Role of predators, winter weather, and habitat on white-tailed deer fawn survival in the south-central Upper Peninsula of Michigan


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Abstract Two adult female and 2 fawn mortalities occurred this quarter. We collected 322 adult female and 55 fawn radiolocations. We located 14 black bear den locations and recovered collars from 2 bobcat, 4 coyote, and 2 wolves. To index beaver abundance, we conducted aerial surveys and detected 24 inactive lodges, 32 active lodges with a cache present, and 4 caches with no evidence of a lodge. We obtained 8,848 images from 64 remote infrared cameras and are currently entering this data to estimate deer abundance/density. We obtained response rates of 25.0% and 1.6% from coyotes and wolves to broadcasted coyote group-yip howls, respectively. We re-established 64 bobcat hair snare sites, prepared 384 hair snares, and began collecting bait in preparation for a bobcat abundance survey beginning in January 2014. We published 2 refereed manuscripts in the journal Population Ecology. We gave an invited presentation at the International Wolf Symposium and 3 presentations to local groups. We continued to update the project website and Facebook page. We hired 6 technicians to assist with winter field activities.
Summary

- We observed 2 dead radiocollared adult female white-tailed deer (*Odocoileus virginianus*). We classified one mortality as a wounding loss and one as probable poaching.

- We observed 2 dead radiocollared fawns, both of which were attributed to coyote (*Canis latrans*) predation.

- We obtained 322 adult female and 55 fawn radiolocations.

- We located 14 black bear (*Ursus americanus*) den sites and recovered collars from 2 bobcat (*Lynx rufus*), 4 coyote, and 2 wolves (*Canis spp.*).

- We conducted a beaver cache survey to estimate beaver abundance within the study area. We flew 558 km or river and lakeshore and detected 36 active beaver caches.

- We obtained 8,848 images from 64 remote infrared cameras to estimate deer density and are currently entering this data.

- We obtained response rates of 25.0% and 1.6% from coyotes and wolves to broadcasted coyote group-yip howls, respectively.

- We repaired 64 bobcat hair snare sites, repaired/replaced and sterilized 384 bobcat hair snares, and began collecting bait in preparation for a bobcat abundance survey beginning in January 2014.

- We hosted 2 observers from Northern Michigan University on several occasions during October–November.

- We published 2 refereed manuscripts in the journal Population Ecology and gave an invited presentation at the International Wolf Symposium in Duluth, Minnesota.

- We gave presentations for Northern Michigan University Wildlife Society’s “Wolf Week” and the Great Lakes Water Operators Annual Conference, where we discussed the project with interested members of the public and tried to improve regional awareness of project goals and activities.

- We updated our Facebook page and project website to provide the public with project results.
Introduction

Management of wildlife is based on an understanding, and in some cases, manipulation of factors that limit wildlife populations. Wildlife managers sometimes manipulate the effect of a limiting factor to allow a wildlife population to increase or decrease. White-tailed deer (*Odocoileus virginianus*) are an important wildlife species in North America 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 change with changes in these limiting factors.

White-tailed deer provide food, sport, income, and viewing opportunities to millions of Americans throughout the United States and are among the most visible and ecologically-important wildlife species in North America. They occur throughout Michigan at various densities, based on geographical region and habitat type. Michigan spans about 600 km from north to south. The importance of factors that limit deer populations vary along this latitudinal gradient. For example, winter severity and winter food availability have less impact on deer numbers in Lower Michigan than in Upper Michigan.

Quantifying the relative role of factors potentially limiting white-tailed deer recruitment and how the importance of these factors varies across this latitudinal gradient is critical for understanding deer demography and ensuring effective management strategies. Considerable research has demonstrated the effects of winter severity on white-tailed deer condition and survival (Ozoga and Gysel 1972, Moen 1976, DelGiudice et al. 2002). In addition, the importance of food supply and cover, particularly during winter, has been documented (Moen 1976, Taillon et al. 2006). Finally, the role of predation on white-tailed deer survival has received considerable attention (e.g., Ballard et al. 2001). However, few studies have simultaneously addressed the roles of limiting factors on white-tailed deer.

Our overall goal is to assess baseline reproductive parameters and the magnitude of cause-specific mortality and survival of white-tailed deer fawns, particularly mortality due to predation, in relation to other possible limiting mortality agents along a latitudinal gradient in Upper Michigan. We will simultaneously assess effects of predation and winter severity and indirectly evaluate the influence of habitat conditions on fawn recruitment. Considering results from Lower Michigan (Pusateri Burroughs et al. 2006, Hiller 2007) as the southern extent of this gradient, we have now completed field work within a low snow depth study site and are currently collecting data within a second study site with moderate snow depth. The following objectives are specific to the Upper Michigan study areas but are also applicable to other study areas with varying predator suites.

Objectives

1. Estimate survival and cause-specific mortality of white-tailed deer fawns and does.

2. Estimate proportion of fawn mortality attributable to black bear (*Ursus americanus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and wolf (*Canis* spp.).
3. Estimate number and age of fawns killed by a bear, coyote, bobcat, or wolf during summer.

4. Provide updated information on white-tailed deer pregnancy and fecundity rates.

5. Estimate annual and seasonal resource use (e.g., habitat) and home range of white-tailed deer.

6. Estimate if familiarity of an area to each predator species affects the likelihood of fawn predation.

7. Assess if estimated composite bear, coyote, bobcat, and wolf use of an area influences fawn predation rates.

8. Describe association between fawn birth site habitat characteristics and black bear, coyote, bobcat, or wolf habitat use.

9. Estimate seasonal resource use (e.g., habitat, prey) and home range size of black bear, coyote, bobcat and wolf.

Study Area

The second phase of this study spans about 1,000 km² (386 mi²) within Deer Management Unit 036 in Iron County (Figure 1). The general study area boundaries follow State Highway M-95 on the east, US Highway 41/28 on the north, US Highway 141 on the west, and State Highway M-69 on the south. The core study area, where most capture efforts and population surveys will occur, is north of the Michigamme Reservoir and includes state forest, commercial forest association, and private lands. The final study area will comprise a minimum convex polygon that will include the composite locations of all telemetered animals. We selected this study area because it occurs within the mid-snowfall range, receiving about 180 cm of snowfall annually (about 53 cm more snowfall annually than the phase 1 study area near Escanaba). Deer in this area migrate longer distances and exhibit yarding behavior during most winters as compared to Escanaba where deer migrate only short distances or are non-migratory (Beyer et al. 2010) and yard less frequently.

Accomplishments

Deer Mortality

We recorded 2 adult female mortalities. We recovered one deer with an arrow in the body cavity, and we classified this mortality as a wounding loss. The second mortality appeared to be poaching, as we found the collar cut off and no remains. We also recorded 2 fawn mortalities, both of which were probable coyote predations.

Deer Telemetry

We used aerial and ground telemetry to locate radiocollared adult females and fawns. We obtained 322 adult female and 55 fawn locations.
Carnivore Monitoring and GPS Radiocollar Recovery

We recovered 2 bobcat, 4 coyote, and 2 wolf GPS radiocollars after the drop-off mechanisms were activated. Three GPS radiocollars were damaged and we sent them to the manufacturer for refurbishment. We were unable to locate or recover 2 wolf GPS collars. Currently we are monitoring 14 GPS and VHF radiocollared black bears until we replace or remove their collars during late-December or late-February.

Black Bear Den Location

From 16 September to 15 December 2013, we located 14 black bears 5 times to monitor their movements and confirm denning location. We located 11 bear den sites (2 male, 9 female) during 3–11 December. Two bears had not denned by 11 December and we did not locate 1 additional bear.

Beaver Cache Survey

To provide an index of beaver abundance, we flew 558 km of river and lakeshore on 29 October and 6 November to identify active beaver caches. We conducted flights at an altitude of 550–650 m. We detected 24 inactive lodges, 32 active lodges with a cache present, and 4 caches with no sign of a lodge (equates to one active cache for every 15.5 km flown; Figure 2).

Deer Camera Survey

We obtained 8,848 images from 64 remote infrared cameras. We are currently entering data obtained during this survey, and from camera images we will estimate deer abundance/density.

Coyote Abundance Estimation

We completed 5 howl surveys at 40 sites (Figure 3) between 20 August and 9 October, for a total of 8 surveys in 2013. Overall, we obtained a coyote response rate of 25.0% to recorded coyote group-yip howls and recorded five wolf responses (1.6% response rate).

Bobcat Hair Snares

We repaired 64 bobcat hair snare sites throughout the study area. We also repaired/replaced and sterilized 384 bobcat hair snares and began collecting bait (i.e. road-killed deer carcasses, deer remains from local game processors, and beaver carcasses from private trappers) in preparation for a bobcat abundance survey beginning January 2014.

Public Outreach

We hosted 2 observers from Northern Michigan University on several occasions during October–November 2013. We gave presentations for Northern Michigan University Wildlife Society’s “Wolf Week” and the Great Lakes Water Operators Annual Conference, where we discussed the project with interested members of the public and tried to improve regional awareness of project goals and activities. We updated our Facebook page (www.Facebook.com/MIpredprey) to provide the public with current project activities.
Presentations:


Technician Selection and Hiring

We hired 6 technicians to assist with field work from 1 January through 31 March 2014:

Steffen Peterson
Alyssa Roddy
Evan Shields
Peter Mumford
Kris Harmon
Greta Schmidt

Publications


Work to be completed (16 December 2013–15 March 2014)

Deer Capture

We will begin capturing deer using Clover traps on 4 January 2014. We will deploy up to 45 radiocollars and vaginal implant transmitters.

Deer Telemetry

We will continue to monitor all radio-collared deer about once each week to monitor survival and obtain locations. We will investigate mortalities as soon as practical after detecting a mortality signal to determine cause of death.
Black Bear Den Checks
We will conduct den checks on 14 collared bear to remove collars or replace batteries on GPS radiocollars. We will complete den checks on males and known females with yearlings in late-December 2013. We will conduct the remaining female black bear den checks in late-February to assess reproduction and replace VHF radio-collars with GPS radio-collars.

Carnivore Capture
We will capture coyotes beginning in February 2014 using relaxing-lock cable neck restraints at sites baited with vehicle-killed deer carcasses. We will also begin to use trained dogs to run and tree bobcats for capture in February 2014.

Carnivore Monitoring
We will continue monitoring collared carnivores once every 2 weeks via aerial telemetry and will download location data from GPS radiocollars.

Bobcat Hair Snares
We will pre-bait snare sites beginning 16 December, deploy hair snares beginning 2 January, and collect hair samples weekly for 8 weeks. We will send hair samples to the MDNR laboratory for DNA extraction and subsequent individual identification.

Winter Track Survey
We will begin winter track surveys for wolves in late January 2014, and will continue until we identify number of packs and individuals/pack within the study area. We will conduct track surveys via truck, snowmobile, or ATV 24–48 hours after snowfall to allow for animal movement. Once identified, we will follow wolf tracks until we confirm number of individuals traveling together. We will use numbers of independent tracks in each group to estimate minimum abundance.

Deer Abundance Estimation
We will use images collected from trail cameras to estimate abundance and densities of males, females, and fawns using occupancy modeling following Royle and Nichols (2003). Survey photos may also allow a supplemental abundance estimate for black bears.

Coyote Abundance Estimation
Using responses obtained from this year’s howl survey, we will estimate coyote abundance using an occupancy modeling approach (Petroelje et al. 2014).

Public Outreach
We will continue to update our project Facebook page (http://www.facebook.com/MIpredprey) and website (http://fwrc.msstate.edu/carnivore/predatorprey/) with project results.

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Participating Upper Peninsula landowners
Jared Duquette, Graduate Student (Phase 1), Mississippi State University
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Literature Cited

predator relationships: a review of recent North American studies with emphasis on mule

Beyer, D., B. Rudolph, K. Kintigh, C. Albright, K. Swanson, L. Smith, D. Begalle, and R.
Doepker. 2010. Habitat and behavior of wintering deer in northern Michigan: a glossary
of terms and associated background information. Michigan Department of Natural
Resources and Environment, Wildlife Division Report 3520, Lansing, Michigan, USA.

characteristics, and cause–specific mortality of white–tailed deer neonates. Journal of

predictive models of nutritional condition in mule deer. Journal of Wildlife Management

Cook, R. S., J. G. Cook, T. R. Stephenson, W. L. Myers, S. M. McCorquodale, D. J. Vales, L. L.
Revisions of rump fat and body scoring indices for deer, elk, and moose. Journal of

Revisions of rump fat and body scoring indices for deer, elk, and moose. Journal of


2006. Cause–specific mortality and survival of white–tailed deer fawns in southwestern


**Figure 1.** Location of phase 1 and 2 study areas and Michigan Department of Natural Resources Deer Management Units, Upper Peninsula of Michigan, USA, 2013.
Figure 2. Locations of beaver caches and lodges detected aerially during 29 October and 6 November, Upper Peninsula of Michigan, USA, 2013.
Figure 3. Locations of 40 howl survey sites to estimate coyote abundance, Upper Peninsula of Michigan, USA, 2013.