2018 Michigan Department of Natural Resources
Research Project Request Descriptions

Title: Predator-Prey Project—Phase III

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 and the third winter of Phase II is starting.

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. This past year, we completed the fieldwork in Phase II and the graduate students are currently analyzing data from the past 3 years and beginning to make comparisons with our findings from the low-snowfall zone study area.

Phase III of the project (high-snowfall zone) began in summer 2016. We established our field housing, captured and collared black bears, established hair snare sites for bobcats and bears, and conducted surveys for white-tailed deer, coyotes, and beavers. Deer trapping will begin in early January 2017 and will occur again in winter 2018.

This cooperative study with Mississippi State University investigating the role of predators, winter weather, and habitat on deer fawn survival in the Upper Peninsula is one of the best-documented research projects conducted by the Michigan DNR. You can find progress reports and links to technical publications from this research project on the project's website:

http://www.fwrc.msstate.edu/carnivore/predatorprey/index.asp

There is also a link to the website on the SCI MIC website:

http://www.scimic.org/projects.html

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/MIpredprey

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; and Mississippi State University

Time Line and Budget: This project is anticipated to be conducted in three snowfall zones in the UP with a total duration of approximately twelve years. Total project costs could exceed $3,000,000.

Title: Gray Wolf Population Project

The gray wolf has returned to its former range in the Upper Peninsula of Michigan (UP). Wolf population growth and range expansion have been monitored since 1989. In winter 2014, we estimated there were at least 636 wolves in the UP and a wolf survey will be conducted in 2018. As the wolf population increased, a program of research was developed to aid in monitoring their recovery and management. Over 400 wolves have been captured and radio-collared providing important information on distribution, movements, and pack and territory size. This information is critical to our annual population census. Population estimates are becoming increasingly difficult as the current technique relies on identification of individuals within discrete packs. We are beginning the transition from deploying VHF collars to GPS collars with a satellite link. The GPS collars should provide more robust data, better location accuracy, and reduce the flight time necessary to conduct surveys. Important work has been done on evaluating alternative approaches to estimating population size and a new sampling procedure, which will save us time and money has been implemented. We have also developed a model of wolf habitat use that predicts the amount and location of suitable habitat. Using data from collared wolves we are currently conducting a comprehensive analysis of wolf survival and dispersal rates. These estimates are necessary for modeling efforts designed to examine wolf population response to various management scenarios.

US Fish and Wildlife Service removed wolves in the Great Lakes Region from the Federal list of threatened and endangered species in January of 2012. However, on December 19, 2014, Federal District Court for the District of Columbia granted the Humane Society's motion for summary judgment and vacated the rule that delisted wolves in the Great Lakes Region. Wolves in Michigan are once again on the federal endangered species list.

Partners: Safari Club International-MIC, USDA-Wildlife Services, Michigan Technological University

Time Line and Budget: This project started in 1999 and will continue for at least five years following Federal delisting, and annual monitoring will likely be needed to support

any potential Michigan wolf harvest seasons. Thus, we need to maintain a sample of radio-collared wolves. Total project costs are greater than $800,000.

Title: American Woodcock Nesting Research

American woodcock (*Scolopax minor*) breeding population indices in Michigan, the Central Management Unit, and range-wide suggest a long-term decline in woodcock abundance since 1968. Management responses to declining woodcock abundance included restricting harvest opportunities (i.e., reduce season lengths and daily limits: Cooper and Rau 2012) and promoting habitat management to increase early successional forests that benefit woodcock and other wildlife species associated with these habitats (e.g., ruffed grouse: *Bonasa umbellus* and golden-winged warbler: *Vermivora chrysoptera*). Although many biologists believe that loss of breeding habitat quality and quantity was responsible for woodcock population declines, there are many uncertainties that may affect woodcock management efficiency and effectiveness; at a continental scale, there is need to "improve understanding of migration, breeding, and wintering habitat quality for American woodcock". Existing habitat models for breeding woodcock rely on correlates between presence/absence or abundance of animals on the landscape and these models may fail to capture important processes underlying declines in reproductive rates. We believe that the highest priority information needed to improve management of woodcock in the Great Lakes Region is better understanding the relation between woodcock breeding habitat characteristics and reproductive rates; better understanding the relation between habitat/landscape attributes and reproductive success would assist managers in targeting habitat treatments to improve woodcock reproductive success.

Available demographic information for woodcock supports the idea that declines in reproductive rates associated with changes in landscape-scale habitat characteristics have contributed to declining woodcock abundance. MDNR's volunteer woodcock banding program has provided long-term estimates of woodcock survival with adult and juvenile survival being relatively stable while woodcock abundance was declining. Woodcock wings from a sample of hunters have been collected by the U.S. Fish and Wildlife Service (USFWS) since 1963 and an index to reproductive success derived from this sample (juveniles per adult females) suggest long-term decline in harvest age ratios. However, the relations between harvest age ratios and more direct measures of reproductive success (e.g., nesting success and brood survival) have not been tested. Woodcock nest early in spring and survival of nests have generally been high (43-67% nest success) and although survival of nests and young can be affected by weather, most nest losses result from predation. The degree to which predation rates and nesting success have changed and are tied to landscape characteristics is relatively unstudied; however, changes in landscape-scale habitat characteristics on breeding areas appear to have affected woodcock demographics as woodcock population trajectories varied among broad ecosystem types (i.e., bird conservation regions: BCR's) with relative population stability in the Boreal Hardwood Transition compared to declines in the Prairie Hardwood Transition and other ecosystems.

OBJECTIVES

- Estimate nesting density, nesting success and fledgling survival for woodcock in 2 distinct Michigan landscapes over a 3-year period.
- Identify predators responsible for predation of woodcock nests and young.
- Link woodcock reproductive rates to vegetative and physical characteristics near nest sites and surrounding landscapes
- Make recommendations on landscape-dependent habitat management practices that efficiently target improvement in woodcock reproductive rates.

Partners: SCI-MIC, Michigan State University.

Time Line and Budget: This project was initiated in the spring of 2015, but field work was delayed a year. The project is now scheduled to continue through 2019. Total project costs will exceed $489,000 (including over $170,000 in matching funds from Michigan State University).

Title: Deer and Northern Hardwoods in Michigan

White-tailed deer are arguably the most important terrestrial wildlife species to the economy of the Great Lakes region. About 700,000 hunters pursue deer in Michigan each year, spending an estimated 9.75 million hunting days and generating over $1 billion in revenue. In general, the hunting community equates high deer densities to an improved hunting experience, thus harvest season quotas and land management practices that reduce deer numbers attract considerable public criticism. However, high deer densities can have negative economic and ecological consequences. For example, deer have been implicated in the decline of desirable northern hardwood forests (like oak, yellow birch and hemlock) in Michigan through browsing of tree seedlings and saplings. In some areas, herbivory by deer (and potentially snowshoe hare) undoubtedly have negative impacts on forest regeneration, which ultimately impacts future forest composition. However, the explanation for the decline of northern hardwood forests in many areas of Michigan is likely more complex than just deer herbivory. Other factors like past forest management (e.g., selection silviculture), forest insect and disease outbreaks, and a rapidly changing climate are also implicated in the decline.

Northern hardwood forests are one of the most valuable timber types in Michigan, both economically and for wildlife habitat. The Michigan Department of Natural Resources (MDNR) and forest products industry are interested in evaluating innovative silvicultural approaches to ensure desirable hardwood tree regeneration while minimizing deer browsing impacts. The proposed project will evaluate innovative silvicultural approaches to forest management that alter deer behavior in northern hardwood management areas to reduce browsing affects on tree regeneration. The premise is that these innovative prescriptions can be used to help mitigate deer herbivory impacts, improve seedbed quality, and provide competitive advantages for desirable tree species. The ultimate goal of the research is to identify cost-effective silvicultural techniques that allow

regeneration of diverse northern hardwood forests in the presence of deer at densities that offer hunters reasonable opportunities for success.

Partners: Safari Club International – Michigan Involvement Committee, MDNR, Michigan State University, Hancock Timber Resources Group, GMO Renewable Resources

Timeframe and budget: Project started in the summer of 2016, with the first phase of the deer portion scheduled to end in the spring of 2021 (4+ years). The initial budget for deer work approved by MDNR-Wildlife Division was $283,777, with equipment costs projected to exceed that budget. The forest monitoring component of the project started in summer of 2016 and is projected to run for 10 years (the time frame required to ensure that tree regeneration is free to grow). The budget for forest monitoring from MDNR-Forest Resources Division is >$600,000.

Title: Quantifying Upper Peninsula Deer Movements and Abundance: Preparing for CWD Management

Chronic wasting disease (CWD) occurs in free-ranging white-tailed deer in Lower Michigan, and in our neighboring state of Wisconsin where the disease is endemic. Although CWD has not yet been documented in the Upper Peninsula (UP), managers found infected deer in two Wisconsin captive cervid facilities within 50 km of the Michigan border. While it is not possible to predict if or when we will find CWD in the UP, preparations seem prudent, as deer in the UP can seasonally migrate 50 km, with overall movements exceeding 80 km. Eradicating or even limiting the spread of CWD is difficult, but even more so in the UP where winter severity results in increased deer movements and yarding behavior that concentrates animals, resulting in increased direct contact and environmental contamination in critical winter habitat.

A scientifically-based understanding of deer movements (i.e., seasonal home ranges, migration, dispersal, transient, and exploratory) and estimates of population abundance are critical for developing management recommendations in response to CWD. Deer movements and abundance can influence the probability of disease establishment, as well as contact rates which affect transmission rate, and the geographic extent of an outbreak. Importantly, these data take time to gather and managers need this information at the time of first discovery. Thus, waiting for a disease outbreak before gathering these data would put managers at a perhaps insurmountable disadvantage.

The current State of Michigan surveillance and response plan recommends establishing a 16-km radius buffer around the location of any free-ranging infected deer, including entire counties whose boundaries fall within this buffer, as modified by knowledge of deer abundance or credible scientific evidence. A primary benefit of this research will be to provide the scientific evidence to immediately establish effective surveillance and management zones if we detect CWD. Our models of white-tailed deer space use, movements, and abundance would identify the spatial extent and relevant deer population for effective management of CWD if detected. This important first step will allow managers to implement our CWD response plan in the most effective manner. In addition, the information collected on deer movements would extend the application of

the new tools Michigan State University is developing for management of CWD in Lower Michigan.

Other important benefits include: (1) the use of camera grids to estimate deer abundance and composition that would provide valuable data for managing harvests, and (2) a better understanding of the spatial distribution of deer populations coupled with our understanding of external drivers of deer abundance (i.e., pred-prey project) would allow us to more effectively manage deer populations.

TIME LINE AND BUDGET: The initial work will span 4 fiscal years beginning FY18. During January-March of year 1, we will attach GPS collars to 50 deer in each of 3 select populations near the Wisconsin border, emphasizing sex and age classes that are likely to exhibit long-distance movements (e.g., male fawns). In addition, we will augment the population of GPS-collared deer in the phase 3 Predator-Prey study area to include fawns and adult males. To maintain adequate sample sizes due to mortality loss, we will conduct additional captures during January-March of year 2 and continue monitoring the collared segments of the populations for 3 years total. Based on early summer movements of adult female deer, we will establish an unbaited camera array (~60 cameras) in the area occupied by each of the populations. During July-September of years 1-3, we will place cameras on established deer trails following procedures developed during the Predator-Prey project to ensure independence among sites. We will use N-mixture models to estimate deer abundance and incorporate deer telemetry data during the time of the camera survey to convert abundance estimates to density estimates.

After completing this research in the western UP, we would propose parallel projects in the central and eastern UP to develop this strategy UP-wide. Project costs for the first phase are approximately $613,000.

Title: Northern Michigan Habitat Work Group

The Michigan Predator Prey study is nearing its conclusion after nearly nine years of study in the UP of Michigan. The study has sought to understand the relationship between white-tailed deer, their primary predators, and environmental conditions. The study has made extensive use of satellite radio GPS collars which were placed on bobcat, wolves, coyotes, black bears and of course white-tailed deer. The study has been supported by Mississippi State Universtiy, Safari Club International, Safari Club International Foundation, SCI Michigan Involvement committee, and Michigan DNR. The study's website is extensive and contains methods, findings, reports, video and photos of this world class research effort. For more information go to www.fwrc.msstate.edu/carnivore/predatorprey/index.asp

The predator prey study has revealed that, more than any other factor, winter weather conditions dictate the survival potential for white-tailed deer in any given winter. Severe winter weather in this region can be described as temperature extremes (to -40 degrees F) accompanied by deep snow which limits the movements of deer and prevents them from foraging for food. Prior to this research, many people believed that predators, especially the regions wolves, were responsible for the steep declines in deer numbers

observed after back-to-back severe winters in 1995 and 1996, and 2014 and 2015. Our research has shown that the lack of quality winter shelter in the form of dense conifer stands is the main contributing factor to the survival of deer. Conifer cover in deer winter range (deer yards) has been diminished due to insect infestations such as the spruce budworm, indiscriminate cutting on some ownerships, and forest succession to trees that do not provide shelter. As a result of these poor habitat conditions, deer may suffer very high mortality during difficult winters, and pregnant does that survive to give birth produce fawns that have extremely high post-natal mortality rates. Some winters can result in the near total loss of the fawn crop. To take steps to correct the lack of quality winter shelter, the Michigan Natural Resources Commission (NRC) formed the UP Habitat Workgroup in 2014. The group's 13 members represent foresters, wildlife managers, private consultants, and sportspersons. Also represented on the panel are major UP landowners such as the Ottawa National Forest, Hiawatha National Forest, State of Michigan, and private industrial forest owners. To date the group has been supported financially by SCI, SCI Foundation, SCI Michigan Involvement committee, MUCC, UP Sportsman's Alliance, MDNR and from private donations. During the past three years that group, through its consultant, has developed a deeryard forest management plan for every deeryard in the UP, conducted public meetings to describe our work attended by more than 500 people, and worked to inform the public through multiple media outlets. The goal of this work is to reestablish suitable winter cover for deer, thus providing sustainability to this important resource that is a cultural, economic, and ecological cornerstone species of the Upper Peninsula. The UP Habitat workgroup is seeking grants to continue this work from the state of Michigan and we are hoping to partner with any other entity that would consider helping in this endeavor to manage critical winter shelter forest for Michigan deer.