ECOLOGY OF COYOTES IN CONNECTICUT

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I. Introduction

The coyote is one of the few large mammals to successfully colonize new territory in modern times. First seen in the state of Connecticut in the 1950's, the coyote had colonized the whole state by the 1980's. While Coyotes are fascinating to biologists due to their many unique adaptive characteristics, in recent years most Connecticut residents have had the opportunity to observe the coyote and its movements right in their own back yard. The presence of the coyote in both urban and rural habitats, along with its unique biotic aspects and behavior, make it one of most notorious and intriguing wildlife residents of the state.

The coyote is a mid-sized predator of the family canidae, and is closely related to the wolf, jackal and domestic dog. It received its name from the Aztecs of Mexico who called it "coytle", meaning song dog. The coyote's scientific name *Canis latrans* in Latin literally means barking dog, and was revered in Mexican and American Indian folklore as an earth-spirit of intelligence and perseverance. (Peterson, 1990) The coyote is shy and very intelligent. It is renowned for it's ability to adapt to almost any habitat. The coyote, in spite of disappearing habitat, changing ecosystems, and a long history of persecution from man, seems to be reclaiming old territories along with establishing new ones.

The eastern coyote is one of the possible evolving dozen or so sub-species of coyote that reside in North America. (Parker,1995) The Eastern Coyote seems to have picked up about 6.75 kg on the average weigh in against specimens of the more traditional western ranges.   Most sources limit the coyote male (usually heavier than the female by 10-20%) to top off at 15.75 kg.(Parker,1995)

When determining evidence of a Coyotes passing during this study, various details were considered. Coyote tracks can be difficult to differentiate between domestic dogs, especially mongrel breeds. Red fox tracks can also add to the confusion. But, with some practice using the many available printed field manuals, tracking the coyote can become quite reliable. The paw more elongated than that of a dog the some size has four toes with non-retractable claws. The forepaws show a rudimentary thumb, reduced to a claw, located high on the inner side. The claws are not used in attack or defense; they are typically blunted from constant contact with the ground and do not leave deep marks. (Peterson, 1993)   Toes 1 and 4 on the front foot are typically larger than 2 and 3; with the over all track being twice as long as wide. (Peterson, 1993) The back foot is much smaller and often steps directly on the track of the front foot. Also, note the distance between the tracks, and the manner in which the canid travels. Coyotes will often follow a deliberate path, traveling on trails or old logging roads in a straight line. Foxes and domestic dogs tend to wander off of trails in a meandering pattern. (Peterson, 1993) Coyotes also leave evidence from their passing at slides. These are sites where Coyotes crawl or slide underneath fences. Scat, or droppings, can easily be identified due to their strategic placement. A coyote scat often has massive amounts of undigested hair and bone, and is usually the size of a medium sized dog's droppings. (Peterson, 1993)   Coyotes often use scat to indicate their presence to others by marking trails and openings to fields. (Peterson, 1993)

Although primarily a flesh-eater, the coyote will eat just about any thing available. Rabbits and hares are typically dietary staples, as are small rodents. Blueberries and other wild fruits are commonly eaten, in quantity, in summer and fall. Coyotes also eat insects, for example, grasshoppers, when they become available (Parker, 1995) Carrion (flesh from dead animals) from livestock and other sources is important to, especially in winter. Coyotes commonly prey on deer fawns in spring and summer; however, they may also prey on adult sized deer and other large hoofed mammals during certain snow conditions in winter. (Parker, 1995) Coyotes in CT often prey on domestic sheep when they are available, and may take beef calves and domestic poultry, too. Coyotes may have flexible social behavior and adjust their hunting methods to the prey size and food sources available. Coyotes often hunt small prey animals alone, whereas they hunt large prey and defend large carcasses in-groups based on evidence and observations I have collected. In Wallingford, near north farms reservoir, I observed an adult doe white tail deer, that had been killed by a coyote. It's hind leg had been ripped off and made a trail of hair and blood to a near by thicket, possibly to a den - as it was early spring.

Coyotes, like some other wild canids including wolves, may leave urine or feces as territorial markings. Many trappers in New England, which spoke to me, said these markings might be messages to competing predators or other Coyotes. They may have various meanings, but in general are warnings to declare their presence.

From 1974-1976, W. Don Bowen and Ian McTaggart Cowan studied Coyotes in Jasper National. They recorded six different types of scent marks, urine alone; urine and scratching; urine, feces and scratching; feces alone; urine alone and urine with scratching. The urine was usually deposited on objects to allow for the distribution of the scent. This practice also allows the urine to act as a visual mark. The Coyotes left most of their marks on the borders of their territories. (Mctaggart and Bowen, 1980)

II. Study Area

The study area was approximately a 1217.3 square kilometers plot in which all captures, samples; den locations, photographs and scat collecting activities were conducted. This area is located in central Connecticut and spans from Southington mountain in the west to the Connecticut River in the east, and from Cromwell in the north to East Rock Park in New Haven. However my fixed wing aircraft searches for transients and juveniles occasionally entered into New York, Rhode Island, and Southern Massachusetts due to dispersal, but were no longer tracked. June temperatures average approximately 20 degrees C and January temperatures average approximately –5 C with 110 cm of rainfall. The area was characterized as having mostly hardwoods with mixed deciduous/conifer areas consisting of mostly oaks, maples, birches, red spruce, white pine and red cedars. The unforested areas were mostly farmland, golf courses and residential areas. The study plot also contained half dozen towns with a population of 50,000 or more.

III. Methods

Various experiments were conducted over 5-year period from the summer of 1998 to the summer of 2003. Starting with collecting anecdotal evidence from hunters and farm owners to snow tracking, predator calling and scat analysis, White Tailed Deer (*Odocoileus virginianus*), and Eastern Wild Turkey *(Meleagris gallopavo)* predation were believed to be apparent.

Statistical, more scientifically sound data was collected through scat analysis and was documented by season and prey presence.

Carrion studies were conducted to determine the scavenging habits of Coyotes with respect to time of year, habitat, and competition with other scavenging animals. Three infra-red sensor tripped cameras rigs (Cubettas Rf360, Trail camera) were set near road killed deer and road killed wild turkey carcasses to assess how often scavenging animals frequented carcass sites. Turkey and deer carcasses were rotated throughout the study along with the sites them selves to prevent individual scavengers from exploiting particular prey or sites. These cameras ran 24 hours a day and were checked about every two days.

Scat analysis was conducted from 10/99 – 11/2001. 123 scats were collected on trails and kept in zip lock bags through all 4 seasons in all habitat types of the study area. White tailed deer guard hairs, cottontail rabbit hair, rodent bones, and eastern wild turkey quills were identified using methods described in Adorjan and Kolenosky (1969). No differentiation was made between eastern cottontail *(Sylvilagus floridansus)* and the new england cottontail *(Sylvilagus transitionalis)* hairs. (Adorjan and Kolenosky, 1969)

Seven Coyotes were captured between the spring of 2001 to the spring of 2002 to determine disease and to equip with radio collars. The first four were captured with baited box traps (Tru-catch traps, TC48F). Three of these Coyotes were juveniles and were not radio collared. One adult male was also captured using this method and was radio collared with a H.A.B.I.T. VHF terrestrial collar. Three Coyotes were captured from the fall of 2001 to the winter of 2002 using #3 and #1 1/2 Victor soft-catch padded traps. Trapped adult Coyotes were anesthetized or subdued with an animal control pole, checked for external parasites, and had a skin, stool, and blood samples taken in the field. Blood samples were sent to wild canine genetic researcher Dr.

Paul J. Wilson PhD of the American Academy of Forensic Sciences, to be analyzed for evidence of coyote/wolf hybridization. The animals were fitted with radio transmitter collars (H.A.B.I.T. VHF terrestrial collar). All tests and procedures were done in the field to reduce time and injury to the subject. Dr. Jim Peddie, wildlife veterinarian, familiar with sedating wild canids such as wolves and Coyotes, was consulted before calculating anesthesia plots. Soft tissue sedative doses were 0.5 to 0.7 cc's of 5 to 1, Ketamine to Rompun, and were injected with a safety pole or a darting rifle into the hindquarters. The weight of coyote was determined by subtracting the trap's weight from the weight of both the trap (for box traps) and coyote. The Coyotes were awakened by a 0.125 mg per Kg IV Yohimbine dose when needed. All samples taken from the Coyotes were analyzed at The East Side Veterinary Clinic (Meriden, CT) for parasites (sarcoptic mange, bacteria, yeast, heart worm, tape worms, fleas, ticks, ear mites, round worm, and hook worm). Blood was analyzed for Lyme disease by using whole blood snap kits.

The Capture/Release Protocol was designed by myself, and the staff at The East Side Veterinary Clinic. First baited box traps (tru-catch trap TC48F) were placed in high coyote densities of the study area that have been approved with cooperating landowners. The bait was used in conjunction with audio and scent lures, and was switched around until a favorable response was achieved. Three Coyotes were captured from the fall of 2001 to the winter of 2002 using #3 and #1 1/2 Victor soft-catch padded traps. The traps were checked three times daily. Traps were always checked from a distance to prevent any target animals from getting too excited, and become difficult to handle. All non-targeted species were released immediately.

After capture of target species a specific protocol was followed: The trap was opened and the manual squeeze was used to push the subject into the back of the cage until into position for sedation. If unsuccessful, then we used a lateral squeeze to position the animal and lock the subject into place for sedation. We then administered the sedative and evaluated the success of the dose delivery. We then muzzled the subject and lubricated the eyes.

Once the subject was stable, collection of samples began: We collected and evaluated the amount of ticks, ear mites and fleas, skin scraped for sarcoptic mange and took a stool sample. We took blood samples (jugular, brachial or femoral), measured the weight, over all length, and sex.

We made sure the magnet was removed from transmitter, removed muzzle, and photographed the dentition (if possible). Finally we administered the Yohimbine reversal and monitored the Coyote's recovery.

Home Range waypoints were calculated through triangulation using methods described in Harrison and Gilbert (1985) and were taken > 6hrs apart. Home Range waypoints were calculated by Using Dog Track Home Range Analysis Software to calculate acceptable waypoints, and Biotas Ecological Software to calculate Home Ranges using Kernel, Minimum Convex Polygon method, and Harmonic Mean methods. Coyotes were tracked with hand-held portable 5-element Yagi antennas or from Cessna 172 aircraft with Telonics two-element wing-mounted antennas. Antennas were calibrated and tested to have +/- 3degree error. Dispersal was determined when Coyotes moved >30 km from Home Range and did not return as described in Harrison(1983).

Den sites were located by observing fresh sign and were assigned a compass direction based on the orientation in which the opening occurred

IV. Results

The results of the various experiments performed in this study will be presented as follows; General field research, Snow Tracks and Anecdotal Collection, Scat Analysis, Carrion Studies, Disease and Pathogen Results, and Radio telemetry.

Various methods of general field research constituted the early stages of this study. Hiking, baiting field locations, using distress calls and looking for sign such as scat and tracks lead to general qualitative conclusions about habitat selection, temporal, seasonal habitat selection along with denning habits.

Coyotes in central CT often had habits comparable to other geographic locations based on my observations and study of other North American observations in other studies, journals and general wildlife and outdoor publications. Based on Snow Tracks, Coyotes observed in CT preferred transitional habitats and ecotones that offered cover and varied habitat that would support a wide range of prey species. Snow tracks, in which Coyotes would be followed for an entire night, would often cover 26 or more kilometers nightly and would travel through habitat from open fields to mixed deciduous woodlands and from wetlands to occasional movements through suburban neighborhoods.

Coyote's used railroad tracks and power lines the most in rural areas, and were almost always used regardless of surrounding habitat. I found through these early, but qualitatively effective searches for data, that individual Coyotes would forage residential areas for anything edible, from garbage to domestic cats. Wild Turkey were observed as a major prey item along with white tailed deer, but we will continue this discussion later when we talk about more advanced methods. Fall was an opportunistic time in which Coyotes would explore all areas due to the food abundance. Berries were observed in coyote scat and were identified by using methods described in Marten and Barklev. 1961. “Seed identification manual”. Winter snow tracks, and later scat analysis and carrion studies, All confirmed an active foraging of deer and wild turkey. It appears there is a considerable impact that Coyotes have on deer and turkey populations, however due to the limiting sample size of this study, proving this is difficult. Coyotes also occasionally scavenge carrion during winter months. Sign indicated that coyotes would often be in grass areas near brush cover in the spring hunting for rabbits and rodents. Summer months were spent close to den sites grabbing anything the coyote parents could forage, sometimes with the help of yearlings from the year before.

Den selection was depicted as having entrances that were south facing, and most natal ranges offered at least 3 alternate sites located within 135 meters. 16 out of 19 den sites were located between 165 degrees and 200 degrees azimuth. The other three were north-east facing. Dens were dug in the first week of March. Typically, year after year, dens would be located in identical spots and I worked with three different family’s Home Ranges. Dens were identified by tracks, guard hairs and large underground dens that were dug out by the adults. Also dens were located in trap rock piles, hollow logs and thick brush piles.

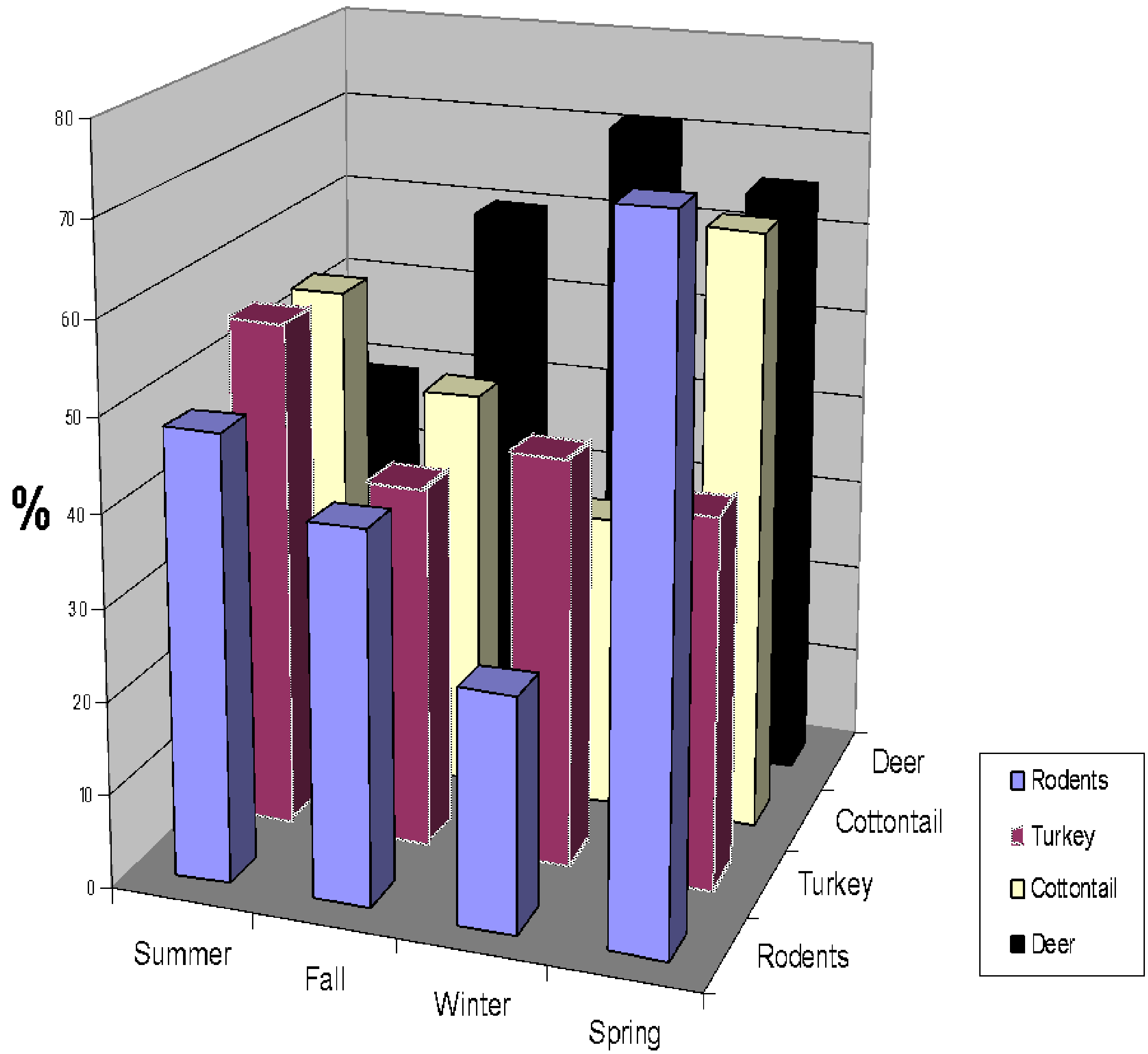
Scat analysis revealed most prey items were White tail deer, wild turkey, cottontail rabbit or rodents although evidence of insects and berries were present to a lesser extent. The presents of these prey species also varied with relation to season as depicted in table 1.

Table 1. Seasonal prey items by percent occurrence per 123 scat.

	Rodents	Turkey	Cottontail	Deer
Summer	48%	55%	54%	39%
Fall	40%	39%	44%	60%
Winter	25%	44%	32%	71%
Spring	75%	40%	65%	65%

The presence of these prey species were identified as being present or absent, and were applied to the sample size of 123 according to methods consistent with Floyd et al, (1978)., and Adorjan et al,(1969).

Fig. 1. Percent frequency of occurrance of prey items in 123 scats collected from 10/1999 - 11/2001



Carrion studies suggested that coyotes scavenged only when prey supply was at a crucial low. Of the deer guard hairs found in winter scat, some is most likely scavenged but snow tracks did appear to suggest that coyotes actively hunt deer. Of the two years of scat analysis, the year with far more snow yield a 25% increase in deer consumption compared to the year with little snow.

Table 2. Number of visits to carcass sites by coyotes and potentially competing scavengers shows month and frequency of coyotes and competing scavengers visiting carcass sites.

Abbreviated months	J	F	M	A	M	J	J	A	S	O	N	D
10/98 - 3/01												
Species												
Eastern coyote	23	14	2						2	8	4	7
Striped skunk				1	3	2		3				
Turkey vulture	3	8	26	41	40	84	75	80	85	21	5	6
Red Fox	3	2										
Raven	9	8	3	4	2	4	3	3	3	9	11	4
Common crow	22	42	33	11	21	15	6	11	5	12	19	12
Opossum	15	11	12	9	42	33	25	26	35	12	8	9
Bobcat												
Red tailed hawk				4								
White tailed deer												
Eastern wild turkey					1							
Raccoon	23	2	0	0	2	0	3	0	15	22	26	9
Black bear												

Results recorded over the three-year carrion visitation experiment proved to be one of the most labor intensive of the study. After checking three cameras that were simultaneously running over three years continuously, the above results (table 2) were recorded. Three carrion sites were simultaneously maintained for a three year period for meat freshness and site location. Carrion was comprised of either deer carcasses or wild turkey remains, no note was made to preference, as they were often combined and fed on equally. Prey species are included to document their avoidance of carrion, which may mean avoidance of predators. Coyotes were only observed scavenging on carrion in January and February suggesting that they will only scavenge meals when prey availability is at its absolute lowest. Other competing scavengers and passing species were recorded as baseline data. This species list was kept complete to possibly offer data to continuing studies.

Of the coyotes general health, tests were taken to evaluate overall status of parasites being present or absent. All seven coyotes tested negative for tapeworm and hookworm. All pups were found positive for roundworm (common in *Canis farmilaris* pups) and Lyme disease exposure. Actually all seven coyotes tested positive for Lyme disease. None of the coyotes tested positive for sarcoptic mange. One of the female adults was found to have canine heartworm. This was the first documentation of eastern coyotes being tested positive for heartworm. Little is known about how this parasite exists in the wild with respect to this area. This worm will, in domestic dogs, take the life of its host in less than three years. The pups also were found to have yeast, bacteria and ear mite infestations that appear common in all canines at an early age(Table 3).

Table 3. Table 3 depicts results from various tests performed on 7 coyotes in 3 different Home Ranges.

Subject ID	P1	P2	P3	M1	F1	F2	M2
STATUS/AGE	4 months	4 months	5 months	Adult	Adult	1 year	Adult
GENDER	male	male	female	male	female	female	male

LOCATIONS	Airport	Airport	Airport	19	61	51	41
Capture/Last contact	Airport	Airport	Airport	9/01-1/02	10/02-1/02	2/02-	2/02-
WEIGHT				22.05 kg#	17.55 kg#	13.05 kg#	18.9 kg#
HEART WORM	neg	neg	neg	pos	neg	pos	neg
SARCOPTIC MANGE	neg	neg	neg	neg	neg	neg	neg
LYME DESEASE	exposed	exposed	exposed	exposed	exposed	exposed	exposed
EAR MITES	pos	pos	pos	neg	neg	pos	neg
EAR BACTERIA	pos	pos	pos	neg	neg	pos	neg
EAR YEAST	pos	pos	pos	neg	neg	pos	neg
HOOK WORM	neg	neg	neg	neg	neg	neg	neg
ROUND WORM	pos	pos	pos	neg	neg	neg	neg
TAPE WORM	neg	neg	neg	neg	neg	neg	neg

Home Range waypoints were used in the Biotas Home Range software and comply with the following equations for Harmonic Mean and Minimum Polygon respectively. Waypoints were determined by triangulation. The telemetry error for this method with 20 test transmitters determined a mean error as 5 ± 3 m (SD) (90% of errors were ≤ 20 m) The results of these formulas can be seen in table four.

When considering Home Range analysis approaches the following factors were considered: Non-probabilistic estimator – doesn't assess probability of occurrence, Probabilistic estimator – assess coyote's probability of occurrence at each point in space, Parametric – makes assumptions regarding coyote use of space, Non-parametric - no assumptions of how coyotes use space(Doherty, 2002). Non-parametric estimators can conform to less regular location distributions and locations are not from a particular statistical distribution. Non-parametric are generally considered better than parametric methods. (Doherty, 2002).

I will focus on using three analysis methods: Minimum Convex Polygon, Harmonic Mean, and kernel estimators. Having a sample size of n=4 was not as important for each individual sample, as long as each sample had greater than 30 waypoints for each individual sample.

Minimum Convex Polygon (MCP) (Mohr, 1947) is the oldest and most common method of estimating Home Range. A convex polygon is constructed by connecting the outer locations ((x,y) coordinate system). With non-parametric there are no underlying distribution assumptions and points should be independent. With sample size dependent, the estimated area of the Home Range will always increase as the number of relocations increases. This seemed to work well with the F1 data set having over 80 relocations(figure 2). MCP tends to underestimate Home Range especially at small sample size (<50). This did not seem to be the case with F1, which had a Home Range (Figure 3) of just over 10 square miles. This is well below the average 51.8 plus square kilometers reported in the Maine study (Harrison,1983). This may be explained by the seasonal calculation, which was from summer to fall for F1, or it could imply that the higher carrying capacity of the study area shortened this female's Home Range.

This potential problem of under estimating Home Range has been partially addressed by constructing algorithm Harmonic Means to restrict the Home Range area estimate to 95% or 90% of the points, eliminates the outliers. Subject M2 had a larger Home Range than M1(Figure 4), However M2 did disperse according to methods described by Harrison (1983). So if these waypoints were removed as outliers, then M2 has a much smaller Home Range. This method seems to fail when some part of the true shape of the Home Range is concave (e.g., Home Range surrounding the end of a small lake – unsuitable habitat within range),(Doherty, 2002). Also, both time interval and standardized sampling effort must remain order to make a valid comparison. Otherwise, difference between two groups may be based only on the length of time sampled which needs to be more standardized than the collection of the data in this study.

Harmonic Mean (Dixon and Chapman, 1980) was the best method for this study for several reasons. The probabilistic estimates the probability of encountering the animal at intersections of a grid, which worked well with Biotas and Dog Track software systems. The Harmonic Mean Grid is superimposed on contours of area activities are developed from this grid of points. Grid points located at centers of activity have the shortest distances and will be included inside a contour with a higher probability of occurrence of the animal, than contours which include grid nodes farther from center of activity. Also problems can occur when observed radio telemetry location is same as grid node location, value of 1/d is undefined. (Doherty, 2002). One of main criticisms of Harmonic Mean estimators is that it is overly sensitive to choice of grid size (Worton, 1987). In simulation studies, Harmonic Mean found to underestimate Home Range at small sample size (<50), is similar to knows at sample size 50 to 100, and tends to overestimate Home Range at large sample sizes. Harmonic Mean is very useful to delineate “core areas” related to intensity of use within the Home Range boundary, and is not able to estimate variance. (Worton, 1987).

Kernel-based methods are currently considered the most sophisticated method of Home Range analysis (Worton, 1995). Each location is covered with a 3-D “hill” which is the Kernel probability density. The shape and width (“band width” or “smoothing parameter”) of the density is defined by the researcher respect to location error and the radius of perception of the species. Narrow kernels allow nearby observations to influence density estimates. Wide kernels allow more influence from observations. (Worton,1995). For the purposes of testing Home Range with Kernel Method I took a grid and superimposed it on the location (by using a digital Topo software map) and estimated the density obtained at grid intersections. Grid cell size and placement does not affect Home Range size estimates as long as the units were proportional to the distances on the map. To compute the kernel Home Range area, the estimated density at each intersection of the grid is the average of the densities of all the kernels that overlap that point. Kernel Methods don’t tend to underestimate Home Range at small sample size (<50), and are generally least affected by sample size. This method also gave me perspective on how sample size might influence my results, which seemed to be much smaller than anticipated. It was apparent that Harmonic Mean seemed to give the best results with respect to Home Range size due to the fragmentation of habitat in an area such as this, with

Table 4. Four coyote Home Ranges (f1, f2, m1, m2) are compared in square kilometers using Minimum Convex Polygon, Harmonic Mean and Kernel Methods. Data corresponds with maps seen in figures 2,3,4, and 5.

	Subject M1	Subject F1	Subject M2	Subject F2
# Of Locations	56	81	47	63
MCP	11.914	26.677	36.519	61.383
HARMONIC MEAN 95%	16.058	41.958	36.778	56.462
HARMONIC MEAN 75%	5.439	13.209	15.779	17.353
HARMONIC MEAN 50%	1.295	3.108	4.662	6.475
K 95%	5.698	26.418	27.195	62.678
K 75%	1.554	10.878	13.209	30.303
K 50%	.518	6.475	3.367	13.7788

respect to studying core areas.

I counted Home Range waypoint values found from relocations separated by > 4.5 hr (Harrison et al, 1985) and typically sampled for activity ≤ once/day during a given time period close to dawn, day, dusk or nightly tracks when actual observed behavior was attempted to be documented.

Movements by a coyote(F1) over a 24 hour period in this study reached 026 km with only one such 24 hour sample. Average movements by coyotes in the Cape Cod study (males = 26.0 km and females = 20.4 km per 24 hr) were greater than found in most studies of western coyotes. This study's data (Males=22.4km/24hrs and Females=18.8 km/24hrs) seemed to have similar distances with Way's results. Adult males and females averaged 8.1 km and 7.8 km during 24-hr travel budgets in Texas (Andelt, 1985), 1.3 to 6.2 km per night in Tucson, AZ (Grinder and Krausman, 2001), 10.9 km per day in Nebraska (Andelt and Gipson, 1979), 3.3-9.9 km in British Columbia (Atkinson and Shackleton, 1991), and 6.3 km in Oklahoma (Litvaitis and Shaw, 1980). Two eastern coyote studies reported coyotes also traveling short distances: 6 km in New Brunswick (Parker and Maxwell, 1989) and 1.59-1.84 km at night in Vermont (Person, 1988). However, a comparison of these results should be taken conservatively because these studies used different methods when reporting movement rates. For instance, both of the studies of eastern coyotes collected data over shorter intervals (8 hr, Person 1988; to daily, Parker and Maxwell 1989); thus, the movements of these coyotes would also be underestimated (Huegel and Rongstad, 1985, Jedrzejewski et al. 2001).

Figure 2, # Of Radio Locations

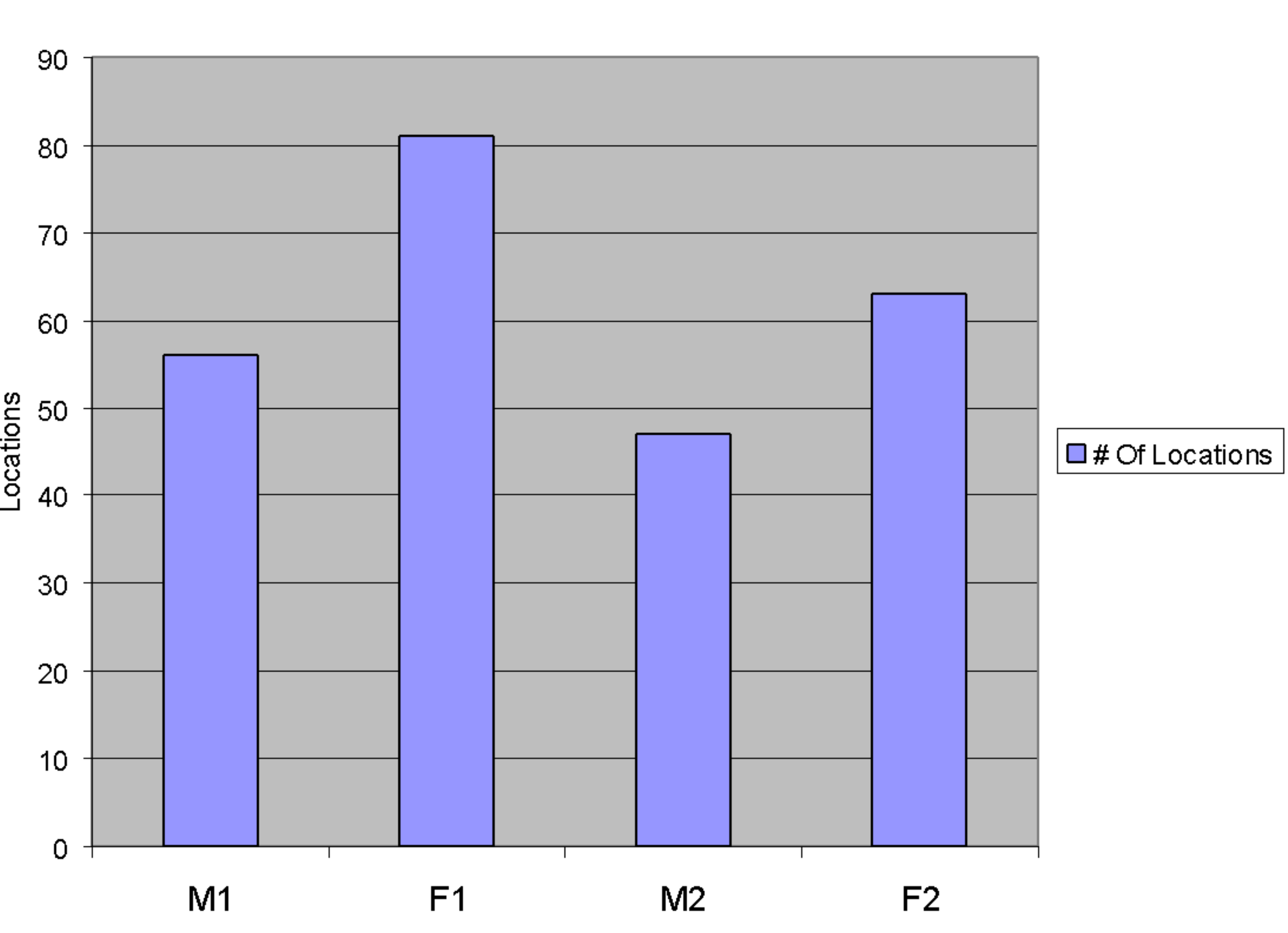


Figure 3, Homerange/ % Harmonic- Mean/ Coyote

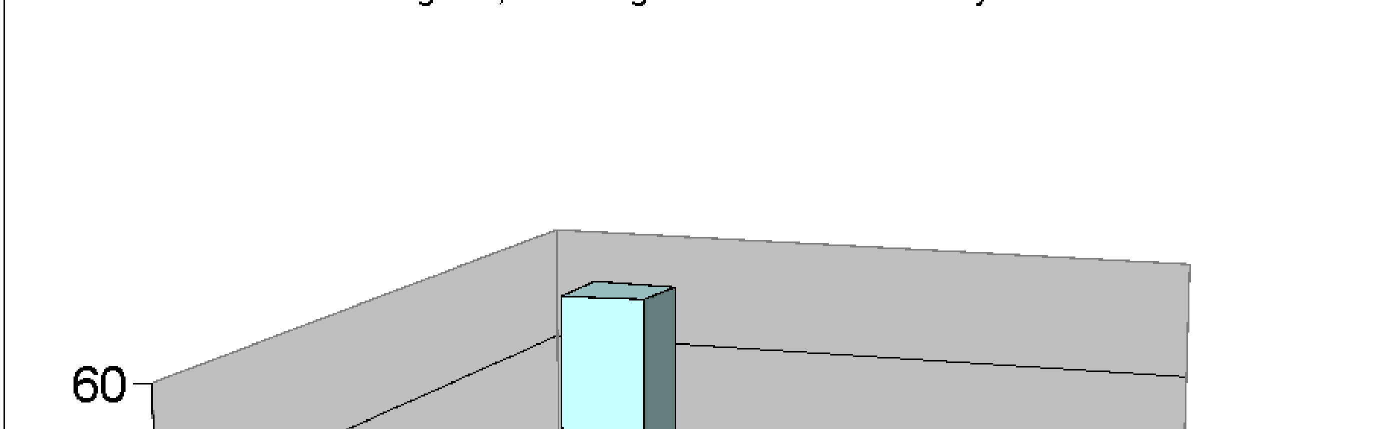


Figure 4, Home Range map of coyote F2. Diamonds represents waypoint locations. All borders indicate Harmonic Mean boundaries with red=95%, green=75% and blue=50% respectively. See Table 3.

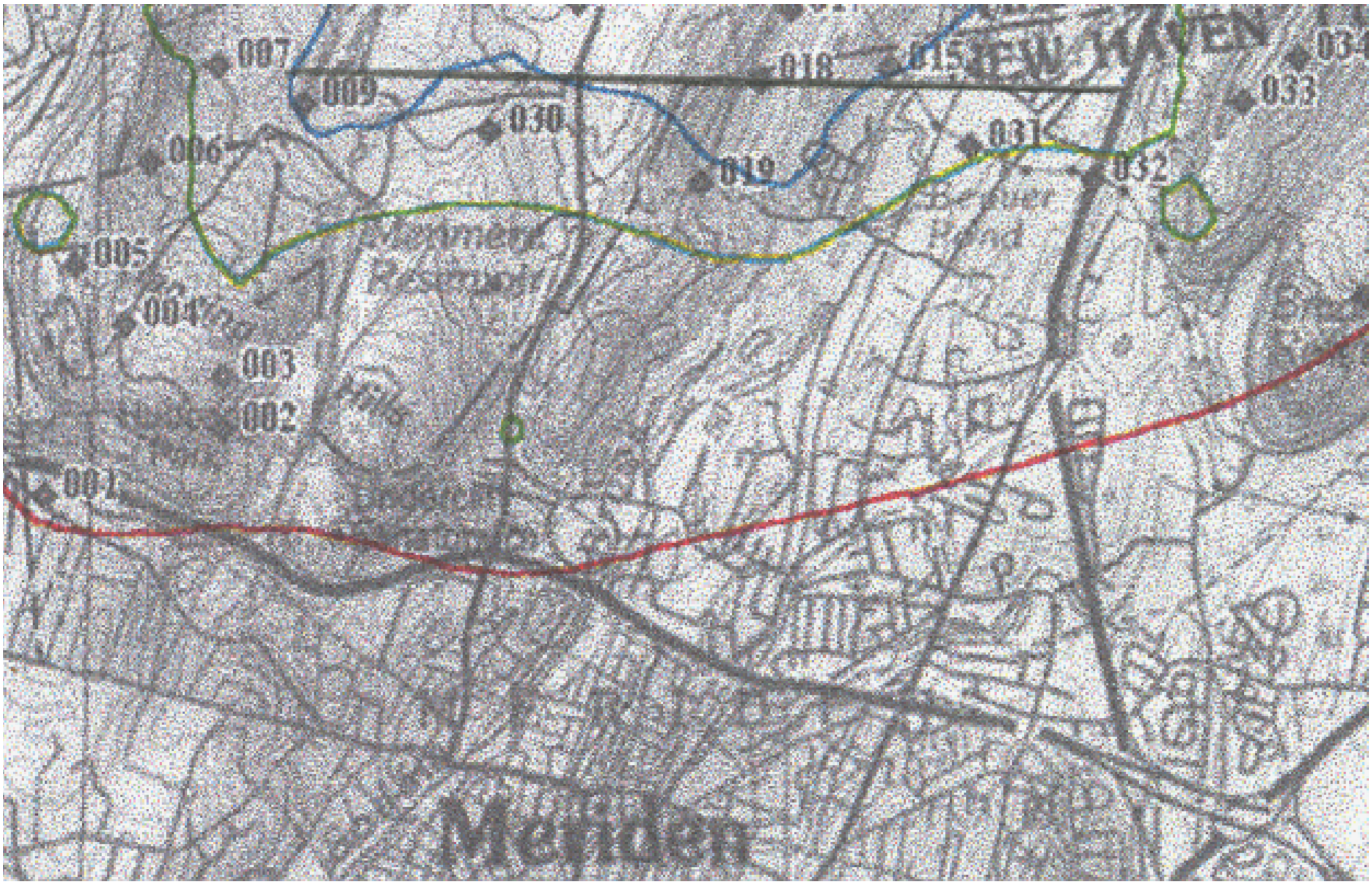


Figure 5, Home Range map of coyote F1. Diamonds represents waypoint locations. All borders indicate Harmonic Mean boundaries with red=95%, green=75% and blue=50% respectively. See Table 3.

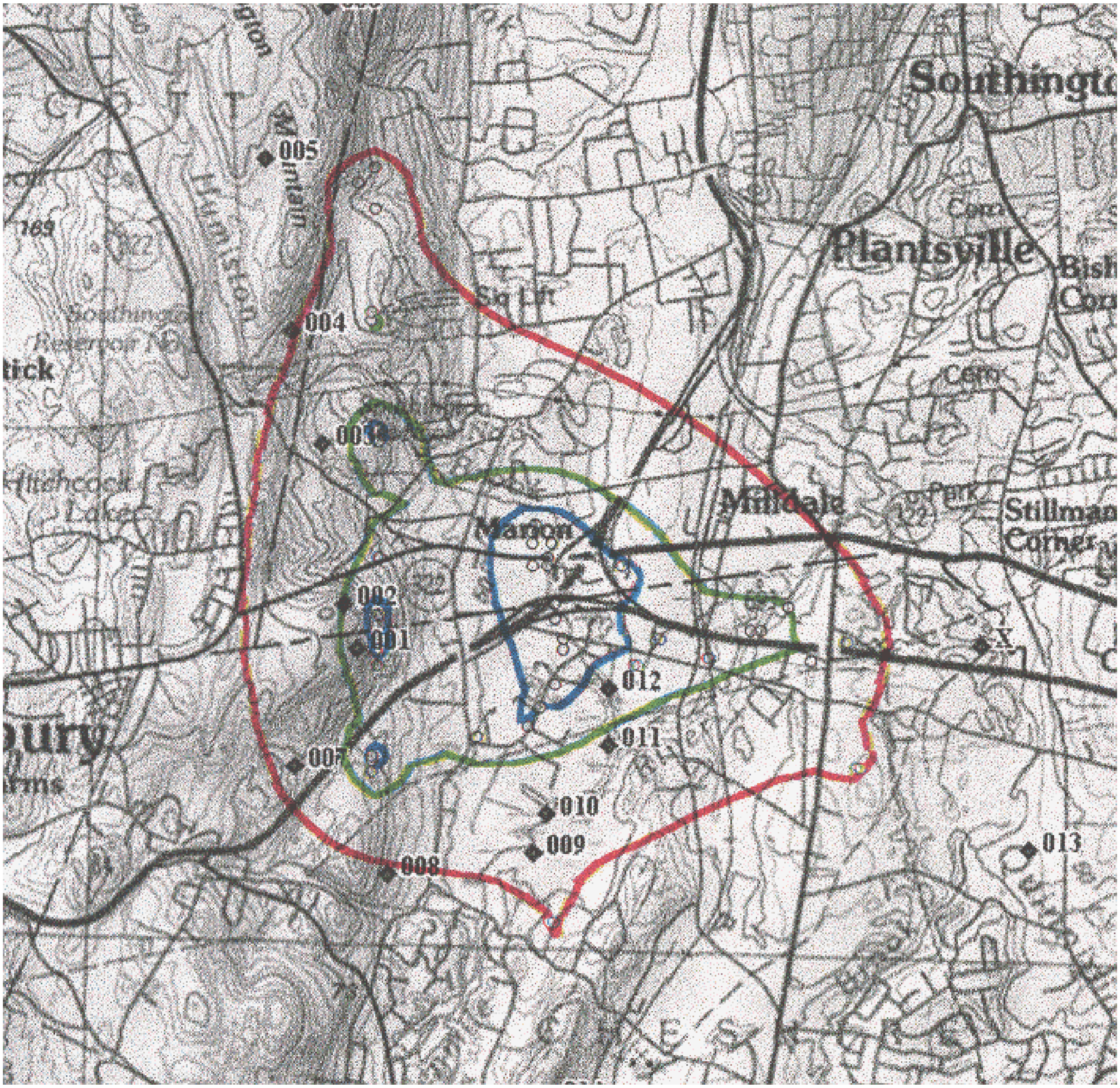


Figure 6, Home Range map of coyote M2. Diamonds represents waypoint locations. All borders indicate Harmonic Mean boundaries with dark blue=95%, green=75% and light blue=50% respectively. See Table 3.

Figure 7 Home Range map of coyote M1. Diamonds represent s waypoint locations. All borders indicate Harmonic Mean boundaries with dark blue=95%, green=75% and light blue=50% respectively. See Table 3.

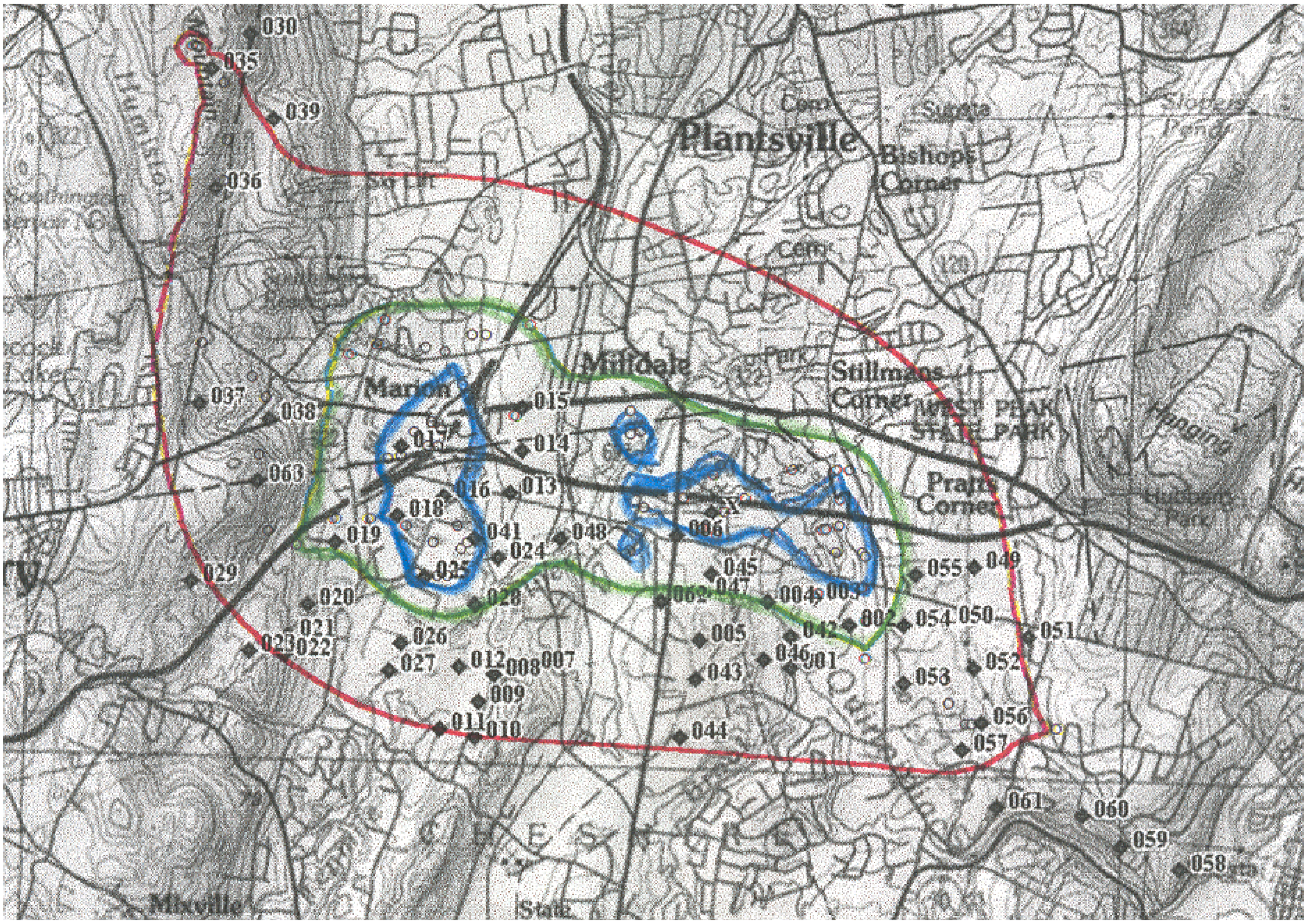


Figure 8, illustrates # of miles squared for Home Range, using Kernel Method for f1,f2,m2 and m1.

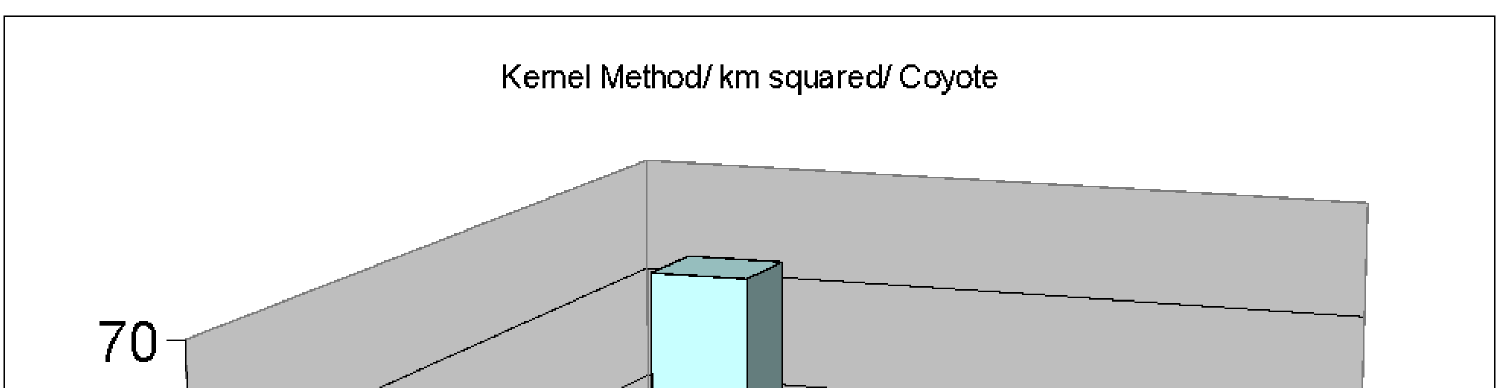
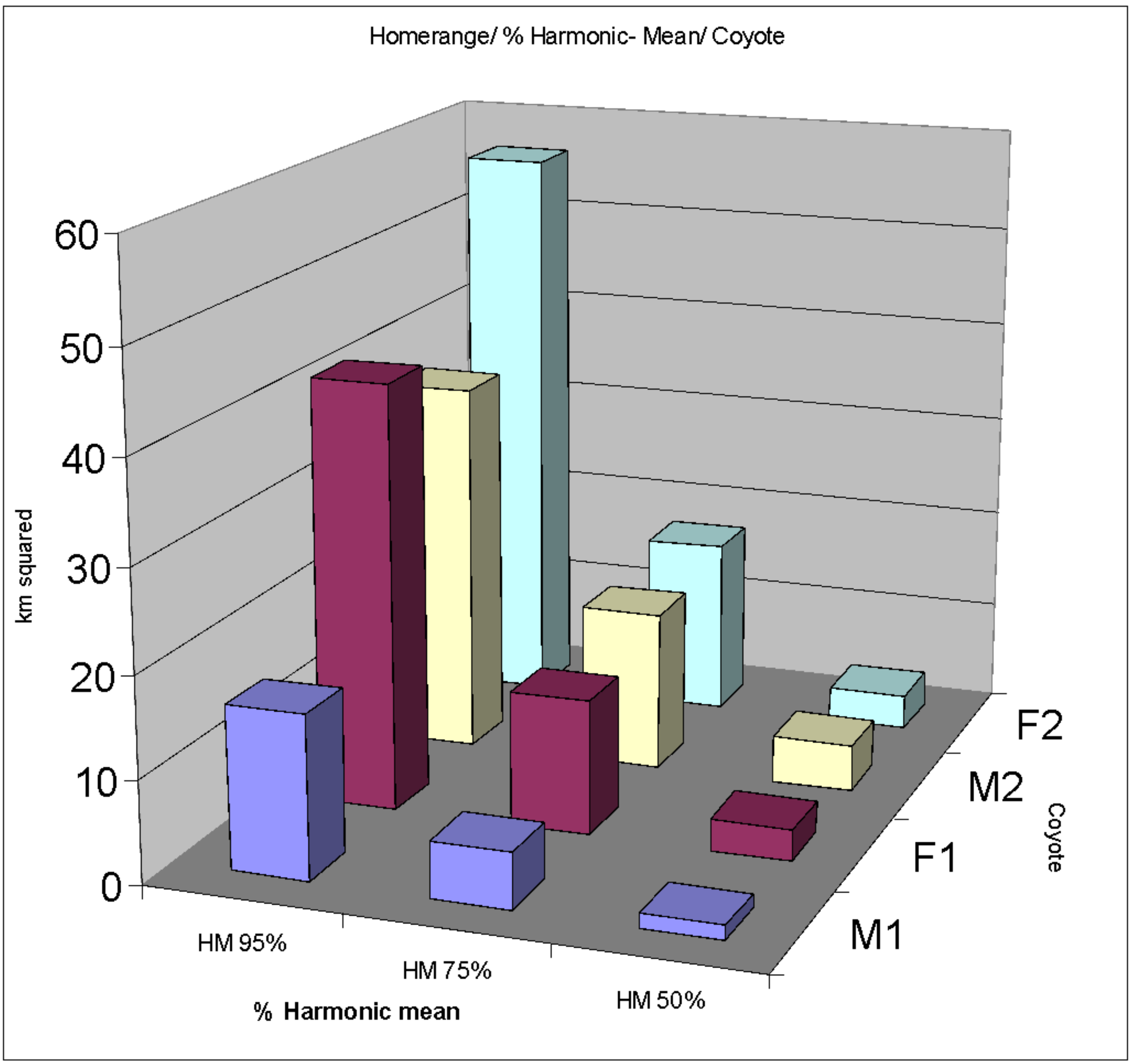
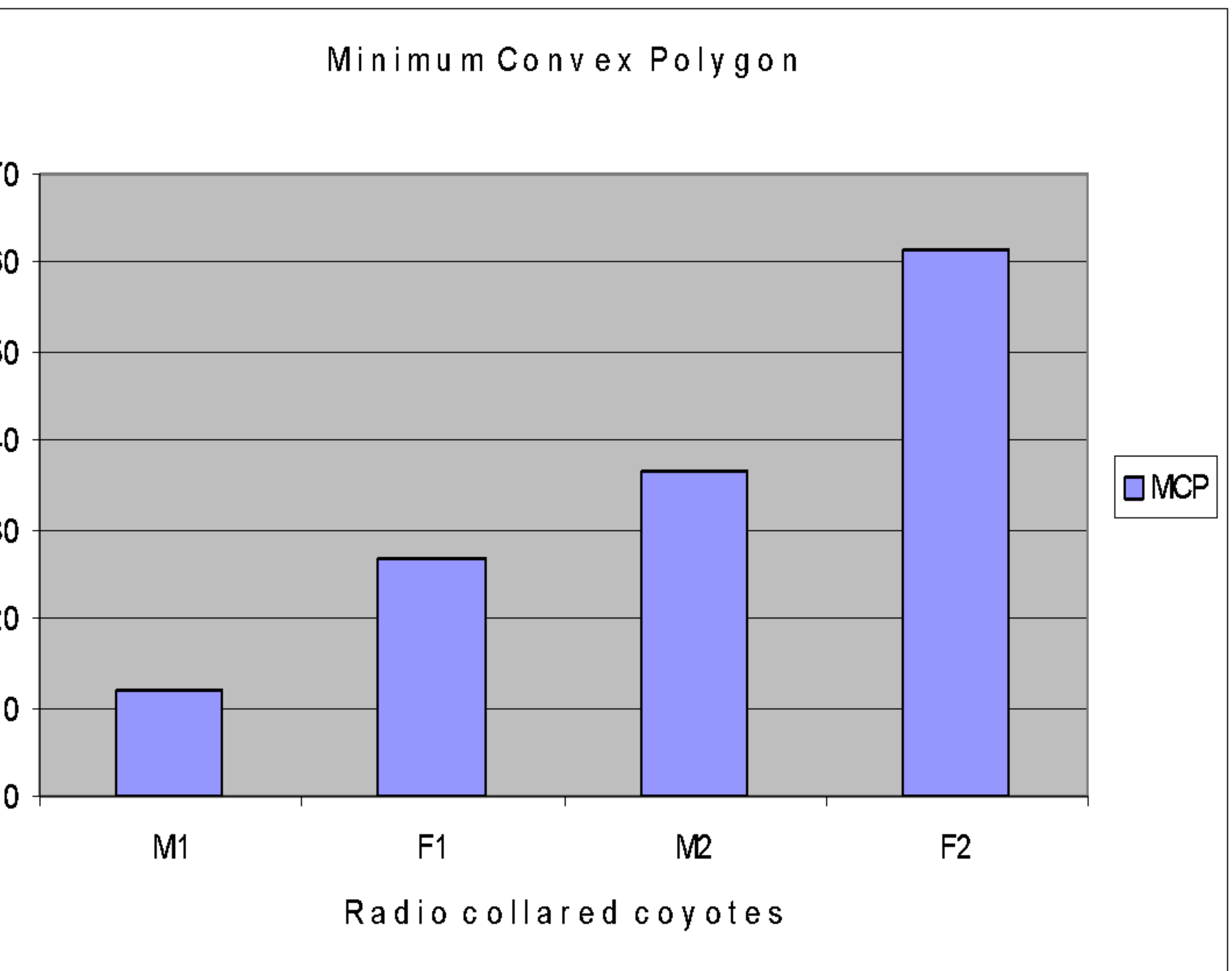


Figure 9, illustrates # of km squared for Home Range using Harmonic Mean and for f1,f2,m2 and m1.



Of all radio collared coyotes that were observed, most were in groups of at least 2 – 3. The long distances achieved by coyotes in this study and coyotes studied by Brandige (1993) and Patterson et al. (1999) suggest that dispersing coyotes are able to colonize new areas relatively quickly.

Figure 10, illustrates # of km squared for Home Range using Minimum Convex Polygon.



Their colonization of eastern North America after the extirpation of the wolf took place in only about 50 years (Parker 1995). This high dispersal potential, combined with their tendencies towards territoriality and monogamy (Messier and Barrette 1982, Patterson and Messier 2001, Person and Hirth 1991, Way 2000), suggest that the removal of resident local adult coyotes will have little effect on overall population dynamics because other coyotes will quickly move in to fill a vacated breeding position (Patterson and Messier 2001).

V. Discussion

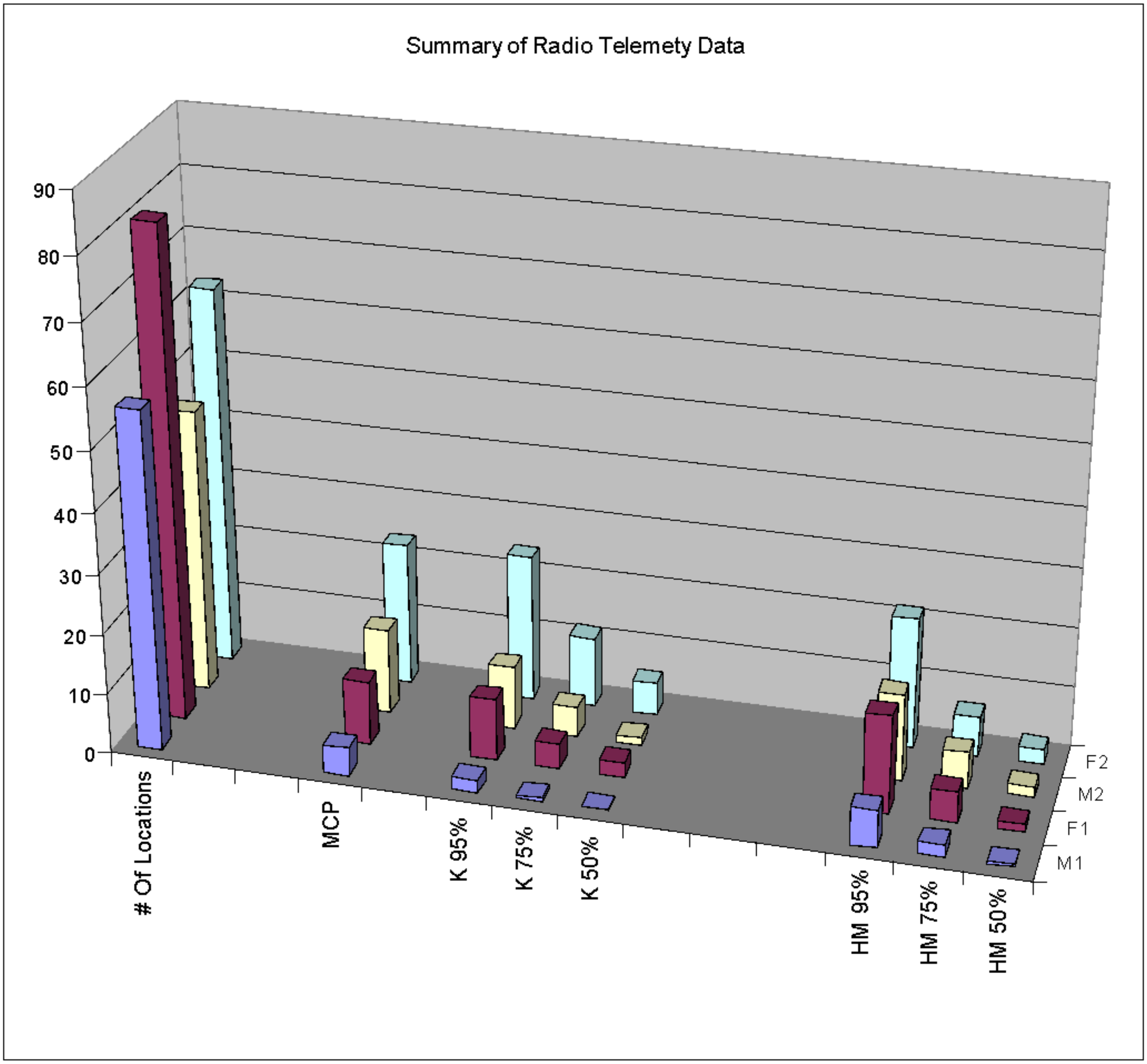
There has been little Home Range activity analysis conducted in southern New England due to the relatively recent arrival of the coyote to this area. " Movement and Activity Patterns of Eastern Coyotes In a Coastal, Suburban Environment" (Way, Jonathan G et al, 2000) is the only study done near the study area of this study and offers many differences is habitat and proximity to human habitation.

Further study was of benefit due to the increased carrying capacity (Parker, 1990) and human development versus more northern studies. Also, the southern most eastern coyote study in New England was conducted in Cape Cod and due to capture method and maritime habit offers much bias. Stomach Content Analysis studies conducted in Connecticut were thorough concerning sample size, however may offer slight bias due to the sampling methods. Hunted and road killed coyotes may be less experienced and thus have smaller prey size selection.

Coyote weights were consistent with northern regions of the northeast. Western coyote

Figure 11, Four coyote Home Ranges f1, f2, m1, m2 are compared in square km using Minimum Convex Polygon, Harmonic Mean and Kernel Method.

females breed in their first year which contrasted with our cell cultures of our young female who



would not breed her first year.

Carrion analysis suggested carrion foraging, especially in winter. Snow tracks seemed to suggest coyotes were apt to follow tracks of turkey and deer until they could ambush them (indicated by change in gait and jumping). Typically when more than one coyote was hunting together success rates were higher. It seems likely that predation on turkeys and deer could be higher than earlier, more northern studies suggest . While further research of coyotes is needed in New England, it seems possible that their behavior is more social than their western counter parts. Disease in eastern coyotes was looked at in this study, and some of the first-ever pathogen test results have been collected with respect to this geographic location. The results for this study have concluded that there may be high rates of exposure to Lyme disease in this population. Heartworm and roundworm were also found to a lesser extent. Sarcoptic mange was not found in any of the subjects but it is documented elsewhere to be common.(Parker, 1990) Due to the small sample size and the fact that these coyote samples were taken from the same region offers bias as well. It would be prudent to follow up with more specific studies of the eastern coyote and its impact on this area.

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Four coyote Home Ranges (f1, f2, m1, m2) are compared in square km using Minimum Convex Polygon, Harmonic Mean and Kernel Methods. Data corresponds with maps seen above in figures 2,3,4, and 5.