99.

DIET, EASTERN WOLF, MORPHOLOGY

Body sizes and feeding habits of coyotes, *Canis latrans,* and wolves, *C. lupus,* in southeastern Ontario were examined between 1959–1969 and 1983–1984. Coyotes increased in mean body weight and length whereas wolves decreased in mean body length. The decrease in body length of wolves was correlated with an increase in the use of smaller, more abundant prey. It appears that body size of wolves and coyotes in Ontario have been selected for by the size and abundance of prey and is not the result of a co-evolutionary response between two competing carnivores.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

DOG, EASTERN WOLF, GENETICS, HYBRID, MORPHOLOGY

Domestic dogs have been shown to have multiple alleles of the Agouti Signal Peptide (ASIP) in exon 4 and we wished to determine the level of polymorphism in the common wild *Canids* of Canada, wolves and coyotes, in comparison. All Canadian coyotes and most wolves have banded hairs. The ASIP coding sequence of the wolf did not vary from the domestic dog but one variant was detected in exon 4 of coyotes that did not alter the arginine at this position. Two other differences were found in the sequence flanking exon 4

of coyotes compared with the 45 dogs and 1 wolf. The coyotes also demonstrated a relatively common polymorphism in the 3' UTR sequence that could be used for population studies. One of the ASIP alleles (R96C) in domestic dogs causes a solid black coat color in homozygotes. Although some wolves are melanistic, this phenotype does not appear to be caused by this same mutation. However, one wolf, potentially a dog–wolf hybrid or descendant thereof, was heterozygous for this allele. Likewise 2 coyotes, potentially dog–coyote or wolf–coyote hybrid descendants, were heterozygous for the several polymorphisms in and flanking exon 4. We could conclude that these were coyote–dog hybrids because both were heterozygous for 2 mutations causing fawn coat color in dogs.

Schultz, V. 1955. Status of the coyote and related forms in Tennessee. Journal of the Tennessee Academy of Science 30:44–46.

RANGE, TENNESSEE

Schrecengost, J. D. 2007. Home range and food habits of the coyote (*Canis latrans*) at the Savannah River site, South Carolina. Thesis, University of Georgia, Athens, USA.

DIET, HABITAT, HOME RANGE, SOUTH CAROLINA

Coyote food habits were assessed by fecal analysis of 415 scats collected from May 2005 through July 2006 on the Savannah River Site, South Carolina. Seasonally available soft mast was the most common food item in 12 of the 15 months sampled. Adult white-tailed deer occurred most frequently in December and March, and fawn remains were common during May and June. Thirty-three adult coyotes were radio collared between April and October 2005 and monitored through September 2006. Radio telemetry locations were used to assess home range size and habitat selection was assessed by compositional analysis. Coyote home ranges averaged 31.8 km^2 using the fixed Kernel method (30.5 km^2, Minimum Convex Polygon) and contained earlier successional habitat than was available on the landscape. Data from this study suggest that coyotes are heavily dependent on soft mast, may be affecting local white-tailed deer populations, and have larger home ranges with more intraspecific overlap than previously reported in the southeast.

Schrecengost, J. D., J. C. Kilgo, D. Mallard, H. S. Ray, and K. V. Miller. 2008. Seasonal food habits of the coyote in the South Carolina coastal plain. Southeastern Naturalist 7:135–144.

DIET, SOUTH CAROLINA

Spatial and temporal plasticity in *Canis latrans* (coyote) diets require regional studies to understand the ecological role of this omnivorous *Canid.* Because coyotes have recently become established in South Carolina, we investigated their food habits by collecting 415 coyote scats on the Savannah River Site in western South Carolina from May 2005-July 2006. Seasonally available soft mast was the most common food item in 12 of the 15 months we sampled. *Odocoileus virginianus* (white-tailed deer) was the most common food item during December (40%) and March (37%). During May-June, fruits of Prunus spp. and Rubus spp. were the most commonly occurring food items. Fawns were the most common mammalian food item during May and June of both years despite low deer density.

Schrecengost, J. D., J. C. Kilgo, H. S. Ray, and K. V. Miller. 2009. Home range, habitat use and survival of coyotes in western South Carolina. American Midland Naturalist 162:3463–55.

HABITAT, HOME RANGE, SOUTH CAROLINA, SURVIVAL

Home range size, habitat use and survival of coyotes are variable throughout their range. Because coyotes have recently become established in South Carolina, we investigated their spatial distribution, habitat use and mortality on the Savannah River Site (SRS) in western South Carolina, USA. Annual survival for adult coyotes on the SRS was 0.658. Off-site trapping and shooting accounted for 60% of mortality. Home ranges averaged 30.5 km^2 and 31.85 km^2 by the 95% minimum convex polygon and 95% fixed kernel methods, respectively. We detected no difference in

home ranges size between males and females. Intraspecific home range overlap averaged 22.4%, excluding mated pair interactions, with 87.5% of coyotes sharing their home range with one or more individuals. Coyotes selected home ranges containing higher proportions of early successional habitat than was available on the landscape. Core areas likewise contained a greater proportion of early successional habitat than available in the animal's home range.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on Canis morphological and ecological variation in a coyote-wolf *C. lupus x latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

DIET, EASTERN WOLF, HABITAT, HYBRID, MORPHOLOGY, ONTARIO, TAXONOMY

The ecology of coyote-wolf (*Canis latrans* x *C. lupus*) hybrids has never fully been typified. We studied morphological and ecological variation in Canis within a region of coyote-wolf hybridization in southeastern Ontario. We assessed Canis morphology from standard body measurements and ten skull measurements of adult specimens and found that Canis in this region are morphologically intermediate between Algonquin Provincial Park Wolves (*C. lupus lycaon*) and coyotes, indicating a latrans x lycaon hybrid origin; however, there is a closer morphological affinity to latrans than lycaon. Analysis of 846 scats indicated dietary habits also intermediate between lycaon and coyotes. We used a geographic information system (GIS) to assess spatial landscape features (road density, land cover and fragmentation) for six study sites representing three landscape types. We found noticeable variation in Canis morphology and diet in different landscape types. In general, *Canis* from landscape type A (lowest road density, more total forest cover, less fragmentation) displayed more wolf-like body morphology and consumed a greater proportion of larger prey (beaver [*Castor canadensis*] and white-tailed deer [*Odocoileus virginianus*]). In comparison, *Canids* from landscape types B and C (higher road density and/or less total forest cover, more fragmentation) were generally more coyote-like in body and skull morphology and made greater use of medium to small-sized prey (groundhog [*Marmota monax*], muskrat [*Ondatra zibethicus*] and lagomorphs). These landscape trends in *Canis* types suggest selection against wolf-like traits in fragmented forests with high road density. The range of lycaon southeast of Algonquin Provincial Park appears to be limited primarily due to human access and consequent exploitation. We suggest that road density is the best landscape indicator of *Canis* types in this region of sympatric, hybridizing and unprotected *Canis* populations.

Severinghaus, C. W. 1974. Notes on the history of wild *Canids* in New York. New York Fish and Game Journal 21:117–125.

NEW YORK, RANGE

Over the past half century, wild *Canids* bearing a resemblance to coyotes have been encountered with increasing frequency in New York, particularly in the Adirondack region where there has become established a population of animals that fit the general description of the eastern coyote (*Canis latrans* var.).

Sharp, D. W. 1981. Siren-elicited responses of coyotes in western Kentucky and Tennessee. Proceedings of the Annual Conference of Fish and Wildlife Agencies 35:273–280.

KENTUCKY, POPULATION DENSITY, TENNESSEE

Three hundred eighty-eight stations were surveyed for siren-elicited responses from coyotes (*Canis latrans*) and dogs (*Canis familiaris*). Responses were received from coyotes at 15 of 388 station soundings (3.9%) whereas dogs were heard at 14 of 388 station soundings (3.6%). November has the highest rate for coyotes (5.8%) and February had the highest rate for dogs (5.3%). Two indices of relative abundance were determined by dividing the average number of individuals responding and average number of responses from 3 surroundings at each station by the estimated area covered at those stations in 1 sounding. To correct of those coyotes that do not respond to the siren, this value was then multiplied by 2. Indices of coyote abundance so determined were 0.017 individual responses/km^2 and 0.010 responses/km^2, whereas indices of dog

abundance were 0.011 individual responses/km^2 and 0.009 responses/km^2.

Silver, H., and W. T. Silver. 1969. Growth and behavior of the coyote-like *Canid* of northern New England with observations on *Canid* hybrids. Wildlife Monographs 17:1–41.

BEHAVIOR, HYBRID, JUVENILE, NEW HAMPSHIRE

Slate, D. L. 1987. Coyotes in the eastern U.S.: status and implications. Proceedings of Eastern Wildlife Damage Control Conference 3:325–326.

CONFLICT, DAMAGE, LIVESTOCK

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

AGE STRUCTURE, DIET, HOME RANGE, JUVENILE, LIVESTOCK, MOVEMENTS, REPRODUCTION, SEX RATIO, SOCIALITY, SURVIVAL, WISCONSIN

Coyote (*Canis latrans*) populations in northern Wisconsin and Minnesota were studied to determine food habits, area use, movements, intraspecific behavior, and population dynamics. White-tailed deer (*Odocoileus virginianus*) occurrence in coyote stomachs was positively correlated with coyote winter body weight and fat indices, and negatively correlated with frequency of livestock occurrence. Coyotes respond functionally to changes in snowshoe hare (*Lepus americanus*) numbers. A total of 203 coyotes were radio-equipped and 6,097 radio locations made. The estimated mean adult home range (22.6 km^2) was significantly larger than 15.6 km^2 estimated for females ($P < 0.05$). Individual home ranges were not significantly different ($P > 0.05$) between Minnesota and Wisconsin populations or between seasons. Shifts in adult home ranges between seasons were more frequent for males than females, and mated adult pairs were territorial. Removal of resident adults appeared to create vacant territories that could be colonized by nomadic or dispersing coyotes. Dispersals ($n = 62$) were classified into 3 types. Most juveniles increased the area used from late summer until they disappeared between October and April (type 1), and accounted for 80% of the dispersals. Male and female dispersal distances were not significantly different ($P > 0.05$), and were random in direction. Eleven percent of the dispersals resulted in a nomadic phase (type II), rather than a colonization of a new area (type I). Type III dispersals (9%) were deferred until the animal was >1 year old. Fall-winter populations consisted 50% juveniles, 20–37% yearlings (1.5 years), and sex ratios were not different from equality ($P > 0.05$). Age structure of the Minnesota population was stable over an entire 11-year period. Pregnancy rates were 23–35%, 38–40%, and 57–58% for juvenile, yearling, and adult female coyotes, respectively. Corpora lutea counts averaged 5.5 ova per female, with 4.4–4.8 embryos carried to full term. Mean annual adult survival was 62% (SD = 16), and juvenile survival rates varied widely between months and years, but were lowest during early winter. Trapping, hunting, and snaring accounted for 72–76% of all mortality. Home range size—population composition data indicate maximum post-birth pulse densities to be about 1 coyote per 3.3 to 4.4 km^2.

Smith, G. J., J. R. Cary, and O. J. Rongstad. 1981. Sampling strategies for radio-tracking coyotes. Wildlife Society Bulletin 9:88–92.

BEHAVIOR, HOME RANGE

Ten coyotes radio-tracked for 24 h periods were most active at night and moved little during daylight hours. Home-range size determined from radio-locations of 3 adult coyotes increased with the number of locations until an asymptote was reached at about 35–40 independent day locations or 3–6 nights of hourly radio-locations. Activity of the coyote did not affect the asymptotic nature of the home-range calculations, but home-range sizes determined from more than 3 nights of hourly locations were considerably larger than home-range sizes determined from daylight locations. Coyote home-range sizes were calculated from daylight locations, full-night tracking periods, and half-night tracking periods. Full and half-night sampling strategies involved obtaining hourly radio-locations during 12 and 6 h periods, respectively. The

half-night sampling strategy was the best compromise for our needs, as it adequately indexed the home-range size, reduced time and energy spent, and standardized the area calculation without requiring the researcher to become completely nocturnal. Night tracking also provided information about coyote activity and sociability.

Smith, R. A., and M. L. Kennedy. 1983. Food habits of the coyote (*Canis latrans*) in western Tennessee. Journal of the Tennessee Academy of Science 58:27–28.

DIET, TENNESSEE

Digestive tracts of 54 western Tennessee coyotes (*Canis latrans*) were examined for food habits from the fall of 1979 through the summer of 1981. The nine food items detected and percent occurrence were: rodent (48.1), livestock (35.2), plant (27.8), rabbit (24.0), bird (16.7), insect (14.8), white-tailed deer (13.0), woodchuck (7.4), and reptile (3.7).

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

DOG, MORPHOLOGY, RED WOLF, TAXONOMY, TENNESSEE

To assess the taxonomic status of the coyote (*Canis latrans*) in Tennessee, the relationship of 61 Tennessee *Canids* (unknown taxonomically) were compared to specimens of coyotes, dogs (*C. familiaris*), and red wolves (*C. rufus*). Twelve skull measurements were used in the assessment. Discriminant function analysis showed a well-defined separation of *Canid* groups sampled. Tennessee *Canids* clustered distinctly and were statistically separable from dog and red wolf groups. Hybridization between taxa was minimal. The wild coyote-like *Canids* occurring in Tennessee are taxonomically coyotes.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

HOME RANGE, MICHIGAN, MOVEMENTS, SOCIALITY, TERRITORY

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

MORPHOLOGY, POPULATION DENSITY, REPRODUCTION, SEX RATIO, TENNESSEE

Population features of the coyote (*Canis latrans*) were studied in the winters of 1989 and 1990 in Gibson and Carroll counties, Tennessee. In 1989, 55 coyotes (24 males, 31 females) were captured. Total length, tail length, hind foot length, and ear length averaged 1,269, 349, 202, and 104 mm, respectively for males. Mean weight was 14.0 kg, and average age was 2.1 years. For females, external measurements were1,186, 318,191, and 99 mm, respectively. Weight averaged 11.9 kg, and age averaged 1.8 years. Mean litter size was 3.9 offspring/female; sexes were 44% male and 56% female. Minimum density was 0.56 coyote/km^2. In 1990, 49 coyotes (25 males, 24 females) were captured. For males, external measurements averaged 1,241, 338, 200, and 101 mm. Mean weight was 13.5 kg, and average age was 1.5 years. For females, external measurements averaged 1,219, 322, 189, and 97 mm. Mean weight was 11.8 kg, and average age was 1.5 years. Mean litter size was 3.4 young/female; sexes were 51% male and 49% female. Minimum density was 0.50 coyote/km^2.

Stewart-Marks, C. 1989. Development of vocal behavior in the coyote (*Canis latrans*). Dissertation, Indiana State University, Terra Haute, USA.

JUVENILE, SOCIALIZATION

Two groups of coyote pups were studied; one (n = 18) was allowed to remain with parents during early development, and the other (n = 6) was removed from the den at birth and denied parental contact. Sound

recordings of both groups were analyzed with respect to context, frequency of occurrence, and physical characteristics (via sonogram). Activity pattern was monitored on a 24-hour basis. Vocal development in young coyotes corresponds with Scott and Fuller's developmental periods, as follows: the neonatal period (birth-12 days), the transition period (13–20 days), the period of socialization (early, 21–35 days; late 5–12 weeks), and the juvenile period (3–10 months). The neonatal period is characterized primarily by distress/discomfort vocalizations. The transition period marks the shift from the neonatal distress/discomfort pattern to one dominated by social vocalizations. The period of socialization, which is characterized by social vocalizations such as the bark and growl, is when group vocal behavior emerges (between 21–24 days of age in all groups). Social status appears to be correlated with group vocal behavior in both adults and pups. Dominant individuals initiate bouts, and they howl and bark more frequently than do subordinates, which yip, yelp and whine. Individual patterns change according to the proximity of dominant animals. Greeting behavior, appeasement, and dominance behavior are common after group yip-howl. Analysis of activity pattern data shows that the adults are most active just before sunrise and just after sunset; the pups show a two-hour periodicity of activity that reflects their feeding behavior. Parental deprivation did not significantly affect vocal development with respect to time of development, frequency of calls, or behavioral context.

Stoskopf, M. K., K. Beck, B. B. Fazio, T. K. Fuller, E. M. Gese, B. T. Kelly, F. F. Knowlton, D. L. Murray, W. Waddell, and L. Waits. 2005. From the field: implementing recovery of the red wolf integrating research scientists and managers. Wildlife Society Bulletin 33:1145–1152.

MANAGEMENT, RED WOLF

The United States Fish and Wildlife Service (USFWS) developed guidelines for the com- position and role of endangered species recovery implementation teams, but few teams have been established and their success has not been evaluated. Using the recovery pro- gram of the red wolf (*Canis rufus*) as a model, we describe the genesis, function, and success of the Red Wolf Recovery Implementation Team (RWRIT) in helping guide the establishment of a viable red wolf population in eastern North Carolina. In operation since 1999, the RWRIT meets bi-annually to review USFWS progress and provide recommendations aimed at maximizing success of species recovery. The team is comprised of 8 research scientists from disciplines including population genetics, *Canid* ecology, population ecology, veterinary medicine, and captive management. Representation from each of these disciplines is deemed necessary for proper evaluation of recovery progress and assessment of future needs. Meeting attendance by the USFWS field management team ensures both proper reporting of past progress and future implementation of management recommendations. Over time, RWRIT members have assumed specific assignments for data analyses, further contributing to the recovery effort. Through the combined efforts of the USFWS field team and the RWRIT, the threat of introgression of coyote (*Canis latrans*) genes into the red wolf population has been substantially curtailed within the recovery area, and red wolf numbers and range have increased. The RWRIT serves as an example of a recovery implementation team that is successfully incorporating the principles of adaptive management and whose template could be adapted to other endangered species.

Stratman, M. R., and M. R. Pelton. 1997. Food habits of coyotes in northwestern Florida. Proceedings of Annual Conference Southeastern Association Fish and Wildlife Agencies 51:269–275.

DIET, FLORIDA, WHITE-TAILED DEER

Recent declines in deer densities in some areas of Eglin Air Force Base (AFB), Florida, have prompted concerns regarding the impact of coyote (*Canis latrans*) predation. We determined the food habits of coyotes from analysis of 166 scats collected on Eglin AFB from November 1994 to October 1996. We compared the frequency of white-tailed deer (*Odocoileus virginianus*) remains found in scats collected in high- and low-deer density areas during the deer fawning season to evaluate impacts of coyotes on white-tailed deer. Important coyote foods (by frequency of occurrence) were shrub/vine fruit (80%), beetles (55%), persimmon (27%), and deer (15%). Deer occurred most often (29%) during the fawning season. There was no difference in the

frequency of deer remains found in scats collected in high- and low-deer density areas. The dominance of soft mast in the diet illustrates the important role that soft mast can play in the diet of coyotes.

Stupakoff, G. 1994. Habitat use of eastern coyotes (*Canis latrans* var.) on Prescott Peninsula, Quabbin Reservation, Massachusetts. Thesis, Hampshire College, Amherst, USA.

HABITAT, MASSACHUSETTS

Habitat use of eastern coyotes (*Canis latrans* var.) on Prescott Peninsula, Quabbin Reservation was studied by means of two techniques; location of scat on the road systems and coyote response to human howling. A southern shift in habitat used was observed from 28 July to 15 December (chi-square; $P < 0.001$). This shift was attributed to changes in prey distribution and denning requirements. During July and August, scat and howling responses centered around two den areas in the northern half of Prescott, characterized with relatively high percentages of open fields (9%), ponds (15%), and black- and blueberry bushes. An increase in distance of scats from the nearest den site was observed in September (mean: July and August 0.91km + 0.02; September 1.72 + 0.9) at the same time that percent occurrence of blueberries declined in coyote scat (23%). Lack of howling responses as well as a decreased in the number of scats located near den sites suggested that these areas were abandoned in September. Scat numbers concentrated in the southern half of Prescott in October, November, and December. This area is associated with high softwood stands and a large apple tree frequented by coyotes in October. In July and August, open fields and ponds were used more than expected (i.e., more scats were located in areas with these habitat types than it was available in the study area). From September through December, softwood stands were used more than expected.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

ALABAMA, BEHAVIOR, HABITAT, HOME RANGE, MISSISSIPPI, MOVEMENTS

Twelve coyotes (*Canis latrans*) were radio-collared in east Mississippi and west Alabama to monitor daily and seasonal movement patters, home range size and habitat utilization. Coyotes were most active and traveled the greatest distances between 1800h and 0600h during diel periods. The highest movement rates occurred near sunset and sunrise. Mean distances traveled by coyotes during 12-hour full-night periods were greatest for three adult females (9.5 km) followed by four adult males (8.6 km) and four juveniles (5.6 km). Average distance traveled by all coyotes during full-night periods was shortest during fall (5.3 km) and longest during winter (12.2 km). Two juveniles and one adult dispersed 20, 140, and 20 km respectively, between November and January.

The mean composite convex polygon home range of three adult females (45.3 km^2) was about twice the size of the mean home range for four adult males (21.9 km^2) and nearly five times the size of the mean home range for four juveniles (9.7km^2). Adult male and adult female mean home ranges were smaller than most home ranges reported previously where similar methods were used. Seasonal mean home range size for adult coyotes was largest in winter (24.5 km^2, n = 3) followed in decreasing order by spring (18.7 km^2, n = 5), summer (14.2 km^2, n = 6) and fall (15.8 km^2, n = 4).

Mature pine, (Pinus spp.), young pine, young hardwood, pasture, and open water edge were the land cover types preferred by seven coyotes on the Noxubee study area in east Mississippi. The preference for the open water edge type resulted from intense use of areas adjacent to two lakes on the Noxubee National Wildlife Refuge.

Smaller home ranges and intense utilization of several habitat types may suggest that higher coyote population densities occur in the southeastern United States than in other regions.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies. 38:174–181.

ALABAMA, BEHAVIOR, HABITAT, HOME RANGE, MISSISSIPPI, MOVEMENTS

Daily activity, home range size, and seasonal and dispersal movements of 13 coyotes (*Canis latrans*) were studied in eastern Mississippi and western Alabama using telemetry techniques. Coyotes were most active and traveled the greatest distances between 1800 hours and 0600 hours. The highest movement rates occurred near sunset and sunrise. Mean distances traveled during 12-hour full-night periods were greatest for adult females (9.5 km) followed by adult males (8.6 km) and juveniles (5.6 km). Average distance traveled by all coyotes during full-night periods was shortest during fall (5.3 km) and longest during winter (12.2 km). Two juveniles and 1 adult dispersed 20 km, 140 km, and 20 km respectively, between November and January. The mean home range of adult females (41.2 km^2) was about twice the size of adult males (20.0 km^2) and nearly 4 times the size of juveniles (11.8 km^2). Adult male and female mean home ranges were smaller than those reported in most previous studies where similar methods were used.

Taylor, R. W., C. L. Counts III, and S. B. Mills. 1976. Occurrence and distribution of the coyote, *Canis latrans* Say, in West Virginia. Proceedings of the West Virginia Academy of Sciences 48:3–4.

WEST VIRGINIA

Thibault, I., J-P. Ouellet. 2005. Hunting behavior of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12:466–475.

BEHAVIOR, HABITAT, MOVEMENTS, PREDATION, SNOWSHOE HARE

Coyotes (*Canis latrans*) have expanded their range to the north and east in North America during the last century. It has been suggested that vegetative cover reduces hunting efficiency of forest-dwelling coyotes, which could explain their lower performance compared to rural coyotes. Also, in their northern range, coyotes must periodically cope with deep and soft snow conditions for which they are not morphologically adapted. We snow-tracked coyotes in a forested landscape of southeastern Québec to test the hypothesis that coyotes modify their hunting strategy with respect to vegetative cover, snow condition, and hare distribution (*Lepus americanus*), the main prey species during winter in our study area. When snow sinking depth hampered mobility, coyotes used habitats with the lowest snow sinking depth (coniferous habitats) in a greater proportion than availability (47.0 versus 29.7%), despite dense lateral cover. As a result, coyotes chased hares over short distances (17 m on average). However, when snow conditions did not hamper mobility, use of coniferous habitats decreased to 18.5% in favor of open habitats, which were used more than availability (47.7 versus 32.5%), despite low hare abundance. Use of sites with little lateral cover and low sinking depth facilitated long chases by coyotes (126 m on average). Throughout winter, coyotes used sites characterized by less lateral cover and lower snow sinking depth than random sites. Our results suggest that coyotes selectively used habitat and hunting strategy to maximize their net energy budget throughout winter. Fragmentation of forest landscapes generates abundant openings and small refuges that may benefit coyotes to the detriment of native prey populations.

Thiel, R. P. 2006. Conditions for sexual interactions between grey wolves, *Canis lupus,* and coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

BEHAVIOR, GRAY WOLF, HYBRID, REPRODUCTION, WISCONSIN

Genetic evidence for the hybridization of wild grey wolves and coyotes was first reported by Lehmann et al (1991). Subsequent genetic and landscape-environmental analyses have attempted to grasp the extent of wolf-coyote crosses in North America. Since wolves are normally territorial and thus aggressive towards coyotes, hybridization events remain rare, not withstanding the taxonomic debates regarding Canis in eastern Ontario. In this paper I report on amicable

interactions between wolves and coyotes observed in Wisconsin in recent decades and discuss circumstances that may lead to pairing between individuals of the two species.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

BEHAVIOR, DIET, BOBCAT, FLORIDA, HABITAT, HOME RANGE

The coyote (*Canis latrans*) has recently expanded its geographic range into Florida, and the impacts of this range expansion on Florida ecosystems are likely to be complex. An area of particular concern is the effect on native carnivores. From May 2001 to May 2002, we investigated the ecological relationships between the coyote and bobcat (*Lynx rufus*) in south-central Florida to determine how they partition space, habitat, time, and food. Ecological separation was facilitated by dietary differences. Coyotes preyed primarily upon large ungulates and consumed substantial quantities of fruit, whereas bobcats primarily consumed rodents and lagomorphs. Coyotes and bobcats displayed similar habitat selection and activity patterns, and their high interspecific overlap in home ranges indicated a lack of large-scale spatial segregation. However, at the finer scale of core areas, patterns of spatial segregation were present. The lack of evidence for negative interactions at our study site suggests that non-overlapping core areas reduce agonistic encounters between the 2 species.

Thurber, J., and R. O. Peterson. 1991. Changes in body size associated with range expansion in the coyote. Journal of Mammalogy 72:750–755.

MORPHOLOGY, NEW HAMPSHIRE, RANGE

Northward and eastward expansion of the range of coyote (*Canis latrans*) in North America has been associated with an increase in body size, although documentation is limited. In this study, published weights of coyotes from various geographic areas and new data from the Kenai Peninsula, Alaska, were found to differ by sex ($P < 0.001$) and longitude (females, $P = 0.036$; males, $P = 0.017$), but not latitude (females, $P = 0.861$; males, $P = 0.302$). Significant longitudinal variation was attributable to the large size of coyotes in New Hampshire. We suggest that phenotypic response to food supply may account for most variation in body size of coyotes.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

CONFLICT, DAMAGE, NEW YORK, LIVESTOCK, PREDATION

The New York State Cooperative Coyote Damage Control Program was established in late 1986 through a cooperative agreement between the New York State Department of Agriculture and Markets (NYSDAM) and USDA/ APHIS/ ADC in response to escalating complaints of coyote (*Canis latrans*) depredations on sheep from 1980–85. Ten counties with histories of and/or potential for coyote/livestock conflicts were identified and targeted for publicity and primary program emphasis. Program staff received 58 reports of coyote depredations on 182 sheep from 32 producers in the ten target counties and seven outlying counties from May 1987 through May 1989/ and verified 46 complaints from 24 producers with a total loss of 121 sheep. Preventative management recommendations included pasture mowing/, carrion removal/ night confinement/ guard dogs/ frightening devices/ and electric fencing. ADC constructed two night corrals with permanent and temporary electric fencing materials for demonstration/evaluation purposes/ tested experimental scare devices/ monitored performance of guard dogs employed by cooperating producers/ and entered into operational control agreements with 15 cooperators during this period. From June 1987 through January 1989/ twelve coyotes were taken on or near 8 of the 15 cooperator farms. Cooperating producers/, who had experienced a collective loss of 105 sheep (an average of 7 sheep per producer over an average period of 20 days) prior to contacting ADC, have reported a total of 35 losses (an average of 2.3 sheep per producer over an average period of 344 days) since initiation of ADC activities.

Trout, J. M., M. Santín, and R. Fayer. 2006. Giardia and cryptosporidium species and genotypes in coyotes (*Canis latrans*). Journal of Zoo and Wildlife Medicine 37:141–144.

DISEASE, PENNSYLVANIA

Feces and duodenal scrapings were collected from 22 coyotes (*Canis latrans*) killed in managed hunts in northeastern Pennsylvania. Polymerase chain reaction (PCR) methods were used to detect Giardia and Cryptosporidium spp. PCR amplified fragments of Giardia and Cryptosporidium spp. SSU-rRNA genes were subjected to DNA sequence analysis for species/genotype determination. Seven coyotes (32%) were positive for *G. dudenalis:* three assemblage C, three assemblage D, and one assemblage B. Six coyotes (27%) were positive for *Cryptosporidium spp.* One isolate shared 99.7% homology with *C. muris,* whereas five others (23%) shared 100% homology with *C. canis,* coyote genotype. This is the first report on multiple genotypes of *Giardia spp.* in coyotes and on the prevalence of *Cryptosporidium spp.* genotypes in coyotes.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indices and public perception. Thesis, University of Connecticut, Storrs, USA.

CONFLICT, CONNETICUT, HABITAT, HUMAN DIMENSIONS, MANAGEMENT, URBAN

The eastern coyote has been successfully adapting to the densely populated regions of Northeastern Connecticut since it first migrated here in the 1950s. To better understand the impact of the coyote on the Connecticut landscape this study was conducted in similar habitats with different human populations. Two permanent array transects were erected in the study locations. Scent stations were operated for 1 night per month from September 2004-August 2005. Our objectives were to evaluated the relative abundance indices (RAI) of the eastern coyote in two similar habitats with different human populations, and to evaluate possible difference sin seasonal activity of the coyote population in the two study areas as well. We found our sample size too small to accurately test for significant differences in RAI's. However we can compare the two results, 50 for Columbia and 42 for Storrs, and observe that there is essentially little difference or that they are nearly equal. The seasonal visitation rates did not indicate a significant difference between the Columbia and Storrs; however we did not observe some variation. We observed that the seasonal visitation in the town of Columbia was consistent throughout the study. The Storrs rates of visitation were highest in late summer and fall suggesting activity of dispersing juveniles whereas rates of visitation for winter and spring were zero suggesting a deficiency of suitable denning environments in the Storrs area.

The primary objective of this study was to evaluate the cultural carrying capacity, management expectations and risk perceptions towards the eastern coyote in the two communities with different human population densities; the rural town of Columbia, CT and the defined urban cluster of Storrs, CT of surveyed Columbia and Storrs residents 74% valued predator species. Although a higher percentage of Storrs residents wanted to see more coyotes than Columbia residents, 70% of surveyed Columbia and Storrs residents were found to be at the optimum cultural carrying capacity towards coyotes; meaning they did not want to see more or less coyotes but were content with the current population. Our assessment is that the cultural carrying capacity towards the coyote has not been surpassed in either community and that residents from both study areas recognize the coyote as a species with elemental value. A higher percentage of surveyed Columbia residents indicated wanting no management, protection or control of the coyote population. Columbia residents were slightly more supportive of regulated hunting and trapping methods of management, while an equal percentage of surveyed Columbia and Storrs residents supported relocating coyotes. Columbia residents overall exhibited higher perceptions of risk towards the coyote species. An equal percentage of surveyed Columbia and Storrs residents viewed the coyote as a nuisance species and an equal percentage of Columbia and Storrs residents did not think the coyote was dangerous.

Van Deelen, T. R., and T. E. Gosselink. 2006. Coyote survival in a row-crop agricultural landscape. Canadian Journal of Zoology 84:1630–1636.

HABITAT, ILLINOIS, SURVIVAL

With intensive farming, planting and harvest are the primary disturbance factors driving cover dynamics that influence wildlife communities. A top predator, coyotes (*Canis latrans* Say, 1823) impact other wildlife when populations are high. Thus, knowledge of coyote demographics in agricultural habitat is critical to understanding ecosystem dynamics. We studied survival of 59 radio-collared coyotes (28 juveniles, 31 adults) from 1996 to 2001 in intensively farmed central Illinois. Logistic regression suggested that age and year were important covariates, but sex was not. Divergence in age-specific Kaplan–Meier survival functions occurred during fall harvest because of higher mortality among juveniles. Annual survival (30 April—29 April) was 0.59 (95% CI = 0.47–0.71) for adults and 0.13 (0.06–0.20) for juveniles captured after June 1. Shooting (58% of mortality) was the principal cause of mortality, followed by road kills (24%) and other mortalities. Mortality of juveniles following agricultural harvest probably occurs because of inexperience, dispersal through unfamiliar territory, intense human activity, and catastrophic loss of agricultural cover. In contrast, we recorded no shootings of coyotes during the growing season when agricultural cover was highest (14 June—29 September) despite a year-round open hunting season on coyotes in Illinois.

Van den Bussche, R. A. 1984. Temporal and spatial variation of helminth parasites in coyotes, *Canis latrans,* from Tennessee. Thesis, Memphis State University, Memphis, USA.

PARASITES, TENNESSEE

During 1980–1984, 267 coyotes (*Canis latrans*) from Tennessee were examined for helminth parasites. Hearts were examined for the presence of *Dirofilaria immitis,* diaphragms for *Trichinella spiralis,* and digestive tracts for other parasites. Six species were found including five nematodes (*D. immitis, Physaloptera rara, Trichuris vulpis, Ancylostoma caninum,* and *Toxascaris leonina*) and one cestode (*Taenia pisiformis*), Univariate and multivariate statistical techniques were used to analyze two-state and multiscale character sets. For two-state data, statistically significant age, seasonal, and temporal variation was determined. Additionally, spatial variation in two-state data was assessed. A matrix of correlation among characters was computed, and the first three principal components were extracted. These accounted for 93.7% of the variation in the character set. Three-dimensional projections of localities onto principal components showed that coyotes from western localities had higher prevalences of *D. immitis, T. pisiformis* and *T. vulpis,* than coyotes from eastern localities. Significant relationships were found between principal component I and longitude, component II and latitude and mean January temperature and component III and July precipitation and January actual evapotranspiration. For multiscale characters, sex dimorphism, age, seasonal, and temporal variation in helminths was indicated. No spatial variability was determined in this character set.

Van den Bussche, R. A., M. L. Kennedy, and W. E. Wilhelm. 1987. Helminth parasites of the coyote (*Canis latrans*) in Tennessee. Journal of Parasitology 73:327–332.

PARASITES, TENNESSEE

From 1980 to 1984, 267 coyotes (*Canis latrans*) from Tennessee were examined for helminth parasites. Hearts were examined for the presence of *Dirofilaria immitis,* diaphragms for *Trichinella spiralis,* and digestive tracts for other helminths. Six species were found including 5 nematodes (*D. immitis, Physaloptera rara, Trichuris vulpis, Ancylostoma caninum,* and *Toxascaris leonine*) and 1 cestode (*Taenia pisiformis*). Univariate and multivariate statistical techniques were used to assess parasite prevalence and intensity. For prevalence data, a matrix of correlation among characters was computed, and the fist 3 principal components were extracted from the original distance matrix. These accounted for 93.7% of the variation in the character set. Three-dimensional projects of localities showed spatial variability on each component. Significant relationships were found between principal component I and longitude, component II and latitude and mean January temperature, and component III and mean July precipitation and mean January actual evapotranspiration. For intensity data, no spatial variability was determined.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

ALABAMA, BOBCAT, DIET, PREDATION, WHITE-TAILED DEER

This project was designed to investigate the seasonal diets of potential white-tailed deer (*Odocoileus virginianus*) predators and quantify their impact on deer recruitment in northeastern Alabama. I inferred predation impacts by comparing recruitment data before and after an intensive predator removal on a 2,000-acre study site. After predator abundance (as shown by scat deposition rates and a scent station index) on the site was reduced by intensive removal, fawn-to-doe ratios (as indicated by camera surveys, hunter observations, and web camera observations) increased on average 189%. Seasonal diets of coyotes (*Canis latrans*) and bobcats (*Lynx rufus*) indicated that coyotes consumed deer significantly more than bobcats, particularly during the fawning season. Overall, bobcats primarily consumed rodents, whereas the coyote diet was more diverse and varied temporally as seasonally abundant food items, including fawns, insects, and soft mast became available. Our results suggest predation, particularly by coyotes, on fawns may reduce recruitment in some areas of the Southeast. Intensive predator removals prior to fawning may be effective at increasing recruitment in some areas where herd productivity does not meet management objectives.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

ALABAMA, BOBCAT, DIET, PREDATION, WHITE-TAILED DEER

Few studies have investigated the impacts of predators on white-tailed deer (*Odocoileus virginianus*) recruitment study in the Southeast. We inferred predation impacts by comparing fawn-to-doe ratios pre-removal using camera surveys in September 2006 and February 2007, hunter observations, and web based cameras (n = 11) mounted over food plots (October through January). We removed 22 coyotes (*Canis latrans*) and 10 bobcats (*Lynx rufus*) during February through July 2007. Predator populations, as indexed using scat deposition rates and scent station surveys, declined to near zero just prior to fawning season. The September fawn-to-doe ratio increased from 0.18 to 0.24 and the February ratio increased from 0.41 to 1.20 in the year following predator removal. Hunter observation data indicated a pre-removal fawn-to-doe ratio of 0.35, compared to a ratio of 1.10 after the removal. Similarly, web camera surveys indicated an increase in recruitment rates from 0.52 fawns per doe to 1.33 following the removal. Our results suggest that predation on fawns may reduce recruitment in some areas of the Southeast. Intense predator removals prior to fawning season maybe effective at increasing recruitment in some areas where heard productivity does not meet management objectives.

VerCauteren, K. C., T. C. Atwood, T. J. DeLiberto, H. J. Smith, J. S. Stevenson, B. V. Thomsen, T. Gidlewski, and J. Payeur. 2008. Emerging Infectious Diseases 14:1862–1869.

DISEASE, MICHIGAN

Bovine tuberculosis (TB) is endemic in white-tailed deer (*Odocoileus virginianus*) in the northeastern portion of Michigan's Lower Peninsula. Bovine TB in deer and cattle has created immense financial consequences for the livestock industry and hunting public. Surveillance identified coyotes (*Canis latrans*) as potential bio-accumulators of *Mycobacterium bovis*, a finding that generated interest in their potential to serve as sentinels for monitoring disease risk. We sampled 175 coyotes in the bovine TB–endemic area. Fifty-eight tested positive, and infection prevalence by county ranged from 19% to 52% (statistical mean 33%, SE 0.07). By contrast, prevalence in deer (n = 3,817) was lower (i.e., 1.49%; Mann-Whitney $U_{4,4}$ = 14, $P < 0.001$). By focusing on coyotes rather than deer, we sampled 97% fewer individuals and increased the likelihood of detecting *M. bovis* by 40%. As a result of reduced sampling intensity, sentinel coyote surveys have the potential to be practical indicators of *M. bovis* presence in wildlife and livestock.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. Journal of Wildlife Management 47:852–857.

BEHAVIOR, MOVEMENTS, RED FOX

Studies of carnivores often indicate clumped or irregular distribution patterns. Spatial anomalies can occasionally be explained on the basis of habitat, hunting, trapping, or disease, but many irregularities remain unexplained. We studied movements and interactions of red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), striped skunks (*Mephitis mephitis*), and raccoons (*Procyon lotor*) in relation to rabies. During this study, several areas that consistently remained vacant of fox-rearing dens were detected. An intensively searched area of 400 km^2 showed no active fox-rearing dens in an area of 60 km^2 during each year from 1975 through 1980. Foxes avoided certain areas and no dens were found there even though these areas appeared to contain suitable fox habitat. This paper provides an explanation for avoidance of areas by fox families.

Vreeland, J. K., D. R. Diefenbach, and B. D. Wallingford. 2004. Survival rates, mortality causes, and habitats of Pennsylvania white-tailed deer fawns. Wildlife Society Bulletin 32:542–553.

PENNSYLVANIA, PREDATION, WHITE-TAILED DEER

Estimates of survival and cause-specific mortality of white-tailed deer (*Odocoileus virginianus*) fawns are important to population management. We quantified cause-specific mortality, survival rates, and habitat characteristics related to fawn survival in a forested landscape and an agricultural landscape in central Pennsylvania. We captured and radio-collared neonatal (<3 weeks) fawns in 2000–2001 and monitored fawns from capture until death, transmitter failure or collar release, or the end of the study. We estimated survivor-ship functions and assessed influence on fawn survival of road density, habitat edge density, habitat patch diversity, and proportion of herbaceous habitat. We captured 110 fawns in the agricultural landscape and 108 fawns in the forested landscape. At 9 weeks after capture, fawn survival was 72.4% (95% CI = 63.3–80.0%) in the agricultural landscape and 57.2% (95% CI = 47.5–66.3%) in the forested landscape. Thirty-four-week survival was 52.9% (95% CI = 42.7–62.8%) in the agricultural landscape and 37.9% (95% CI = 27.7–49.3%) in the forested landscape. We detected no relationship between fawn survival and road density, percent herbaceous cover, habitat edge density, or habitat patch diversity (all $P > 0.05$). Predation accounted for 46.2% (95% CI = 37.6–56.7%) of 106 mortalities through 34 weeks. We attributed 32.7% (95% CI = 21.9–48.6%) and 36.7% (95% CI = 25.5–52.9%) of 49 predation events to black bears (Ursus americanus) and coyotes (*Canis latrans*), respectively. Natural causes, excluding predation, accounted for 27.4% (95% CI = 20.1–37.3) of mortalities. Fawn survival in Pennsylvania was comparable to reported survival in forested and agricultural regions in northern portions of the white-tailed deer range. We have no evidence to suggest that the fawn survival rates we observed were preventing population growth. Because white-tailed deer are habitat generalists, home-range-scale habitat characteristics may be unrelated to fawn survival; therefore, future studies should consider landscape-related characteristics on fawn survival.

Wagner, G. D. 1993. Coyote diet in areas of wild turkey abundance during the wild turkey reproductive season. Thesis, Mississippi State University, Starkville, USA.

ALABAMA, DIET, FLORIDA, MISSISSIPPI, TURKEY

Proportions of prey species in coyote (*Canis latrans*) diet during the wild turkey (*Meleagris gallopavo*) reproductive season were determined for 4 study areas with abundant wild turkey populations. Study areas were located in Arkansas, Mississippi, Alabama and Florida. Proportions of prey species were determined by scat analysis and expressed using frequency data and prey biomass consumed. Feeding trials using captive coyotes were conducted to examine effects of digestion on prey remains.

Wild turkey occurred in 1.9% of 688 scats collected during the wild turkey reproductive season, and equaled 4.0% of prey biomass consumed. Compared to winter, wild turkey increased in coyote diet during the wild turkey reproductive season, but the increase was not statistically significant.

Cotton rats (*Sigmodon hispidus*), lagomorphs (*Sylvilagus spp.*), white-tailed deer (*Odocoileus virginianus*), and fruit (*Prunus spp.* and *Rubus spp.*) constituted the majority of prey consumed.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

ALABAMA, DIET, FLORIDA, MISSISSIPPI, TURKEY

The role of coyotes (*Canis latrans*) as predators of wild turkeys (*Meleagris gallopavo*) remains unclear. We determined proportion of wild turkey and other prey species in coyote scats collected during the wild turkey reproductive and non-reproductive seasons from 4 study areas with wild turkey populations. Wild turkey constituted only a small portion ($\bar{x}$ = < 4%) of coyote diet on all study areas. Wild turkey increased in coyote diet during the wild turkey reproductive season, but the differences were not significant. Wild turkeys have evolved in the presence of predators and possess adaptations for dealing with predation such as wariness, large clutch sizes, and roosting at night. Wild turkeys in quality habitat appear to maintain populations when sympatric with coyotes.

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

ATTACK, CONFLICT, DISEASE, HUMAN DIMENSIONS, MASSACHUSETTS

Warfel, H. E. 1937. A coyote in Hampshire County, Massachusetts. Journal of Mammalogy 18:241.

RANGE, MASSACHUSETTS

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

BEHAVIOR, HOME RANGE, MASSACHUSETTS, REPRODUCTION, SOCIALITY, TRANSIENT, URBAN

Padded-leg hold traps became illegal to use in 1996 in Massachusetts. Thus, box traps were tested as a capture technique for eastern coyotes (*Canis latrans* var.) in a suburban environment within Barnstable County, Cape Cod, Massachusetts between May 1998 and February 2000. Box traps were in the field for 4,076 trap days resulting in 977 armed trap days. Traps were sprung 253 times resulting in 224 animals, of 11 species, captured. Eleven individual coyotes (7 adults/ 4 pups) were captured a total of 16 times; three adults were captured twice and one adult was captured three times. The capture efficiency rating for coyotes was 16.4. Coyotes were successfully captured during 10 of the 12 months. Box traps were relatively inefficient in capturing coyotes because of the expense of each trap, the time involved in baiting and conditioning coyotes into traps, the high rate of non-target captures and only one adult coyote (at most) was captured in a social group. I recommend the use of padded leg-hold traps to successfully capture and release coyotes for scientific study in Massachusetts.

I studied home range sizes, movement and activity patterns, and sociality of 11 radio-transmitted eastern coyotes, *Canis latrans* var., inhabiting a heavily suburban area (Cape Cod, Massachusetts) between June 1998 and March 2000. A total of 3,086 radiolocations were obtained, representing 2,973 successful and 113 unsuccessful finds. Home ranges sizes were variable depending on the method used. Average home range for breeding adult coyotes using the 95% minimum convex polygon vertex edited method was 29.7 ± 5.3 (SE) km^2. Resident coyote groups showed minimum overlap in home ranges. Juvenile coyotes had small home ranges varying from 0.3–10.8 km^2. One transient and one associate coyote had the largest home ranges (152.2 km^2 and 100.4 km^2, respectively) in the study. The home range of a reproductive female coyote compared to a non-reproductive one was considerably smaller during the denning season. Resident coyotes typically traveled and lived in social groups of three members. Coyotes were strictly nocturnal with activ-

ity generally beginning just after dusk and ending just before dawn. Twenty-four hour movements of coyotes ranged up to 31.9 linear km. Coyote numbers appear to be stable with an estimated 0.08–0.15 coyotes/km^2 (90% CI) residing on the study area.

Way, J. G. 2002. Radiocollared coyote crosses Cape Cod Canal. Northeast Wildlife 57:63–65.

MASSACHUSETTS, MOVEMENTS

In this note I describe evidence for the dispersal of a radio-collared female coyote (*Canis latrans*), originally captured on Cape Cod, to an area off Cape Cod.

Way, J. G. 2003. Description and possible reasons for an abnormally large group size of adult eastern coyotes observed during summer. Northeastern Naturalist 10:335–342.

BEHAVIOR, MASSACHUSETTS, SOCIALITY

During summer 2001 I consistently observed a group of 6 adult coyotes (the breeding female was radio-collared) raising 1 pup in a suburban area on Cape Cod, Massachusetts. In this note I describe the activities of this group and possible reasons for the large pack size.

Way, J. G. 2004. Survival of 8-week old eastern coyote pups following the death of their mother. Northeastern Naturalist 58:66–71.

JUVENILE, MASSACHUSETTS, SOCIALITY, SURVIVAL

I monitored the survival of four 8-week-old eastern coyote (*Canis latrans*) pups after the death of their mother on Cape Cod, Massachusetts. At least 2 other adults were observed with the pups until the age of independence in September. This note documents the breeding female's death and the subsequent survival of her pups past the age of independence.

Way, J. G. 2007. A comparison of body mass of *Canis latrans* (coyotes) between eastern and western North America. Northeastern Naturalist 14:111–124.

MORPHOLOGY

Contrary to previous literature concluding the body size of *Canis latrans* (coyotes) does not increase in North America with decreasing longitude, this study presents data from different regions and concludes that northeastern coyotes are the largest extant version of coyote. Male coyotes from northeastern North America (16.4 ± 1.5 [SD] kg, range = 14.2–20.4) were heavier than females from the northeast (14.7 ± 1.6 kg, range = 11.9–117.9) and were also heavier than male (10.6 ± 1.0 kg, range = 8.8–12.0) and female coyotes (12.1 ± 1.1 kg, range = 10.5–14.1) from outside of the northeast. Female coyotes from northeastern North America were heavier than all male and female western coyotes. Longitude was significantly correlated in both male ($r = -0.786$, $P < 0.0001$) and female ($r = -0.769$, $P < 0.0001$) body mass, whereas there was less of a correlation for latitude and body mass for males ($r = 0.355$, $P = 0.043$) and females ($r = 0.364$, $P = 0.044$). Sixty-two percent ($P < 0.0001$) and 59% ($P < 0.0001$) of variation in body mass of males and females, respectively, could be explained by longitude, while 13% ($P = 0.043$ for males; $P = 0.044$ for females) could be accounted for by latitude.

Way, J. G. 2007. Movements of transient coyotes, *Canis latrans,* in urbanized eastern Massachusetts. Canadian Field-Naturalist 121:364–369.

MASSACHUSETTS, MOVEMENTS, URBAN, TRANSIENT

I document the movements of five transient (or nomadic) eastern coyotes (*Canis latrans*) in heavily urbanized eastern Massachusetts. Linear movements from capture location to end location varied from 23.0 to 100.5 km and averaged 63.8 ± 52.0 km for two females and 38.7 ± 17.2 km for three males ($t = 0.657$, $df = 1.15$, $P = 0.618$). Transients ranged in age between 1–2 yr old. There was no relationship between coyote body weight and dispersal distances ($r = 0.389$, $P = 0.518$). Coyotes travel long distances even

in human-dominated areas, allowing transients to find vacant territories. Because of the ability of coyotes to colonize and re-colonize areas, I recommend that coyote management efforts focus more on educating the public about actual coyote behavior and their life history needs than on killing them.

Way, J. G. 2007. Social and play behavior in a wild eastern coyote, *Canis latrans,* pack. Canadian Field-Naturalist 121:397–401.

BEHAVIOR, MASSACHUSETTS, SOCIALITY

I had close and consistent observations of a wild eastern coyote pack (*Canis latrans*) from January 2000 to August 2007. During this time, I obtained 3156 radio-locations on a specific radio-collared breeding male ("Sill") and observed him and/or members of his pack on 375 occasions. The average group size = 3.0 ± 2.3 (SD) coyotes with 1.9 ± 1.2 (SD) being adults and 1.1 ± 1.9 being pups. Maximal group size involved 12 coyotes (9 pups, 3 adults). During these observations, coyotes most often behaved in a friendly manner toward each other as indicated by 80 of my observations involving play between pups, and 15 involving play among adult coyotes. On the evening of 6 July 2007 I observed the breeding male (>8 yr old), his mate (>5 yr old), one of their full-sized probable yearlings, and five pups playing intensely for 33 minutes. This paper details social and play behavior from this pack, especially from the 6 July 2007 observation.

Way, J. G. 2008. Eastern coyotes, *Canis latrans,* observed feeding on periodical cicadas, *Magicicada septendecim.* Canadian Field-Naturalist 122:271–272.

DIET, MASSACHSUETTS

Eastern coyotes (*Canis latrans*) were observed feeding on periodical cicadas (*Magicicada septendecim*) during their once very 17 year emergence (for three weeks) in June 2008.

Way, J. G. 2009. Observations of coy-wolves, *Canis latrans× lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

BEHAVIOR, MASSSACHUSETTS, MOVEMENTS, REPRODUCTION, URBAN

I directly observed coy-wolves (*Canis latrans× lycaon;* also called eastern coyote) successfully crossing over rivers/bays by traveling on paved (i.e., used by vehicles) bridges within their established territories. These data confirm that coyotes/coy-wolves use these narrow corridors in their travels, such as when colonizing new areas. I also report on breeding female, sick, and old coy-wolves using human structures, including under overturned boats/canoes, under houses, and under sheds/decks. Breeding females (n = 3) used these sites as dens, and sick (n = 2) and old (n = 2) individuals used them for shelter.

Way, J. G., P. J. Auger, I. M. Ortega, and E. S. Strauss. 2001. Eastern coyote denning behavior in an anthropogenic environment. Northeast Wildlife 56:18–30.

MASSACHUSETTS, URBAN, REPRODUCTION

We document coyote (*Canis latrans*) litter sizes and birth dates, characteristics of den and rendezvous sites, and associations of radio-tagged adults (n = 9) and pups (n = 5) to den and rendezvous sites in an urbanized landscape in the northeastern United States (Cape Cod, Massachusetts) from 1994–2001. Size of 16 litters averaged 4.5 ± 1.15 (SD). Backdating of sightings indicated that pups were born between 21 March and 12 April. Mean den width at narrowest point was 28.9 ± 5.0 cm. Minimum den depth ranged from 2–>5 m. Dens >2 m long had roots that protruded from all sides of the tunnel suggesting that tree root systems were important structural components of dens in sandy soils. Aspect that dens faced varied from 2–303º; circular mean aspect was 246º but there was no selection for direction of den entrance. Use of rendezvous sites began between late May and mid-June when pups were 8–10 weeks of age. Rendezvous sites had open areas bordered by densely vegetated woods that provided distant views in an otherwise forested en-

vironment. There was no difference between male and female attendance at den and rendezvous sites. Adults commonly located at den and rendezvous sites during late-may through early June, gradually decreased their frequency of den and rendezvous site attendance during the remainder of the summer. Wildlife managers in the northeast can use these data to identify potential den and rendezvous sites for coyotes, particularly in an urbanized environment.

Way, J. G., S. M. Cifuni, D. L. Eatough, and E. G. Strauss. 2006. Rat poison kills a pack of eastern coyotes, *Canis latrans,* in an urban area. Canadian Field-Naturalist 120:478–480.

CONFLICT, HUMAN DIMENSIONS, MASSACHUSETTS, SURVIVAL

We document the death of a pack of Eastern Coyotes (*Canis latrans*) from high levels of brodifacoum, a second generation poison that is the active ingredient in some forms of rat poison (e.g., d-Con®). The coyotes died within a week of each other during late March/early April 2005. This incident indicates the vulnerability of wild animals to commercial over-the-counter rodenticides.

Way, J. G., and D. L. Eatough. 2006. Use of "micro"-corridors by eastern coyotes, *Canis latrans,* in an heavily urbanized area: implications for ecosystem management. Canadian Field-Naturalist 120:474–476.

MASSACHUSETTS, MOVEMENTS, URBAN, TRANSIENT

We document the use of very narrow, linear corridors (termed "micro-corridors") that facilitated movements by both a transient and a resident group of eastern coyotes (*Canis latrans*) in a heavily urbanized area in north Boston, Massachusetts. Two corridors are discussed: one, a railroad line through downtown Boston; and two, a hole in a cemetery fence giving access to two separated cemeteries in a region of intense human development. Coyotes can be good subjects to illustrate the use of fragmented landscapes because they are common and thus are abundant enough to study yet are wary and avoid novel things and generally avoid people.

Way, J. G., I. M. Ortega, P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

HOME RANGE, MASSACHUSETTS, URBAN, SOCIALITY, TERRITORY, TRANSIENT

We studied home range size, spatial arrangements, territoriality, and sociality of 11 radio-tagged eastern coyotes, *Canis latrans,* inhabiting an urbanized area (Cape Cod, Massachusetts) between June 1998 and May 2000. Estimates of home range size depended on the method used. Average home range size for breeding adult coyotes, using the 95% minimum convex polygon vertex edited method, was 29.8 + 5.3 km^2. Resident coyote groups showed limited overlap in home ranges. Juvenile coyotes had small home ranges ranging from 0.3–10.8 km^2. A transient and an associate coyote had the largest ranges (152.2 km^2 and 100.4 km^2, respectively). Home ranges of reproductive female coyotes were smaller than those of non-reproductive females during the denning season. Coyote social groups (or packs) consisted of 3–4 members and mean observed group size was 1.7 + 0.1 (SE) coyotes. The density of resident coyotes on the study area was estimated at 0.07–0.15 coyotes/km^2 for the 95% vertex edited home range technique and 0.06–0.13 coyotes/km^2 for the more traditional 95% minimum convex polygon method.

Way, J. G., I. M. Ortega, P. J. Auger, and E. G. Strauss. 2002. Box-trapping eastern coyotes in southeastern Massachusetts. Wildlife Society Bulletin 30:695–702

MASSACHUSETTS

The humaneness of various coyote (*Canis latrans*) capture methods (especially foothold traps) is an issue that has made trapping controversial. In Massachusetts the use of padded foothold traps and snares became illegal in 1996. In response, we tested metal box traps as an alternative capture technique for eastern coyotes in a suburban environment within Barnstable County,

Cape Cod, Massachusetts between March 1998–May 2000 and February 2001–April 2002. Box traps were in the field for 7,006 trap days and were set for 1,447 trap days. Trapping effort was 4,458 trap visits. Traps were sprung 447 times, and 387 animals of 12 species were captured. Twenty-two individual coyotes (12 adults, 5 sub-adults, and 5 pups) were captured 29 times; 3 adults were captured twice and 2 adults 3 times. Coyotes were captured during 11 of 12 months. Few injuries were sustained to coyotes captured in box traps, and no captured animals showed indicators of poor welfare; 1 coyote had minor limb damage, 2 had minor and 2 had moderate tooth damage, and no injuries to the body were documented. Box traps were undesirable to use for capturing coyotes because of trap expense, time involved in baiting and conditioning coyotes to traps, the high rate of non-target captures, and the fact that it was difficult to capture >1 adult in a social group.

Way, J. G., I. M. Ortega, and E. G. Strauss. 2004. Movement and activity patterns of eastern coyotes in a costal, suburban environment. Northeastern Naturalist 11:237–254.

BEHAVIOR, HABITAT, MASSACHUSETTS, MOVEMENTS, URBAN

We studied the activity of 11 and movement of 6 radio-tagged eastern coyotes (*Canis latrans* var.) inhabiting suburban Cape Cod, MA between June 1998 and August 2001. Coyotes were nocturnal year round except for breeding females, which were active day and night during April-June. Twenty four-hour movements of coyotes ranged up to 31.9 linear km and averaged 23.5 ± 7.3 (SD) km from 5–14 radio-fixes during each 24 hr monitoring period. There was no difference between male and female movement rates. Coyotes moved through altered open areas more than expected when compared to residential and natural areas. Coyotes inhabiting urbanized areas generally use residential areas for traveling and/or foraging.

Way, J. G., and R. L. Proietto. 2005. Record size female coyote, *Canis latrans.* Canadian Field Naturalist 119:139–140.

MASSACHUSETTS, MORPHOLOGY

On 11 March 2004 we recaptured and re-radio-collared a 8–9 year old, 25.1 kg (55.3 lb), 157 cm long (tip of nose to tail tip) female eastern coyote (*Canis latrans*) in the town of Barnstable on Cape Cod, Massachusetts, that was originally captured in November 1998. This is believed to be the largest female coyote ever recorded.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

EASTERN WOLF, GENETICS, HYBRID, MASSACHUSETTS, TAXONOMY

This study examined the genetic nature and relatedness of *Canis latrans* (coyotes) in eastern Massachusetts (i.e., eastern coyotes). We characterized 67 animals at the mitochondrial DNA control region, and 55 of those at 8 microsatellite loci. Structure analysis and factorial correspondence analysis of the microsatellite genotypes indicated that the eastern coyotes in Massachusetts clustered with other northeastern canis populations and away from western coyotes, *C. lycaon* (eastern wolves), and *C. lupus* (gray wolves). They contained mitochondrial haplotypes from both western coyotes and eastern wolves, consistent with their hybrid origin from these two species. There was no evidence of either *C. lupus* familiaris (domestic dog) or gray wolf mitochondrial DNA in the animals. These results indicate that the eastern coyotes should more appropriately be termed 'coywolf' to reflect their hybrid (*C. latrans* x *lycaon*) origin. Genetic data were also used to assess parental and kinship relationships, and confirmed that family units typically contain an unrelated breeding pair and their offspring. Lastly, a synthesis of knowledge of the eastern coyote as well as implications for wolf recovery in the northeast U.S. is provided.

Way, J. G., D.-L. M. Szumylo, and E. G. Strauss. 2006. An ethogram developed on captive eastern coyotes *Canis latrans.* Canadian Field-Naturalist 120:263–288.

BEHAVIOR

We studied capture Eastern Coyotes (*Canis latrans*) from 27–585 days of age and compiled an ethogram on them. A total of 72247 15-sec samples were taken, amounting to 301 h of field time varying between 59.441 .3 h per coyote. A total of 540 behavioral patterns were observed amongst the 16 behavior categories ranging from 9 (miscellaneous) to 72 (explore/investigate) action patterns per parent category. The 16 parent categories that we believed best described and appropriately sorted the behavioral actions were resting, sitting, sitting1, sitting 2, standing, traveling, explore/investigating, hunting, feeding, infantile, greeting, self play, play initiating, playing, agonistic, and miscellaneous. Exploring accounted for >317 of all of the behaviors observed with resting and sitting (combined), standing, traveling, and play as categories decreasing in order of most to least frequent. Despite some omissions in our ethogram and drift associated with its ongoing development, we believe that the large amount of data collected made it rigorous enough to be a useful guide for the species. We argue that although future research will no doubt add to and/or modify components of it, its ease of use in the field (in captivity or in the wild) and it being the first complete ethogram described for the species, make it a useful tool for future researchers

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

MASSACHUSETTS, MOVEMENTS, URBAN, TERRITORY, TRANSIENT

We document the fate of a female eastern coyote on Cape Cod, Massachusetts that was a breeding resident of a ~30 km^2 territory for at least six years (1998–2004) and then became nomadic. Her behavior dramatically changed in January 2005, when she was located on six occasions sleeping under sheds and/or decks in highly residential neighborhoods at the southeastern edge of her range. On 11 March 2005 she localized in a small area (95% MCP range = 5.85 km^2) at the northeastern edge of her old territory, where she remained until 1 March 2006. After briefly associating with other coyotes (late-February 2006), her movement patterns changed again. She used a much larger area (~200 km^2) until she was shot dead in February 2007. Tracking data indicated that she lived in localized areas during this nomadic period, possibly to avoid resident coyote packs.

Way, J. G., B. C. Timm. 2011. Record pack-density of eastern coyotes/coywolves (*Canis latrans* × lycaon). American Midland Naturalist 165:201–203.

MASSACHUSETTS, POPULATION DENSITY, SOCIALITY, TERRITORY

We report on an eastern coyote or coywolf (*Canis latrans* × *lycaon*) pack in a heavily urbanized area at the northern edge of Boston, Massachusetts, living at a high pack density. We radio-collared four members of this social unit, a breeding pair and two of their juvenile offspring and tracked them from May 2004–Apr. 2005. The pack had a small cumulative territory area (overall = 2.05 km^2), yet lived at a normal group size (fall = 6–7, winter = 4) for coyotes/coywolves in eastern North America. Fall density for this pack was 2.92–3.41/km^2 and winter density was 1.95/km^2, representing the highest recorded density for coyotes in this region.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male. Canadian Field-Naturalist 123:199–205.

MASSACHUSETTS, POPULATION DENSITY, SOCIALITY, SURVIVAL, TERRITORY

We studied a subset of four radio-collared individuals that were a part of a larger study documenting coywolf (*Canis latrans* × *lycaon;* eastern coyote) ecology in an urbanized landscape (Cape Cod, Massachusetts), and report on the territory of a typical sized pack that was subdivided roughly in half following the death of the

breeding male from the original ("Centerville") pack. The original residents lived in a winter pack size (i.e., after pup/juvenile dispersal) of three or four individuals in a 19.66 km^2 territory and a density of 0.15–0.20 individuals/km^2, as determined by radio-tracking and direct observations, with their territory bordering that of other monitored packs. Following the death of the breeding male, two other radio-collared coywolves (a young male from the original Centerville pack and a young female from a bordering pack) shifted their respective territories to overlap the majority of the original Centerville pack's territory. These two groups were the same size as the original pack (three or four individuals each) but occupied smaller territories (5.28 km^2 and 12.70 km^2) within the previous pack's territory. The combined density for the two new packs was estimated at 0.33–0.45 individuals/km^2 or 2.2 times greater than the former pack's density and was 2.5 times (0.38–0.50 individuals/km^2) greater when accounting for the slight (12%) overlap between the territories of the two new packs. Our results suggest that local coyote/coywolf density (i.e., at the pack level) may increase following the death of the breeding male of a given pack, probably because of the reduced (or lack of) protection of territorial boundaries. This finding has particular relevance to coyote/coywolf management programs aimed at reducing local densities via removal of individuals from these populations. Further implications exist for enriching our understanding of the trophic dynamics of urbanized habitats.

Wayne, R. K., and S. M. Jenks. 1991. Mitochondrial DNA analysis implying extensive hybridization of the endangered red wolf, *Canis rufus.* Nature 351:565–568.

GENETICS, HYBRID, RED WOLF

The red wolf, previously endemic to the southeastern United States, declined precipitously in numbers after 1900 because of habitat destruction, predator control programs, and hybridization with coyotes. Hybridization with coyotes probably occurred as these animals, which adjust well to agriculture, became numerous and moved eastwards. By 1970, red wolves existed only in extreme southeastern Texas and southwestern Louisiana (Fig. 1). In 1967, red wolves were classified as endangered and a captive breeding program was begun in 1974 after passage of the Endangered Species Act, about a year before they became extinct in the wild. Protein electrophoresis and morphometrics have been used to try to discriminate red wolves from hybrids and coyotes. But because the average substitution rate of mitochondrial DNA in mammals is much greater than that of nuclear genes, mtDNA analysis is a more useful way of distinguishing closely related species. We have now analyzed mtDNA restriction-enzyme sites and cytochrome b gene sequence variation in captive red wolves and in 77 *Canids* sampled during the capture period. We also used the polymerase chain reaction to amplify and then sequenced mtDNA from red wolf skins collected before substantial hybridization of red wolves with coyotes is thought to have occurred. Phylogenetic analysis indicates that red wolves have either a grey wolf or coyote mtDNA genotype, demonstrating hybridization among these species. Thus, the red wolf is entirely a hybrid form or a distinct taxon that hybridized with coyotes and grey wolves over much of its previous geographical range. Our findings, however, do not argue against the continued protection of the red wolf.

Wayne, R. K., and N. Lehman. 1992. Mitochondrial DNA analysis of the eastern coyote: origins and hybridization. Pages 9–22 in A. H. Boer, editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

GENETICS, GRAY WOLF, HYBRID

The eastern coyote (*Canis latrans*) is an unusually large recent immigrant whose origin may have involved interbreeding between coyotes and gray wolves (*C. lupus*). Analysis of mitochondrial DNA (mtDNA) variability of coyotes and wolves suggest that hybridization between them has occurred in the eastern United States and Canada and may be widespread. Approximately half of the gray wolves in Minnesota and all wolves examined in Quebec and southeastern Ontario have an mtDNA genotype identical or related to those in coyotes. However, the coyote-related genotypes found in Minnesota wolves are different from those found in wolves farther to the east and may indicate two separate hybridization episodes. We suggest that hybridiza-

tion occurring in southeastern Ontario and Quebec is more recent than in areas to the west. Coyotes in the New England states have mtDNA genotypes found in coyotes from Michigan, Ontario, and Minnesota and in wolves from southeastern Ontario and Quebec. This result is consistent with historical records showing a recent range extension of eastern Canadian coyotes into New England. During the range expansion, coyotes are likely to have hybridized with gray wolves, and therefore we suggest that the distinct phenotype of the eastern coyote probably reflects a mixed genetic heritage.

Wayne, R. K., M. S. Roy, and J. L. Gittleman. 1998. Origin of the red wolf: response to Nowak and Federoff and Gardener. Conservation Biology 12:726–729.

RED WOLF

Weckel, M. E., D. Mack, C. Nagy, R. Christie, and A. Wincorn. 2010. Using citizen science to map human-coyote interaction in suburban New York, USA. Journal of Wildlife Management 74:1163–1171.

HABITAT, HUMAN DIMENSIONS, NEW YORK, URBAN

The expansion of coyotes (*Canis latrans*) into the northeastern United States is a major challenge to wildlife professionals, especially in suburban and urban areas where reports of human-coyote interaction (HCI) are on the rise. To assist wildlife professionals in indentifying potential hot spots of interaction and homeowners in evaluating their risk of a backyard encounter, we used the techniques of citizen science to build a landscape model of HCI for suburban residential properties in Westchester County, New York, USA. We distributed surveys via school children (kindergarten to grade 12) as part of a voluntary class assignment, to maximize the number of homeowners participating in our study and to provide learning experiences for students. Of 6,000 surveys distributed to schools, >1,500 students interviewed their parents on whether a coyote had been seen or heard on their property from 2003 to 2006. Although survey should not be distributed randomly owing to the participatory process of individual schools, we did receive responses from across Westchester County, representing the spectrum from the most rural to the most urban towns. Homeowners who encountered (i.e., seen or heard) a coyote on their property were on average 50% closer to forest, 36% closer to grassland, and 66% farther from medium-to high-intensity development, complementing existing knowledge on urban coyote habitat use. Our model seemed robust in predicting an independent set of coyote observations (r = 0.88). Based on this model, we generated a map describing the probability of HCI that can be used by both wildlife professionals and homeowners. Regarding the former, state wildlife agencies could more precisely target education campaigns on how to live with coyotes where the possibility of HCI was greatest. Homeowners, in turn, could evaluate their own risk and modify behaviors that would make their property less attractive to coyotes. Furthermore, in creating a descriptive model of HCI from citizen-generated data, we demonstrated how citizen science can be a useful exploratory tool, generating a wealth of data over a large geographic area in a short period, especially when the inquest is appropriate to stakeholder participation in data collection.

Weeks, J. L., G. M. Tori, and M. C. Shieldcastle. 1990. Coyotes (*Canis latrans*) in Ohio. Ohio Journal of Science 90:142–145.

OHIO, RANGE, TAXONOMY

Past and present status of the coyote (*Canis latrans*) in Ohio was documented by a historical review, a survey of encounters, and a skull collection and analysis. Coyotes were first recorded in Ohio in 1919. In 1979 and 1980, 336 wild *Canid* encounters were reported in 46 of Ohio's 88 counties. From 1982 to 1988, skull collections were made in 71 counties, yielding 379 (87%) coyotes, 10 (2%) coydogs, and 25 (6%) feral dogs. The coyote is well established and distributed throughout the state.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

EASTERN WOLF, GENETICS, HYBRID, MORPHOLOGY, RANGE, TAXONOMY

Wheeldon, T., B. Patterson, and B. White. 2010. Sympatric wolf and coyote populations of the western Great Lakes region are reproductively isolated. Molecular Ecology 19:4428–4440.

EASTERN WOLF, HYBRID

Interpretation of the genetic composition and taxonomic history of wolves in the western Great Lakes region (WGLR) of the United States has long been debated and has become more important to their conservation given the recent changes in their status under the Endangered Species Act. Currently, the two competing hypotheses on WGLR wolves are that they resulted from hybridization between (i) grey wolves (*Canis lupus*) and western coyotes (*C. latrans*) or (ii) between grey wolves and eastern wolves (*C. lycaon*). We performed a genetic analysis of sympatric wolves and coyotes from the region to assess the degree of reproductive isolation between them and to clarify the taxonomic status of WGLR wolves. Based on data from maternal, paternal and bi-parental genetic markers, we demonstrate a clear genetic distinction between sympatric wolves and coyotes and conclude that they are reproductively isolated and that wolf–coyote hybridization in the WGLR is uncommon. The data reject the hypothesis that wolves in the WGLR derive from hybridization between grey wolves and western coyotes, and we conclude that the extant WGLR wolf population is derived from hybridization between grey wolves and eastern wolves. Grey-eastern wolf hybrids (*C. lupus* × *lycaon*) comprise a substantial population that extends across Michigan, Wisconsin, Minnesota and western Ontario. These findings have important implications for the conservation and management of wolves in North America, specifically concerning the overestimation of grey wolf numbers in the United States and the need to address policies for hybrids.

White, L. A., and S. D. Gehert. 2009. Coyote attacks on humans in the United States and Canada. Human Dimensions of Wildlife 14:419–432.

ATTACK, CONFLICT, HUMAN DIMENSIONS

Coyotes (*Canis latrans*) have expanded their range across much of North America and are now established in many metropolitan areas. Their presence in urban areas has often elicited concern from the public, although the actual risk that they pose to human populations is unclear. We conducted an analysis of coyote attacks on humans in the United States and Canada, including 142 reported incidents of coyote attacks resulting in 159 victims. Most attacks were classified as predatory (37%) or investigative (22%) in nature. The number of reported attacks was nearly equal between adults and children, although child victims were more ($p < .001$) prevalent in predatory attacks. Future coyote attacks could be reduced or prevented through modification of human behavior and public education designed to prevent the habituation of coyotes. A standardized reporting system for coyote attack incidents would be beneficial for further investigating characteristics of coyote attack incidents.

Whiteman, E. E. 1940. Studies of pelage changes, food habits and breeding habits of captive coyotes (*Canis latrans* latrans). Thesis, Michigan State College of Agriculture and Applied Science, East Lansing, USA.

DIET, MORPHOLOGY, REPRODUCTION

Whitlaw, H. A., W. B. Ballard, D. L. Sabine, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1998. Survival and cause-specific mortality rates of adult white-tailed deer in New Brunswick. Journal of Wildlife Management 62:1335–1341.

DIET, NEW BRUNSWICK, PREDATION, WHITE-TAILED DEER

Survival and cause-specific mortality rates between yarded and non-yarded white-tailed deer populations have not been previously studied with the use of radio telemetry. We captured, radio-collared, and monitored

the survival of 103 adult male and female white-tailed deer (*Odocoileus virginianus*) in northern and southern New Brunswick from February 1994 through May 1997. Annual survival rates for adult does in northern New Brunswick were higher than those for females in the south but were not different for adult males between the 2 study areas. Six of 37 adult female mortalities in the northern, yarded population died as a result of coyote (*Canis latrans*) predation (0.098); doe harvest was illegal in this portion of the province. However, in the southern population, where a limited number of antlerless permits were issued but deer did not concentrate in traditional deeryards, 9 of 21 adult female mortalities were from hunting-related causes (0.114). Mortality rates for adult females as a result of predation did not differ between the 2 study areas (0.098 for north, 0.058 for south), and mortality rates of northern females (0.151) did not differ from hunting- related mortality rates for does in the south (0.128). A majority of adult males in northern New Brunswick died as a result of predation and hunting-related causes, while most (5 of 10) mortality in the southern study area resulted from legal harvest. There were no differences in adult male mortality rates among seasons or between study areas ($P > 0.05$). Annual survival of adult white-tailed deer in New Brunswick, where deer exist on the northern edge of their North American distribution, appeared dependent on either legal harvest rates in those populations that were exploited, or on coyote predation. Our results did not support the hypothesis that yarded white-tailed deer have higher winter survival rates than non-yarded populations.

Wiley, J. E. 1975. Status of the eastern coyote in New Hampshire. Pages 20–32 in Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

NEW HAMPSHIRE, RANGE

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

EASTERN WOLF, GENETICS, GRAY WOLF, RED WOLF, TAXONOMY

The origin and taxonomy of the red wolf (*Canis rufus*) has been the subject of considerable debate and it has been suggested that this taxon was recently formed as a result of hybridization between the coyote and gray wolf. Like the red wolf, the eastern Canadian wolf has been characterized as a small "deer-eating" wolf that hybridizes with coyotes (*Canis latrans*). While studying the population of eastern Canadian wolves in Algonquin Provincial Park we recognized similarities to the red wolf, based on DNA profiles at 8 microsatellite loci. We examined whether this relationship was due to similar levels of introgressed coyote genetic material by comparing the microsatellite alleles with those of other North American populations of wolves and coyotes. These analyses indicated that it was not coyote genetic material, which led to the close genetic affinity between red wolves and eastern Canadian wolves. We then examined the control region of the mitochondrial DNA (mtDNA) and confirmed the presence of coyote sequences in both. However, we also found sequences in both that diverged by 150,000–300,000 years from sequences found in coyotes. None of the red wolves or eastern Canadian wolf samples from the 1960s contained gray wolf (*Canis lupus*) mtDNA sequences. The data are not consistent with the hypothesis that the eastern Canadian wolf is a subspecies of gray wolf as it is presently designated. We suggest that both the red wolf and the eastern Canadian wolf evolved in North America sharing a common lineage with the coyote until 150,000–300,000 years ago. We propose that it retain its original species designation, *Canis lycaon.*

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

EASTERN WOLF, GENETICS, GRAY WOLF, RED WOLF, TAXONOMY

We analyzed the mitochondrial DNA (mtDNA) from two historical samples of eastern North American wolves: the last wolf reported to have been killed in northern New York State (ca. 1890s) and a wolf killed in Maine in the 1880s. These wolves represent eastern wolves, presently classified as the gray wolf (*Canis lupus*) subspecies Canis lupus lycaon, which were present well before the expansion of western coyotes (*Canis latrans*) into these regions. We show the absence of gray wolf mtDNA in these wolves. They both contain New World mtDNA, supporting previous findings of a North American evolution of the eastern timber wolf (originally classified as *Canis lycaon*) and red wolf (*Canis rufus*) independently of the gray wolf, which originated in Eurasia. The presence of a second wolf species in North America has important implications for the conservation and management of wolves. In the upper Great Lakes region, wolves of both species may exist in sympatry or interbreed with each other, which impacts the accuracy of estimates of numbers of wolves of each species within this geographic region. Furthermore, the historical distribution of the eastern timber wolf (*C. lycaon*), as revealed by these skin samples, has important implications for the reintroduction of wolves into the northeastern U.S. states, such as New York and Maine.

Wilson, P. J., W. J. Jakubas, and S. Mullen. 2004. Genetic status and morphological characteristics of Maine coyotes as related to neighboring coyote and wolf populations. Final report to the Maine Outdoor Heritage Fund Board, Grant #011–3-7. Maine Department of Inland Fisheries and Wildlife, Bangor, 58 pp.

GENETICS, MAINE

Winter, L. A. 1990. Home range size and spatial relationships of coyotes and red foxes in Acadia National Park, Mount Desert Island, Maine. Thesis, University of Maine, Orono, USA.

BEHAVIOR, HOME RANGE, MAINE, RED FOX

Twelve coyotes (*Canis latrans*) and 14 red foxes (*Vulpes vulpes*) were radio-tracked on Mount Desert Island, Maine from August, 1988 to March, 1990. Home range size and interspecific spatial overlap were calculated and compared with results from other recent New England studies. Juvenile coyote dispersal rate was also documented and compared with results elsewhere in Maine. The average 95% minimum convex polygon home range for coyotes was 42.2 km^2, but varied from 10.1 to 77.8 km^2. the mean home range size on Mount Desert Island was characterized by greater variability than determined in earlier Maine studies. The variability in coyote home range size on Mount Desert Island suggests that it would be inappropriate to apply results from coyote research elsewhere in Maine to make projections and management decisions regarding spatial requirements in Acadia. The 95% minimum convex polygon fox home range size averaged 8.6 km^2 but varied from 1.9 to 20.8 km^2. These results are consistent with other Maine studies. Dispersal and gradual home range expansion may account for the variability in home range size of foxes. Preliminary data suggests that a high percentage of juvenile coyotes disperse of Mt. Desert, although dispersal appears to be delayed in comparison to the mainland. Harmonic mean home range analysis suggests little interspecific overlap between coyotes and red fox core areas of use. These results imply that the arrival of coyotes on Mount Desert Island may limit the habitat available for red foxes.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

CONFLICT, DAMAGE, LIVESTOCK, MANAGEMENT, PENNSYLVANIA, PREDATION

The coyote (*Canis latrans*) population in Pennsylvania has grown in the last several decades to about 4,000. It continues to grow, despite a known annual harvest of more than 850 animals. There is a growing concern about the effects of coyotes on game and livestock populations. We discuss known and potential coyote-human conflicts in Pennsylvania and propose a program of depredation prevention and control. To be successful, the program requires cooperation, funding, research, educational materials, and training workshops.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings of the Eastern Wildlife Damage Control Conference 6:194–200.

CONFLICT, DAMAGE, LIVESTOCK, PENNSYLVANIA, PREDATION, PRODUCER

The eastern coyote (*Canis latrans*) has become common and widespread in many eastern states. We surveyed 331 sheep producers in Pennsylvania (PA); 22% reported predator losses in 1991, primarily to dogs and coyotes. Losses were heaviest in the southwest part of PA and producers reporting losses tended to have more sheep and more acreage in pasture. To reduce losses producers used lambing sheds, fences, guard dogs, and donkeys, confinement of sheep, trapping, and shooting. It appears that we can expect greater depredations in the future because of increased coyote numbers and a relatively low level of protection of sheep; however, most sheep losses were to old age, disease, lambing problems, and accidents.

Witmer, G. W., M. J. Pipas, and A. Hayden. 1995. Some observations on coyote food habits in Pennsylvania. Journal of the Pennsylvania Academy of Science 69:77–80.

DIET, PENNSYLVANIA

We analyzed 310 coyotes (*Canis latrans*) scats collected in Pennsylvania during April-August 1991–92. Based on frequency of occurrence, white-tailed deer (*Odocoileus virginianus*) (55.2%) were the most common prey or scavenged item. *Murid* rodents (mice/voles) (14.8%) were the next most common mammalian prey group, followed by cottontail rabbits (*Sylvilagus spp.*) (9.4%) and woodchucks (*Marmota monax*) (9.4%). Insects (18.1%) were also common in the scats; birds (11.9%) were less so. Plant materials of various types were found in 52.3% of the scats. Reptilian/amphibian remains were rare, and livestock remains were not found. Some regional differences in food habits were observed: e.g., deer were more common in the diets in north-central and north-eastern parts of the state than in the south-central.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

ALABAMA, BEHAVIOR, DIET, HOME RANGE, MISSISSIPPI, RED FOX

Food habits of coyotes (*Canis latrans*) from the upper coastal plain province of Alabama and Mississippi were determined from scats (n = 211) and stomachs (n = 100) collected from December 1980 through April 1984. Frequency of occurrence of major food items found in scats and stomachs for all seasons were rodents (43.1%), fruit (38.6%), rabbits (*Sylvilagus spp.*; 34.7%), insects (29.9%), white-tailed deer (*Odocoileus virginianus*) (28.0%), and birds (22.5%). Seasonally, rabbits and rodents were most frequent in spring; rodents, insects, and birds in summer; fruit, primarily persimmons (*Diospyros virginiana*) in fall; deer and rodents in winter. Peak deer occurrences in summer coincided with the fawning periods in both states.

Coyotes, gray fox (*Urocyon cinereoargenteus*), and a red fox (*Vulpes vulpes*) were radio tracked during 1981–84 in east central Mississippi and west central Alabama. Mean home range sizes for coyotes and gray foxes were 27.03 km^2 (SD = 16.35) and 4.93 km^2 (SD = 2.78), respectively. Coyotes and gray foxes exhibited similar activity periods. Based on analysis of radio locations, gray foxes occurred more frequently than coyotes in wooded areas. Overlap occurred in home ranges and gray foxes. The red fox seemed to avoid a coyote's home range. The relationship among coyotes and red and gray foxes is discussed.

Wooding, J. B., and T. S. Hardisky. 1990. Coyote distribution in Florida. Florida Field Naturalist 18:12–14.

FLORIDA, RANGE

Woodling, J. B., E. P. Hill, and P. W. Sumner. 1984. Coyote food habits in Mississippi and Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 38:182–188.

ALABAMA, DIET, MISSISSIPPI

Food habits of coyotes (*Canis latrans*) from the upper coastal plain province of Alabama and Mississippi were determined from scats (n = 211) and stomachs (n = 100) collected from December 1980 through April 1984. Frequency of occurrence of major food items found in scats and stomachs for all seasons were rodents (43.1%), fruit (38.6%), rabbits (34.7%), insects (29.9%), white-tailed deer (28.0%), and birds (22.5%). Seasonally, rabbits and rodents occurred most frequently in spring; rodents, insects, and birds in summer; fruit, primarily persimmons, in the fall; and deer and rodents in winter. Peak deer occurrences in summer coincide with the fawning periods in both states.

Worley, K. J. 2005. Geospatial and statistical analysis of home range areas and suburban/urban land use patterns of eastern coyotes (*Canis latrans*) on Cape Cod, Massachusetts. Thesis, University of Massachusetts, Boston, USA.

HABITAT, HOME RANGE, MASSACHUSETTS, URBAN

The eastern coyote (*Canis latrans*) is thought to be a primary source of increased human/wildlife conflict across the country. This *Canid,* considered by many a non-native species of Massachusetts, has achieved suburban/urban residency in the state. Currently, this modern-day *Canid* successfully occupies this niche and virtually every habitat type across the country, yet habitat preference has not been clearly defined for the eastern coyote in northeastern suburban/urban areas.

Geographic information systems (GIS) and chi-squared goodness-of-fit, analysis of variance (ANOVA), and 95% confidence interval tests were used as habitat use and selection assessment tools. These methods were used to accurately assess movement patterns of 23 Cape Cod, Massachusetts, eastern coyotes. Results from these analyses suggest that study animals strongly prefer residential areas and use human-altered areas in proportion to availability, while avoiding natural areas.

These results suggest how suburban coyotes are responding and adapting to human-dominated areas. This is critical information when forming wildlife management strategies and associated policies that are tailored to animals living in a rapidly developing area. In addition, this study provides a better understanding of suburban/urban coyote ecology that could be useful in predicting complex relationships between humans, other species, and associated habitats.

Worstall, C. A, and J. L. Dooley. 2004. Predation habits of the eastern coyote (*Canis latrans*) in southeastern Ohio. Ohio Journal of Science 104:A-17.

DIET, OHIO

Wydeven, A. P., T. K. Fuller, W. Weber, and K. MacDonald. 1998. The potential for wolf recovery in the northeastern United States via dispersal form southeastern Canada. Wildlife Society Bulletin 26:776–784.

EASTERN WOLF

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

DIET, MORPHOLOGY, RANGE, TAXONOMY, WEST VIRGINIA

The coyote, *Canis latrans,* is a recent addition to the fauna of West Virginia and has expanded into a previously empty large predator niche. Distribution, relative abundance, and ecological information were collected from agency records and a survey of 201 West Virginians. Coyote populations are established throughout the state with higher numbers estimated in the mountainous regions of West Virginia. The ecology of coy-

otes in West Virginia is similar to coyotes elsewhere. Winter diet consisted of 83 percent deer carrion in 24 coyote stomachs. The sampled population had a higher number of females (39) than males (34), and 61 percent were less than two years old. Coyotes were found to be most active in the morning hours and at night. Coyote habitat was mostly a mixture of fields and forests. And their dens were mainly located in rocky areas. Morphometric analysis was used to taxonomically assess 85 adult coyotes captured in West Virginia. Ten to 25 percent of the 85 adults captured were identified as possible coyote-dog hybrids. Cranial differences detected between the northern form (*Canis latrans thamnos*) and the southern form (*Canis latrans frustror*), but weight differences and a postulated north-south geographical gradient were not found. Coyotes in West Virginia were statistically similar to coyotes in Kentucky and Ohio, and significantly different from Pennsylvania coyotes, suggesting an origin from the west; questionnaire results propose migration from the north as well.

KEYWORD INDEX

AGE STRUCTURE

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Daine, K. 1989. Cranial variations and skull suture obliterations as related to age in the coyote (*Canis latrans*). Thesis, Eastern Illinois University, Charleston, USA.

Dumond, M., and M. A. Villard. 2000. Demography and body condition of coyotes (*Canis latrans*) in eastern New Brunswick. Canadian Journal of Zoology 78:399–406.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Houben, J. M., and J. R. Mason. 2004. Weight and age of coyotes captured in Virginia, USA. Proceedings of Vertebrate Pest Conference 21:75–76.

Jean, Y., and J. M. Bergeron. 1984. Productivity of coyotes (*Canis latrans*) from southern Québec. Canadian Journal of Zoology 62:2240–2243.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Maher, M. 2002. Aging coyotes using dental characteristics. Thesis, Eastern Illinois University, Charleston, USA.

Mahan, B. R., and E. C. Mahan. 2007. Demographics of coyotes (*Canis latrans*) during the late 1970s and 1990s in southwestern Illinois. Transactions of the Illinois State Academy of Science 100:251–257.

Moore, G. C., and J. S. Millar. 1984. A comparative study of colonizing and longer established eastern coyote populations. Journal of Wildlife Management 48:691–699.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

ALABAMA

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Hoerath, J. D. 1990. Influences of coyotes on game animals as monitored by fecal analysis. Thesis, Auburn University, Auburn, USA.

Hoerath, J. D., and M. K. Causey. 1991. Seasonal diets of coyotes in western central Alabama. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies. 45:91–96.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Linzey, D. W. 1971. Animal harvested in south Alabama probably coyote-red wolf hybrid. Alabama Conservation December issue:6–7.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1993. Perceptions knowledge of Alabama fruit and vegetable producers towards coyotes. Proceedings of the Sixth Eastern Wildlife Damage Control Conference 6:175–181

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Saalfeld, S. T., and S. S. Ditchkoff. 2006. Survival of neonatal white-tailed deer in an exurban population. Journal of Wildlife Management 71:940–944.

Santana, E. M. 2010. Food habits and anthropogenic supplementation in the diet of coyotes (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

ATTACK

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

White, L. A., and S. D. Gehert. 2009. Coyote attacks on humans in the United States and Canada. Human Dimensions of Wildlife 14:419–432.

BEHAVIOR

Bekoff, M. 1978. Behavioral development in coyotes and eastern coyotes. Pages 97–127 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and P. C. Mankin. 2007. Survival and cause-specific mortality of red foxes in agricultural and urban areas of Illinois. Journal of Wildlife Management 71:1862–1873.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Hill, H. L., and M. Bekoff. 1977. The variability of some motor components of social play and agnostic behavior in infant eastern coyotes. Animal Behavior 25:907–909.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*)

along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an antipredator strategy. Canadian Journal of Zoology 63:785–789.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Muntz, E. M., and B. R. Paterson. 2004. Evidence for the use of vocalization to coordinate the killing of a white-tailed deer, *Odocoileus virginianus,* by coyotes, *Canis latrans.* Canadian Field Naturalist 118:278–280.

Okoniewski, J. C. 1980. Vocal response of eastern coyotes to an electronic siren and human howling. Thesis, State University of New York, Syracuse, USA.

Okoniewski, J. C., and R. E. Chambers. 1984. Coyote vocal response to an electronic siren and human howling. Journal of Wildlife Management 48:217–222.

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

Parks, M. B. 1979. Physical and behavioral development of captive eastern coyote pups. Thesis, University of Maine, Orono, USA.

Patterson, B. R., S. Bondrup-Nielsen, and F. Messier. 1999. Activity patterns and daily movements of the eastern coyote, *Canis latrans,* in Nova Scotia. Canadian Field Naturalist 113:251–257.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Peterson, L. M. 1995. Effectiveness of using a trailmaster infrared sensor for monitoring activity of captive coyotes. Thesis, Western Illinois University, Macomb, USA.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Ryon, J. 1986. Den digging and pup care in captive coyotes (*Canis latrans*). Canadian Journal of Zoology 64:1582–1585.

Silver, H., and W. T. Silver. 1969. Growth and behavior of the coyote-like canid of northern New England with observations on canid hybrids. Wildlife Monographs 17:1–41.

Smith, G. J., J. R. Cary, and O. J. Rongstad. 1981. Sampling strategies for radio-tracking coyotes. Wildlife Society Bulletin 9:88–92.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

Thibault, I., and J. P. Ouellet. 2005. Hunting behaviour of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12(4):466–475.

Thiel, R. P. 2006. Conditions for sexual interactions between Grey Wolves, *Canis lupus,* and Coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. Journal of Wildlife Management 47:852–857.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2003. Description and possible reasons for an abnormally large group size of adult eastern coyotes observed during summer. Northeastern Naturalist 10:335–342.

Way, J. G. 2007. Social and play behavior in a wild eastern coyote, *Canis latrans,* pack. Canadian Field-Naturalist 121:397–401.

Way, J. G. 2009. Observations of coyowolves, *Canis latrans× lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

Way, J. G., I. M. Ortega, and E. G. Strauss. 2004. Movement and activity patterns of eastern coyotes in a costal, suburban environment. Northeastern Naturalist 11:237–254.

Way, J. G., D. L. M. Szumylo, and E. G. Strauss. 2006. An ethogram developed on captive eastern coyotes *Canis latrans.* Canadian Field-Naturalist 120:263–288.

Winter, L. A. 1990. Home range size and spatial relationships of coyotes and red foxes in Acadia National Park, Mount Desert Island, Maine. Thesis, University of Maine, Orono, USA.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

BOBCAT (*LYNX RUFUS*)

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Chamberlain, M. J., and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:204–219.

Chamberlain, M. J., and B. D. Leopold. 2005. Overlap in space use among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*). American Midland Naturalist 153:171–179.

Dibello, F. J., S. M. Arthur, and W. B. Krohn. 1990. Food habits of sympatric coyotes, *Canis latrans,* red fox, *Vulpes vulpes,* and bobcats, *Lynx rufus,* in Maine. Canadian Field Naturalist 104:403–408.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

McDonald, P. T. 2006. Habitat affiliations of sympatric carnivores in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

CANADA GOOSE (*BRANTA CANADENSIS*)

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

CARIBOU (*RANGIFER TARANDUS*)

Boisjoly, D., J. Ouellet, and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

Mosnier, A., D. Boisjoly, R. Courtois, and J. P. Ouellet. 2006. Extensive predator space use can limit the efficacy of a control program. Journal of Wildlife Management 72:483–491.

CONFLICT

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Billodeaux, L. E. 2007. The presence and public perception of coyotes (*Canis latrans*) in suburban and rural areas of western Georgia. Thesis. Auburn University, Auburn, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Gompper, M. E. 2002. Top Carnivores in the suburbs? Ecological and conservation issues raised by colonization of north-eastern North America by coyotes. BioScience 52:185–190.

Hilton, H. 1992. Coyotes in Maine: a case study. Pages 183–194 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia

integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Jones, E. J. 1987. Coyote damage in the southeastern United States. Third Eastern Wildlife Damage Control Conference 3:320.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1993. Perceptions knowledge of Alabama fruit and vegetable producers towards coyotes. Proceedings of the Sixth Eastern Wildlife Damage Control Conference 6:175–181.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Slate, D. L. 1987. Coyotes in the eastern U.S.: status and implications. Proceedings of Eastern Wildlife Damage Control Conference 3:325–326.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

Way, J. G., S. M. Cifuni, D. L. Eatough, and E. G. Strauss. 2006. Rat poison kills a pack of eastern coyotes, *Canis latrans,* in an urban area. Canadian Field-Naturalist 120:478–480.

White, L. A., and S. D. Gehert. 2009. Coyote attacks on humans in the United States and Canada. Human Dimensions of Wildlife 14:419–432.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

CONNECTICUT

Glatz, R. G. 1975. The status of the coyote in Connecticut. Pages 33–40 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Pringle, L. P. 1960. Notes on coyotes in southern New England. Journal of Mammalogy 41:278.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

DAMAGE

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia

Polytechnic Institute and State University, Blacksburg, USA.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Houben, J. M. 2004. Status and management of coyote depredations in the eastern United States. Sheep and Goat Research Journal 19:16–22.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

Jones, E. J. 1987. Coyote damage in the southeastern United States. Third Eastern Wildlife Damage Control Conference 3:320.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1993. Perceptions knowledge of Alabama fruit and vegetable producers towards coyotes. Proceedings of the Sixth Eastern Wildlife Damage Control Conference 6:175–181.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Slate, D. L. 1987. Coyotes in the eastern U.S.: status and implications. Proceedings of Eastern Wildlife Damage Control Conference 3:325–326.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

DENNING (SEE JUVENILE AND REPRODUCTION)

DENSITY (SEE POPULATION DENSITY)

DIET

Alesandrini, J. A. 1983. Winter food habits of coyotes in central Illinois. Thesis, Illinois State University, Normal, USA.

Bixel, K. D. 1995. Trophic ecology of adult coyotes (*Canis latrans*) in south central Pennsylvania. Thesis, Shippensburg University, Shippensburg, USA.

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Boisjoly, D., J. Ouellet and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

Bollin-Booth, H. A. 2007. Diet analysis of the coyote (*Canis latrans*) in metropolitan park systems of northeast Ohio. Thesis, Cleveland State University, Cleveland, USA.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Buck, W. S. 1999. Citizen research of Chicago coyote: diet, population indexing, and the effects of research participation. Thesis, University of Minnesota, St. Paul, USA.

Cepek, J. D. 2000. Population monitoring and diet analysis of coyotes in the Cuyahoga Valley National Recreation Area, Ohio. Thesis, Cleveland State University, Cleveland, USA.

Cepek, J. D. 2004. Diet composition of coyotes in the Cuyahoga Valley National Park, Ohio. Ohio Journal of Science 104:60–64.

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Chamberlain, M. J., and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:204–219.

Chambers, R. E. 1987. Diets of Adirondack coyotes and red foxes in the central Adirondacks. Transactions of the North Eastern Section of the Wildlife Society 44:90.

Chambers, R. E. 2000. A howling success: the eastern coyote. New York State Conservationist 55:1 19–21.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Crossett III, R. L., and C. L. Elliott. 1991. Winter food habits of red foxes and coyotes in central Kentucky. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies 45:97–103.

Cypher, B. L. 1993. Food item use by three sympatric canids in southern Illinois. Transactions of the Illinois State Academy of Science 86:139–144.

Cypher, B. L. 1993. Food item use by coyote pups at Crab Orchard National Wildlife Refuge, Illinois. Transactions of the Illinois State Academy of Science 86:133–137.

Cypher, B. L., A. Woolf, and D. C. Yancy. 1993. Summer food habits of coyotes at Union County Conservation Area, Illinois. Transactions of the Illinois State Academy of Science 86:145–152.

Dibello, F. J., S. M. Arthur, and W. B. Krohn. 1990. Food habits of sympatric coyotes, *Canis latrans,* red fox, *Vulpes vulpes,* and bobcats, *Lynx rufus,* in Maine. Canadian Field Naturalist 104:403–408.

Dumond, M., M. A. Villard, and E. Tremblay. 2001. Does coyote diet vary seasonally between a protected and an unprotected forest landscape? Ecoscience 8:301–310.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Epstein, M. B., G. A. Feldhamer, R. L. Joyner, R. J. Hamilton, and W. G. Moore. 1985. Home range and mortality of white-tailed deer fawns in coastal South Carolina. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 39:373–379.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Gabor, T. M. 1993. An assessment of the feeding ecology of coyotes in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Gammons, D. J. 2004. Early fall coyote foods in Campbell and Bath Counties, Virginia. Banisteria 23: 45–47.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Grogan, M. E. 1996. Feeding strategies of the coyote (*Canis latrans*) in western Tennessee. Thesis, University of Memphis, Memphis, USA.

Hamilton Jr., W. J. 1974. Food habits of the coyote in the Adirondacks. New York Fish and Game Journal 21:177–181.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Harrison, D. J., and J. A. Harrison. 1984. Foods of adult Maine coyotes and their known-aged pups. Journal of Wildlife Management 48:922–926.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Hilton, H., and V. B. Richens. 1975. Coyote food habits and prey relationships in Maine. Pages 74–82 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Hoerath, J. D. 1990. Influences of coyotes on game animals as monitored by fecal analysis. Thesis, Auburn University, Auburn, USA.

Hoerath, J. D., and M. K. Causey. 1991. Seasonal diets of coyotes in western central Alabama. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies. 45:91–96.

Huegel, C. N. 1979. Winter ecology of coyotes in northern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

Huegel, C. N., and O. J. Ronstad. 1985. Winter foraging patterns and consumption rates of northern Wisconsin coyotes. American Midland Naturalist 113:203–207.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

Land, E. D., D. S. Maehr, J. C. Roof, and J. W. McCown. 1993. Mortality patterns of female white-tailed deer in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:176–184.

Lapierre, L. E. 1985. Fall and winter food habits of the eastern coyote *Canis latrans* in southeastern New Brunswick. Proceedings of Nova Scotia Institute of Science 35:71–74.

Lee III, R. M. 1986. Food habits of the Coyote (*Canis latrans*) in Tennessee. Thesis, Memphis State University, Memphis, USA.

Lee III, R. M., and M. L. Kennedy. 1986. Food habits of the coyote in Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies. 40:364–372.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Litvaitis, J. A., and W. M. Mautz. 1980. Food and energy use by captive coyotes. Journal of Wildlife Management 44:56–61.

MacKinnon, C. M., A. C. Kennedy, and D. W. Colpitts. 2007. Details of eastern coyote, *Canis latrans,* predation on great black-backed gull, *Larus marinus,* eggs on Boot Island National Wildlife Area, Nova Scotia.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

Moore, G. C., and J. S. Millar. 1986. Food habits and average weights of a fall-winter sample of eastern coyotes, *Canis latrans.* Canadian Field Naturalist 100:105–106.

Moore, W. J., and J. C. Williamson. 1975. Food habits and morphometry of coyotes in Ontario's Prince Edward County. Pages 68–73 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Morey, P. S., E. M. Gese, and S. Gehrt. 2007. Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. American Midland Naturalist 158:147–161.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Morton, L. D. 1989. Winter ecology of the eastern coyote (*Canis latrans*) in Fundy National Park. Thesis, University of New Brunswick, Fredericton, Canada.

Niebauer, T. J. 1974. Coyote food habits in northwestern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

O'Connell Jr., A. F., D. J. Harrison, B. Connery, and K. B. Anderson. 1992. Food use by an insular population of coyotes. Northeast Wildlife 49:36–42.

Owens, K. M. 2006. Seasonal dietary composition of the eastern coyote (*Canis latrans*) on the Berry College campus in Northwestern Georgia. Thesis, University of Tennessee at Chattanooga, Chattanooga, USA.

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

Parker, G. R. 1986. The seasonal diets of coyotes, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 100:74–77.

Parker, T. S. 1999. Food habits of the coyote (*Canis latrans*) in urban and suburban areas of western Tennessee. Thesis, University of Memphis, Memphis, USA.

Patterson, B. R., L. K. Benjamin, and F. Messier. 1998. Prey switching and feeding habits of eastern coyotes in relation to snowshoe hare and white-tailed deer densities. Canadian Journal of Zoology 76:1885–1879.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

Pekins, P. J. 1992. Winter diet and bioenergenics of eastern coyotes: a review. Pages 87–100 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Perkins, P. J., and W. W. Mautz. 1990. Energy requirements of eastern coyotes. Canadian Journal of Zoology 68:656–659.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

Randa, L. A., and J. A. Yunger. 2004. The influence of prey availability and vegetation characteristics on scent station visitation rates of coyotes, *Canis latrans,* in a heterogeneous environment. Canadian Field Naturalist. 118:341–353.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

Richer, M. C., M. Crête, J. P. Ouellet, L. P. Rivest, and J. Huot. 2002. The low performance of forest versus rural coyotes in northeastern North America: Inequality between presence and availability of prey. Ecoscience 9:44–54.

Robinson, K. J. 2010. Scat identification and dietary trends of coyote *(Canis latrans),* gray fox *(Urocyon cinereoargenteus),* and red fox *(Vulpes vulpes)* in a mid-Atlantic ecosystem. Thesis, George Mason University, Fairfax, USA.

Saalfeld, S. T., and S. S. Ditchkoff. 2006. Survival of neonatal white-tailed deer in an exurban population. Journal of Wildlife Management 71:940–944.

Samson, C., and M. Crete. 1997. Summer food habits and population density of coyotes, *Canis latrans,* in boreal forests of southeastern Quebec. Canadian Field Naturalist 111:227–233.

Santana, E. M. 2010. Food habits and anthropogenic supplementation in the diet of coyotes (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Schmitz, O. J., and D. M. Lavigne. 1987. Factors affecting body size in sympatric Ontario *Canis.* Journal of Mammalogy 68:92–99.

Schrecengost, J. D. 2007. Home range and food habits of the coyote (*Canis latrans*) at the Savannah River site, South Carolina. Thesis, University of Georgia, Athens, USA.

Schrecengost, J. D., J. C. Kilgo, D. Mallard, H. S. Ray, and K. V. Miller. 2008. Seasonal food habits of the coyote in the South Carolina coastal plain. Southeastern Naturalist 7:135–144.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Smith, R. A., and M. L. Kennedy. 1983. Food habits of the coyote (*Canis latrans*) in western Tennessee. Journal of the Tennessee Academy of Science 58:27–28.

Stratman, M. R., and M. R. Pelton. 1997. Food habits of coyotes in northwestern Florida. Proceedings of Annual Conference Southeastern Association Fish and Wildlife Agencies 51:269–275.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

Wagner, G. D. 1993. Coyote diet in areas of wild turkey abundance during the wild turkey reproductive season. Thesis, Mississippi State University, Starkville, USA.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

Way, J. G. 2008. Eastern coyotes, *Canis latrans,* observed feeding on periodical cicadas, *Magicicada septendecim.* Canadian Field-Naturalist 122:271–272.

Whiteman, E. E. 1940. Studies of pelage changes, food habits and breeding habits of captive coyotes (*Canis* latrans latrans). Thesis, Michigan State College of Agriculture and Applied Science, East Lansing, USA.

Whitlaw, H. A., W. B. Ballard, D. L. Sabine, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1998. Survival and cause-specific mortality rates of adult white-tailed deer in New Brunswick. Journal of Wildlife Management 62:1335–1341.

Witmer, G. W., M. J. Pipas, and A. Hayden. 1995. Some observations on coyote food habits in Pennsylvania. Journal of the Pennsylvania Academy of Science 69:77–80.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

Woodling, J. B., E. P. Hill, and P. W. Sumner. 1984. Coyote food habits in Mississippi and Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 38:182–188.

Worstall, C. A, and J. L. Dooley. 2004. Predation habits of the eastern coyote (*Canis latrans*) in southeastern Ohio. The Ohio Journal of Science 104:A-17.

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

DISEASE

Agostine, J. C., and G. S. Jones. 1982. Heartworms (*dirofilaria immitis*) in coyotes (*Canis latrans*) in New England. Journal of Wildlife Diseases 18:343–345.

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Berentsen, A. R., M. R. Dunbar, S. R. Johnson, S. Robbe-Austerman, L. Martinez, and R. L. Jones. 2011. Active use of coyotes (Canis latrans) to detect Bovine Tuberculosis in northeastern Michigan, USA. Vetenary Microbiology: in press.

Bixel, K. D. 1995. Survey of the endoparasites of south central Pennsylvania coyotes using fecal analysis. Journal of the Pennsylvania Academy of Science 69:17–21.

Bourque, A., H. Whitney, and G. Conboy. 2005. *Angiostrongylus vasorum* infection in a coyote (*Canis latrans*) from Newfoundland and Labrador, Canada. Journal of Wildlife Diseases 41:816–819.

Bruning-Fann, C. S., S. M. Schmitt, S. D. Fitzgerald, J. B. Payeur, D. L. Whipple, T. M. Cooley, T. Carision, and P. Friedrich. 1998. *Mycobacterium bovis* in coyotes from Michigan. Journal of Wildlife Diseases 34:632–636.

Davidson, W. R., M. J. Appel, G. L. Doster, O. E. Baker, and J. F. Brown. 1992. Diseases and parasites from commercial sources selling to fox-chasing enclosures. Journal of Wildlife Disease 28:581–589.

Dunatchik, D. D. 1967. The helminth parasites of Michigan coyotes. Thesis, University of Michigan, Ann Arbor, USA.

Eastman, S. A. 2000. Home ranges and diseases of coyotes (*Canis latrans*) in northwestern New Jersey and northeastern Pennsylvania. Thesis, East Stroudsburg University, East Stroudsburg, USA.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Foster, G. W., M. B. Main, J. M. Kinsella, L. M. Dixon, S. P. Terrell, and D. J. Forrester. 2003. Parasitic helminthes and arthropods of coyotes (*Canis latrans*) from central Florida, U.S.A. Comparative Parasitology 70:162–166.

Freeman, R. S., A. Adorjan, and D. H. Pimlott. 1961. Cestodes of wolves, coyotes, and coyote-dog hybrids in Ontario. Canadian Journal of Zoology 39:527–532.

Gier, H. T., S. M. Kruckenberg, and R. J. Marler. 1978. Parasites and diseases of coyotes. Pages 37–72 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Gompper, M. E., R. M. Goodman, R. W. Kays, J. C. Ray, C. V. Fiorello and S. E. Wade. 2003. A survey of the parasites of coyotes (*Canis latrans*) in New York based on fecal analysis. Journal of Wildlife Diseases 39:712–717.

Gregory, D. G. 1998. Heartworm and lungworms in Illinois canids and their possible effect on coyote condition and reproduction. Thesis, Eastern Illinois University, Charleston, USA.

Holzman, S., M. J. Conroy, and W. R. Davidson. 1992. Diseases, parasites and survival of coyotes in south-central Georgia. Journal of Wildlife Diseases 28:572–580.

Keener, V. 1981. Gastrointestinal cestodes and nematodes of coyotes from southeastern Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Kick, T. J., G. F. Hubert Jr., and R. D. Andrews. 1984. Heartworms (*Dirofilaria immitis*) in coyotes (*Canis latrans*) in Illinois. Transactions of Illinois Academy of Sciences 77:127–134.

King, A. W., and A. M. Bohning. 1984. The incidence of heartworm, *Dirofilaria immitis* (*Filarioidea*), in the wild canids of northeast Arkansas. Southwestern Naturalist 29:89–92.

Miller, D. L., J. Schrecengost, J. Kilgo, S. Ray, and K. V. Miller. 2007. Ruptured aortic aneurysm in a coyote (*Canis latrans*) from South Carolina. Journal of Zoo and Wildlife Medicine 38:492–494.

Monson, R. A., W. B. Stone, and B. L. Weber. 1973. Heartworms in foxes and wild Canids in New York. New York Fish and Game Journal 20:48–53.

Nelson, T. A., D. G. Gregory, and J. R. Laursen. 2003. Canine heartworms in coyotes in Illinois. Journal of Wildlife Diseases 39:593–599.

Rosatte, R. C. 2002. Long distance movement of a coyote, *Canis latrans,* and red fox, *Vulpes vulpes,* in Ontario: implications for disease spread. Canadian Field Naturalist 116:129–131.

Trout, J. M., M. Santín, and R. Fayer. 2006. *Giardia* and *cryptosporidium* species and genotypes in coyotes (*Canis latrans*). Journal of Zoo and Wildlife Medicine 37:141–144.

VerCauteren, K. C., T. C. Atwood, T. J. DeLiberto, H. J. Smith, J. S. Stevenson, B. V. Thomsen, T. Gidlewski, and J. Payeur. 2008. Emerging Infectious Diseases 14:1862–1869.

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

DISPERSAL (SEE JUVENILE AND MOVEMENTS)

DOG (*CANIS FAMILIARIS*)

Adams, J. R., J. A. Leonard, and L. P. Waits. 2003. Widespread occurrence of a domestic dog mitochondrial DNA haplotype in southeastern U.S. coyotes. Molecular Ecology 12:541–546.

Aquadro, C. F. 1975. Electrophoretic determination of blood protein variation between the eastern coyote and dog. Pages 12–19 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Bider, J. R., and P. G. Weil. 1984. Dog, *Canis familiaris,* killed by a coyote, *Canis latrans,* on Montreal Island, Quebec. Canadian Field Naturalist 98:498–499.

Cox, J. J. 1997. Detection of hybridization events between the coyote, *Canis latrans,* and the domestic dog, *Canis familiaris,* using two polymorphic microsatellite loci and cranial morphometric analysis. Thesis, Morehead State University, Morehead, USA.

Cox, J. J., L. Meade, D. C. Yancy, and D. S. Maehr. 2001. The taxonomic status of wild Canis in Kentucky. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 55:408–417.

Dice, L. R. 1942. A family of dog-coyote hybrids. Journal of Mammalogy:186–192.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of canids from Missouri. Journal of Mammalogy 58:17–24.

Lawrence, B., and W. H. Bossert. 1969. The cranial evidence for hybridization in New England canis. Breviora 330:1–13.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic dogs in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild Canis populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

Mengel, R. M. 1971. A study of dog-coyote hybrids and implications concerning hybridization in *Canis.* Journal of Mammalogy 52:316–336.

co-evolutionary response between two competing carnivores.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

EASTERN WOLF (*CANIS LYCAON*)

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

Harrison, D. J., and T. B. Chapin. 1997. An assessment of potential habitat for eastern timber wolves in the northeastern United States and connectivity with occupied habitat in southeastern Canada. Wildlife Conservation Society. Working Paper 7.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Kolenosky, G. B. 1971. Hybridization between wolf and coyote. Journal of Mammalogy 52:446–449.

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild Canis populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

Schmitz, O. J., and G. B. Kolenosky. 1985. Hybridization between wolf and coyote in captivity. Journal of Mammalogy 66:402–405.

Schmitz, O. J., and G. B. Kolenosky. 1985. Wolves and coyotes in Ontario: morphological relationships and origins. Canadian Journal of Zoology 63:1130–1137.

Schmitz, O. J., and D. M. Lavigne. 1987. Factors affecting body size in sympatric Ontario *Canis.* Journal of Mammalogy 68:92–99.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Wheeldon, T., B. Patterson, and B. White. 2010. Sympatric wolf and coyote populations of the western Great Lakes region are reproductively isolated. Molecular Ecology 19:4428–4440.

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves

killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

Wydeven, A. P., T. K. Fuller, W. Weber, and K. MacDonald. 1998. The potential for wolf recovery in the northeastern United States via dispersal form southeastern Canada. Wildlife Society Bulletin 26:776–784.

FARMER (SEE PRODUCER)

FLORIDA

Brady, J. R., and H. W. Campell. 1983. Distribution of coyotes in Florida. Florida Field Naturalist 11:40–41.

Cunningham, V. C., and R. D. Dunford. 1970. Recent coyote record from Florida. Q. J. Florida Academy Sciences 33:279–280.

Foster, G. W., M. B. Main, J. M. Kinsella, L. M. Dixon, S. P. Terrell, and D. J. Forrester. 2003. Parasitic helminthes and arthropods of coyotes (*Canis latrans*) from central Florida, U.S.A. Comparative Parasitology 70:162–166.

Land, E. D., D. S. Maehr, J. C. Roof, and J. W. McCown. 1993. Mortality patterns of female white-tailed deer in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:176–184.

Maehr, D. S., R. T. McBride, and J. J. Mullahey. 1996. Status of coyotes in south Florida. Florida Field Naturalist 24:101–107.

Main, M. B., S. F. Coates, and G. M. Allen. 2000. Coyote distribution in Florida extends southward. Florida Field Naturalist 28:201–203.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

Main, M. B., P. B. Walsh, K. M. Portier, and S. F. Coates. 1999. Monitoring the expanding range of coyotes in Florida: results of the 1997–8 statewide scent station surveys. Florida Field Naturalist 27:150–162.

Stratman, M. R., and M. R. Pelton. 1997. Food habits of coyotes in northwestern Florida. Proceedings of Annual Conference Southeastern Association Fish and Wildlife Agencies 51:269–275.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

Wagner, G. D. 1993. Coyote diet in areas of wild turkey abundance during the wild turkey reproductive season. Thesis, Mississippi State University, Starkville, USA.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

Wooding, J. B., and T. S. Hardisky. 1990. Coyote distribution in Florida. Florida Field Naturalist 18:12–14.

FOOD HABITS (SEE DIET)

GENETICS

Adams, J. R., B. T. Kelly, and L. P. Waits. 2003. Using faecal DNA sampling and GIS to monitor hybridization between red wolves (*Canis rufus*) and coyotes (*Canis latrans*). Molecular Ecology 12:2175–2186.

Adams, J. R., J. A. Leonard, and L. P. Waits. 2003. Widespread occurrence of a domestic dog mitochondrial DNA haplotype in southeastern U.S. coyotes. Molecular Ecology 12:541–546.

Adams, J. R., C. Lucash, L. Schutte, and L. P. Waits. 2007. Locating hybrid individuals in the red wolf (*Canis rufus*) experimental population area using a spatially targeted sampling strategy and faecal DNA genotyping. Molecular Ecology 16:1823–1834.

Adams, J. R., and L. P. Waits. 2007. An efficient method for screening faecal DNA genotypes and detecting new individuals and hybrids in the red wolf (*Canis rufus*) experimental population area. Conservation Genetics 8:123–131.

Anderson, T. M., B. M. vonHoldt, S. I. Candille, M. Musiani, C. Greco, D. R. Stahler, D. W. Smith, B. Padhukasahasram, E. Randi, J. A. Leonard, C. D. Bustamante, E. A. Ostrander, H. Tang, R. K. Wayne, and G. S. Barsh. 2009. Molecular and evolutionary history of melanism in North American Gray Wolves. Science 323:1339–1343.

Aquadro, C. F. 1975. Electrophoretic determination of blood protein variation between the eastern coyote and dog. Pages 12–19 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Bozarth, C. A. 2010. Phylogeography and non-invasive molecular monitoring of coyote *(Canis latrans)* and gray fox *(urocyon cineroargenteus)* in northern Virginia and the eastern United States. Dissertation, George Mason University, Fairfax, USA.

Chambers, R. E. 2000. A howling success: the eastern coyote. New York State Conservationist 55:1 19–21.

Chambers, S. M. 2010. A perspective on the Genetic Composition of Eastern Coyotes. Northeastern Naturalist 17:205–210.

Cox, J. J. 1997. Detection of hybridization events between the coyote, *Canis latrans,* and the domestic dog, *Canis familiaris,* using two polymorphic microsatellite loci and cranial morphometric analysis. Thesis, Morehead State University, Morehead, USA.

Dennis, D. L. 2010. Genetic analysis of dispersal and population dynamics of the southeastern coyote (*Canis latrans*). Thesis, Auburn University, Auburn, USA.

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

Hedrick, P. W., R. N. Lee, and D. Garrigan. 2002. Major histocompatibiltiy complex variation in red wolves: evidence for common ancestry with coyotes and balancing selection. Molecular Ecology 11:1905–1913.

Hennessy, C. A. 2007. Mating strategies and pack structure of coyotes in an urban landscape: a genetic investigation. Thesis, Ohio State University, Columbus, USA.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

Lariviére, S., and M. Crête. 1993. The size of eastern coyotes a comment. Journal of Mammalogy 74:1072–1074.

Lehman, N., A. Eisenhawer, K. Hansen, L. D. Mech, R. O. Peterson, P. J. P. Gogan, and R. K. Wayne. 1991. Introgression of coyote mitochondrial DNA into sympatric North American gray wolf populations. Evolution 45:104–119.

Lehman, N., and R. K. Wayne. 1991. Analysis of coyote mitochondrial DNA genotype frequencies: estimation of the effective number of alleles. Genetics 128:405–416.

MacKenzie, S. H. 1988. Genetic variation in nine northern subspecies of the coyote, *Canis latrans.* Thesis, University of Tennessee, Knoxville, USA.

Mengel, R. M. 1971. A study of dog-coyote hybrids and implications concerning hybridization in *Canis.* Journal of Mammalogy 52:316–336.

Miller, C. R., J. R. Adams, and L. P. Waits. 2003. Pedigree-biased assignment tests for reversing coyote (*Canis latrans*) introgression into the wild red wolf (*Canis rufus*) population. Molecular Ecology 12:3287–3301.

Nowak, R. M., and N. E. Federoff. 1998. Validity of the red wolf: response to Roy et al. Conservation Biology 12:722–725.

Peppers, J. A. 1994. Genetic variation in the coyote, *Canis latrans.* Thesis, Memphis State University, Memphis, USA.

Peterson, R. O., and J. M. Thurber. 1993. The size of eastern coyotes: a rebuttal. Journal of Mammalogy 74:1075–1076.

Reich, D. E., R. K. Wayne, and D. B. Goldstein. 1999. Genetic evidence for a recent origin by hybridization of red wolves. Molecular Ecology 8:139–144.

Roy, M. S., E. Geffen, D. Smith, E. A. Ostrander, and R. K. Wayne. 1994. Patterns of differentiation and hybridization in North American wolflike canids, revealed by analysis of microsatellite loci. Molecular Biology and Evolution 11:553–570.

Roy, M. S., E. Geffen, D. Smith, and R. K. Wayne. 1996. Molecular genetics of pre-1940 red wolves. Conservation Biology 10:1413–1424.

Rutledge, L. Y., C. J. Garroway, K. M. Loveless, and B. R. Patterson. 2010. Genetic differentiation of eastern wolves in Algonquin Park despite bridging gene flow between coyotes and gray wolves. Heredity 64:1–12.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

Wayne, R. K., and S. M. Jenks. 1991. Mitochondrial DNA analysis implying extensive hybridization of the endangered red wolf, *Canis rufus.* Nature 351:565–568.

Wayne, R. K., and N. Lehman. 1992. Mitochondrial DNA analysis of the eastern coyote: origins and hybridization. Pages 9–22 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

Wilson, P. J., W. J. Jakubas, and S. Mullen. 2004. Genetic status and morphological characteristics of Maine coyotes as related to neighboring coyote and wolf populations. Final report to the Maine Outdoor Heritage Fund Board, Grant #011–3-7. Maine Department of Inland Fisheries and Wildlife, Bangor, 58 pp.

GEORGIA

Billodeaux, L. E. 2007. The presence and public perception of coyotes (Canis latrans) in suburban and rural areas of western Georgia. Thesis. Auburn University, Auburn, USA.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

Holzman, S., M. J. Conroy, and W. R. Davidson. 1992. Diseases, parasites and survival of coyotes in south-central Georgia. Journal of Wildlife Diseases 28:572–580.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Howze, M. B. 2009. Predator removal and white-tailed deer recruitment in southwestern Georgia. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:17–20.

Owens, K. M. 2006. Seasonal dietary composition of the eastern coyote (*Canis latrans*) on the Berry College campus in Northwestern Georgia. Thesis, University of Tennessee at Chattanooga, Chattanooga, USA.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic doges in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

GRAY FOX (*UROCYON CINEREOARGENTEUS*)

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Chamberlain, M. J., and B. D. Leopold. 2005. Overlap in space use among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*). American Midland Naturalist 153:171–179.

Cypher, B. L. 1993. Food item use by three sympatric canids in southern Illinois. Transactions of the Illinois State Academy of Science 86:139–144.

Davidson, W. R., M. J. Appel, G. L. Doster, O. E. Baker, and J. F. Brown. 1992. Diseases and parasites from commercial sources selling to fox-chasing enclosures. Journal of Wildlife Disease 28:581–589.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

GRAY WOLF (*CANIS LUPUS*)

Anderson, T. M., B. M. vonHoldt, S. I. Candille, M. Musiani, C. Greco, D. R. Stahler, D. W. Smith, B. Padhukasahasram, E. Randi, J. A. Leonard, C. D. Bustamante, E. A. Ostrander, H. Tang, R. K. Wayne, and G. S. Barsh. 2009. Molecular and evolutionary history of melanism in North American Gray Wolves. Science 323:1339–1343.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of canids from Missouri. Journal of Mammalogy 58:17–24.

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

Lehman, N., A. Eisenhawer, K. Hansen, L. D. Mech, R. O. Peterson, P. J. P. Gogan, and R. K. Wayne. 1991. Introgression of coyote mitochondrial DNA into sympatric North American gray wolf populations. Evolution 45:104–119.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

Nowak, R. M., and N. E. Federoff. 1998. Validity of the red wolf: response to Roy et al. Conservation Biology 12:722–725.

Roy, M. S., E. Geffen, D. Smith, and R. K. Wayne. 1996. Molecular genetics of pre-1940 red wolves. Conservation Biology 10:1413–1424.

Rutledge, L. Y., C. J. Garroway, K. M. Loveless, and B. R. Patterson. 2010. Genetic differentiation of eastern wolves in Algonquin Park despite bridging gene flow between coyotes and gray wolves. Heredity 64:1–12.

Thiel, R. P. 2006. Conditions for sexual interactions between Grey Wolves, *Canis lupus,* and Coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

Wayne, R. K., and N. Lehman. 1992. Mitochondrial DNA analysis of the eastern coyote: origins and hybridization. Pages 9–22 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

GREATER BLACK-BACKED GULL (*LARUS MARINUS*)

MacKinnon, C. M., A. C. Kennedy, and D. W. Colpitts. 2007. Details of eastern coyote, *Canis latrans,* predation on great black-backed gull, *Larus marinus,* eggs on Boot Island National Wildlife Area, Nova Scotia.

GUARD ANIMAL

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

HABITAT

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

Atwood, T. C., and H. P. Weeks Jr. 2002. Facultative dyad formation in adult male coyotes. Northeastern Naturalist 9:353–358.

Atwood, T. C., and H. P. Weeks Jr. 2002. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. Canadian Journal of Zoology 81:1589–1597.

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis. State University of New York at Albany, Albany, USA.

Boisjoly, D., J. Ouellet and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Caturano, S. L. 1983. Habitat and home range use by coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

Crawford, B. A. 1992. Coyotes in Great Smoky Mountains National Park: evaluation of methods to monitor relative abundance, movement ecology, and habitat use. Thesis, University of Tennessee, Knoxville, USA.

Crête, M., J. P. Ouellet, J. P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Dumond, M., M. A. Villard, and E. Tremblay. 2001. Does coyote diet vary seasonally between a protected and an unprotected forest landscape? Ecoscience 8:301–310.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and M. G. Joselyn. 2003. Temporal habitat partitioning and spatial use of coyotes and red foxes in east-central Illinois. Journal of Wildlife Management 67:90–103.

Harrison, D. J., and T. B. Chapin. 1997. An assessment of potential habitat for eastern timber wolves in the northeastern United States and connectivity with occupied habitat in southeastern Canada. Wildlife Conservation Society. Working Paper 7.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Judy, B. A. 2010. Assessment of habitat use by eastern coyote (Canis latrans) along an urban-parkland gradient. Thesis, Cleveland State University, Cleveland, USA.

Kays, R. W., M. E. Gompper, and J. C. Ray. 2008. Landscape ecology of eastern coyotes based on large-scale estimates of abundance. Ecological Applications 18:1014–1027.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

McDonald, P. T. 2006. Habitat affiliations of sympatric carnivores in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

Morey, P. S., E. M. Gese, and S. Gehrt. 2007. Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. American Midland Naturalist 158:147–161.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Morton, L. D. 1989. Winter ecology of the eastern coyote (*Canis latrans*) in Fundy National Park. Thesis, University of New Brunswick, Fredericton, Canada.

Oehler, J. D., and J. A. Litvaitis. 1996. The role of spatial scale in understanding responses of medium-sized carnivores to forest fragmentation. Canadian Journal of Zoology 74:2070–2079.

Page, M. S. 2010. Spatial ecology of eastern coyotes (*Canis latrans*) in the anthropogenic landscape of Cape Cod, Massachusetts. Thesis, University of Massachusetts, Amherst, USA.

Parker, G. R. and J. W. Maxwell. 1989. Seasonal movements and winter ecology of the coyote, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 103:1–11.

Pekins, P. J. 1992. Winter diet and bioenergenics of eastern coyotes: a review. Pages 87–100 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

Randa, L. A., and J. A. Yunger. 2004. The influence of prey availability and vegetation characteristics on scent station visitation rates of coyotes, *Canis latrans,* in a heterogeneous environment. Canadian Field Naturalist. 118:341–353.

Richer, M. C., M. Crête, J. P. Ouellet, L. P. Rivest, and J. Huot. 2002. The low performance of forest versus rural coyotes in northeastern North America: Inequality between presence and availability of prey. Ecoscience 9:44–54.

Samson, C., and M. Crete. 1997. Summer food habits and population density of coyotes, *Canis latrans,* in boreal forests of southeastern Quebec. Canadian Field Naturalist 111:227–233.

Santana, E. M. 2010. Food habits and anthropogenic supplementation in the diet of coyotes (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Schrecengost, J. D. 2007. Home range and food habits of the coyote (*Canis latrans*) at the Savannah River site, South Carolina. Thesis, University of Georgia, Athens, USA.

Schrecengost, J. D., J. C. Kilgo, H. S. Ray, and K. V. Miller. 2009. Home range, habitat use and survival of coyotes in western South Carolina. American Midland Naturalist 162:346–355.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Stupakoff, G. 1994. Habitat use of eastern coyotes (*Canis latrans* var.) on Prescott Peninsula, Quabbin Reservation, Massachusetts. Thesis, Hampshire College, Amherst, USA.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

Thibault, I., and J. P. Ouellet. 2005. Hunting behaviour of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12(4):466–475.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

Van Deelen, T. R., and T. E. Gosselink. 2006. Coyote survival in a row-crop agricultural landscape. Canadian Journal of Zoology 84:1630–1636.

Way, J. G., I. M. Ortega, and E. G. Strauss. 2004. Movement and activity patterns of eastern coyotes in a costal, suburban environment. Northeastern Naturalist 11:237–254.

Weckel, M. E., D. Mack, C. Nagy, R. Christie, and A. Wincorn. 2010. Using citizen science to map human-coyote interaction in suburban New York, USA. Journal of Wildlife Management 74:1163–1171.

Worley, K. J. 2005. Geospatial and statistical analysis of home range areas and suburban / urban land use patterns of eastern coyotes (*Canis latrans*) on Cape Cod, Massachusetts. Thesis, University of Massachusetts, Boston, USA.

HOME RANGE

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Atwood, T. C., and H. P. Weeks Jr. 2002. Facultative dyad formation in adult male coyotes. Northeastern Naturalist 9:353–358.

Atwood, T. C., and H. P. Weeks Jr. 2002. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. Canadian Journal of Zoology 81:1589–1597.

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

Babb, J. G. 1988. Density and home range of the coyote (*Canis latrans*) in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Babb, J. G., and M. L. Kennedy. 1988. Home range of the coyote in western Tennessee. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 42:443–447.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis. State University of New York at Albany, Albany, USA.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Caturano, S. L. 1983. Habitat and home range use by coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Chamberlain, M. J., and B. D. Leopold. 2005. Overlap in space use among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*). American Midland Naturalist 153:171–179.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

Crawford, B. A. 1992. Coyotes in Great Smoky Mountains National Park: evaluation of methods to monitor relative abundance, movement ecology, and habitat use. Thesis, University of Tennessee, Knoxville, USA.

Crête, M., J. P. Ouellet, J. P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Eastman, S. A. 2000. Home ranges and diseases of coyotes (*Canis latrans*) in northwestern New Jersey and northeastern Pennsylvania. Thesis, East Stroudsburg University, East Stroudsburg, USA.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Engelhardt, D. B. 1986. Analysis of red fox and coyote home range use in relation to artificial scent marks. Thesis, University of Maine, Orono, USA.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

Gehrt, S. D., and S. Prange. 2006. Interference competition between coyotes and raccoons: a test of the mesopredator release hypothesis. Behavioral Ecology 18:204–214.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and M. G. Joselyn. 2003. Temporal habitat partitioning and spatial use of coyotes and red foxes in east-central Illinois. Journal of Wildlife Management 67:90–103.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

Morton, L. D. 1989. Winter ecology of the eastern coyote (*Canis latrans*) in Fundy National Park. Thesis, University of New Brunswick, Fredericton, Canada.

Mosnier, A., D. Boisjoly, R. Courtois, and J. P. Ouellet. 2006. Extensive predator space use can limit the efficacy of a control program. Wildlife Management 72:483–491.

Parker, G. R. and J. W. Maxwell. 1989. Seasonal movements and winter ecology of the coyote, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 103:1–11.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Schrecengost, J. D. 2007. Home range and food habits of the coyote (*Canis latrans*) at the Savannah River site, South Carolina. Thesis, University of Georgia, Athens, USA.

Schrecengost, J. D., J. C. Kilgo, H. S. Ray, and K. V. Miller. 2009. Home range, habitat use and survival of coyotes in western South Carolina. American Midland Naturalist 162:3463–55.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Smith, G. J., J. R. Cary, and O. J. Rongstad. 1981. Sampling strategies for radio-tracking coyotes. Wildlife Society Bulletin 9:88–92.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

Thorton, D. H., M. E. Sunquist, and M. B. Main. 2004. Ecological separation within newly sympatric populations of coyotes and bobcats in south-central Florida. Journal of Mammalogy 85:973–982.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G., I. M. Ortega, P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Winter, L. A. 1990. Home range size and spatial relationships of coyotes and red foxes in Acadia National Park, Mount Desert Island, Maine. Thesis, University of Maine, Orono, USA.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

Worley, K. J. 2005. Geospatial and statistical analysis of home range areas and suburban / urban land use patterns of eastern coyotes (*Canis latrans*) on Cape Cod, Massachusetts. Thesis, University of Massachusetts, Boston, USA.

HUMAN DIMENSIONS

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Billodeaux, L. E. 2007. The presence and public perception of coyotes (*Canis latrans*) in suburban and rural areas of western Georgia. Thesis. Auburn University, Auburn, USA.

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

Dumond, M., M. A. Villard, and E. Tremblay. 2001. Does coyote diet vary seasonally between a protected and an unprotected forest landscape? Ecoscience 8:301–310.

Draheim, M. 2007. Who's afraid of the big, bad coyote?: a survey of messaging and existing attitudes in the national capital region. Thesis, George Mason University, Fairfax, USA.

Draheim, M. M., L. L. Rockwood, G. Guagnano, and E. C. M. Parsons. 2011. The impact of information on students' beliefs and attitudes toward coyotes. Human Dimensions of Wildlife 16:67–72.

Gompper, M. E. 2002. Top Carnivores in the suburbs? Ecological and conservation issues raised by colonization of north-eastern North America by coyotes. BioScience 52:185–190.

Hill, E. P., P. W. Sumner, and J. B. Wooding. 1987. Human influences on range expansion of coyotes in the southeast. Wildlife Society Bulletin 15:521–524.

Hilton, H. 1992. Coyotes in Maine: a case study. Pages 183–194 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Inslerman, R. A. 1991. Public involvement in coyote management decisions. Proceedings of the Eastern Wildlife Damage Control Conference 5:196–197.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

Jones, E. J. 1987. Coyote damage in the southeastern United States. Third Eastern Wildlife Damage Control Conference 3:320.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1993. Perceptions knowledge of Alabama fruit and vegetable producers towards coyotes. Proceedings of the Sixth Eastern Wildlife Damage Control Conference 6:175–181.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

Way, J. G., S. M. Cifuni, D. L. Eatough, and E. G. Strauss. 2006. Rat poison kills a pack of eastern coyotes, *Canis latrans,* in an urban area. Canadian Field-Naturalist 120:478–480.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Weckel, M. E., D. Mack, C. Nagy, R. Christie, and A. Wincorn. 2010. Using citizen science to map human-coyote interaction in suburban New York, USA. Journal of Wildlife Management 74:1163–1171.

White, L. A., and S. D. Gehert. 2009. Coyote attacks on humans in the United States and Canada. Human Dimensions of Wildlife 14:419–432.

HYBRID

Adams, J. R., B. T. Kelly, and L. P. Waits. 2003. Using faecal DNA sampling and GIS to monitor hybridization between red wolves (*Canis rufus*) and coyotes (*Canis latrans*). Molecular Ecology 12:2175–2186.

Adams, J. R., J. A. Leonard, and L. P. Waits. 2003. Widespread occurrence of a domestic dog mitochondrial DNA haplotype in southeastern U.S. coyotes. Molecular Ecology 12:541–546.

Adams, J. R., C. Lucash, L. Schutte, and L. P. Waits. 2007. Locating hybrid individuals in the red wolf (*Canis rufus*) experimental population area using a spatially targeted sampling strategy and faecal DNA genotyping. Molecular Ecology 16:1823–1834.

Adams, J. R., and L. P. Waits. 2007. An efficient method for screening faecal DNA genotypes and detecting new individuals and hybrids in the red wolf (*Canis rufus*) experimental population area. Conservation Genetics 8:123–131.

Aquadro, C. F. 1975. Electrophoretic determination of blood protein variation between the eastern coyote and dog. Pages 12–19 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Chambers, S. M. 2010. A perspective on the Genetic Composition of Eastern Coyotes. Northeastern Naturalist 17:205–210.

Cox, J. J. 1997. Detection of hybridization events between the coyote, *Canis latrans,* and the domestic dog, *Canis familiaris,* using two polymorphic microsatellite loci and cranial morphometric analysis. Thesis, Morehead State University, Morehead, USA.

Cox, J. J., L. Meade, D. C. Yancy, and D. S. Maehr. 2001. The taxonomic status of wild Canis in Kentucky. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 55:408–417.

Dice, L. R. 1942. A family of dog-coyote hybrids. Journal of Mammalogy:186–192.

Fredrickson, R. J., and P. W. Hedrick. 2006. Dynamics of hybridization and introgression in red wolves and coyotes. Conservation Biology 20:1272–1283.

Gaskin, P. N. 1975. A multivariate analysis of skull characteristics of New York coyotes. Pages 5–11 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Kolenosky, G. B. 1971. Hybridization between wolf and coyote. Journal of Mammalogy 52:446–449.

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

Lawrence, B., and W. H. Bossert. 1969. The cranial evidence for hybridization in New England canis. Breviora 330:1–13.

Lehman, N., A. Eisenhawer, K. Hansen, L. D. Mech, R. O. Peterson, P. J. P. Gogan, and R. K. Wayne. 1991. Introgression of coyote mitochondrial DNA into sympatric North American gray wolf populations. Evolution 45:104–119.

Linzey, D. W. 1971. Animal harvested in south Alabama probably coyote-red wolf hybrid. Alabama Conservation December issue:6–7.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic dogs in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild Canis populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

Mengel, R. M. 1971. A study of dog-coyote hybrids and implications concerning hybridization in *Canis.* Journal of Mammalogy 52:316–336.

Miller, C. R., J. R. Adams, and L. P. Waits. 2003. Pedigree-biased assignment tests for reversing coyote (*Canis latrans*) introgression into the wild red wolf (*Canis rufus*) population. Molecular Ecology 12:3287–3301.

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

Nowak, R. M., and N. E. Federoff. 1998. Validity of the red wolf: response to Roy et al. Conservation Biology 12:722–725.

Reich, D. E., R. K. Wayne, and D. B. Goldstein. 1999. Genetic evidence for a recent origin by hybridization of red wolves. Molecular Ecology 8:139–144.

Roth, J. D., D. L. Murray, and T. D. Steury. 2008. Spatial dynamics of sympatric canids: modeling the impact of coyotes on red wolf recovery. Ecological Modeling 214:391–403.

Roy, M. S., E. Geffen, D. Smith, E. A. Ostrander, and R. K. Wayne. 1994. Patterns of differentiation and hybridization in North American wolflike canids, revealed by analysis of microsatellite loci. Molecular Biology and Evolution 11:553–570.

Roy, M. S., E. Geffen, D. Smith, and R. K. Wayne. 1996. Molecular genetics of pre-1940 red wolves. Conservation Biology 10:1413–1424.

Rutledge, L. Y., C. J. Garroway, K. M. Loveless, and B. R. Patterson. 2010. Genetic differentiation of eastern wolves in Algonquin Park despite bridging gene flow between coyotes and gray wolves. Heredity 64:1–12.

Schmitz, O. J., and G. B. Kolenosky. 1985. Hybridization between wolf and coyote in captivity. Journal of Mammalogy 66:402–405.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Silver, H., and W. T. Silver. 1969. Growth and behavior of the coyote-like canid of northern New England with observations on canid hybrids. Wildlife Monographs 17:1–41.

Thiel, R. P. 2006. Conditions for sexual interactions between Grey Wolves, *Canis lupus,* and Coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

Wayne, R. K., and S. M. Jenks. 1991. Mitochondrial DNA analysis implying extensive hybridization of the endangered red wolf, *Canis rufus.* Nature 351:565–568.

Wayne, R. K., and N. Lehman. 1992. Mitochondrial DNA analysis of the eastern coyote: origins and hybridization. Pages 9–22 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Wheeldon, T., B. Patterson, and B. White. 2010. Sympatric wolf and coyote populations of the western Great Lakes region are reproductively isolated. Molecular Ecology 19:4428–4440.

ILLINOIS

Alesandrini, J. A. 1983. Winter food habits of coyotes in central Illinois. Thesis, Illinois State University, Normal, USA.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Cypher, B. L. 1993. Food item use by three sympatric canids in southern Illinois. Transactions of the Illinois State Academy of Science 86:139–144.

Cypher, B. L. 1993. Food item use by coyote pups at Crab Orchard National Wildlife Refuge, Illinois. Transactions of the Illinois State Academy of Science 86:133–137.

Cypher, B. L., A. Woolf, and D. C. Yancy. 1993. Summer food habits of coyotes at Union County Conservation Area, Illinois. Transactions of the Illinois State Academy of Science 86:145–152.

Daine, K. 1989. Cranial variations and skull suture obliterations as related to age in the coyote (*Canis latrans*). Thesis, Eastern Illinois University, Charleston, USA.

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

Gehrt, S. D., and S. Prange. 2006. Interference competition between coyotes and raccoons: a test of the mesopredator release hypothesis. Behavioral Ecology 18:204–214.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and M. G. Joselyn. 2003. Temporal habitat partitioning and spatial use of coyotes and red foxes in east-central Illinois. Journal of Wildlife Management 67:90–103.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and P. C. Mankin. 2007. Survival and cause-specific mortality of red foxes in agricultural and urban areas of Illinois. Journal of Wildlife Management 71:1862–1873.

Gregory, D. G. 1998. Heartworm and lungworms in Illinois canids and their possible effect on coyote condition and reproduction. Thesis, Eastern Illinois University, Charleston, USA.

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

Keener, V. 1981. Gastrointestinal cestodes and nematodes of coyotes from southeastern Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Kick, T. J., G. F. Hubert Jr., and R. D. Andrews. 1984. Heartworms (*Dirofilaria immitis*) in coyotes (*Canis latrans*) in Illinois. Transactions of Illinois Academy of Sciences 77:127–134.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Maher, M. 2002. Aging coyotes using dental characteristics. Thesis, Eastern Illinois University, Charleston, USA.

Mahan, B. R., and E. C. Mahan. 2007. Demographics of coyotes (*Canis latrans*) during the late 1970s and 1990s in southwestern Illinois. Transactions of the Illinois State Academy of Science 100:251–257.

McDonald, P. T. 2006. Habitat affiliations of sympatric carnivores in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Morey, P. S., E. M. Gese, and S. Gehrt. 2007. Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. American Midland Naturalist 158:147–161.

Nelson, T. A., D. G. Gregory, and J. R. Laursen. 2003. Canine heartworms in coyotes in Illinois. Journal of Wildlife Diseases 39:593–599.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

Nelson, T. A., and A. Woolf. 1987. Mortality of white-tailed deer fawns in southern Illinois. Journal of Wildlife Management 51:326–329.

Piccolo, B. P., T. R. Van Deelen, K. Hollis-Etter, D. R. Etter, R. E. Warner, and C. Anchor. 2010. Behavior and survival of white-tailed deer neonates in two suburban forest preserves.

Prange, S., and S. D. Gehrt. 2007. Response of skunks to a simulated increase in coyote activity. Journal of Mammalogy 88:1040–1049.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

Randa, L. A., and J. A. Yunger. 2004. The influence of prey availability and vegetation characteristics on scent station visitation rates of coyotes, *Canis latrans,* in a heterogeneous environment. Canadian Field Naturalist. 118:341–353.

Van Deelen, T. R., and T. E. Gosselink. 2006. Coyote survival in a row-crop agricultural landscape. Canadian Journal of Zoology 84:1630–1636.

INDIANA

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

Atwood, T. C., and H. P. Weeks Jr. 2002. Facultative dyad formation in adult male coyotes. Northeastern Naturalist 9:353–358.

Atwood, T. C., and H. P. Weeks Jr. 2002. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. Canadian Journal of Zoology 81:1589–1597.

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

JUVENILE

Bekoff, M. 1978. Behavioral development in coyotes and eastern coyotes. Pages 97–127 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Cypher, B. L. 1993. Food item use by coyote pups at Crab Orchard National Wildlife Refuge, Illinois. Transactions of the Illinois State Academy of Science 86:133–137.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Harrison, D. J. 1992. Dispersal characteristics of juvenile coyotes in Maine. Journal of Wildlife Management 56:128–138.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Harrison, D. J., and J. A. Harrison. 1984. Foods of adult Maine coyotes and their known-aged pups. Journal of Wildlife Management 48:922–926.

Harrison, D. J., J. A. Harrison, and M. O'Donoghue. 1991. Predispersal movements of coyote in eastern Maine. Journal of Mammalogy 72:756–763.

Hill, H. L., and M. Bekoff. 1977. The variability of some motor components of social play and agnostic behavior in infant eastern coyotes. Animal Behavior 25:907–909.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

Parks, M. B. 1979. Physical and behavioral development of captive eastern coyote pups. Thesis, University of Maine, Orono, USA.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Ryon, J. 1986. Den digging and pup care in captive coyotes (*Canis latrans*). Canadian Journal of Zoology 64:1582–1585.

Silver, H., and W. T. Silver. 1969. Growth and behavior of the coyote-like canid of northern New England with observations on canid hybrids. Wildlife Monographs 17:1–41.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Stewart-Marks, C. 1989. Development of vocal behavior in the coyote (*Canis latrans*). Dissertation, Indiana State University, Terra Haute, USA.

Way, J. G. 2004. Survival of 8-week old eastern coyote pups following the death of their mother. Northeastern Naturalist 58:66–71.

KENTUCKY

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

Cox, J. J., L. Meade, D. C. Yancy, and D. S. Maehr. 2001. The taxonomic status of wild Canis in Kentucky. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 55:408–417.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Crossett III, R. L., and C. L. Elliott. 1991. Winter food habits of red foxes and coyotes in central Kentucky. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies 45:97–103.

Sharp, D. W. 1981. Siren-elicited responses of coyotes in western Kentucky and Tennessee. Proceedings of the Annual Conference of Fish and Wildlife Agencies 35:273–280.

LIVESTOCK

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Houben, J. M. 2004. Status and management of coyote depredations in the eastern United States. Sheep and Goat Research Journal 19:16–22.

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Jones, J. M. 1982. Food habits of west-central Illinois coyotes with emphasis on swine and white-tailed deer fawns as food items. Dissertation, Southern Illinois University at Carbondale, Carbondale, USA.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Slate, D. L. 1987. Coyotes in the eastern U.S.: status and implications. Proceedings of Eastern Wildlife Damage Control Conference 3:325–326.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

MAINE

Aldous, C. M. 1939. Coyotes in Maine. Journal of Mammalogy. 20(1):104–106.

Caturano, S. L. 1983. Habitat and home range use by coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Dibello, F. J., S. M. Arthur, and W. B. Krohn. 1990. Food habits of sympatric coyotes, *Canis latrans,* red fox, *Vulpes vulpes,* and bobcats, *Lynx rufus,* in Maine. Canadian Field Naturalist 104:403–408.

Engelhardt, D. B. 1986. Analysis of red fox and coyote home range use in relation to artificial scent marks. Thesis, University of Maine, Orono, USA.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern north America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Harrison, D. J. 1992. Dispersal characteristics of juvenile coyotes in Maine. Journal of Wildlife Management 56:128–138.

Harrison, D. J., J. A. Bissonette, and J. A. Sherburne. 1989. Spatial relationships between coyotes and red foxes in eastern Maine. Journal of Wildlife Management 53:181–185.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Harrison, D. J., and J. A. Harrison. 1984. Foods of adult Maine coyotes and their known-aged pups. Journal of Wildlife Management 48:922–926.

Harrison, D. J., J. A. Harrison, and M. O'Donoghue. 1991. Predispersal movements of coyote in eastern Maine. Journal of Mammalogy 72:756–763.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Hilton, H. 1992. Coyotes in Maine: a case study. Pages 183–194 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Hilton, H., and N. P. Kutscha. 1978. Distinguishing characteristics of the hairs of eastern coyote, domestic dog, red fox and bobcat in Maine. American Midland Naturalist 100:223–227.

Hilton, H., and V. B. Richens. 1975. Coyote food habits and prey relationships in Maine. Pages 74–82 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Lavigne, G. R. 1992. Sex/age composition and physical condition of deer killed by coyotes during winter in Maine. Pages 141–160 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

O'Connell Jr., A. F., D. J. Harrison, B. Connery, and K. B. Anderson. 1992. Food use by an insular population of coyotes. Northeast Wildlife 49:36–42.

Parks, M. B. 1979. Physical and behavioral development of captive eastern coyote pups. Thesis, University of Maine, Orono, USA.

Perkins, P. J., and W. W. Mautz. 1990. Energy requirements of eastern coyotes. Canadian Journal of Zoology 68:656–659.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

Wilson, P. J., W. J. Jakubas, and S. Mullen. 2004. Genetic status and morphological characteristics of Maine coyotes as related to neighboring coyote and wolf populations. Final report to the Maine Outdoor Heritage Fund Board, Grant #011–3-7. Maine Department of Inland Fisheries and Wildlife, Bangor, 58 pp.

Winter, L. A. 1990. Home range size and spatial relationships of coyotes and red foxes in Acadia National Park, Mount Desert Island, Maine. Thesis, University of Maine, Orono, USA.

MANAGEMENT

Billodeaux, L. E. 2007. The presence and public perception of coyotes (*Canis latrans*) in suburban and rural areas of western Georgia. Thesis. Auburn University, Auburn, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Chambers, R. E. 1987. Status of the coyote in the northeastern United States. Third Eastern Wildlife Damage Control Conference 3:318–319.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Hilton, H. 1992. Coyotes in Maine: a case study. Pages 183–194 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Howze, M. B. 2009. Predator removal and white-tailed deer recruitment in southwestern Georgia. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:17–20.

Inslerman, R. A. 1991. Public involvement in coyote management decisions. Proceedings of the Eastern Wildlife Damage Control Conference 5:196–197.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

Owens, R. D. 1987. Coyote control techniques and their applications in the eastern United States. Proceedings of the Eastern Wildlife Damage Control Conference 3:323–324.

Roth, J. D., D. L. Murray, and T. D. Steury. 2008. Spatial dynamics of sympatric canids: modeling the impact of coyotes on red wolf recovery. Ecological Modeling 214:391–403.

Stoskopf, M. K., K. Beck, B. B. Fazio, T. K. Fuller, E. M. Gese, B. T. Kelly, F. F. Knowlton, D. L. Murray, W. Waddell, and L. Waits. 2005. From the field: implementing recovery of the red wolf integrating research scientists and managers. Wildlife Society Bulletin 33:1145–1152.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

MASSACHUSETTS

Decker, T. A., W. M. Healy, and S. A. Williams. 1992. Survival of white-tailed deer fawns in western Massachusetts. Northeast Wildlife 49:28–35.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Page, M. S. 2010. Spatial ecology of eastern coyotes (*Canis latrans*) in the anthropogenic landscape of Cape Cod, Massachusetts. Thesis, University of Massachusetts, Amherst, USA.

Pringle, L. P. 1960. Notes on coyotes in southern New England. Journal of Mammalogy 41:278.

Stupakoff, G. 1994. Habitat use of eastern coyotes (*Canis latrans* var.) on Prescott Peninsula, Quabbin Reservation, Massachusetts. Thesis, Hampshire College, Amherst, USA.

Wang, X., C. M. Brown, S. Smole, B. G. Werner, L. Han, M. Farris, and A. DeMaris. 2010. Aggression and rabid coyotes, Massachusetts, USA. Emerging Infectious Diseases 16:357–359.

Warfel, H. E. 1937. A coyote in Hampshire County, Massachusetts. Journal of Mammalogy 18:241.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2002. Radiocollared coyote crosses Cape Cod canal. Northeast Wildlife 57:63–65.

Way, J. G. 2003. Description and possible reasons for an abnormally large group size of adult eastern coyotes observed during summer. Northeastern Naturalist 10:335–342.

Way, J. G. 2004. Survival of 8-week old eastern coyote pups following the death of their mother. Northeastern Naturalist 58:66–71.

Way, J. G. 2007. A comparison of body mass of *Canis latrans* (coyotes) between eastern and western North America. Northeastern Naturalist 14:111–124.

Way, J. G. 2007. Movements of transient coyotes, *Canis latrans,* in urbanized Eastern Massachusetts. Canadian Field-Naturalist 121:364–369.

Way, J. G. 2007. Social and play behavior in a wild eastern coyote, *Canis latrans,* pack. Canadian Field-Naturalist 121:397–401.

Way, J. G. 2008. Eastern coyotes, *Canis latrans,* observed feeding on periodical cicadas, *Magicicada septendecim.* Canadian Field-Naturalist 122:271–272.

Way, J. G. 2009. Observations of coyowolves, *Canis latrans* × *lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

Way, J. G., P. J. Auger, I. M. Ortega, and E. S. Strauss. 2001. Eastern coyote denning behavior in an anthropogenic environment. Northeast Wildlife 56:18–30.

Way, J. G., S. M. Cifuni, D. L. Eatough, and E. G. Strauss. 2006. Rat poison kills a pack of eastern coyotes, *Canis latrans,* in an urban area. Canadian Field-Naturalist 120:478–480.

Way, J. G., and D. L. Eatough. 2006. Use of "micro"–corridors by eastern coyotes, *Canis latrans,* in an heavily urbanized area: implications for ecosystem management. Canadian Field-Naturalist 120:474–476.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Way, J. G., I. M. Ortega, P. J. Auger, and E. G. Strauss. 2002. Box-trapping eastern coyotes in southeastern Massachusetts. Wildlife Society Bulletin 30:695–702

Way, J. G., I. M. Ortega, and E. G. Strauss. 2004. Movement and activity patterns of eastern coyotes in a costal, suburban environment. Northeastern Naturalist 11:237–254.

Way, J. G., and R. L. Proietto. 2005. Record size female coyote, *Canis latrans.* Canadian Field Naturalist 119:139–140.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

Way, J. G., and B. C. Timm. 2011. Record pack-density of eastern coyotes/coywolves (*canis latrans* × *lycaon*). American Midland Naturalist 165:201–203.

Worley, K. J. 2005. Geospatial and statistical analysis of home range areas and suburban / urban land use patterns of eastern coyotes (*Canis latrans*) on Cape Cod, Massachusetts. Thesis, University of Massachusetts, Boston, USA.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male.

MICHIGAN

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Berentsen, A. R., M. R. Dunbar, S. R. Johnson, S. Robbe-Austerman, L. Martinez, and R. L. Jones. 2011. Active use of coyotes (Canis latrans) to detect Bovine Tuberculosis in northeastern Michigan, USA. Vetenary Microbiology: in press.

Bruning-Fann, C. S., S. M. Schmitt, S. D. Fitzgerald, J. B. Payeur, D. L. Whipple, T. M. Cooley, T. Carision, and P. Friedrich. 1998. *Mycobacterium bovis* in coyotes from Michigan. Journal of Wildlife Diseases 34:632–636.

Davidson-Nelson, S. J., and T. M. Gehring. 2010. Testing fladry as a nonlethal management tool for wolves and coyotes in Michigan. Human-Wildlife Interactions 4:87–94.

Dunatchik, D. D. 1967. The helminth parasites of Michigan coyotes. Thesis, University of Michigan, Ann Arbor, USA.

Krefting, L. W. 1969. The rise and fall of the coyote on Isle Royale. Naturalist 20(4):24–31.

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

Ozoga, J. J., and E. M. Harger. 1966. Occurence of albino and melanistic coyotes in Michigan. Journal of Mammalogy 47:339–340.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

VerCauteren, K. C., T. C. Atwood, T. J. DeLiberto, H. J. Smith, J. S. Stevenson, B. V. Thomsen, T. Gidlewski, and J. Payeur. 2008. Emerging Infectious Diseases 14:1862–1869.

MISSISSIPPI

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Chamberlain, M. J., and B. D. Leopold. 1999. Dietary patterns of sympatric bobcats and coyotes in central Mississippi. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 53:204–219.

Chamberlain, M. J., and B. D. Leopold. 2001. Survival and cause specific mortality of adult coyotes (*Canis latrans*) in central Mississippi. American Midland Naturalist 145:414–418.

Chamberlain, M. J., and B. D. Leopold. 2005. Overlap in space use among bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and gray foxes (*Urocyon cinereoargenteus*). American Midland Naturalist 153:171–179.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Hill, E. P., P. W. Sumner, and J. B. Wooding. 1987. Human influences on range expansion of coyotes in the southeast. Wildlife Society Bulletin 15:521–524.

Lovell, C. D. 1996. Bobcat, coyote, and gray fox micro-habitat use and interspecies relationships in a managed forest in central Mississippi. Thesis, Mississippi State, Starkville, USA.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic doges in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

Paradiso, J. L. 1966. Recent records of coyotes, *Canis latrans,* from the southeastern United States. Southwest Naturalist 11:500–501.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

Wagner, G. D. 1993. Coyote diet in areas of wild turkey abundance during the wild turkey reproductive season. Thesis, Mississippi State University, Starkville, USA.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

Woodling, J. B., E. P. Hill, and P. W. Sumner. 1984. Coyote food habits in Mississippi and Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 38:182–188.

MORPHOLOGY

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Crête, M., and S. Larivière. 2003. Estimating the costs of locomotion in snow for coyotes. Canadian Journal of Zoology 81:1808–1814.

Daine, K. 1989. Cranial variations and skull suture obliterations as related to age in the coyote (*Canis latrans*). Thesis, Eastern Illinois University, Charleston, USA.

Dumond, M., and M. A. Villard. 2000. Demography and body condition of coyotes (*Canis latrans*) in eastern New Brunswick. Canadian Journal of Zoology 78:399–406.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of canids from Missouri. Journal of Mammalogy 58:17–24.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

Gaskin, P. N. 1975. A multivariate analysis of skull characteristics of New York coyotes. Pages 5–11 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Glatz, R. G. 1975. The status of the coyote in Connecticut. Pages 33–40 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Gregory, D. G. 1998. Heartworm and lungworms in Illinois canids and their possible effect on coyote condition and reproduction. Thesis, Eastern Illinois University, Charleston, USA.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Hilton, H., and N. P. Kutscha. 1978. Distinguishing characteristics of the hairs of eastern coyote, domestic dog, red fox and bobcat in Maine. American Midland Naturalist 100:223–227.

Houben, J. M., and J. R. Mason. 2004. Weight and age of coyotes captured in Virginia, USA. Proceedings of Vertebrate Pest Conference 21:75–76.

Howard, W. E. 1949. A means to distinguish skulls of coyotes and domestic dogs. Journal of Mammalogy 30:169–171.

Huot, J., M. L. Poulle, and M. Crête. 1995. Evaluation of several indices for assessment of coyote (*Canis latrans*) body composition. Canadian Journal of Zoology 73:1620–1624.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Kennedy, M. L., P. L. Leberg, and G. D. Baumgardner. 1986. Morphologic variation in the coyote, *Canis latrans,* in the southern United States. The Southwestern Naturalist 31:139–148.

Kennedy, M. L., S. G. Mech, B. Tran, J. W. Grubaugh, and R. F. Lance. 2003. An assessment of geographic variation in sexual size dimorphism in the coyote (*Canis latrans*). Mammalia 67:411–417.

Lariviére, S., and M. Crête. 1993. The size of eastern coyotes a comment. Journal of Mammalogy 74:1072–1074.

Lawrence, B., and W. H. Bossert. 1969. The cranial evidence for hybridization in New England canis. Breviora 330:1–13.

Litvaitis, J. A., and W. M. Mautz. 1980. Food and energy use by captive coyotes. Journal of Wildlife Management 44:56–61.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Lydeard, C. 1986. Morphologic assessment of recently founded population of the coyote, *Canis latrans,* in Tennessee. Thesis, Memphis State University, Memphis, USA.

Lydeard, C., and M. L. Kennedy. 1988. Morphologic assessment of recently founded populations of the coyote, *Canis latrans,* in Tennessee. Journal of Mammalogy 69:773–781.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic dogs in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

Maher, M. 2002. Aging coyotes using dental characteristics. Thesis, Eastern Illinois University, Charleston, USA.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild Canis populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

McKenna, S. 1985. Cranial morphometry of eastern coyotes (*Canis latrans* var). Thesis, Tennessee Technological University, Cookeville, USA.

Moore, G. C., and J. S. Millar. 1986. Food habits and average weights of a fall-winter sample of eastern coyotes, *Canis latrans.* Canadian Field Naturalist 100:105–106.

Moore, W. J., and J. C. Williamson. 1975. Food habits and morphometry of coyotes in Ontario's Prince Edward County. Pages 68–73 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Nelson, T. A., D. G. Gregory, and J. R. Laursen. 2003. Canine heartworms in coyotes in Illinois. Journal of Wildlife Diseases 39:593–599.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

Ozoga, J. J., and E. M. Harger. 1966. Occurrence of albino and melanistic coyotes in Michigan. Journal of Mammalogy 47:339–340.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

Pekins, P. J. 1992. Winter diet and bioenergenics of eastern coyotes: a review. Pages 87–100 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Perkins, P. J., and W. W. Mautz. 1990. Energy requirements of eastern coyotes. Canadian Journal of Zoology 68:656–659.

Peterson, R. O., and J. M. Thurber. 1993. The size of eastern coyotes: a rebuttal. Journal of Mammalogy 74:1075–1076.

Poulle, M. .L., M. Crête, and J. Hout. 1995. Seasonal variation in body mass and composition of eastern coyotes. Canadian Journal of Zoology 73:1625–1633.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

Schmitz, O. J., and G. B. Kolenosky. 1985. Wolves and coyotes in Ontario: morphological relationships and origins. Canadian Journal of Zoology 63:1130–1137.

Schmitz, O. J., and D. M. Lavigne. 1987. Factors affecting body size in sympatric Ontario *Canis.* Journal of Mammalogy 68:92–99.

Schmutz, S. M., T. G. Berryere, J. L. Barta, K. D. Reddick, and J. K. Schmutz. 2007. Agouti sequence polymorphisms in coyotes, wolves and dogs suggest hybridization. Journal of Heredity 98:351–355.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

Thurber, J., and R. O. Peterson. 1991. Changes in body size associated with range expansion in the coyote. Journal of Mammalogy 72:750–755.

Way, J. G. 2007. A comparison of body mass of *Canis latrans* (coyotes) between eastern and western North America. Northeastern Naturalist 14:111–124.

Way, J. G., and R. L. Proietto. 2005. Record size female coyote, *Canis latrans.* Canadian Field Naturalist 119:139–140.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Whiteman, E. E. 1940. Studies of pelage changes, food habits and breeding habits of captive coyotes (*Canis* latrans latrans). Thesis, Michigan State College of Agriculture and Applied Science, East Lansing, USA.

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

MOVEMENTS (SEE ALSO HOME RANGE, TRANSIENT)

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

Babb, J. G. 1988. Density and home range of the coyote (*Canis latrans*) in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Babb, J. G., and M. L. Kennedy. 1988. Home range of the coyote in western Tennessee. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 42:443–447.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

Crawford, B. A. 1992. Coyotes in Great Smoky Mountains National Park: evaluation of methods to monitor relative abundance, movement ecology, and habitat use. Thesis, University of Tennessee, Knoxville, USA.

Crête, M., J. P. Ouellet, J. P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Dennis, D. L. 2010. Genetic analysis of dispersal and population dynamics of the southeastern coyote (*Canis latrans*). Thesis, Auburn University, Auburn, USA.

Edwards, D. A. 1996. Ecological relationships among bobcats, coyotes, and gray foxes in central Mississippi. Thesis, Mississippi State University, Starkville, USA.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Harrison, D. J. 1992. Dispersal characteristics of juvenile coyotes in Maine. Journal of Wildlife Management 56:128–138.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Harrison, D. J., J. A. Harrison, and M. O'Donoghue. 1991. Predispersal movements of coyote in eastern Maine. Journal of Mammalogy 72:756–763.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Litvaitis, J. A., and D. J. Harrison. 1989. Bobcat-coyote niche relationships during a period of coyote population increase. Canadian Journal of Zoology 67:1180–1188.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

Morton, L. D. 1989. Winter ecology of the eastern coyote (*Canis latrans*) in Fundy National Park. Thesis, University of New Brunswick, Fredericton, Canada.

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

Parker, G. R. and J. W. Maxwell. 1989. Seasonal movements and winter ecology of the coyote, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 103:1–11.

Patterson, B. R., S. Bondrup-Nielsen, and F. Messier. 1999. Activity patterns and daily movements of the eastern coyote, *Canis latrans,* in Nova Scotia. Canadian Field Naturalist 113:251–257.

Pekins, P. J. 1992. Winter diet and bioenergenics of eastern coyotes: a review. Pages 87–100 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

Rosatte, R. C. 2002. Long distance movement of a coyote, *Canis latrans,* and red fox, *Vulpes vulpes,* in Ontario: implications for disease spread. Canadian Field Naturalist 116:129–131.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

Sumner, P. W. 1984. Movements, home range and habitat use by coyotes in east Mississippi and west Alabama. Thesis, Mississippi State University, Starkville, USA.

Sumner, P. W., E. P. Hill, and J. B. Wooding. 1984. Activity and movements of coyotes in Mississippi and Alabama. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 38:174–181.

Thibault, I., and J. P. Ouellet. 2005. Hunting behaviour of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12(4):466–475.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. Journal of Wildlife Management 47:852–857.

Way, J. G. 2002. Radiocollared coyote crosses Cape Cod canal. Northeast Wildlife 57:63–65.

Way, J. G. 2007. Movements of transient coyotes, *Canis latrans,* in urbanized Eastern Massachusetts. Canadian Field-Naturalist 121:364–369.

Way, J. G. 2009. Observations of coyowolves, *Canis latrans× lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

Way, J. G., and D. L. Eatough. 2006. Use of "micro"-corridors by eastern coyotes, *Canis latrans,* in an heavily urbanized area: implications for ecosystem management. Canadian Field-Naturalist 120:474–476.

Way, J. G., I. M. Ortega, and E. G. Strauss. 2004. Movement and activity patterns of eastern coyotes in a costal, suburban environment. Northeastern Naturalist 11:237–254.

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

NEWFOUNDLAND AND LABRADOR

Bourque, A., H. Whitney, and G. Conboy. 2005. *Angiostrongylus vasorum* infection in a coyote (*Canis latrans*) from Newfoundland and Labrador, Canada. Journal of Wildlife Diseases 41:816–819.

Chubbs, T. E., and F. R. Phillips. 2002. First record of an eastern coyote, *Canis latrans,* in Labrador. Canadian Field Naturalist 116:127–129.

Chubbs, T. E., and F. R. Phillips. 2005. Evidence of range expansion of eastern coyotes, *Canis latrans,* in Labrador. Canadian Field Naturalist 119:381–384.

NEW HAMPSHIRE

Moore, G. C., and J. S. Millar. 1986. Food habits and average weights of a fall-winter sample of eastern coyotes, *Canis latrans.* Canadian Field Naturalist 100:105–106.

Silver, H., and W. T. Silver. 1969. Growth and behavior of the coyote-like canid of northern New England with observations on canid hybrids. Wildlife Monographs 17:1–41.

Thurber, J., and R. O. Peterson. 1991. Changes in body size associated with range expansion in the coyote. Journal of Mammalogy 72:750–755.

Wiley, J. E. 1975. Status of the eastern coyote in New Hampshire. Pages 20–32 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

NEW JERSEY

Eastman, S. A. 2000. Home ranges and diseases of coyotes (*Canis latrans*) in northwestern New Jersey and northeastern Pennsylvania. Thesis, East Stroudsburg University, East Stroudsburg, USA.

Lund, R. C. 1975. Status of the eastern coyote in New Jersey. Pages 41–47 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

NEW YORK

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis. State University of New York at Albany, Albany, USA.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Chambers, R. E. 1987. Diets of Adirondack coyotes and red foxes in the central Adirondacks. Transactions of the North Eastern Section of the Wildlife Society 44:90 (abstract). (Proceedings

of the Northeast Fish and Wildlife Conference Boston, MA) (this same article was cited in two articles. One cited as coming from one conference, the other cited it as coming from another)

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

Fener, H. M., J. R. Ginsberg, E. W. Sanderson, and M. E. Gompper. 2005. Chronology of range expansion of the coyote, *Canis latrans,* in New York. Canadian Field Naturalist 119:1–5.

Gaskin, P. N. 1975. A multivariate analysis of skull characteristics of New York coyotes. Pages 5–11 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Gompper, M. E., R. M. Goodman, R. W. Kays, J. C. Ray, C. V. Fiorello and S. E. Wade. 2003. A survey of the parasites of coyotes (*Canis latrans*) in New York based on fecal analysis. Journal of Wildlife Diseases 39:712–717.

Hamilton Jr., W. J. 1974. Food habits of the coyote in the Adirondacks. New York Fish and Game Journal 21:177–181.

Inslerman, R. A. 1991. Public involvement in coyote management decisions. Proceedings of the Eastern Wildlife Damage Control Conference 5:196–197.

Kays, R. W., M. E. Gompper, and J. C. Ray. 2008. Landscape ecology of eastern coyotes based on large-scale estimates of abundance. Ecological Applications 18:1014–1027.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Monson, R. A., W. B. Stone, and B. L. Weber. 1973. Heartworms in foxes and wild Canids in New York. New York Fish and Game Journal 20:48–53.

Okoniewski, J. C. 1980. Vocal response of eastern coyotes to an electronic siren and human howling. Thesis, State University of New York, Syracuse, USA.

Okoniewski, J. C., and W. B. Stone. 1983. Causes of morbidity and mortality in coyotes in New York. New York Fish and Game Journal 30:224–227.

Post, R. A. 1975. An ecological study of Northern Tug Hill coyotes. Thesis, State University of New York, Syracuse, USA.

Severinghaus, C. W. 1974. Notes on the history of wild Canids in New York. New York.Fish and Game Journal 21:117–125.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

Weckel, M. E., D. Mack, C. Nagy, R. Christie, and A. Wincorn. 2010. Using citizen science to map human-coyote interaction in suburban New York, USA. Journal of Wildlife Management 74:1163–1171.

NORTH CAROLINA

Debow, T. M., W. D. Webster, and P. W. Sumner. 1998. Range expansion of the coyote, *Canis latrans* (Carnivora: Canidae), into North Carolina; with comments on some management implications. Journal of the Elisha Mitchell Scientific Society 114:113–118.

NOVA SCOTIA

MacKinnon, C. M., A. C. Kennedy, and D. W. Colpitts. 2007. Details of eastern coyote, *Canis latrans,* predation on great black-backed gull, *Larus marinus,* eggs on Boot Island National Wildlife Area, Nova Scotia.

Moore, G. C., and J. S. Millar. 1986. Food habits and average weights of a fall-winter sample of eastern coyotes, *Canis latrans.* Canadian Field Naturalist 100:105–106.

Muntz, E. M., and B. R. Paterson. 2004. Evidence for the use of vocalization to coordinate the killing of a white-tailed deer, *Odocoileus virginianus,* by coyotes, *Canis latrans.* Canadian Field Naturalist 118:278–280.

Patterson, B. R., S. Bondrup-Nielsen, and F. Messier. 1999. Activity patterns and daily movements of the eastern coyote, *Canis latrans,* in Nova Scotia. Canadian Field Naturalist 113:251–257.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

OHIO

Bollin-Booth, H. A. 2007. Diet analysis of the coyote (*Canis latrans*) in metropolitan park systems of northeast Ohio. Thesis, Cleveland State University, Cleveland, USA.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Cepak, J. D. 2000. Population monitoring and diet analysis of coyotes in the Cuyahoga Valley National Recreation Area, Ohio. Thesis, Cleveland State University, Cleveland, USA.

Cepek, J. D. 2004. Diet composition of coyotes in the Cuyahoga Valley National Park, Ohio. Ohio Journal of Science 104:60–64.

Hennessy, C. A. 2007. Mating strategies and pack structure of coyotes in an urban landscape: a genetic investigation. Thesis, Ohio State University, Columbus, USA.

Judy, B. A. 2010. Assessment of habitat use by eastern coyote (Canis latrans) along an urban-parkland gradient. Thesis, Cleveland State University, Cleveland, USA.

Weeks, J. L., G. M. Tori, and M. C. Shieldcastle. 1990. Coyotes (*Canis latrans*) in Ohio. Ohio Journal of Science 90:142–145.

Worstall, C. A, and J. L. Dooley. 2004. Predation habits of the eastern coyote (*Canis latrans*) in southeastern Ohio. The Ohio Journal of Science 104:A-17.

ONTARIO

Freeman, R. S., A. Adorjan, and D. H. Pimlott. 1961. Cestodes of wolves, coyotes, and coyote-dog hybrids in Ontario. Canadian Journal of Zoology 39:527–532.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Moore, W. J., and J. C. Williamson. 1975. Food habits and morphometry of coyotes in Ontario's Prince Edward County. Pages 68–73 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Rand, A. L. 1945. Mammals of the Ottawa district. Canadian Field Naturalist 59:111–132.

Rosatte, R. C. 2002. Long distance movement of a coyote, *Canis latrans,* and red fox, *Vulpes vulpes,* in Ontario: implications for disease spread. Canadian Field Naturalist 116:129–131.

Schmitz, O. J., and G. B. Kolenosky. 1985. Wolves and coyotes in Ontario: morphological relationships and origins. Canadian Journal of Zoology 63:1130–1137.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

PENNSYLVANIA

Bixel, K. D. 1995. Trophic ecology of adult coyotes (*Canis latrans*) in south central Pennsylvania. Thesis, Shippensburg University, Shippensburg, USA.

Bixel, K. D. 1995. Survey of the endoparasites of south central Pennsylvania coyotes using fecal analysis. Journal of the Pennsylvania Academy of Science 69:17–21.

Eastman, S. A. 2000. Home ranges and diseases of coyotes (*Canis latrans*) in northwestern New Jersey and northeastern Pennsylvania. Thesis, East Stroudsburg University, East Stroudsburg, USA.

McGinnis, H. J. 1979. Pennsylvania coyotes and their relationship to other wild Canis populations in the Great Lakes region and the northeastern United States. Thesis, Pennsylvania State University, State College, USA.

Trout, J. M., M. Santín, and R. Fayer. 2006. *Giardia* and *cryptosporidium* species and genotypes in coyotes (*Canis latrans*). Journal of Zoo and Wildlife Medicine 37:141–144.

Vreeland, J. K., D. R. Diefenbach, and B. D. Wallingford. 2004. Survival rates, mortality causes, and habitats of Pennsylvania white-tailed deer fawns. Wildlife Society Bulletin 32:542–553.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennslvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

Witmer, G. W., M. J. Pipas, and A. Hayden. 1995. Some observations on coyote food habits in Pennsylvania. Journal of the Pennsylvania Academy of Science 69:77–80.

POPULATION DENSITY

Babb, J. G. 1988. Density and home range of the coyote (*Canis latrans*) in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Babb, J. G., and M. L. Kennedy. 1989. An estimate of minimum density for coyotes in western Tennessee. Journal of Wildlife Management 53:186–188.

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Chambers, R. E. 1987. Status of the coyote in the northeastern United States. Third Eastern Wildlife Damage Control Conference 3:318–319.

Crawford, B. A., M. R. Pelton, and K. G. Johnson. 1993. Techniques to monitor relative abundance of coyotes in east Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies 47:62–70.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Fisher, R. M. 1977. A survey on the status of the coyote (*Canis latrans*) in Georgia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, USA.

Goff, G. R. 1979. Analysis and evaluation of three indices of eastern coyote abundance. Thesis, College of Environmental Science and Forestry, Syracuse, USA.

Kays, R. W., M. E. Gompper, and J. C. Ray. 2008. Landscape ecology of eastern coyotes based on large-scale estimates of abundance. Ecological Applications 18:1014–1027.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

Richer, M. C., M. Crête, J. P. Ouellet, L. P. Rivest, and J. Huot. 2002. The low performance of forest versus rural coyotes in northeastern North America: Inequality between presence and availability of prey. Ecoscience 9:44–54.

Samson, C., and M. Crete. 1997. Summer food habits and population density of coyotes, *Canis latrans,* in boreal forests of southeastern Quebec. Canadian Field Naturalist 111:227–233.

Sharp, D. W. 1981. Siren-elicited responses of coyotes in western Kentucky and Tennessee. Proceedings of the Annual Conference of Fish and Wildlife Agencies 35:273–280.

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

Way, J. G., and B. C. Timm. 2011. Record pack-density of eastern coyotes/coywolves (*canis latrans* × *lycaon*). American Midland Naturalist 165:201–203.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male.

POPULATION DYNAMICS

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Dennis, D. L. 2010. Genetic analysis of dispersal and population dynamics of the southeastern coyote (*Canis latrans*). Thesis, Auburn University, Auburn, USA.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Lovell, C. D., B. D. Leopold, and C. C. Shropshire. 1998. Trends in Mississippi predator populations, 1980–1995. Wildlife Society Bulletin 26:552–556.

PUP (SEE JUVENILE)

PREDATION

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Ballard, W. B., H. A. Whitlaw, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1999. Predation and survival of white-tailed deer fawns in northcentral New Brunswick. Journal of Wildlife Management 63:574–579.

Bider, J. R., and P. G. Weil. 1984. Dog, *Canis familiaris,* killed by a coyote, *Canis latrans,* on Montreal Island, Quebec. Canadian Field Naturalist 98:498–499.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

Decker, T. A., W. M. Healy, and S. A. Williams. 1992. Survival of white-tailed deer fawns in western Massachusetts. Northeast Wildlife 49:28–35.

Gehrt, S. D., and S. Prange. 2006. Interference competition between coyotes and raccoons: a test of the mesopredator release hypothesis. Behavioral Ecology 18:204–214.

Gélinas, G. 1980. The feeding habits of the eastern coyote (*Canis latrans thamnos*) on Manitoulin Island, Ontario. Thesis, Laurentian University, Sudbury, Canada.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Houben, J. M. 2004. Status and management of coyote depredations in the eastern United States. Sheep and Goat Research Journal 19:16–22.

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Howze, M. B. 2009. Predator removal and white-tailed deer recruitment in southwestern Georgia. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:17–20.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

Land, E. D., D. S. Maehr, J. C. Roof, and J. W. McCown. 1993. Mortality patterns of female white-tailed deer in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:176–184.

Lavigne, G. R. 1992. Sex/age composition and physical condition of deer killed by coyotes during winter in Maine. Pages 141–160 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

MacKinnon, C. M., A. C. Kennedy, and D. W. Colpitts. 2007. Details of eastern coyote, *Canis latrans,* predation on great black-backed gull, *Larus marinus,* eggs on Boot Island National Wildlife Area, Nova Scotia.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an antipredator strategy. Canadian Journal of Zoology 63:785–789.

Messier, F., C. Barrette, and J. Huot. 1986. Coyote predation on a white-tailed deer population in southern Quebec. Canadian Journal of Zoology 64:1134–1136.

Muntz, E. M., and B. R. Paterson. 2004. Evidence for the use of vocalization to coordinate the killing of a white-tailed deer, *Odocoileus virginianus,* by coyotes, *Canis latrans.* Canadian Field Naturalist 118:278–280.

Nelson, T. A., and A. Woolf. 1987. Mortality of white-tailed deer fawns in southern Illinois. Journal of Wildlife Management 51:326–329.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

Patterson, B. R., and F. Messier. 2003. Age and condition of deer killed by coyotes in Nova Scotia. Canadian Journal of Zoology 81:1894–1898.

Piccolo, B. P., T. R. Van Deelen, K. Hollis-Etter, D. R. Etter, R. E. Warner, and C. Anchor. 2010. Behavior and survival of white-tailed deer neonates in two suburban forest preserves.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Saalfeld, S. T., and S. S. Ditchkoff. 2006. Survival of neonatal white-tailed deer in an exurban population. Journal of Wildlife Management 71:940–944.

Thibault, I., and J. P. Ouellet. 2005. Hunting behaviour of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12(4):466–475.

Tomsa, T. N., and J. E. Forbes. 1989. Coyote depredation control in New York—an integrated approach. Proceedings of Eastern Wildlife Damage Control Conference 4:75–82.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

Vreeland, J. K., D. R. Diefenbach, and B. D. Wallingford. 2004. Survival rates, mortality causes, and habitats of Pennsylvania white-tailed deer fawns. Wildlife Society Bulletin 32:542–553.

Whitlaw, H. A., W. B. Ballard, D. L. Sabine, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1998. Survival and cause-specific mortality rates of adult white-tailed deer in New Brunswick. Journal of Wildlife Management 62:1335–1341.

Witmer, G., and A. Hayden. 1991. Status of coyotes and coyote depredations in Pennsylvania. Proceedings of Eastern Wildlife Damage Control Conference 5:83–87.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

PRODUCER

Armstrong, J. B., and N. K. Walters. 1995. Using a toll-free telephone "hotline" to assess coyote depredation in Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 49:537–544.

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Main, M. B., M. D. Fanning, J. J. Mullahey, S. Coates, and D. H. Thornton. 2002. Cattlemen's perceptions of coyotes in Florida. Florida Scientist 66:55–62.

McAninch, J. B., and M. G. Fargione. 1987. Characteristics of predation and losses in the New York Sheep Industry. Eastern Wildlife Damage Control Conference 3:260–268.

Phillipp, M. C. 1994. Perceptions and knowledge of three Alabama agribusiness organizations towards coyotes and coyote damage. Thesis, Auburn University, Auburn, USA.

Philipp, M. C., and J. B. Armstrong. 1994. Perceptions by Alabama livestock producers of coyotes. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:191–200.

Witmer, G., A. Hayden, and M. Pipas. 1993. Predator depredations on sheep in Pennsylvania. Proceedings Eastern Wildlife Damage Control Conference 6:194–200.

QUEBEC

Bider, J. R., and P. G. Weil. 1984. Dog, *Canis familiaris,* killed by a coyote, *Canis latrans,* on Montreal Island, Quebec. Canadian Field Naturalist 98:498–499.

Boisjoly, D., J. Ouellet and R. Courtois. 2010. Coyote habitat selection and management implications for the Gaspésie caribou. Journal of Wildlife Management 74:3–11.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Crête, M., J. P. Ouellet, J. P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

Georges, S. 1976. A range extension of the coyote in Quebec. Canadian Field Naturalist 90:78–79.

Jean, Y., and J. M. Bergeron. 1984. Productivity of coyotes (*Canis latrans*) from southern Québec. Canadian Journal of Zoology 62:2240–2243.

Mosnier, A., D. Boisjoly, R. Courtois, and J. P. Ouellet. 2006. Extensive predator space use can limit the efficacy of a control program. Wildlife Management 72:483–491.

Samson, C., and M. Crete. 1997. Summer food habits and population density of coyotes, *Canis latrans,* in boreal forests of southeastern Quebec. Canadian Field Naturalist 111:227–233.

RACCOON (*PROCYON LOTOR*)

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Gehrt, S. D., and S. Prange. 2006. Interference competition between coyotes and raccoons: a test of the mesopredator release hypothesis. Behavioral Ecology 18:204–214.

RANGE / RANGE EXPANSION

Aldous, C. M. 1939. Coyotes in Maine. Journal of Mammalogy. 20(1):104–106.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Brady, J. R., and H. W. Campell. 1983. Distribution of coyotes in Florida. Florida Field Naturalist 11:40–41.

Chambers, R. E. 1987. Status of the coyote in the northeastern United States. Third Eastern Wildlife Damage Control Conference 3:318–319.

Chambers, R. E. 2000. A howling success: the eastern coyote. New York State Conservationist 55:1 19–21.

Chubbs, T. E., and F. R. Phillips. 2005. Evidence of range expansion of eastern coyotes, *Canis latrans,* in Labrador. Canadian Field Naturalist 119:381–384.

Crête, M., and A. Desrosiers. 1995. Range expansion of coyotes, *Canis latrans,* threatens a remnant herd of caribou, *Rangifer tarandus,* in southeastern Quebec. Canadian Field Naturalist 109:227–235.

Cunningham, V. C., and R. D. Dunford. 1970. Recent coyote record from Florida. Q. J. Florida Academy Sciences 33:279–280.

Debow, T. M., W. D. Webster, and P. W. Sumner. 1998. Range expansion of the coyote, *Canis latrans* (Carnivora: Canidae), into North Carolina; with comments on some management implications. Journal of the Elisha Mitchell Scientific Society 114:113–118.

Fener, H. M., J. R. Ginsberg, E. W. Sanderson, and M. E. Gompper. 2005. Chronology of range expansion of the coyote, *Canis latrans,* in New York. Canadian Field Naturalist 119:1–5.

Georges, S. 1976. A range extension of the coyote in Quebec. Canadian Field Naturalist 90:78–79.

Glatz, R. G. 1975. The status of the coyote in Connecticut. Pages 33–40 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Gompper, M. E. 2002. The ecology of northeast coyotes: current knowledge and priorities for future research. Wildlife Conservation Society Working Paper 17.

Gompper, M. E. 2002. Top Carnivores in the suburbs? Ecological and conservation issues raised by colonization of north-eastern North America by coyotes. BioScience 52:185–190.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Hill, E. P., P. W. Sumner, and J. B. Wooding. 1987. Human influences on range expansion of coyotes in the southeast. Wildlife Society Bulletin 15:521–524.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Lund, R. C. 1975. Status of the eastern coyote in New Jersey. Pages 41–47 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Maehr, D. S., R. T. McBride, and J. J. Mullahey. 1996. Status of coyotes in south Florida. Florida Field Naturalist 24:101–107.

Main, M. B., S. F. Coates, and G. M. Allen. 2000. Coyote distribution in Florida extends southward. Florida Field Naturalist 28:201–203.

Main, M. B., P. B. Walsh, K. M. Portier, and S. F. Coates. 1999. Monitoring the expanding range of coyotes in Florida: results of the 1997–8 statewide scent station surveys. Florida Field Naturalist 27:150–162.

Moore, G. C., and G. R. Parker. 1992. Colonization by the eastern coyote *(Canis latrans).* Pages 23–38 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Paradiso, J. L. 1966. Recent records of coyotes, *Canis latrans,* from the southeastern United States. Southwest Naturalist 11:500–501.

Pringle, L. P. 1960. Notes on coyotes in southern New England. Journal of Mammalogy 41:278.

Rand, A. L. 1945. Mammals of the Ottawa district. Canadian Field Naturalist 59:111–132.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

Schultz, V. 1955. Status of the coyote and related forms in Tennessee. Journal of the Tennessee Academy of Science 30:44–46.

Severinghaus, C. W. 1974. Notes on the history of wild Canids in New York. New York Fish and Game Journal 21:117–125.

Thurber, J., and R. O. Peterson. 1991. Changes in body size associated with range expansion in the coyote. Journal of Mammalogy 72:750–755.

Warfel, H. E. 1937. A coyote in Hampshire County, Massachusetts. Journal of Mammalogy 18:241.

Weeks, J. L., G. M. Tori, and M. C. Shieldcastle. 1990. Coyotes (*Canis latrans*) in Ohio. Ohio Journal of Science 90:142–145.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Wiley, J. E. 1975. Status of the eastern coyote in New Hampshire. Pages 20–32 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Wooding, J. B., and T. S. Hardisky. 1990. Coyote distribution in Florida. Florida Field Naturalist 18:12–14.

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

RED FOX (*VULPES VULPES*)

Chambers, R. E. 1987. Diets of Adirondack coyotes and red foxes in the central Adirondacks. Transactions of the North Eastern Section of the Wildlife Society 44:90.

Crossett III, R. L. 1990. Spatial arrangements and habitat use of sympatric red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*) in central Kentucky. Thesis, Eastern Kentucky University, Richmond, USA.

Crossett III, R. L., and C. L. Elliott. 1991. Winter food habits of red foxes and coyotes in central Kentucky. Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies 45:97–103.

Cypher, B. L. 1993. Food item use by three sympatric canids in southern Illinois. Transactions of the Illinois State Academy of Science 86:139–144.

Davidson, W. R., M. J. Appel, G. L. Doster, O. E. Baker, and J. F. Brown. 1992. Diseases and parasites from commercial sources selling to fox-chasing enclosures. Journal of Wildlife Disease 28:581–589.

Dibello, F. J., S. M. Arthur, and W. B. Krohn. 1990. Food habits of sympatric coyotes, *Canis latrans,* red fox, *Vulpes vulpes,* and bobcats, *Lynx rufus,* in Maine. Canadian Field Naturalist 104:403–408.

Engelhardt, D. B. 1986. Analysis of red fox and coyote home range use in relation to artificial scent marks. Thesis, University of Maine, Orono, USA.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and M. G. Joselyn. 2003. Temporal habitat partitioning and spatial use of coyotes and red foxes in east-central Illinois. Journal of Wildlife Management 67:90–103.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and P. C. Mankin. 2007. Survival and cause-specific mortality of red foxes in agricultural and urban areas of Illinois. Journal of Wildlife Management 71:1862–1873.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Harrison, D. J., J. A. Bissonette, and J. A. Sherburne. 1989. Spatial relationships between coyotes and red foxes in eastern Maine. Journal of Wildlife Management 53:181–185.

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in an agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Litvaitis, J. A. 1992. Niche relations between coyotes and sympatric carnivora. Pages 73–86 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

McDonald, P. T. 2006. Habitat affiliations of sympatric carnivores in southern Illinois. Thesis, Southern Illinois University, Carbondale, USA.

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. Journal of Wildlife Management 47:852–857.

Winter, L. A. 1990. Home range size and spatial relationships of coyotes and red foxes in Acadia National Park, Mount Desert Island, Maine. Thesis, University of Maine, Orono, USA.

Wooding, J. B. 1984. Coyote food habits and the spatial relationship of coyotes and foxes in Mississippi and Alabama. Thesis, Mississippi State University, Starkville, USA.

RED WOLF (*CANIS RUFUS*)

Adams, J. R., B. T. Kelly, and L. P. Waits. 2003. Using faecal DNA sampling and GIS to monitor hybridization between red wolves (*Canis rufus*) and coyotes (*Canis latrans*). Molecular Ecology 12:2175–2186.

Adams, J. R., C. Lucash, L. Schutte, and L. P. Waits. 2007. Locating hybrid individuals in the red wolf (*Canis rufus*) experimental population area using a spatially targeted sampling strategy and faecal DNA genotyping. Molecular Ecology 16:1823–1834.

Adams, J. R., and L. P. Waits. 2007. An efficient method for screening faecal DNA genotypes and detecting new individuals and hybrids in the red wolf (*Canis rufus*) experimental population area. Conservation Genetics 8:123–131.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of canids from Missouri. Journal of Mammalogy 58:17–24.

Fredrickson, R. J., and P. W. Hedrick. 2006. Dynamics of hybridization and introgression in red wolves and coyotes. Conservation Biology 20:1272–1283.

Grenwal, S. K., P. J. Wilson, T. K. Kung, K. Shami, M. T. Theberge, J. B. Theberge, and B. N. White. 2004. A genetic assessment of the eastern wolf in Algonquin Provincial Park. Journal of Mammalogy 85:625–632.

Hedrick, P. W., R. N. Lee, and D. Garrigan. 2002. Major histocompatibiltiy complex variation in red wolves: evidence for common ancestry with coyotes and balancing selection. Molecular Ecology 11:1905–1913.

McCarley, H. 1962. The taxonomic status of wild *canis* (Canidae) in the south central United States. Southwestern Naturalist 7:227–235.

Miller, C. R., J. R. Adams, and L. P. Waits. 2003. Pedigree-biased assignment tests for reversing coyote (*Canis latrans*) introgression into the wild red wolf (*Canis rufus*) population. Molecular Ecology 12:3287–3301.

Nowak, R. 2002. The original status of wolves in eastern North America. Southeastern Naturalist 1:95–130.

Nowak, R. M., and N. E. Federoff. 1998. Validity of the red wolf: response to Roy et al. Conservation Biology 12:722–725.

Reich, D. E., R. K. Wayne, and D. B. Goldstein. 1999. Genetic evidence for a recent origin by hybridization of red wolves. Molecular Ecology 8:139–144.

Roth, J. D., D. L. Murray, and T. D. Steury. 2008. Spatial dynamics of sympatric canids: modeling the impact of coyotes on red wolf recovery. Ecological Modeling 214:391–403.

Roy, M. S., E. Geffen, D. Smith, and R. K. Wayne. 1996. Molecular genetics of pre-1940 red wolves. Conservation Biology 10:1413–1424.

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

Stoskopf, M. K., K. Beck, B. B. Fazio, T. K. Fuller, E. M. Gese, B. T. Kelly, F. F. Knowlton, D. L. Murray, W. Waddell, and L. Waits. 2005. From the field: implementing recovery of the red wolf integrating research scientists and managers. Wildlife Society Bulletin 33:1145–1152.

Wayne, R. K., and S. M. Jenks. 1991. Mitochondrial DNA analysis implying extensive hybridization of the endangered red wolf, *Canis rufus.* Nature 351:565–568.

Wayne, R. K., M. S. Roy, and J. L. Gittleman. 1998. Origin of the red wolf: response to Nowak and Federoff and Gardener. Conservation Biology 12:726–729.

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

REPRODUCTION

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Chambers, R. E. 1992. Reproduction of coyotes in their northeastern range. Pages 39–52 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Harrison, D. J. 1983. Denning ecology, movements, and dispersal of coyotes in eastern Maine. Thesis, University of Maine, Orono, USA.

Harrison, D. J., and J. R. Gilbert. 1985. Denning ecology and movements of coyotes in Maine during pup rearing. Journal of Mammalogy 66:712–719.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Hilton, H. 1978. Systematics and ecology of the eastern coyote. Pages 210–228 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Jean, Y., and J. M. Bergeron. 1984. Productivity of coyotes (*Canis latrans*) from southern Québec. Canadian Journal of Zoology 62:2240–2243.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Mahan, B. R., and E. C. Mahan. 2007. Demographics of coyotes (*Canis latrans*) during the late 1970s and 1990s in southwestern Illinois. Transactions of the Illinois State Academy of Science 100:251–257.

Nelson, T. A., D. G. Gregory, and J. R. Laursen. 2003. Canine heartworms in coyotes in Illinois. Journal of Wildlife Diseases 39:593–599.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

Parker, G. R. and J. W. Maxwell. 1989. Seasonal movements and winter ecology of the coyote, *Canis latrans,* in northern New Brunswick. Canadian Field Naturalist 103:1–11.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Ryon, J. 1986. Den digging and pup care in captive coyotes (*Canis latrans*). Canadian Journal of Zoology 64:1582–1585.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

Thiel, R. P. 2006. Conditions for sexual interactions between Grey Wolves, *Canis lupus,* and Coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2009. Observations of coyowolves, *Canis latrans× lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

Way, J. G., P. J. Auger, I. M. Ortega, and E. S. Strauss. 2001. Eastern coyote denning behavior in an anthropogenic environment. Northeast Wildlife 56:18–30.

Whiteman, E. E. 1940. Studies of pelage changes, food habits and breeding habits of captive coyotes (*Canis* latrans latrans). Thesis, Michigan State College of Agriculture and Applied Science, East Lansing, USA.

RESEARCH NEEDS

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

Gompper, M. E. 2002. The ecology of northeast coyotes: current knowledge and priorities for future research. Wildlife Conservation Society Working Paper 17.

SCAT (SEE DIET)

SEX RATIO

Dumond, M., and M. A. Villard. 2000. Demography and body condition of coyotes (*Canis latrans*) in eastern New Brunswick. Canadian Journal of Zoology 78:399–406.

Ford, S. D. 1983. Ecological studies on coyotes in northwestern Indiana. Dissertation, Purdue University, West Lafayette, USA.

Kick, T. J., G. F. Hubert Jr., and R. D. Andrews. 1984. Heartworms (*Dirofilaria immitis*) in coyotes (*Canis latrans*) in Illinois. Transactions of Illinois Academy of Sciences 77:127–134.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Mahan, B. R., and E. C. Mahan. 2007. Demographics of coyotes (*Canis latrans*) during the late 1970s and 1990s in southwestern Illinois. Transactions of the Illinois State Academy of Science 100:251–257.

Moore, G. C., and J. S. Millar. 1984. A comparative study of colonizing and longer established eastern coyote populations. Journal of Wildlife Management 48:691–699.

Nelson, T. A., and D. M. Lloyd. 2005. Demographics and condition of coyotes in Illinois. American Midland Naturalist 153:418–427.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

SKUNK (*MEPHITIS MEPHITIS*)

Prange, S., and S. D. Gehrt. 2007. Response of skunks to a simulated increase in coyote activity. Journal of Mammalogy 88:1040–1049.

SMALL MAMMALS

Randa, L. A. 1996. Prey selectivity and foraging activity of *Canis latrans* and *Vulpes vulpes* in response to prey fluctuations and habitat in a heterogeneous landscape. Thesis, Northern Illinois University, DeKalb, USA.

Randa, L. A., and J. A. Yunger. 2004. The influence of prey availability and vegetation characteristics on scent station visitation rates of coyotes, *Canis latrans,* in a heterogeneous environment. Canadian Field Naturalist. 118:341–353.

SNOWSHOE HARE (*LEPUS AMERICANUS*)

Patterson, B. R., L. K. Benjamin, and F. Messier. 1998. Prey switching and feeding habits of eastern coyotes in relation to snowshoe hare and white-tailed deer densities. Canadian Journal of Zoology 76:1885–1879.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

Thibault, I., and J. P. Ouellet. 2005. Hunting behaviour of eastern coyotes in relation to vegetation cover, snow conditions, and hare distribution. Ecoscience 12(4):466–475.

SOCIALITY

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

Atwood, T. C., and H. P. Weeks Jr. 2002. Facultative dyad formation in adult male coyotes. Northeastern Naturalist 9:353–358.

Atwood, T. C., and H. P. Weeks Jr. 2002. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. Canadian Journal of Zoology 81:1589–1597.

Bekoff, M. 1978. Behavioral development in coyotes and eastern coyotes. Pages 97–127 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

Harrison, D. J. 1992. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53–72 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Hennessy, C. A. 2007. Mating strategies and pack structure of coyotes in an urban landscape: a genetic investigation. Thesis, Ohio State University, Columbus, USA.

Hill, H. L., and M. Bekoff. 1977. The variability of some motor components of social play and agnostic behavior in infant eastern coyotes. Animal Behavior 25:907–909.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an antipredator strategy. Canadian Journal of Zoology 63:785–789.

Muntz, E. M., and B. R. Paterson. 2004. Evidence for the use of vocalization to coordinate the killing of a white-tailed deer, *Odocoileus virginianus,* by coyotes, *Canis latrans.* Canadian Field Naturalist 118:278–280.

Okoniewski, J. C. 1980. Vocal response of eastern coyotes to an electronic siren and human howling. Thesis, State University of New York, Syracuse, USA.

Ozoga, J. J. 1963. An ecological study of the coyote on Beaver Island, Lake Michigan. Thesis, Michigan State University, Ann Arbor, USA.

Ozoga, J. J., and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809–818.

Parks, M. B. 1979. Physical and behavioral development of captive eastern coyote pups. Thesis, University of Maine, Orono, USA.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Ryon, J. 1986. Den digging and pup care in captive coyotes (*Canis latrans*). Canadian Journal of Zoology 64:1582–1585.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2003. Description and possible reasons for an abnormally large group size of adult eastern coyotes observed during summer. Northeastern Naturalist 10:335–342.

Way, J. G. 2004. Survival of 8-week old eastern coyote pups following the death of their mother. Northeastern Naturalist 58:66–71.

Way, J. G. 2007. Social and play behavior in a wild eastern coyote, *Canis latrans,* pack. Canadian Field-Naturalist 121:397–401.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Way, J. G., and B. C. Timm. 2011. Record pack-density of eastern coyotes/coywolves (*canis latrans* × *lycaon*). American Midland Naturalist 165:201–203.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male.

SOUTH CAROLINA

Epstein, M. B., G. A. Feldhamer, R. L. Joyner, R. J. Hamilton, and W. G. Moore. 1985. Home range and mortality of white-tailed deer fawns in coastal South Carolina. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 39:373–379.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

Miller, D. L., J. Schrecengost, J. Kilgo, S. Ray, and K. V. Miller. 2007. Ruptured aortic aneurysm in a coyote (*Canis latrans*) from South Carolina. Journal of Zoo and Wildlife Medicine 38:492–494.

Schrecengost, J. D. 2007. Home range and food habits of the coyote (Canis latrans) at the Savannah River site, South Carolina. Thesis, University of Georgia, Athens, USA.

Schrecengost, J. D., J. C. Kilgo, D. Mallard, H. S. Ray, and K. V. Miller. 2008. Seasonal food habits of the coyote in the South Carolina coastal plain. Southeastern Naturalist 7:135–144.

Schrecengost, J. D., J. C. Kilgo, H. S. Ray, and K. V. Miller. 2009. Home range, habitat use and survival of coyotes in western South Carolina. American Midland Naturalist 162:3463–55.

SUMMARY

Gompper, M. E. 2002. The ecology of northeast coyotes: current knowledge and priorities for future research. Wildlife Conservation Society Working Paper 17.

Parker, G. E. 1995. Eastern coyote: the story of its success. Nimbus, Halifax, Nova Scotia, Canada.

SURVIVAL

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis. State University of New York at Albany, Albany, USA.

Bourque, A., H. Whitney, and G. Conboy. 2005. *Angiostrongylus vasorum* infection in a coyote (*Canis latrans*) from Newfoundland and Labrador, Canada. Journal of Wildlife Diseases 41:816–819.

Chamberlain, M. J., and B. D. Leopold. 2001. Survival and cause specific mortality of adult coyotes (*Canis latrans*) in central Mississippi. American Midland Naturalist 145:414–418.

Crête, M., and R. Lemieux. 1996. Population dynamics of coyotes colonizing the boreal forest of southeastern Québec. Journal of Wildlife Resources 1:99–105.

Crête, M., J. P. Ouellet, J. P. Tremblay, and R. Arsenault. 2001. Suitability of the forest landscape for coyotes in northeastern North America and its implications for coexistence with other carnivores. Ecoscience 8:311–319.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

Harrison, D. J. 1986. Coyote dispersal, mortality, and spatial relationships with red foxes in Maine. Dissertation, University of Maine, Orono, USA.

Holzman, S., M. J. Conroy, and W. R. Davidson. 1992. Diseases, parasites and survival of coyotes in south-central Georgia. Journal of Wildlife Diseases 28:572–580.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Kendrot, S. R. 1998. The effects of roads and land use on home range use, behavior and mortality of eastern coyotes (*Canis latrans* var.) in northern New York. Thesis, State University of New York, Syracuse, USA.

Lloyd, D. M. 1998. Demographics and condition of coyotes in Illinois. Thesis, Eastern Illinois University, Charleston, USA.

Miller, D. L., J. Schrecengost, J. Kilgo, S. Ray, and K. V. Miller. 2007. Ruptured aortic aneurysm in a coyote (*Canis latrans*) from South Carolina. Journal of Zoo and Wildlife Medicine 38:492–494.

Okoniewski, J. C., and W. B. Stone. 1983. Causes of morbidity and mortality in coyotes in New York. New York Fish and Game Journal 30:224–227.

Post, R. A. 1975. Movements and home ranges of coyotes in New York: preliminary observations. Pages 83–93 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Priest, J. M. 1986. Some aspects of the ecology of the coyote: Dixon Springs Agricultural Center, S.E. Illinois. Dissertation, Southern Illinois University, Carbondale, USA.

Schrecengost, J. D., J. C. Kilgo, H. S. Ray, and K. V. Miller. 2009. Home range, habitat use and survival of coyotes in western South Carolina. American Midland Naturalist 162:3463–55.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Van Deelen, T. R., and T. E. Gosselink. 2006. Coyote survival in a row-crop agricultural landscape. Canadian Journal of Zoology 84:1630–1636.

Way, J. G. 2004. Survival of 8-week old eastern coyote pups following the death of their mother. Northeastern Naturalist 58:66–71.

Way, J. G., S. M. Cifuni, D. L. Eatough, and E. G. Strauss. 2006. Rat poison kills a pack of eastern coyotes, *Canis latrans,* in an urban area. Canadian Field-Naturalist 120:478–480.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male.

TAXONOMY

Chambers, S. M. 2010. A perspective on the Genetic Composition of Eastern Coyotes. Northeastern Naturalist 17:205–210.

Cox, J. J., L. Meade, D. C. Yancy, and D. S. Maehr. 2001. The taxonomic status of wild Canis in Kentucky. Proceedings of the Annual Conference of Southeast Fish and Wildlife Agencies 55:408–417.

Elder, W. H., and C. M. Hayden. 1977. Use of discriminant function in taxonomic determination of canids from Missouri. Journal of Mammalogy 58:17–24.

Gaskin, P. N. 1975. A multivariate analysis of skull characteristics of New York coyotes. Pages 5–11 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Glatz, R. G. 1975. The status of the coyote in Connecticut. Pages 33–40 *in* Transactions of the Eastern Coyote Workshop. Northeast Fish and Wildlife Conference, 23–26 February 1975, New Haven, Connecticut, USA.

Hilton, H. 1976. The physical characteristics, taxonomic status and food habits of the eastern coyote in Maine. Thesis, University of Maine, Orono, USA.

Howard, W. E. 1949. A means to distinguish skulls of coyotes and domestic dogs. Journal of Mammalogy 30:169–171.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Rapid adaptive evolution of northeastern coyotes via hybridization with wolves. Biology Letters 6:89–93.

Kays, R. W., A. Curtis, and J. J. Kirchman. 2010. Reply to Wheeldon *et al.* 'Colonization history and ancestry of northeastern coyotes.' Biology Letters 6:248–249.

Kyle, C. J., A. R. Johnson, B. R. Patterson, P. J. Wilson, K. Shami, S. K. Grewal, and B. N. White. 2006. Genetic nature of eastern wolves: past, present and future. Conservation Genetics 7:273–287.

Lawrence, B., and W. H. Bossert. 1969. The cranial evidence for hybridization in New England canis. Breviora 330:1–13.

Lydeard, C. 1986. Morphologic assessment of recently founded population of the coyote, *Canis latrans,* in Tennessee. Thesis, Memphis State University, Memphis, USA.

Lydeard, C., and M. L. Kennedy. 1988. Morphologic assessment of recently founded populations of the coyote, *Canis latrans,* in Tennessee. Journal of Mammalogy 69:773–781.

MacKenzie, S. H. 1988. Genetic variation in nine northern subspecies of the coyote, *Canis latrans.* Thesis, University of Tennessee, Knoxville, USA.

McCarley, H. 1962. The taxonomic status of wild *canis* (Canidae) in the south central United States. Southwestern Naturalist 7:227–235.

McKenna, S. 1985. Cranial morphometry of eastern coyotes (*Canis latrans* var). Thesis, Tennessee Technological University, Cookeville, USA.

Nowak. R. M. 1978. Evolution and taxonomy of coyotes and related *Canis.* Pages 3–16 *in* Bekoff, M., editor. Coyotes: biology, behavior, and management. 2001, reprint. Blackburn Press, Caldwell, New Jersey, USA.

Richens, V. B., and R. D. Hugie. 1974. Distribution, taxonomic status, and characteristics of coyotes in Maine. Journal of Wildlife Management 38:447–454.

Sears, H. J., J. B. Theberge, M. T. Theberge, I. Thorton, and G. D. Campbell. 2003. Landscape influence on *Canis* morphological and ecological variation in a coyote-wolf *C. lupus* x *latrans* hybrid zone, southeastern Ontario. Canadian Field Naturalist 117:589–600.

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

Way, J. G., L. Rutledge, T. Wheeldon, and B. N. White. 2010. Genetic characterization of eastern "coyotes" in eastern Massachusetts. Northeastern Naturalist 17:189–204.

Weeks, J. L., G. M. Tori, and M. C. Shieldcastle. 1990. Coyotes (*Canis latrans*) in Ohio. Ohio Journal of Science 90:142–145.

Wheeldon, T., B. Patterson, and B. White. 2010. Comment: colonization history and ancestry of northeastern coyotes. Biology Letters 6:246–247.

Wilson, P. J., S. Grewal, I. D. Lawford, J. N. M. Heal, A. G. Granacki, D. Pennock, J. B. Theberge, M. T. Theberge, D. R. Voigt, W. Waddell, R. E. Chambers, P. C. Paquet, G. Goulet, D. Cluff, and B. N. White. 2000. DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf. Canadian Journal of Zoology 78:2156–2166.

Wilson, P. J., S. Grewal, T. McFadden, R. C. Chambers, and B. N. White. 2003. Mitochondrial DNA extracted from eastern North American wolves killed in the 1800s is not of gray wolf origin. Canadian Journal of Zoology 81:936–940.

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

TENNESSEE

Babb, J. G. 1988. Density and home range of the coyote (*Canis latrans*) in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Babb, J. G., and M. L. Kennedy. 1989. An estimate of minimum density for coyotes in western Tennessee. Journal of Wildlife Management 53:186–188.

Babb, J. G., and M. L. Kennedy. 1988. Home range of the coyote in western Tennessee. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 42:443–447.

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Crawford, B. A. 1992. Coyotes in Great Smoky Mountains National Park: evaluation of methods to monitor relative abundance, movement ecology, and habitat use. Thesis, University of Tennessee, Knoxville, USA.

Crawford, B. A., M. R. Pelton, and K. G. Johnson. 1993. Techniques to monitor relative abundance of coyotes in east Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies 47:62–70.

Gabor, T. M. 1993. An assessment of the feeding ecology of coyotes in Western Tennessee. Thesis, Memphis State University, Memphis, USA.

Grogan, M. E. 1996. Feeding strategies of the coyote (*Canis latrans*) in western Tennessee. Thesis, University of Memphis, Memphis, USA.

Lee III, R. M. 1986. Food habits of the Coyote (*Canis latrans*) in Tennessee. Thesis, Memphis State University, Memphis, USA.

Lee III, R. M., and M. L. Kennedy. 1986. Food habits of the coyote in Tennessee. Proceedings of Annual Conference of Southeastern Association of Fish and Wildlife Agencies. 40:364–372.

Lydeard, C. 1986. Morphologic assessment of recently founded population of the coyote, *Canis latrans,* in Tennessee. Thesis, Memphis State University, Memphis, USA.

Lydeard, C., and M. L. Kennedy. 1988. Morphologic assessment of recently founded populations of the coyote, *Canis latrans,* in Tennessee. Journal of Mammalogy 69:773–781.

Lydeard, C., M. L. Kennedy, and E. P. Hill. 1988. Taxonomic assessment of coyotes and domestic doges in the southeastern United States. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 42:513–519.

McKenna, S. 1985. Cranial morphometry of eastern coyotes (*Canis latrans* var). Thesis, Tennessee Technological University, Cookeville, USA.

Parker, T. S. 1999. Food habits of the coyote (*Canis latrans*) in urban and suburban areas of western Tennessee. Thesis, University of Memphis, Memphis, USA.

Schultz, V. 1955. Status of the coyote and related forms in Tennessee. Journal of the Tennessee Academy of Science 30:44–46.

Sharp, D. W. 1981. Siren-elicited responses of coyotes in western Kentucky and Tennessee. Proceedings of the Annual Conference of Fish and Wildlife Agencies 35:273–280.

Smith, R. A., and M. L. Kennedy. 1983. Food habits of the coyote (*Canis latrans*) in western Tennessee. Journal of the Tennessee Academy of Science 58:27–28.

Smith, R. A., and M. L. Kennedy. 1983. Taxonomic status of the coyote in Tennessee. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 37:219–227.

Stephenson, S. W., and M. L. Kennedy. 1993. Demography of a coyote population in western Tennessee. Journal of the Tennessee Academy of Science 68:122–124.

Van Den Bussche, R. A. 1984. Temporal and spatial variation of helminth parasites in coyotes, *Canis latrans,* from Tennessee. Thesis, Memphis State University, Memphis, USA.

Van Den Bussche, R. A., M. L. Kennedy, and W. E. Wilhelm. 1987. Helminth parasites of the coyote (*Canis latrans*) in Tennessee. Journal of Parasitology 73:327–332.

TERRITORY

Atwood, T. C. 2006. The influence of habitat patch attributes on coyote group size and interaction in a fragmented landscape. Canadian Journal of Zoology 84:80–87.

Boer, A. H., editor. 1992. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Chamberlain, M. J., C. D. Lovell, and B. D. Leopold. 2000. Spatial-use patterns, movements, and interactions among adult coyotes in central Mississippi. Canadian Journal of Zoology 78:2087–2095.

Harrison, D. J., J. A. Bissonette, and J. A. Sherburne. 1989. Spatial relationships between coyotes and red foxes in eastern Maine. Journal of Wildlife Management 53:181–185.

Major, J. T. 1983. Ecology and interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Thesis, University of Maine, Orono, USA.

Major, J. T., and J. A. Sherburne. 1987. Interspecific relationships of coyotes, bobcats, and red foxes in western Maine. Journal of Wildlife Management 51:606–616.

Messier, F., and C. Barrette. 1982. The social system of the coyote (*Canis latrans*) in a forested habitat. Canadian Journal of Zoology 60:1743–1753.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an antipredator strategy. Canadian Journal of Zoology 63:785–789.

Patterson, B. R., and F. Messier. 2001. Social organization and space use of coyotes in eastern Canada relative to prey distribution and abundance. Journal of Mammalogy 82:463–477.

Stebler, A. M. 1975. The ecology of Michigan coyotes and wolves. Dissertation, University of Michigan, Lansing, USA.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

Way, J. G., and B. C. Timm. 2011. Record pack-density of eastern coyotes/coywolves (*canis latrans* × *lycaon*). American Midland Naturalist 165:201–203.

Way, J. G., B. C. Timm, and E. G. Strauss. 2009. Coywolf, (*Canis latrans* × *lycaon*), pack density doubles following the death of a resident territorial male.

TRANSIENT

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

Holzman, S., M. J. Conroy, and J. Pickering. 1992. Home range, movements, and habitat use of coyotes in south-central Georgia. Journal of Wildlife Management 56:139–146.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2007. Movements of transient coyotes, *Canis latrans,* in urbanized Eastern Massachusetts. Canadian Field-Naturalist 121:364–369.

Way, J. G., and D. L. Eatough. 2006. Use of "micro"-corridors by eastern coyotes, *Canis latrans,* in an heavily urbanized area: implications for ecosystem management. Canadian Field-Naturalist 120:474–476.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

TURKEY (*MELEAGRIS GALLOPAVO)*

Chamberlain, M. J. 1999. Ecological relationships among bobcats, coyotes, gray fox, and raccoons and their interactions with wild turkey hens. Dissertation, Mississippi State University, Starkville, USA.

Wagner, G. D. 1993. Coyote diet in areas of wild turkey abundance during the wild turkey reproductive season. Thesis, Mississippi State University, Starkville, USA.

Wagner, G. D., and E. P. Hill. 1994. Evaluation of southeastern coyote diets during the wild turkey reproductive season. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 48:173–181.

URBAN

Atwood, T. C., H. P. Weeks, and T. M. Gehring. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. Journal of Wildlife Management 68:1000–1009.

Billodeaux, L. E. 2007. The presence and public perception of coyotes (*Canis latrans*) in suburban and rural areas of western Georgia. Thesis. Auburn University, Auburn, USA.

Bogan, D. A. 2004. Eastern coyote (*Canis latrans*) home range, habitat selection, and survival rates in the suburban Albany pine bush landscape of New York. Thesis. State University of New York at Albany, Albany, USA.

Bollin-Booth, H. A. 2007. Diet analysis of the coyote (*Canis latrans*) in metropolitan park systems of northeast Ohio. Thesis, Cleveland State University, Cleveland, USA.

Brown, J. L. 2007. The influence of coyotes on an urban Canada goose population in the Chicago metropolitan area. Thesis, Ohio State University, Columbus, USA.

Buck, W. S. 1999. Citizen research of Chicago coyote: diet, population indexing, and the effects of research participation. Thesis, University of Minnesota, St. Paul, USA.

Curtis, P. D., D. A. Bogan, and G. Batcheller. 2007. Suburban coyote management and research needs: a northeast perspective. Proceedings of Wildlife Damage Management Conference 12:413–417.

Draheim, M. 2007. Who's afraid of the big, bad coyote?: a survey of messaging and existing attitudes in the national capital region. Thesis, George Mason University, Fairfax, USA.

Draheim, M. M., L. L. Rockwood, G. Guagnano, and E. C. M. Parsons. 2011. The impact of information on students' beliefs and attitudes toward coyotes. Human Dimensions of Wildlife 16:67–72.

Gehrt, S. D. 2007. Ecology of coyotes in urban landscapes. Proceedings of the 12th Wildlife Damage Management Conference 12:303–311.

Gehrt, S. D. 2009. Home range and landscape use of coyotes in a metropolitan landscape: conflict or coexistence? Journal of Mammalogy 90:1045–1057.

Gompper, M. E. 2002. Top Carnivores in the suburbs? Ecological and conservation issues raised by colonization of north-eastern North America by coyotes. BioScience 52:185–190.

Gosselink, T. E., T. R. Van Deelen, R. E. Warner, and P. C. Mankin. 2007. Survival and cause-specific mortality of red foxes in agricultural and urban areas of Illinois. Journal of Wildlife Management 71:1862–1873.

Hennessy, C. A. 2007. Mating strategies and pack structure of coyotes in an urban landscape: a genetic investigation. Thesis, Ohio State University, Columbus, USA.

Jantz, H. E. 2011. Home range, activity patterns, and habitat selection of the coyote (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Judy, B. A. 2010. Assessment of habitat use by eastern coyote (Canis latrans) along an urban-parkland gradient. Thesis, Cleveland State University, Cleveland, USA.

Morey, P. S. 2004. Landscape use and diet of coyotes, *Canis latrans,* in the Chicago metropolitan area. Thesis, Utah State University, Logan, USA.

Morey, P. S., E. M. Gese, and S. Gehrt. 2007. Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. American Midland Naturalist 158:147–161.

Page, M. S. 2010. Spatial ecology of eastern coyotes (*Canis latrans*) in the anthropogenic landscape of Cape Cod, Massachusetts. Thesis, University of Massachusetts, Amherst, USA.

Parker, T. S. 1999. Food habits of the coyote (*Canis latrans*) in urban and suburban areas of western Tennessee. Thesis, University of Memphis, Memphis, USA.

Piccolo, B. P., T. R. Van Deelen, K. Hollis-Etter, D. R. Etter, R. E. Warner, and C. Anchor. 2010. Behavior and survival of white-tailed deer neonates in two suburban forest preserves.

Richer, M. C., M. Crête, J. P. Ouellet, L. P. Rivest, and J. Huot. 2002. The low performance of forest versus rural coyotes in northeastern North America: Inequality between presence and availability of prey. Ecoscience 9:44–54.

Santana, E. M. 2010. Food habits and anthropogenic supplementation in the diet of coyotes (*Canis latrans*) along an urban-rural gradient. Thesis, Auburn University, Auburn, USA.

Twiss, R. R. 2006. The eastern coyote (*Canis latrans*) in Connecticut: relative abundance indicies and public perception. Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2000. Ecology of Cape Cod coyotes (*Canis latrans* var.). Thesis, University of Connecticut, Storrs, USA.

Way, J. G. 2007. Movements of transient coyotes, *Canis latrans,* in urbanized Eastern Massachusetts. Canadian Field-Naturalist 121:364–369.

Way, J. G. 2009. Observations of coyowolves, *Canis latrans× lycaon,* crossing bridges and using human structures on Cape Cod, Massachusetts. Canadian Field-Naturalist 123:206–209.

Way, J. G., P. J. Auger, I. M. Ortega, and E. S. Strauss. 2001. Eastern coyote denning behavior in an anthropogenic environment. Northeast Wildlife 56:18–30.

Way, J. G., and D. L. Eatough. 2006. Use of "micro"-corridors by eastern coyotes, *Canis latrans,* in an heavily urbanized area: implications for ecosystem management. Canadian Field-Naturalist 120:474–476.

Way, J. G., I. M. Ortega, and P. J. Auger. 2002. Eastern coyote home range, territoriality, and sociality on urbanized Cape Cod. Northeast Wildlife 57:1–18.

Way, J. G., and B. C. Timm. 2008. Nomadic behavior of an old formerly territorial eastern coyote, *Canis latrans.* Canadian Field-Naturalist 122:316–322.

Weckel, M. E., D. Mack, C. Nagy, R. Christie, and A. Wincorn. 2010. Using citizen science to map human-coyote interaction in suburban New York, USA. Journal of Wildlife Management 74:1163–1171.

VERMONT

Ingle, M. A. 1990. Ecology of red foxes and gray foxes and spatial relationships with coyotes in a agricultural region of Vermont. Thesis, University of Vermont, Burlington, USA.

Lorenz, J. R. 1978. Physical characteristics, movement, and population estimate of the eastern coyote in New England. Thesis, University of Massachusetts, Amherst, USA.

Person, D. K. 1988. Home range, activity, habitat use, and food habits of eastern coyotes in the Champlain Valley region of Vermont. Thesis, University of Vermont, Burlington, USA.

Person, D. A., and D. H. Hirth. 1991. Home range and habitat use of coyotes in a farm region in Vermont. Journal of Wildlife Management 55:433–441.

Pringle, L. P. 1960. Notes on coyotes in southern New England. Journal of Mammalogy 41:278.

VIRGINIA

Bozarth, C. A. 2010. Phylogeography and non-invasive molecular monitoring of coyote *(Canis latrans)* and gray fox *(urocyon cineroargenteus)* in northern Virginia and the eastern United States. Dissertation, George Mason University, Fairfax, USA.

Gammons, D. J. 2004. Early fall coyote foods in Campbell and Bath Counties, Virginia. Banisteria 23: 45–47.

Houben, J. M., and J. R. Mason. 2004. Weight and age of coyotes captured in Virginia, USA. Proceedings of Vertebrate Pest Conference 21:75–76.

Robinson, K. J. 2010. Scat identification and dietary trends of coyote *(Canis latrans),* gray fox *(Urocyon cinereoargenteus),* and red fox *(Vulpes vulpes)* in a mid-Atlantic ecosystem. Thesis, George Mason University, Fairfax, USA.

WEIGHT (SEE MORPHOLOGY)

WEST VIRGINIA

Houben, J. A., W. R. Bonwell, and T. R. McConnell. 2004. Development of the West Virginia integrated predation management program to protect livestock. Proceedings of the 21st Vertebrate Pest Conference 21:70–74.

Taylor, R. W., C. L. Counts III, and S. B. Mills. 1976. Occurrence and distribution of the coyote, *Canis latrans Say,* in West Virginia. Proceedings of the West Virginia Academy of Sciences 48:73–77.

Wykle, J. 1999. The status of the coyote, *Canis latrans,* in West Virginia. Thesis, Marshall University, Huntington, USA.

WHITE-TAILED DEER

Atwood, T. A., K. C. Vercauteren, T. J. Deliberto, H. J. Smith, and J. S. Stevenson. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. The Journal of Wildlife Management 71:1545–1554.

Ballard, W. B., H. A. Whitlaw, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1999. Predation and survival of white-tailed deer fawns in northcentral New Brunswick. Journal of Wildlife Management 63:574–579.

Blanton, K. M. 1988. Summer diet of coyotes in the southeast: and the response of coyotes to siren surveys. Thesis, Mississippi State University, Starkville, USA.

Blanton, K. M., and E. P. Hill. 1989. Coyote use of white-tailed deer fawns in relation to deer density. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 43:470–478.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Dissertation, State University of New York, Syracuse, USA.

Cox, J. J. 2003. Community dynamics among reintroduced elk, white-tailed deer, and coyote in southeastern Kentucky. Dissertation, University of Kentucky, Lexington, USA.

Decker, T. A., W. M. Healy, and S. A. Williams. 1992. Survival of white-tailed deer fawns in western Massachusetts. Northeast Wildlife 49:28–35.

Epstein, M. B., G. A. Feldhamer, R. L. Joyner, R. J. Hamilton, and W. G. Moore. 1985. Home range and mortality of white-tailed deer fawns in coastal South Carolina. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 39:373–379.

Howze, M. B. 2009. Predator removal and white-tailed deer recruitment in southwestern Georgia. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:17–20.

Kilgo, J. C., H. S. Ray, C. Ruth, and K. V. Miller. 2010. Can coyotes affect deer populations in southeastern North America? Journal of Wildlife Management 74:929–933.

Land, E. D., D. S. Maehr, J. C. Roof, and J. W. McCown. 1993. Mortality patterns of female white-tailed deer in southwest Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:176–184.

Lavigne, G. R. 1992. Sex/age composition and physical condition of deer killed by coyotes during winter in Maine. Pages 141–160 *in* Boer, A. H., editor. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Fredericton, New Brunswick, Canada.

Messier, F., and C. Barrette. 1985. The efficiency of yarding behavior by white-tailed deer as an antipredator strategy. Canadian Journal of Zoology 63:785–789.

Messier, F., C. Barrette, and J. Huot. 1986. Coyote predation on a white-tailed deer population in southern Quebec. Canadian Journal of Zoology 64:1134–1136.

Nelson, T. A., and A. Woolf. 1987. Mortality of white-tailed deer fawns in southern Illinois. Journal of Wildlife Management 51:326–329.

Patterson, B. R., L. K. Benjamin, and F. Messier. 1998. Prey switching and feeding habits of eastern coyotes in relation to snowshoe hare and white-tailed deer densities. Canadian Journal of Zoology 76:1885–1879.

Patterson, B. R., L. K. Benjamin, and F. Messier. 2000. Winter nutritional condition of eastern coyotes in relation to prey density. Canadian Journal of Zoology 78:420–427.

Patterson, B. R., and F. Messier. 2000. Factors influencing killing rates of white-tailed deer by coyotes in eastern Canada. Journal of Wildlife Management 64:721–732.

Patterson, B. R., and F. Messier. 2003. Age and condition of deer killed by coyotes in Nova Scotia. Canadian Journal of Zoology 81:1894–1898.

Piccolo, B. P., T. R. Van Deelen, K. Hollis-Etter, D. R. Etter, R. E. Warner, and C. Anchor. 2010. Behavior and survival of white-tailed deer neonates in two suburban forest preserves.

Saalfeld, S. T., and S. S. Ditchkoff. 2006. Survival of neonatal white-tailed deer in an exurban population. Journal of Wildlife Management 71:940–944.

Stratman, M. R., and M. R. Pelton. 1997. Food habits of coyotes in northwestern Florida. Proceedings of Annual Conference Southeastern Association Fish and Wildlife Agencies 51:269–275.

VanGlider, C. L. 2008. Coyote and bobcat food habits and the effects of an intensive predator removal on white-tailed deer recruitment in northeastern Alabama. Thesis, University of Georgia, Athens, USA.

VanGlider, C. L., G. R. Woods, and K. V. Miller 2009. Effects of an intensive predator removal on white-tailed deer recruitment in Northeastern Alabama. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 63:11–16.

Vreeland, J. K., D. R. Diefenbach, and B. D. Wallingford. 2004. Survival rates, mortality causes, and habitats of Pennsylvania white-tailed deer fawns. Wildlife Society Bulletin 32:542–553.

Whitlaw, H. A., W. B. Ballard, D. L. Sabine, S. J. Young, R. A. Jenkins, and G. J. Forbes. 1998. Survival and cause-specific mortality rates of adult white-tailed deer in New Brunswick. Journal of Wildlife Management 62:1335–1341.

WISCONSIN

Huegel, C. N. 1979. Winter ecology of coyotes in northern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

Huegel, C. N., and O. J. Ronstad. 1985. Winter foraging patterns and consumption rates of northern Wisconsin coyotes. American Midland Naturalist 113:203–207.

Niebauer, T. J. 1974. Coyote food habits in northwestern Wisconsin. Thesis, University of Wisconsin, Madison, USA.

Smith, G. J. 1984. Coyote ecology in northern Wisconsin and Minnesota. Dissertation, University of Wisconsin, Madison, USA.

Thiel, R. P. 2006. Conditions for sexual interactions between Grey Wolves, *Canis lupus,* and Coyotes, *Canis latrans.* Canadian Field Naturalist 120:27–30.

WOLF (SEE RED WOLF, GRAY WOLF, EASTERN WOLF)