Interim Progress Report

Research Title:

Population Status and Foraging Ecology of Eastern Coyotes in New York State

Principle Investigators:

Dr. Jacqueline Frair and Dr. James Gibbs
SUNY College of Environmental Science and Forestry

Gordon Batcheller and Paul Jensen
NYS Department of Environmental Conservation

Graduate Student Investigators:

Robin Holevinski, *ESF Ph.D. Candidate*
Christina Boser, *ESF M.S. Candidate*

Project Initiation: 1 January 2007 **Coverage of Report:** May 2008 – April 2009

Summary: The over-arching goals of this research are to estimate coyote abundance and evaluate the potential impacts of coyotes on deer populations in NY State. Since project initiation in January 2007, our research has focused on intensive monitoring of radio- and GPS-collared coyotes in two focal areas, Steuben and Otsego Counties, to document coyote diets, estimate deer kill rates, and evaluate alternatives for estimating coyote population size. Biomass-corrected diet estimates indicated that consumption of deer varied seasonally (from 46-50% in summer to 63-74% in winter), and to some degree among years (e.g., fawns comprised 15 and 27% of the summer 2007 and 2008 diets in Steuben County), but was similar between the two study areas. Despite a two-fold difference in both coyote and deer densities between study areas, per capita consumption rates of deer remained similar with coyotes appearing selective for deer in Otsego County where deer density was lower. We searched GPS collar 'clusters' (where coyotes spent ≥40 minutes within the previous week) to find deer carcasses fed upon by coyotes. Carcasses occurred at 11% of the 226 clusters searched this past winter, of which the cause of mortality could be identified for 11 and none of which had been killed by coyotes. Although no kills were recorded, search results were consistent with the previous year observation that approximately 1 in 10 carcasses fed upon by coyotes were actually killed by coyotes. Last summer, searches of 35% of all coyote locations uncovered 13 fawns killed by coyotes. Searches for fawn kills continue this summer, and analyses of kill rate estimates will commence this fall. Noninvasive DNA surveys based on scats and hair, and site occupancy approaches have been undertaken in both areas to estimate coyote density and inform the large-scale population monitoring that we will undertake in the coming year.

Progress

This past year we met diverse tactical and analytical objectives and collected information critical to establishing an efficient state-wide monitoring program. Christina Boser completed data collection for her M.S. thesis this past March, and plans to defend her study of seasonal diet selection, movements, and habitat selection by coyotes in early fall 2009. She left ESF for a full-time position with The Nature Conservancy in California this May, but will continue to work with her committee to complete thesis revisions this summer. This report summarizes the main findings from her research to date. Robin Holevinski is completing her second and final season of intensive monitoring of coyotes to quantify deer kill rates and estimate population sizes. Her dissertation proposal was approved by her academic advisory committee last fall. Robin began analyzing DNA samples in-house, which makes estimating population size using noninvasive genetic approaches cost-effective. In partnership with Dr. Chris Whipps, we secured an additional $50K in research support for the noninvasive genetics work , which provides Robin with two years of salary in addition to modest research funds. Since January 2009, Robin has been in the field back-tracking collared coyotes, live-trapping and radio-collaring coyotes for the summer field work, and collecting DNA and site occupancy data.

Coyote Trapping and Monitoring

Coyote Trapping:-- Trapping efforts were conducted by NYS-DEC personnel, SUNY-ESF students, and local trappers during the regular trapping season in 2008 and in April 2009. This past year, 9 coyotes were trapped and collared in Otsego County and 1 in Steuben County. Since the beginning of this project a total of 31 collared coyotes have been monitored in Otsego County (Table 1) and 14 in Steuben County (Table 2).

Coyote Monitoring:-- We are currently monitoring 19 collared coyotes, 12 in Otsego County (6 GPS and 6 VHF) and 7 in Steuben County (3 GPS and 4 VHF). However, two GPS collars in each study site failed to drop off, and 1 GPS-collared coyote is missing from the Otsego County study site. In addition, 7 VHF-collared coyotes are missing from the study sites. Efforts are being organized to recover GPS collars for placement on additional coyotes, and trapping will continue in 2009 until the remaining 3 GPS and 2 VHF collars are deployed.

Table 1. Capture details and status of GPS- and VHF-collared coyotes in Otsego County from June 2007 – April 2009.

Animal ID #	Capture date	Sex	Age / status	Collar type	Trap type	Injuries/comments	Current status	Cause of death
M1	6/10/07	M	Adult	VHF	Foothold		Dead 1/23/09	Trapped
M2	6/10/07	M	Adult	GPS	Foothold	Cut on foot	Dead 11/5/07	Shot by landowner
M3	6/11/07	M	Adult	VHF	Cable restraint	Swollen neck	Dead 2/15/08	Shot by landowner
F4	6/18/07	F	Adult	GPS	Cable restraint		Dead 10/20/07	Shot by landowner
F5	6/21/07	F	Adult	GPS	Foothold	Cut on foot	Dead 1/24/09	Shot by houndsman
M6	6/22/07	M	Adult	GPS	Foothold		Dead 11/18/07	Found dead, broadhead
M7	6/30/07	M	Yearling	VHF	Cable restraint		Tracking	
F8	7/15/07	F	Sub-Adult	VHF	Cable restraint	Swollen neck	Dead 5/12/08	Found dead, unknown
F9	7/25/07	F	Adult	VHF	Foothold	Cut on foot	Dead 10/19/09	Shot by landowner
F10	7/27/07	F	Adult	VHF	Foothold		Tracking	
M11	8/15/07	M	Adult	VHF	Foothold		Dead 6/01/08	Shot by landowner
F12	11/8/07	F	Adult	VHF	Foothold	Missing 2 toes	Dead 11/14/07	Shot by landowner
M13	11/18/07	M	Sub-Adult	VHF	Foothold	Cut on foot	Dead 11/20/08	Shot by landowner
F14	1/13/08	M	Adult	VHF	Foothold		Tracking	
F15	1/29/08	F	Yearling	VHF	Foothold		Dead	Shot by houndsman
M16	4/10/08	M	Adult	GPS	Foothold		Dead 1/8/09	Trapped in Pennsylvania
F17	4/17/08	F	Sub-Adult	VHF	Foothold		Tracking	
F18	4/17/08	F	Sub-Adult	VHF	Foothold		Missing	
F19	4/18/08	F	Adult	GPS	Foothold		Tracking, drop-off failed	
F20	4/19/08	F	Adult	GPS	Foothold		Dead 1/14/09	Shot by houndsman
M21	4/22/08	M	Adult	GPS	Foothold	Toe bleeding	Tracking, drop-off failed	
F22	4/25/08	F	Sub-Adult	VHF	Foothold	Cut on foot	Dead 1/13/09	Found dead, gunshot
F23	6/13/08	F	Sub-Adult	VHF	Foothold	Cut on foot	Missing	
M24	11/04/08	M	Sub-Adult	VHF	Foothold	Cut on toe	Missing	
F25	11/05/08	F	Sub-Adult	VHF	Foothold		Missing	
F26	11/15/08	F	Adult	GPS	Foothold		Tracking	
F27	4/16/08	F	Yearling	VHF	Foothold	Cut on foot	Tracking	
F28	4/16/09	F	Sub-Adult	GPS	Foothold	Cut on foot	Tracking	
F29	4/18/09	F	Sub-Adult	VHF	Foothold		Tracking	
M30	4/18/09	M	Adult	GPS	Foothold		Tracking	
M31	4/20/09	F	Adult	GPS	Foothold		Missing	

[1] To protect the integrity of the study, capture locations and radio-collar frequencies will be kept confidential until the close of the study.

Table 2. Capture details and status of GPS- and VHF-collared coyotes in Steuben County from June 2007 – April 2009.

Animal ID #	Capture date	Sex	Age / status	Collar type	Trap type	Injuries/comments	Current status	Cause of death
SF1	11/02/07	F	Adult	VHF	Foothold	Cut on foot	Missing	
SF2	11/05/07	F	Adult	VHF	Foothold	Cut on foot	Tracking	
SF3	11/06/07	F	Sub-Adult	GPS	Foothold	Cut on back	GPS dropped off	
SF4	11/17/07	F	Adult	GPS	Foothold		GPS dropped off	
SM5	12/30/07	M	Adult	GPS	Cable restraint	Swollen neck	Tracking, drop-off failed	
SM6	1/14/08	M	Sub-Adult	GPS	Foothold		GPS dropped off	
SF7	1/18/08	F	Sub-Adult	GPS	Cable restraint		Dead 2/23/08	Found dead, gunshot
SF8	4/09/08	F	Adult	VHF	Foothold	Cut on foot	Dead 10/25/08	Shot by hunter
SF9	4/12/08	F	Adult	GPS	Foothold	Cut on foot	Tracking, drop-off failed	
SF10	4/12/08	F	Adult	GPS	Foothold	Cut on foot	Tracking	
SM11	4/24/08	M	Adult	VHF	Foothold	Abrasion on foot	Dead 11/6/08	Trapped
SM12	4/26/08	M	Adult	VHF	Cable restraint	Swollen neck	Missing	
SM13	6/12/08	M	Adult	VHF	Cable restraint	Swollen neck	Tracking	
SF14	4/29/08	F	Sub-Adult	VHF	Foothold	Cut on foot	Tracking	

[1] To protect the integrity of the study, capture locations and radio-collar frequencies will be kept confidential until the close of the study.

Table 3. Ranking of diet items and biomass-corrected estimates of prey occurrence in coyote scats (standard deviations shown in parentheses).

	Average Rank of Item in Diet		Average Percent Occurrence by Season and Study Area			
			Summers 2007-08		Winter 2008	
Prey item	Summer[a]	Winter[b]	Steuben	Otsego	Steuben	Otsego
Deer – adult	1.3 (0.4)	1.0 (0.0)	30.5 (16.3)	25.5 (3.5)	63	74
Deer – fawn	1.3 (0.4)	-- NA --	21.0 (8.5)	29.0 (4.2)	NA	NA
Livestock	2.3 (0.4)	3.0 (0.0)	8.0 (9.9)	15.5 (4.9)	6	4
Rabbit	3.0 (0.0)	2.0 (0.0)	6.0 (4.2)	6.0 (1.4)	10	8
Woodchuck	3.3 (0.4)	3.5 (0.7)	9.0 (5.7)	4.5 (3.5)	2	1
Microtine rodent	3.3 (0.4)	2.0 (0.0)	8.0 (4.2)	5.5 (2.1)	13	6
Turkey	3.5 (0.7)	3.0	4.0	1.0	--	1
Other	3.5 (0.0)	3.5 (0.7)	2.5 (0.7)	3.5 (2.1)	3	4
Gray squirrel	3.8 (0.4)	4.0	4.0 (1.4)	2.5 (0.7)	1	--
Passerine bird	3.8 (0.4)	--	2.0 (0.0)	2.5 (0.7)	--	--
Plant (various)	3.8 (0.4)	3.5 (0.7)	3.5 (2.1)	2.0 (1.4)	1	2
Domestic cat	4.0 (0.0)	4.0	2.0	2.5 (0.7)	1	--
Insect	4.0 (0.7)	--	2.5 (0.7)	0.5 (0.7)	1	2

[a] Across years and study areas, [b] across study areas.

Coyote Mortalities:-- In Otsego County, a total of 16 animals with known fates were monitored this past year (excluding animals that were lost or dispersed, and those captured this year). Of those, 62.5% (10/16) died with hunters or landowners accounting for 60.0% (6/10) of the mortalities. The animals that died included 3 coyotes harvested by landowners, 3 harvested by houndsmen, 2 trapped (1 trapped in Pennsylvania ~150 km south of its capture location), and 2 that were found dead (1 severely decomposed and the cause of death was not determined, and 1 severe case of sarcoptic mange possibly causing death from exposure). In Steuben County, there were 11 animals of known fate over the past year, of which 18.2% (2/11) died (1 harvested by a hunter and 1 trapped 50 km west of the study site). All harvest mortalities to date have occurred during the legal season for coyotes (Tables 1 and 2).

Diet Selection, Movements, and Habitat Selection by Coyotes (C. Boser)

Diet Selection:-- The objectives of this study were to: 1) document coyote diets, and 2) assess whether selection for deer varied with deer density, seasonal deer vulnerability, alternate prey availability, or variation in coyote density. A total of 523 scats were collected from deer trails, farm lanes, and while back-tracking collared coyotes between Jun-Aug 2007, Jan-Apr 2008, and Jun-Aug 2008. Prey items were identified from hair, teeth, and bone fragments and, in early summer, adult deer were differentiated from fawns based upon cuticular scale patterns. Relative use of prey was quantified as the frequency of scats (# scats containing deer / total # scats), percent occurrence (total number of deer occurrences in scat / total number of any prey occurrence), and percent biomass consumed (corrects for differential digestibility of small versus large-bodied animals). Diet selection was estimated using selection indices that compared: 1) deer use to deer availability, 2) use of deer versus microtine rodents to the relative availability of each prey item, and 3) the per capita consumption of deer to the per capita availability of deer. Deer availability was estimated using distance-sampling and microtine rodent density was estimated using a combination of mark-recapture and track plate approaches.

Deer comprised the majority of coyote diets, representing from 51-74% of the biomass consumed depending upon season (Table 3). Fawns represented 15-32% of the overall biomass consumed in summer, and per capita estimates of fawn consumption by coyotes ranged from 2-4 by study area and year. Livestock generally was the second ranked item by total biomass consumed, and during the period of this study this represented scavenging in carcass dumps and not livestock killed by coyotes (no reported predator kills). The other prey actively pursued by coyotes, ranking third in terms of biomass consumed, included eastern cottontails, woodchucks, and microtine rodents (Table 2).

We expected that these generalist predators would consume prey in proportion to their abundance, and thus we did not expect coyotes to exhibit selection for deer. Although consumption of deer was consistent between study areas, deer density was 1.5-2.7 times greater in Steuben County (see October 2008 progress report), thus coyotes appeared selective of deer in the lower density location (Otsego site). Moreover, coyotes consistently selected for fawns relative to small mammals in Otsego County despite this study area having higher overall microtine rodent densities than the Steuben site. In contrast, coyotes used both fawns and rodents in proportion to their relative availability in Steuben County.

To correct selection indices for variation in both deer and coyote density we needed to estimate per capita consumption of deer, which required an understanding of coyote population structure. Summer home ranges for resident coyotes wearing GPS collars were essentially two times larger in Steuben (32.2 km^2, N = 5) than Otsego County (15.2 km^2, N = 7), and trapping data indicated more subdominant individuals in Otsego County as well. From these data we inferred that coyote density may be 2-3 times greater in Otsego compared to Steuben County (which was corroborated by the lower trapping success in Steuben County, in addition to being consistent with DEC pelt sealing reports and bow hunter sighting logs). Based on the energy needs of the average coyote, we estimated that an adult coyote consumed the equivalent of 2 adult deer during winter, 0.7-1.5 adult deer in summer, and 2-4 fawns in summer depending upon the year and study site. Selection ratios based on per capita estimates indicated that coyotes were up to 4-7 times more selective for deer in Otsego County compared to Steuben County depending upon season and year.

The per capita consumption rate of adult and fawn deer by coyotes was similar between study areas despite evidence that coyote density was twice as high and deer density half as much in Otsego versus Steuben County. Deer density may thus be sufficiently high to satiate coyotes, suggesting that further increases in deer density would not result in higher consumption levels. Coyote diets will need to be documented across a greater range of variation in deer density to detect at what level of deer (and alternate prey) density coyotes may alter their use of deer. An alternative hypothesis is that competition by black bear may act to equilibrate per capita consumption rates between our two study areas by physically reducing deer availability in Steuben County (the DEC recorded 34 times more harvest of black bear in Steuben County than Otsego County in 2008). Given similar land use patterns between study areas, we presume that the availability of supplementary food (in the form of cattle carcasses) to also be similar, and thus unlikely to explain the equilibration of per capita deer consumption. It is also implausible that deer may be physically more available for coyotes to predate upon in Otsego County, say from greater vehicle-related accidents or due to greater wounding during the fall hunt, because road densities were similar between study sites and the annual deer take, and thus hunting effort, is higher in Steuben than Otsego County. In the coming year we will continue to evaluate coyote diets as part of the statewide monitoring program to gain additional insight into how coyote consumption of deer varies with deer and competitor density.

Movements and Habitat Selection:-- Given that coyotes actively hunted fawns in summer, we expected them to focus their effort (and thus concentrate their movements) in areas where fawns were most vulnerable to predation. Back-tracking work indicated that fawns were killed disproportionately in open areas (R. Holevinski, unpublished data). Consequently, we hypothesized that coyote movement paths should become more tortuous in more open areas compared to more forested areas. Coyote movements were generally more tortuous than expected at random (based on a correlated random walk), but preliminary analyses indicated no relationship between path tortuosity and the percent of time coyotes spent in open areas (using 20-minute GPS collar data). Multiple metrics of tortuosity need yet to be compared as they can capture different aspects of the foraging path.

Given differences in both coyote selectivity for fawns and levels of mortality risk between study areas, we further hypothesized that coyotes in Otsego County might select paths that increased encounters with open areas, carried lower overall energetic costs, and represented lower mortality risk compared to coyotes in Steuben County. We estimated a step-selection function (SSF; Fortin et al. 2005) to investigate this hypothesis. The SSF involves a comparison of recorded coyote moves (displacements between consecutive GPS collar fixes) to potential moves based on the known coyote location at a given time and constraints on coyote movements. This approach can help identify fine-scale variation in movement decisions that may be missed by the simpler approach of considering only the density of telemetry locations occurring in a given habitat type.

Preliminary analyses indicate that coyotes generally avoid crossing roads (assumed to carry higher mortality risk), and travel in areas of lower terrain variability (lower energy expenditure), but did not selectively move through open versus forested habitats (differential prey availability). Overall, it appears that energy and mortality costs direct coyote movements more than prey availability in our two study areas. These trends were strongest in Otsego County (versus Steuben) and summer (versus winter).

Quantifying Deer Killed by Coyotes (R. Holevinski)

A second winter of back-tracking occurred 15 February - 21 March 2009 to find adult deer killed by GPS-collared coyotes. Recall that searches of 395 clusters for 5 GPS-collared coyotes during the 2007-08 winter returned 45 deer carcasses (11.4% of the clusters), 28 of which had known fates, with 25 having been scavenged versus 3 killed by coyotes (3/28 = 10.7% of known-fate animals killed). However, each of the 3 killed deer had a previously injured appendage, making them more vulnerable to predation. Had kill rates remained constant between seasons, we would expect approximately 1 out of 10 carcasses visited in winter 2008-09 would have been killed by coyotes. Further, given that we were able to determine a cause of death for only 62% of the carcasses detected (28/45), we would need a substantially larger sample size of carcasses to formally estimate a kill rate for adult deer.

To improve detection of carcass sites we reduced GPS collar fix intervals from 1 hour in 2008 to 20 minutes in 2009. We further programmed GPS collars in 2009 to take 20-minute fixes for 3 consecutive weeks, and staggered recording intervals among animals throughout the backtracking period to increase the duration of winter covered. However, only 5 GPS-collared coyotes (4 females, 1 male) survived until January to be monitored. Two full-time technicians and several part-time volunteers from local colleges and universities monitored the animals, visiting 266 location clusters and finding 17 deer carcasses, 11 of which had known fates (64%, consistent with the previous year). All 11 known-fate animals had been scavenged by coyotes, thus we found no evidence of coyote-kills in winter 2009. Given how rare coyote kills are (~1 in 10 known-fate deer carcasses based on the 2008 data), our sample sizes are too low to formally estimate winter kill rates. Nevertheless, the results from this past winter corroborate data collected in the first year, and this information will prove useful for bracketing predation effects in a deer population model.

To quantify fawn kills during summer, we back-tracked 9 GPS-collared coyotes (3 males, 6 females) from 15 May – 30 June 2008. GPS collars were set to record the location of each coyote every 20 minutes, and location data were downloaded and searched every few days. Both clusters of locations (consecutive points within 25 m of each other) and single points were searched in the field for evidence of fawn kills because we suspected coyotes to spend little time on fawn carcasses. Approximately 1,742 of 5,047 locations (34%) collected for these 9 coyotes were searched, and a total of 13 fawn carcasses were detected. This was a proof-of-concept that fawn kills could be detected using this approach, and we are increasing our back-tracking effort in summer 2009 to increase sample sizes so as to produce

Fawn killed by coyotes in Steuben County, detected by backtracking a GPS collared coyote.

a statistically rigorous kill rate estimate. This summer we intend to back-track at least 8 animals, using 20-minute fixes, for a period of 9 weeks. We have enlisted a crew of 8 full-time volunteers and 2 graduate students to achieve this more intensive back-tracking effort.

In spring 2008, we also installed infrared motion-sensing cameras outside of coyote den sites as a means of calculating fawn kills in summer. Cameras were placed at a total of 21 dens used by 6 GPS-collared females between 15 April and 10 July 2008. To minimize disturbance, cameras were deployed at dens when the collared animals were known to be elsewhere. Coyote pups were observed up to 4 days following camera deployment at a den, but the female subsequently moved to a new den, suggesting the camera or our presence was a source of disturbance. Adult coyotes were rarely seen in the hundreds of photos and video clips recorded, thus, we were unable to detect them bringing any prey items back to dens. The GPS back-tracking method proved to be a more fruitful, although more time intensive, approach to quantifying fawn kills.

Estimating Coyote Population Size (R. Holevinski)

This past year, we contracted Wildlife Genetics International, Inc. to optimize a protocol for analyzing coyote DNA from scat samples. From this pilot study based on 30 scats, we estimate that roughly 25% of the scats collected during winter would yield sufficient DNA for individual coyote identification. Combined with the need for a 25% recapture rate, that means that up to 150-300 scats must be analyzed from a given area for a useful estimate of population size. Dr. Paetkau at Wildlife Genetics International indicated this to be on par with other noninvasive DNA studies and worth pursuing. Running this many samples through a commercial lab would be cost-prohibitive, so we have replicated the process internally at SUNY-ESF working collaboratively with Dr. Chris Whipps. In addition to reducing project costs considerably, we also procured additional funding to support this work. R. Holevinski has completed a molecular techniques course and has begun processing scat samples collected during winter 2008 (n=466) and winter 2009 (n=212). Analysis of these samples will take place in the coming fall to ensure they are from coyotes, to estimate a multilocus genotype, and to evaluate the utility of open and closed mark-recapture models for estimating population size.

In the coming year we transition from the intensive field surveys of coyote behavior and populations in Steuben and Otsego Counties, to broad-scale surveys of coyote abundance. We recognize that a broad-scale sampling effort will likely require a combination of approaches at different scales, because the noninvasive DNA approaches will require considerable setup, monitoring, and lab analytical time to complete. We are investigating three alternative options: augmenting noninvasive genetic sampling using hair samples, modeling site-occupancy patterns, and conducting vocalization surveys. Hair samples can return more reliable DNA compared to scats, may require less effort to obtain (for some species), but tend not to be preferred for genetic surveys of canids. Nevertheless, augmenting a scat-based survey with better quality hair samples should help increase certainty around population estimates and reduce overall costs. The National Lynx Survey reported capturing a large sample of coyote hairs using hair snares made from carpet squares doused in lure and attached low on a tree (with roofing nails poking through to catch the hairs from any animal that rubs on the pad). We replicated this design and, in January 2009, deployed 48 hair snares throughout our study areas. After collecting only 8 hair samples over a 6-week period, we modified the design by enclosing a larger area around the baited tree with two strands of barbed wire. We baited the barbed-wire stations with portions of road-killed deer carcasses and checked stations weekly. We collected 19 hair samples from Otsego County and 32 samples from Steuben County, which have yet to be examined thoroughly for the presence of hair follicles and identified to species (DNA analyses will be conducted this fall). Only 2 of 10 infrared cameras placed at hair snare sites detected coyotes entering and exiting our bait stations. Cameras also detected raccoons, opossums, grey fox, red fox, bobcat, fisher, domestic dogs, domestic cats, crows, ravens, turkey vultures, and red-tailed hawks feeding on bait within our hair snare stations. Efforts are ongoing to refine these ‘traps’ and determine whether useful coyote hair samples (with follicles) are collected.

Volunteers C.J. Hazel and Catherine Kostigan check for hair samples and rebait a hair snare station.

An eastern coyote feeding on a road-killed deer carcass placed inside a hair snare enclosure in

An alternative approach to direct population estimation that we are investigating is based on species occupancy-abundance relationships. For a variety of species site-occupancy approaches (based on the proportion of area occupied) is a useful metric for tracking changes in population size over time and space. This winter we divided our two 400 km^2 study areas into 25-km^2 sampling grids and established random scat transects, hair snare stations, and camera trap stations in each grid cell to track temporal variation in occupancy. Occupancy data will be calibrated with population estimates to refine the design for use in broad-scale population surveys.

Future Plans

This summer we will complete our back-tracking of GPS collared animals to estimate fawn kill rates. We also begin an investigation that combines vocalization surveys with distance sampling to estimate coyote density as a potentially cost- and time-efficient alternative to the DNA-based population estimates. A new graduate student, Sandra Walczyk will undertake that effort. This fall we will integrate the information we have gained from our focal study areas into a statewide surveying plan, and will work with the DEC to refine and implement that plan in the coming year. We will be contacting the furbearer management team soon to set a date for a planning meeting.

Outreach

The following professional and public presentations (and interviews) on the coyote project were given during the past year:

Public Presentations

- Northeast Trappers Convention, Herkimer (May 2008)
- Elmcrest Children’s Center, Syracuse (August 2008)
- McGill University undergraduate wildlife course, AEC, Newcomb (August 2008)
- Northeast Furbearer Resources Technical Committee, Newcomb (September 2008)
- Great Swamp Conservancy, Canastota, NY (September 2008)
- DEC Region 8 Wildlife Staff, Bath, NY (January 2009)
- National Wild Turkey Federation, New York Chapter, Waterloo, NY (January 2009)
- Thompkins County Federation of Sportsman, Danby, NY (January 2009)
- New York Houndsmen Conservation Association Annual Banquet, Camden, NY (Mar 09)
- SUNY Cobleskill Wildlife Techniques Course, Cobleskill, NY (April 2009)
- Allegany State Park Girls’ Day, Salamanca, NY (April 2009)

Press Interviews

- Pittsburg Post-Gazette (Scott Shalaway), 18 Jan 2009
- Syracuse Post Standard (Dave Figura), 21 Jan 2009
- WTVH Syracuse (Haley Hinds), 26 Jan 2009
- News 10 Syracuse, "Going Green", 14 April 2009

Professional Presentations

Boser, C.L., Frair, J.L., Holevinski, R., Batcheller, G. 2008. Coyote foraging ecology in New York State (poster). The Wildlife Society, National Meeting, Miami, FL.

Boser, C.L., Frair, J.L., Holevinski, R., Batcheller, G. 2008. Coyote foraging ecology in New York State (oral presentation). Northeast Natural History Conference, Albany, NY.

Holevinski, R.A., Frair, J.L., Boser, C.L., Gibbs, J., and Batcheller, G. 2008. Estimating coyote kill rates of white-tailed deer with GPS collar technology (oral presentation). Northeast Natural History Conference, Albany, NY.

Acknowledgements

In addition to the approximately 200 landowners in the Otsego and Steuben County study areas that grant us access to their lands, we owe many thanks to the cadre of people and organizations that have provided expertise, equipment, time, and technical support to the project. Below is what we hope is an exhaustive list in generally alphabetical order (we are very sorry if a person or organization has been overlooked. Please help us to keep this list complete by letting us know).

STUDENT INTERNS AND VOLUNTEERS

Bath-Haverling High School
Ryan Masti, volunteer

Finger Lakes Community College
Aaron Ackley, volunteer
Jeff Gettmann, volunteer
Jim Cooney and family, volunteers
Sasha Ewing, volunteer
Zach Amidon, volunteer

SUNY Cobleskill
Aaron Behrens, volunteer
Adam Fuest, volunteer
A.J. Griech, volunteer
Ben Shern, intern
Brad Sherburne, intern
Brett Sherburne, volunteer
Brian Danish, volunteer
Eric Pettit, volunteer

Humbolt State University
Molly Corcoran, volunteer
Tony Stremski, volunteer

Michigan State University
Megan Esmay, volunteer

Ossining High School
Kimberly Snyder, volunteer

SUNY ESF
Alan Low, volunteer
Alex Spitzer, volunteer
Allison Roy, volunteer
Ashley Brown, volunteer
Carissa Michaud, volunteer
C.J. Hazell (and Mara), dog handler
Deanna Russell, volunteer
Elizabeth Trotter, volunteer

SUNY Cobleskill continued …
Garrett Grilli, intern
Jeb McConnell, intern
Jennifer Kurilovitch, volunteer
Jenny Murtaugh, intern & volunteer
Justin Harvey, volunteer
Kristen Coakley, volunteer
Kristen Wokanick, volunteer
Kyle Klob, volunteer
Michaelina Dziadzio, volunteer
Mike Davis, volunteer
Nate Bent, volunteer
Pat Kraft, volunteer
Ryan Droney, volunteer
Stephanie Parsons, volunteer
Tom Cunningham, intern
Tom Koepft, volunteer
Zach Mahoney, volunteer

SUNY Oswego
Anthony Hartman, volunteer

Nazareth College
Elaina Burns, volunteer

SUNY ESF continued …
Jennifer Ma, volunteer
Jessica VanWoert, volunteer
Jim Stickles, volunteer
Joe Mosley, volunteer
John Vanek, volunteer
Josh Ferguson, volunteer
Kaytee Steinkerchner, volunteer
Keith Chappell, volunteer
Michelle Koprowski, volunteer
Morgan Dair, volunteer
Phil Savoy, volunteer
Phillip Scott, volunteer
Priscilla Wilson, volunteer
Sarah Rotundo, volunteer
Sarah Wyman, volunteer
Shaina Gertenslager, volunteer
Shannon Romeling, volunteer
Wil Macaluso, volunteer
Yi-Chuan Luk, volunteer

Trent University
Dan Andrés, volunteer

FIELD TECHNICIANS

Dan Quinn
Michael Clark

UNIVERSITY / ACADEMIC SUPPORT

SUNY ESF
Bill Porter
Brian Underwood
Dale Plunkett, Fleet Management
Paul Szemkow, Mapping
Robert Chambers, Emeritus
Steve Campbell, Post-doc

SUNY Cobleskill
Kevin Berner
Mike Losito

Cornell University
Dan Bogen, Ph.D. Student
Paul Curtis
Richard Malecki

GOVERNMENT AGENCY SUPPORT

NYS Dept. of Environmental Conservation
Andrew Drake, volunteer
Bill Hoffman
Bill Sharick
Ed Kautz

NYS Dept. of Transportation
Dick Simonson, volunteer

NYS Police, Aviation Unit
Gregg Gantter, pilot

Gary Golja
Jeff Piel
Jeremy Hurst
Joel Fiske
Justin Rejman, seasonal technician
Lou Berchielli
Marty Delong
Michael Clancy, volunteer
Scott Smith

USDA-APHIS Wildlife Services
Martin Lowney

PRIVATE SECTOR SUPPORT

Private Citizens
Adam Buck , trapper
Charlie Miller, trapper
Jack Sincock, trapper
Jerry Gamet, trapper
Jim Phenes, trapper
John Keroak, volunteer
John Olin, trapper
Jon Wood, volunteer
Ken Ellison (and Molly), dog handler
Leith McKendrick, volunteer
Phil Peeters, volunteer

Non-Profit and Commercial Support
Bath Veterinary Hospital
Cobleskill Veterinary Clinic
Costa Flying Services (Joe Cost, Pete Randall)
NY State Trappers Association
Steuben Veterinary Clinic

Contact Information

Jacqueline Frair
Office Phone: 315-470-4905
Email: jfrair@esf.edu

James Gibbs
Office Phone: 315-470-6764
Email: jpgibbs@esf.edu

Christina Boser (M.S. Student)
Cell Phone: 608-712-4182
Email: clboser@syr.edu

Robin Holevinski (Ph.D. Student)
Cell Phone: 585-507-0745
Email: raholevi@syr.edu

Sandra Walczyk (M.S. Student)
Cell Phone: 516-587-2248, Email: swalczyk@coa.edu
Mailing Address for ESF:
1 Forestry Drive, 250 Illick Hall, Syracuse, NY 13210

Gordon Batcheller
NYS DEC
625 Broadway, 5th Floor
Albany, NY 12233-4754
Office Phone: 508-402-8885
Email: grbatche@gw.dec.state.ny.us

Paul Jensen
NYS DEC
232 Hudson Street Extension, P.O. Box 220
Warrensburgh, NY 12885-0220
Office Phone: 518-623-1242
Email: pgjensen@gw.dec.state.ny.us