Department of Natural Resources
SCI-MIC Supported Research Projects

Progress Reports for 2018:

TITLE: Predator-Prey Project

The impact of predators on prey populations has been the subject of numerous scientific studies and has been debated at length by the public. There is agreement in the scientific community that the relationship between predators and prey is very complex and broad descriptive statements cannot be made. In some cases, predators limit prey populations and in other cases they do not. The relationship between predators and prey is influenced by a host of factors that can vary from place to place and over time. Factors that must be considered include the number of different prey species available, the number of different predators in the system, the relative density of predators and prey in the area, the response of predators and prey to changes in prey numbers, and the effects of weather and disease on predators and prey. Unfortunately, data from areas where predators prey predominately on white-tailed deer are limited yet results from Phase I of this study are helping to clarify these complex relationships.

White-tailed deer are an important species in Michigan providing many ecological, social and economic values. Most generally, factors that can limit deer numbers include food supply, winter cover, disease, predation, weather, and hunter harvest. Deer numbers fluctuate in relation to these limiting factors. Considerable research has been conducted demonstrating the effects of winter severity on white-tailed deer condition and survival and the importance of food supply and cover, particularly during winter, has been documented. While the role of predation on white-tailed deer survival has received some attention, many questions remain. A better understanding of the possible impact of predators on deer population dynamics requires information on the role of predation on white-tailed deer fawn survival and the extent to which predation is additive or compensatory with other causes of death. The predator-prey system is complex, so this project is simultaneously addressing the roles of various limiting factors (e.g., predators, winter weather).

To assess the role of predation on white-tailed deer fawns we are capturing and radio-collaring newborn fawns to estimate their survival and determine the causes of mortality. We are simultaneously assessing the effects of predation and winter severity and indirectly evaluating the influence of habitat conditions on fawn recruitment.

Phase I of the study occurred in the low snowfall zone of the Upper Peninsula and data analysis is underway. Preliminary results include:

- Over the 3 years, we captured and radio-collared 141 fawns and investigated 65 mortalities.
- We collected over 550,000 locations on GPS collared predators (bears, bobcats, coyotes, and wolves) and investigated almost 1,400 predator locations clusters for evidence of kill sites. These searches indicate that coyotes and bobcats are important predators of fawns.

- We found high pregnancy rates in adult does. This is important and useful to managers because pregnancy rates have not been measured in over 25 years and hunters have expressed concern that bucks are harvested too intensively and doe-to-buck ratios are unacceptably skewed.

- Estimating abundance of species such as coyotes and bobcat is difficult and rarely has been attempted. The howl survey/sonographic technique for estimating coyote abundance and the hair snare/genetic technique for estimating bobcat abundance we are using are showing good promise.
- Winter severity effects on nutritional condition of adult females influenced survival of adult females and fawns. However, adult female avoidance of interior lowland forests which had greater wolf use and commonly aging and over-browsed vegetation ostensibly reduced fawn recruitment through a lack of hiding vegetation and poorer forage. Also, by adult females raising fawns in habitats near roads, the predatory efficacy of coyotes on adult females and fawns increased. Although predation was the leading cause of deer mortality, winter severity affecting nutritional condition and resource use appeared to be most important factor precluding population increases. We suggest habitat management that increases landscape heterogeneity of early successional forests to enhance year-round browse to increase nutritional condition of adult females and hiding cover for fawns could improve population growth.

Phase II of the project (mid-snowfall zone) started in the summer of 2012, with the new study area located near the Michigamme Reservoir. Deer trapping in 2013 and 2014 resulted in 192 (140 female, 52 male) captures and 89 pregnant females received vaginal implant transmitters. In the first two years, 61 fawns were captured, radio-collared, and monitored. We have completed the fieldwork in Phase II and the graduate students are currently analyzing data and beginning to make comparisons with our findings from the low-snowfall zone study area.

This cooperative study investigating the role of predators, winter weather, and habitat on deer fawn survival in the Upper Peninsula beginning in 2009 with a planned completion date of 2021. In 2018, our collaborator, Dr. Jerrold Belant, accepted the Campfire Professor of Wildlife Conservation Endowed Chair position at the State University of New York's College of Environmental Science and Forestry (SUNY ESF), thus we have transferred the research grant from Mississippi State University to SUNY ESF.

You can find progress reports and links to technical publications from this research project on the project's new website:

https://campfirewildlife.com/projects/predator-prey/

The project also maintains a Facebook page that is updated with current activities and interesting observations from the field. Follow the link below to keep up with the latest news:

https://www.facebook.com/campfirewildlife/

Phase III of the project (high-snowfall zone) began in summer 2016. This past year, work continued analyzing and interpreting data from the mid-snowfall zone. This work continues our focus on disentangling complex interactions among deer, multiple predators, habitat, and weather in the Upper Peninsula. In the mid-snowfall study area, the study period aligned with a 4-year trend of deer population decrease. During this period, adult female deer densities decreased by 40% from 3.5 to 2.1 does/km^2. This provided an opportunity for insights into conditions that lead to deer population decline but did not allow a similar opportunity to observe conditions that lead to deer population growth. While temperature and snow conditions throughout winter influence deer winter survival, the timing of spring snowmelt appears to be

more important than early- and mid-winter weather patterns. Years with late spring snowmelt are likely to result in high deer mortality, even if conditions were mild during early winter.

The deer population decline appeared to be driven by both low adult female survival and low fawn recruitment. Poor survival in adult and juvenile age classes was proximally driven by high predation rates and appeared ultimately related to nutritional condition. In the case of adult female deer, most mortality occurred during late winter but heavier does were less likely to die, which suggests that summer/fall condition influences winter survival. In the case of fawns, condition at birth was important which indicates that doe condition during pregnancy influences early life fawn survival. Taken together, these conclusions support the hypothesis that severe winters weaken deer, and weak deer are more susceptible to predation and produce weak offspring which in turn have lower survival. Under this hypothesis, managers can expect predation rates of deer to vary considerably among years due to changes in weather, even if predator populations remain constant.

The most abundant predator species in the mid-snowfall zone study area were black bears and coyotes at 0.26 and 0.24 individuals/km^2, respectively. Wolves and bobcats were also present at densities of 0.03 and 0.04 individuals/km2, respectively. Predator species did not appear to contribute equally to deer mortality. Coyotes were the most important deer predator as a leading mortality source of both adult and juvenile deer. Wolves were a major predator of adult female deer but were the least important fawn predator, while bears were a major fawn predator but were not observed to kill any adult deer. Bobcats killed both adult and fawn deer but at low rates and were likely the least influential predator on the deer population. In combination, coyotes and wolves can affect white-tailed deer populations as coyotes can exploit unused areas within or near wolf territories to coexist and increase deer mortality more than may be expected.

We also continued fieldwork in the high-snowfall zone study area. In 2018, we captured and radio-collared 57 adult female and yearling deer and monitored an additional 32 adult female deer captured during 2017 for a total adult female sample of 99 individuals. We also captured and radio-collared 48 neonatal fawns. We detected pregnancy with ultrasound in 98% of adult (n = 57) and 50% of yearling (n = 12) females.

We captured 14 bear, 8 wolves, 1 bobcat, and 1 coyote which were fit with GPS collars. From 8 May to 28 August 2018 cluster sites were investigated for each species totaling 134 bear, 272 wolf, 39 bobcat, and 86 coyote clusters. Evidence of fawn predation was determined at 2 bear, 36 wolf, 12 coyote, and no bobcat cluster sites.

During black bear den checks and white-tailed deer trapping we hosted individuals from Michigan Department of Natural Resources (MDNR), Michigan State University, Michigan Technological University, 906 Outdoors (Discovering), Safari Club International Michigan Involvement Committee, ABC 10 News, WJMN-TV3 News, WLUC-TV6 News, Daily Mining Gazette, The Mining Journal, The L'Anse Sentinel, Into the Outdoors Education Network and other interested members of the public.

We attended several local sportsman's coalition meetings to discuss the project and improve awareness of project goals and activities. We hosted 23 and 19 undergraduate students from Purdue University (8 June) and Michigan Technological University (1 August) for demonstrations of detection dogs, carnivore immobilizations, fawn capture, vegetation surveys, and deer telemetry. We gave presentations to 17 classes at local public schools, reaching 378 students. We hosted 23 educators from the Michigan DNR Academy of Natural Resources-North for demonstrations of detection dogs, carnivore capture, and telemetry.

Partners: Safari Club International-MIC; Safari Club International Foundation; Northwoods Chapter Safari Club International; U.P. Whitetails Association, Inc., Menominee County Chapter; Wildlife Unlimited of Delta County; Ottawa Sportsmen's Club, Ontonagon Valley Sportsmen's Club, Plum Creek Timber Company, and Mississippi State University

Time Line and Budget: This project is being conducted in three snowfall zones in the UP with a total duration of approximately twelve years (2009-2021). Total project costs could exceed $3,000,000. Targeted 2019 funding request from SCI-MIC: $16,000.