Food Habits and Anthropogenic Supplementation in the Diet of Coyotes (*Canis latrans*) along an Urban-Rural Gradient

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ABSTRACT: Coyotes are recent colonists of the Southeast and have broadened their niche to include exploitation of urban areas. The aim of this 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 and foods consumed were similar among habitats. 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.

KEY WORDS: Alabama, anthropogenic feeding, *Canis latrans*, coyote, diet, food habits, scat analysis, urban coyote

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INTRODUCTION

Research on diet of coyotes (*Canis latrans*) has spanned decades (e.g., Sperry 1934, Korschgen 1957, Gipson 1974, Bowyer et al. 1983, Quinn 1997, Cepek 2004). However, most literature about diet of coyotes reflects studies conducted in the western part of North America. A geographic expansion of the range of coyotes into the eastern United States began in the early 20th century following extirpation of wolves (Young and Jackson 1951). In the last 25 years, Alabama has experienced a gradual shift in reported human-coyote interactions from primarily agriculture to primarily urban-exurban (Armstrong 2012, Damm et. al. 2015).

While some studies of the diet of coyotes have been conducted in the Southeast region (Wooding et al. 1984, Lee and Kennedy 1986, Hoerath and Causey 1991), none have focused specifically on anthropogenic sources of food or differences in diet where coyotes live in proximity to humans in the Southeast. With increasing populations in urban-exurban areas, as evidenced by increasing numbers of harvested coyotes (Alabama Division of Wildlife and Freshwater Fisheries 2013), and human-coyote interactions in these areas (F. Boyd, USDA, Auburn, AL, pers. comm.), it is critical that we understand dynamics of their diet in areas occupied by humans.

One potential area of dietary shift is predation on ungulates. White-tailed deer (*Odocoileus virginianus*) play a vital role in diet in some regions (Ozoga and Harger 1966, Todd 1985). In a study in west Alabama, Hoerath and Causey (1991) noted an increase in deer hair in coyote scat during fawning season and during hunting season (mid-October to mid-February). Outside of fawning season, presence of deer in the diet has been mostly attributed to non-predation sources (Hamilton 1974, Schrecengost et al. 2008). It would appear that coyotes are behaving in a predatory fashion with regards to fawns (Holle 1978) and primarily acting as scavengers on carcasses of adult deer during hunting season (Kleinman and Brady 1978, Cepek 2004). Recently, there have been studies in the Southeast suggesting that survival of fawns has been reduced significantly by coyotes (e.g., Kilgo 2009, VanGilder et al. 2009).

Anthropogenic feeding (i.e., feeding on foods associated with humans) in mammals often is linked to synurbanization − the adjustment animals make to specific conditions of the urban environment (Luniak 2004). Specific to coyotes, studies conducted in urbanized landscapes have reported diets dominated by natural foods, such as small mammals and seasonal fruits, with the presence of anthropogenic foods varying considerably (McClure et al. 1995, Fedriani et al. 2001, Morey et al. 2007). As noted by Van Vuren and Thompson (1982), coyotes will consume whatever foods are locally and seasonally available.

The urban-rural interface is the most resource-rich and fastest-growing habitat available to coyotes (Fedriani et al. 2001). Anthropogenic feeding indicates behavioral plasticity under anthropogenic pressure, and consumption of anthropogenic foods has been linked to certain behavioral changes (Timm et al. 2004). Absence of harassment allows animals to habituate to humans and a developed landscape (Orthmeyer et al. 2007), creating potential for negative coyote-human interactions including aggressive behavior and attacks on pets and humans.

The primary focus of this study was to examine diet of coyotes in areas of differing levels of development by humans in a region of the southeastern coastal plain, and to examine extent of anthropogenic feeding to determine if exurban habitats influence diet of coyotes. By measuring the extent of anthropogenic foods in the diet, managers can gain a better understanding of how coyotes are using the urban-exurban matrix. This information would provide a basis for management decisions regarding urban coyotes and reduce the risk of negative coyote-human interactions.

METHODS

This study was conducted in east-central Alabama,

centering on the cities of Auburn and Opelika (Lee County). These cities have doubled in size since the late 1980s (American Planning Association 2010), with this growth occurring in a serpentine fashion as a result of the Performance Zoning Regime, which allows for multiple land uses within a district instead of the traditional Euclidean system (i.e., pertaining to geometric principles) of designating parcels of land for specific uses.

To examine diets thoroughly, foods were analyzed by volumetric intake, using estimates of volumetric proportions (VP) of items consumed, and frequency of consumption (FOC), using frequency of occurrence for each item encountered (Korschgen 1971). Statistical Analysis Software (SAS Institute, Inc. 2001) was used to perform a non-parametric chi-square test to determine the frequency at which items occurred in the diet across the urban-rural gradient. In instances where values in cells of the contingency table were <5, Fisher's exact test was used. A parametric, one-way multivariate analysis of variance (MANOVA) was used on estimates of volumetric proportions to assess significance of categories of items across the gradient. Due to inherent non-normal distribution of proportional measures, volumetric measurements were transformed using an arcsine transformation to make the data more normal. Where relationships were detected, one-way analysis of variance (ANOVA) was conducted and an *a posteriori* test (least-squares means) for multiple comparisons among means was conducted to assess differences among habitats.

Fecal samples (scats) were collected on public and private lands bimonthly and opportunistically by walking trails, roads, and footpaths, and by driving unpaved roads. Road-killed animals were collected opportunistically and contents of the large intestine taken for analysis. Scats were placed into plastic bags, labeled, and processed similar to methods described by Korschgen (1971). Frequency of occurrence (FOC) was an indicator of how often a diet item occurred and was determined by quantifying the number of samples that included a particular food item. This was a separate measurement from volumetric proportion, which was calculated by dividing the frequency of each item by the total number of items (and expressing it as a percentage). Items were classified as taxonomically-specific as possible and were later condensed into categories for statistical analysis. Anthropogenic items included synthetic materials such as plastic, paper products, rubber, tin foil, food wrappers, and human hair.

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ArcMap in ArcGIS (ESRI) was used to classify sampling localities as urban, exurban, or rural, based on three parameters: density of populations of humans, type of landcover, and density and type of roads. Data on populations of humans were from the U.S. Census Bureau (2000 Census) and were measured as humans/km^2/census block. Each parameter was further classified into a rating system on a scale of 1-3, with 1 being the most natural and 3 being the most developed. Landcover also was reclassified on a 1-3 scale with natural areas classified as 1, low-intensity development as 2, and medium and high-intensity development as 3. Roads were classified according to type (primary, secondary, and rural) and density (weighted by length of each type of road that persisted in each measurement unit). These ratings were averaged together to create an overall rating. Rankings of density of populations of humans and types of roads were paired with class of landcover to determine if each sampling locality was urban, exurban, or rural.

RESULTS

Overall Diet

From Lee County and the surrounding counties, 159 scats were collected; 91 in rural areas, 46 in exurban areas, and 22 in urban areas. Frequencies of Consumption (FOC) for each item in the diet and means of Volumetric Proportions (Table 1) did not always coincide. The category including other plants was the most commonly encountered (FOC 54.1%). Amphibians were not detected, and reptiles were the least-encountered item (FOC 1.3%). White-tailed deer was the most common mammalian prey (FOC 37.7%).

In terms of VP, persimmons (*Diospyros virginiana*) and deer were the most important food items, with average proportions at 18.4% and 18.3%, respectively. Overall, anthropogenic sources of food comprised 15.0% of the diet volumetrically, being consumed at a frequency of 13.8%. Anthropogenic supplementation was comparable across the gradient and did not significantly vary among habitats. It is noteworthy to mention that deer consumed during the hunting season were presumed to have been scavenged from hunter kills and comprised a large proportion of anthropogenic feedings (18 occurrences). Only one each of wild turkey (*Meleagris gallopavo*) and mourning dove (*Zenaida macroura*) were detected.

Diet Across the Urban-Rural Gradient

In rural areas, grass (Poaceae) was the most common food item (FOC 54.6%) but only comprised 4.2% of the total volume of diet of rural animals; there was an increasing trend in frequency of grass from urban to rural areas. Deer were in 39.6% (FOC) of rural samples, were consumed in the greatest volume compared to other foods

Table 1. Number of occurrences, frequency of occurrence (expressed as a percentage), mean, standard error, and maximum values of volumetric proportions of food items of coyotes, September 2007-February 2009.

Food Item	# Occurrences	FOC [%]	SE	Mean	Min	Max
Bryophyta	5	3.14	0.002	0.001	0.000	0.100
Poaceae	68	42.77	0.050	0.010	0.000	1.000
Aceraceae	1	0.63	0.001	0.001	0.000	0.150
Rannunculaceae	6	3.77	0.006	0.003	0.000	0.500
Rubus	6	*3.77*	0.001	0.001	0.000	0.075
Malus	2	1.26	0.002	0.001	0.000	0.200
Pyrus	5	3.14	0.001	0.001	0.000	0.100
Prunus	5	3.14	0.001	0.001	0.000	0.100
Betulaceae	11	6.92	0.006	0.003	0.000	0.300
Moraceae	4	2.52	0.011	0.007	0.000	1.000
Fabaceae	2	1.26	<0.001	<0.001	0.000	0.050
Cucurbitaceae	1	0.63	0.002	0.002	0.000	0.250
Juglandaceae	1	0.63	<0.001	<0.001	0.000	0.050
Rubiaceae	1	0.63	<0.001	<0.001	0.000	0.010
Solanaceae	2	1.26	<0.001	<0.001	0.000	0.010
Brassica	2	1.26	<0.001	<0.001	0.000	0.050
Quercus	11	6.92	0.008	0.004	0.000	0.650
Ulmus	1	0.63	<0.001	<0.001	0.000	0.050
Alnus	2	1.26	0.002	0.001	0.000	0.150
Vaccinium	4	2.52	0.001	0.001	0.000	0.100
Vitis	13	8.18	0.25	0.010	0.000	0.900
Geranium	2	1.26	<0.001	<0.001	0.000	0.010
Liriodendron tulipifera	2	1.26	<0.001	<0.001	0.000	0.505
Diosporos virginiana	53	33.33	0.184	0.027	0.000	1.00
Ambrosia artemesifolia	1	0.63	0.001	0.001	0.000	0.100
Unknown plant matter	20	12.58	0.012	0.004	0.000	0.600
Arachnida	2	1.26	<0.001	<0.001	0.000	0.050
Annelida	1	0.63	<0.001	<0.001	0.000	0.010
Coleoptera	28	17.61	0.013	0.006	0.000	0.950
Orthoptera	23	14.47	<0.001	<0.001	0.000	0.008
Lepidoptera	5	3.14	0.005	0.003	0.000	0.500
Dermaptera	1	0.63	<0.001	<0.001	0.000	0.100
Diptera	3	1.89	0.001	0.001	0.000	0.050
Hymenoptera	5	3.14	0.001	0.001	0.000	0.100
Unknown insect	2	1.26	<0.001	<0.001	0.000	0.050
Gastropoda	3	1.89	<0.001	<0.001	0.000	0.050
Crustacea	1	0.63	0.006	0.006	0.000	0.950
Isopoda	1	0.63	<0.001	<0.001	0.000	0.050
Unknown vertebrate	2	1.26	0.001	<0.001	<0.001	0.050
Osteicthyes	9	5.66	0.019	0.009	0.000	0.950
Amphibia	0	0.00	0.000	0.000	0.000	0.000
Reptilia	2	1.26	0.003	0.002	0.000	0.300
Aves	11	6.92	0.017	0.007	0.000	0.750
Sciurus carolinensis	*6*	3.77	0.080	0.004	0.000	0.600
Sciurus niger	*2*	1.26	0.011	0.008	0.000	0.000
Tamias striatus	1	0.63	0.003	0.003	0.000	0.400
Castor canadensis	2	1.26	0.011	0.008	0.000	0.900
Sigmodon hispidus	15	9.43	0.052	0.016	0.000	1.000
Microtus	8	5.03	0.017	0.008	0.000	0.700
Reithrodontomys humulis	2	1.26	0.001	0.001	0.000	0.010
Geomys pinetis	1	0.63	<0.001	<0.001	0.000	0.050
Rattus	3	1.89	0.012	0.007	0.000	0.800
Mus musculus	1	0.63	0.001	0.001	0.000	0.100
Zapus husdonius	1	0.63	0.002	0.002	0.000	0.300
Sylvilagus	25	15.72	0.098	0.022	0.000	1.000
Dasypus novemcinctus	1	0.63	0.001	0.002	0.000	0.100

(21.3%), and differed significantly from exurban samples (P = 0.007); however, persimmons were similar to deer, occurring 31.9% of the time at a volume of 20.2%. The most common prey based on FOC were insects (28.6%), while the most common mammalian prey were rodents at 24.2%.

In exurban areas, insects were the most common food item (FOC 45.7%), but were only 4.7% of the volume in exurban habitats. The proportion of insects in the diet in exurban areas was significantly greater than in urban and rural areas (P = 0.025). Neither reptiles nor the category "Other Mammals" (Table 2) were in exurban samples, and "Other Invertebrates" were the least-encountered items (FOC 4.4%). Deer, the most common mammalian prey overall in exurban areas were in 26.1% of exurban samples. Persimmon was the most prevalent item in terms of volume (20.3%), followed by rabbits (*Sylvilagus* spp.; 13.9%).

Table 2. Average estimates of volumetric proportions (%) of food items of coyotes in differing areas of development by humans, Lee Co., AL, September 2007-February 2009.

Food Item	Rural	Exurban	Urban
Persimmons	20.23	20.26	6.59
Other native fruits	4.34	11.29	9.33
Grasses	4.21	6.04	5.82
Other plants	5.07	2.07	7.50
Insects	1.13	4.68	0.30
Other invertebrates	1.18	0.04	0.00
Amphibians	0.00	0.00	0.00
Reptiles	0.33	0.00	0.68
Birds	1.44	2.72	0.68
Rodents	11.13	10.76	16.36
Rabbits	7.36	13.91	11.14
Deer	21.26	6.40	30.91
Carnivores	3.32	0.67	0.05
Other mammals	3.19	0.00	0.00
Unknown mammals	1.18	0.24	0.05
Abiotic materials	3.40	5.22	4.14
Anthropogenic	16.27	11.96	15.73

In urban areas, "Other Plants" and deer were the most common items, both with a frequency of consumption of 54.6%. Table 2 provides a summary of the volumetric proportion of food items across the rural to urban gradient. Proportions of other plants were marginally significant in urban areas compared to exurban areas (P = 0.057), as was their frequency of occurrence (P = 0.056). Other native fruit was the next most frequent item at 50%. Consumption of deer in urban areas varied significantly from that in exurban areas (P = 0.007). Aside from deer, rodents were the most-encountered prey (FOC 27.3%). Deer were the most important item volumetrically (30.9%), followed by rodents (16.4%).

Diversity of diet was greatest in rural areas with a total of 66 kinds of items, and least in urban areas with 32 items; diversity was intermediate in exurban areas with 37 items recorded. In terms of vegetation, 21 species of plants were in diets of rural coyotes, 10 in exurban, and 16 in urban. Diversity of prey was greatest in rural areas at 25 items and decreased along the gradient, with 14 items in exurban areas and 11 in urban areas.

Anthropogenic Feeding

Anthropogenic feeding often is associated with ingestion of trash, debris, and other synthetic (man-made) material; however, anthropogenic foods may go undetected if their origin is not carefully considered. Supplementation in the form of natural foods provided by humans may be overlooked (e.g., commensal rodents, livestock, and domestic pets). When such items were considered in this study, prevalence of anthropogenic items increased nearly two-fold. As evidenced by previous research, anthropogenic supplementation is as much a function of availability as is consumption of natural foods. Anthropogenic items were encountered 67 times. Synthetic materials were the most common anthropogenic items (20 occurrences), followed by hunter-killed deer (18 occurrences). It is important to mention that the inclusion of natural anthropogenic items (naturally-occurring items provided as supplemental items by humans) with synthetic material increases prevalence of anthropogenic items nearly two-fold.

DISCUSSION

Overall Diet

Urban and exurban areas generally are believed to be resource-rich areas for exploitation; however, prevalence of anthropogenic feeding did not vary significantly across the urban-rural gradient and was relatively similar in each habitat. This is not surprising, as availability of anthropogenic foods seems to be consistent along the gradient. While rural areas by definition have a lower human population, they receive nominal amounts of vehicular traffic. Refuse along roadsides, in washes, and along property boundaries is common. Also, cities do not collect trash outside their limits, and residents of rural areas either take their waste to a community dump site, or burn it on their own property making trash a readily available resource for coyotes.

Deer (FOC 37.7%, VP 18.3%) was the second-most-important food item volumetrically after persimmon, which was almost identical in volume (18.4% VP). This is somewhat novel for animals in urban-exurban areas, as similar studies do not report such high occurrence of deer in diets of coyotes (MacCracken 1982, Atkinson and Shackleton 1991, McClure et al. 1995, Fedriani et al. 2001).

With the exception of white-tailed deer, the detection of Alabama-recognized game animals in scats of coyotes was diminutive. Contrary to beliefs of many local hunters, coyotes do not consume vast quantities of game animals. Wild turkey and mourning dove were only consumed on one occasion each, and no quail or waterfowl were detected. While rabbits occurred commonly, they were in exurban areas where hunting was not permitted, thus eliminating potential competition between hunters and coyotes. Deer and raccoon (*Procyon lotor*) were detected but were believed to be consumed almost exclusively as carrion. However, these results should not be interpreted to rule out nest predation, for which evidence may not persist since the soft tissues of eggs and natal animals are often not evidenced in scat. Previous studies have reported conflicting results as to the impact of coyotes on various prey species (Korschgen 1957, Litvaitis and Shaw 1980, Bowyer et al. 1983, Schrecengost et al. 2008).

Diet Along the Urban-Rural Gradient

Diet of Urban Coyotes

Vegetation was an important part of the diet overall (the most commonly encountered food), particularly in diets of urban coyotes in terms of volume and frequency of consumption. A possible reason for frequent consumption of plant material in urban areas could be that other sources of nourishment are lacking. Increased consumption of vegetation could be because non-mast plants are not as nutritious as other foods (e.g., fruits, animal protein) and therefore need to be consumed in greater volume. Increased consumption of vegetation in urban areas could merely be a function of availability of such items, and a paucity of others, as was postulated by Stratman and Pelton (1997). In urban areas, many invertebrates and mammals were not encountered in the diet, most likely because these items usually are not associated with urban areas. This supports the hypothesis

that coyotes are eating what is locally available in the habitat in which they are foraging, consistent with what others have observed (MacCracken 1982, McClure et al. 1995), providing additional evidence of the highly omnivorous diet of coyotes.

Deer was the most widely consumed item by urban coyotes (30.9% FOC) and differed significantly from exurban areas, occurring twice as much by volume as any other item consumed; this is presumably in the form of carrion from road-killed animals. Road-killed deer in Alabama are abundant and widespread, as deer-vehicle collisions are common and frequent (Hussain et al. 2007). After deer and other plants, fruit followed closely in terms of frequency of consumption. This is not surprising, because many suburban-dwellers cultivate gardens and berry patches that are easily exploited by coyotes.

Diet of Exurban Coyotes

Exurban areas, the presumed transition zone for dietary shifts, revealed persimmon as being the most heavily consumed item at 20.3%VP. This is almost identical to what was observed in rural areas, where persimmon was consumed at 20.2%VP. Persimmon trees are common in natural areas of the Southeast but are not commonly encountered in urbanized landscapes. The only food that differed significantly in exurban areas was insects, which occurred in greater volume than in urban and rural areas. This is likely due to the life-history traits of insects that were consumed. The majority of insects consumed were orthopterans (grasshoppers and crickets); these insects are most-often encountered in areas where grass is abundant. Exurban areas are laden with empty parcels, power line corridors, and early successional areas that would support such insect life.

Deer occurred significantly less frequently in diets and in lower volumes in exurban areas than in urban and rural areas. Volumetric proportion of deer in the diet was 6.4% compared to 30.9% and 21.3% in urban and rural areas, respectively. This is surprising, because exurban areas should have relatively equal proportions of deer compared to urban and rural areas. Deer are common in residential areas, and vehicular-traffic patterns are sufficient to produce road-killed animals in a similar proportion to their occurrence in urban areas; thus, deer-vehicle collisions might be nearly as common in exurban areas as they are in urban areas. Deer-vehicle collisions occur more often in fragmented landscapes of mixed use, such as exurban areas (Hussain et al. 2007). Low occurrence of deer in diets of exurban coyotes is puzzling.

Rabbits were the second-most-important food with respect to volume and occurred in greater volume in exurban areas than both urban and rural areas, although not significantly so. This is likely due to the nature of suburbia, with manicured lawns and yards providing a plethora of grasses and forbs that are attractive to lagomorphs. The nature of the suburban landscape also provides sources of cover and supplemental water, all of which attract rabbits to exurban areas (Craven 1993).

Diets of Rural Coyotes

In rural areas, grass was the most commonly encountered item, but only comprised 4.2% VP of the diet. Possible theories for coyotes' use of grasses are: as a digestive agent similar to behavior observed in domestic dogs (Thorne 1995); a mechanical function, forming a bolus of indigestible fibers that serve to scrub the intestines, helping to eliminate intestinal parasites (Emmons, Smithsonian Institution, Washington D.C., pers. comm.); and a deliberate choice, suggesting further investigation of the nutritive properties of grass and its importance in the diet of coyotes (Best et al. 1981). Volumetrically, deer was the most important food item in rural areas, followed closely by persimmon; this is similar to what was observed overall. Persimmons were common in natural areas and are nutritious, containing high amounts of glucose and proteins. When fruits ripen, they swell and fall from the tree, littering the ground with sweet, fermenting fruit. Coyotes gorge themselves under persimmon trees (P. Getsgow, Seale, AL, pers. comm.); it is not surprising that they are capitalizing on this abundant, high-energy fruit. In support of this observation, Gipson (1974) found from a stomach contents study that persimmon was the most common autumn food for coyotes in Arkansas, and year-round was the second-most-common food item, following poultry.

Anthropogenic Feeding

Although there was no significant difference along the gradient, anthropogenic items comprised a fair amount of the diet, occurring in 13.8% of samples, and being consumed at 15% volume, the third-most-important food volumetrically. It is possible that anthropogenic foods are widely available and not concentrated in urban-exurban areas as was hypothesized. Another possible explanation could be that animals feeding in urban and exurban areas are not strictly foraging in those areas. As samples were collected without knowledge of sex, age, or social status of the individual from which it was collected, there was no information available regarding home range or other behaviors.

Anthropogenic feeding often is associated with ingestion of trash, debris, and other synthetic material; however, anthropogenic foods may go undetected if their origin is not carefully considered. Supplementation in the form of natural foods provided by humans may be overlooked (e.g., commensal rodents, livestock, and domestic pets). When such items were considered in this study, prevalence of anthropogenic items increased nearly two-fold. As evidenced by previous research (MacCracken 1982, Atkinson and Shackleton 1991, Fedriani et al. 2001) anthropogenic supplementation is as much a function of availability as is consumption of natural foods.

Deer was an important component of diet across the urban-rural gradient. Predation on fawns has been observed in the Southeast and likely is increasing (Saalfeld and Ditchkoff 2007, Kilgo 2009). In this study, deer were consumed 60 times by coyotes, 18 during the period when fawns were most susceptible to predation (mid-July through late September). It is hypothesized that most consumption of deer is a function of coyotes scavenging carrion. While traditional evidence of anthropogenic feeding was detected, it is likely that natural anthropogenic foods, such as road-killed deer,

were underestimated, and the extent of anthropogenic supplementation in the diet is greater than actually observed.

Considerations

Previous studies of diet of coyotes in developed areas have been conducted in highly urbanized cities (San Diego, MacCracken 1982; Los Angeles, Fedriani et al. 2001; Chicago, Morey et al. 2007). While the Auburn-Opelika area meets the technical definition of an urban area, the degree of development and juxtaposition of the landscape differ considerably from more traditional urban areas. This could explain the lack of a clearly defined transition zone in exurban areas, where it was expected to observe intermediate levels of native and non-native foods. As prevalence of anthropogenic food has differed considerably among studies, the relatively low occurrence of anthropogenic foods in urban-exurban areas at this study site may or may not be influenced by this landscape. Future research in landscapes of varying levels of development and juxtaposition may help to further elucidate diet of coyotes in diverse urban areas.

CONCLUSION

Overall, few significant differences in diet of coyotes were observed along the urban-rural gradient. This was somewhat unexpected. The dynamic nature of the landscape was a likely explanation for the similar distribution of resources along the gradient. Coyotes in the three habitats likely were consuming what was available, which was similar among habitats. Results of this study largely are consistent with studies in developed areas (MacCracken 1982, Atkinson and Shackleton 1991, McClure et al. 1995, Parker 1999, Fedriani 2001, Morey et al. 2007). Diet varied by locality and availability. Other than increased consumption of anthropogenic foods in developed areas, diet varies widely, with natural items comprising the bulk of the diet. Results of this research support previous conclusions that coyotes are highly adaptable, opportunistic omnivores, and supports the claim by Wade (1978) that availability is the rule that governs diet of coyotes. Thus, we believe that the diet is not necessarily shifting; coyotes simply are continuing to operate as opportunists, taking advantage of anthropogenic supplementation when it is available.

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