

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 One fawn and no adult female deer mortalities occurred this quarter. We collected 1128 adult female and 42 fawn radiolocations. Six ear-tagged male deer were reported as harvested by hunters. We located 9 black bear dens and recovered collars from 2 bobcat, 3 coyote, and 3 wolves. To provide an index of beaver abundance, we conducted aerial surveys and detected 32 inactive lodges, 55 active lodges with a cache present, and 15 caches with no sign of a lodge. We obtained response rates of 28.7% and 1.7% from coyotes and wolves, respectively, to broadcasted coyote group-yip howls. We gave presentations to 1 public group, 13 school classes, and hosted 8 observers to increase awareness of the project and provide information on the study. We updated the project website and project Facebook page with information and results obtained this quarter.

Summary

- We observed no dead radio-collared adult female white-tailed deer (*Odocoileus virginianus*).
- We observed 1 radio-collared fawn mortality, which was attributed to a vehicle collision.
- Six ear-tagged male deer were reported as harvested by hunters.
- We obtained 1128 adult female and 42 fawn radiolocations.
- We located 9 black bear (*Ursus americanus*) den locations and performed den checks on 2 males and 2 females w/ yearlings.
- We recovered GPS collars from 2 bobcats (*Lynx rufus*), 3 coyotes, and 3 wolves.
- We conducted a beaver cache survey to estimate beaver abundance within the study area. We flew 558 km of river and lakeshore and detected 70 active beaver caches.
- We obtained response rates of 28.7% and 1.7% from coyotes and wolves to broadcasted coyote group-yip howls, respectively.
- We hosted 8 observers from the Michigan DNR and local community during den checks in mid-December.
- We gave a presentation at the Sagola Sportsman's Meeting to improve awareness of project goals and activities.
- We updated our Facebook page and project website 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 no adult female mortalities this quarter. Two adult female deer were censored from the study due to radio-collar failure. We observed 1 fawn mortality due to vehicular collision. Three radio-collared fawns were censored after slipping their collars. Apparent fawn survival from birth to 15 December was 35% (9 of 26 fawns surviving). Six ear-tagged males were reported as hunter harvest. Two of these males were captured as fawns during June 2013, one was captured as an adult during January 2014, and three were captured as adults during Jan–Mar 2015.

Deer Telemetry

We used aerial telemetry and GPS collars to locate adult females and fawns. We obtained 1128 adult female and 42 fawn locations. We are continuing to monitor 36 adult females and 9 fawns.

Carnivore Monitoring and GPS Radio-collar Recovery

We recovered 2 bobcat, 3 coyote, and 3 wolf GPS radio-collars after the drop-off mechanisms were activated. Three GPS radio-collars were damaged and sent to the manufacturer for refurbishment. Six marked black bear were harvested (2 collared, 4 ear tagged only), during the Michigan and Wisconsin black bear hunting seasons. We were unable to locate or recover GPS collars from 1 wolf, 2 bobcats, and 1 coyote. Currently we are monitoring 5 GPS radio-collared black bears until we remove their collars in late-February.

Black Bear Dens

From 22 October to 2 December 2015, we located 9 black bears (2 male, 7 female) 5 times to follow their movements and confirm denning locations. One bear was not relocated since the Michigan hunting season. During December 14–17 we removed collars from 2 males and 2 females with yearlings. One female had a single male yearling and the second female had 4 yearlings (2 male, 2 female [Table 1]).

Beaver Cache Survey

We flew 558 km of river and lakeshore during 30 October–3 November to identify active beaver caches. We conducted flights at an altitude of 550–650 m. We detected 32 inactive lodges, 55 active lodges with a cache present, and 15 caches with no sign of a lodge (equates to one active cache for every 8.0 km flown; Figure 2).

Coyote Abundance Estimation

We completed 5 howl surveys at 40 sites (Figure 3) from 13 July to 25 September, for a total of 8 surveys in 2015. Overall, we obtained a coyote response rate of 28.7% to recorded coyote group-yip howls and recorded five wolf responses (1.7% response rate).

Equipment Organization, Inventory, and Storage

We inventoried, organized, and repaired all field equipment and moved it to storage for the next phase of the study in Baraga. We inventoried all capture gear and repaired and stored all project ATVs.

Public Outreach

We hosted 8 observers from the Michigan DNR and local community during den checks in mid-December. We gave 1 presentation at the Sagola Sportsman's Meeting where we discussed the project with interested members of the public and tried to improve regional awareness of project goals and activities. We also made 12 presentations to Forest Park Schools in Crystal Falls. We updated our Facebook page (www.Facebook.com/MIpredprey) to provide the public with current project activities.

Presentations to hunting groups and service organizations:

- Fowler, N.L., T.M. Kautz, T.R. Petroelje, A.L. Lutto, J.L. Belant, D.E. Beyer, Jr. 15 October 2015. Update on Michigan Predator-Prey Project. Sagola Sportsman's Coalition Meeting, Sagola, MI. 15 attendees.
- Kautz, T.M., T.R. Petroelje, N.L. Fowler, A.L. Lutto, J.L. Belant, and D.E. Beyer, Jr. 4 November 2015. Michigan Predator Prey Project and the Role of Research in Natural Resource Management. Ithaca High School, Ithaca, NY. 130 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 17 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School Second and Third Grade, Crystal Falls, MI. 30 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 17 November 2015. Role of predators, winter weather, and habitat on white-tailed deer fawn survival in Michigan. Forest Park High School, Crystal Falls, MI. 13 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 17 November 2015. Role of predators, winter weather, and habitat on white-tailed deer fawn survival in Michigan. Forest Park High School, Crystal Falls, MI. 17 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School Second Grade, Crystal Falls, MI. 17 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School Kindergarten, Crystal Falls, MI. 12 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Role of predators, winter weather, and habitat on white-tailed deer fawn survival in Michigan. Forest Park Middle School Eighth Grade, Crystal Falls, MI. 17 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Role of predators, winter weather, and habitat on white-tailed deer fawn survival in Michigan. Forest Park Middle School Sixth Grade, Crystal Falls, MI. 19 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Role of predators, winter weather, and habitat on white-tailed deer fawn survival in Michigan. Forest Park Middle School Seventh Grade, Crystal Falls, MI. 15 attendees.
- Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School Kindergarten, Crystal Falls, MI. 10 attendees.

Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 18 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School Fourth Grade, Crystal Falls, MI. 20 attendees.

Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 24 November 2015. Michigan Predator-Prey Project. Forest Park Elementary School First Grade, Crystal Falls, MI. 16 attendees.

Lutto, A.L., T.R. Petroelje, T. Kautz, N. Fowler, J.L. Belant, and D.E. Beyer, Jr. 10 December 2015. Michigan Predator-Prey Project. Forest Park Elementary School Fifth Grade, Crystal Falls, MI. 17 attendees.

Peer-Reviewed Publications

Bled, F., S. Summers, D. Martell, T.R. Petroelje, D.E. Beyer, Jr., J.L. Belant. 2015. Effects of prey presence and scale on bobcat resource selection during winter. PLoS ONE 10:e0143347.

Duquette, J.F., J.L. Belant, N.J. Svoboda, D.E. Beyer, Jr., P.E. Lederle. 2015. Scale dependence of female ungulate reproductive success in relation to nutritional condition, resource selection and multi-predator avoidance. PLoS ONE 10:e0140433.

Work to be completed (2016)

Deer Telemetry

We will continue to record survival and locations of radio-collared females up to once each week through February 2016 and fawns through June 2016. 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 in late February on 5 remaining female collared bear to remove their GPS radio-collars and assess reproductive output and body condition.

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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Literature Cited

- Ballard, W. B., D. Lutz, T. W. Keegan, L. H. Carpenter, and J. C. deVos, Jr. 2001. Deer–predator relationships: a review of recent North American studies with emphasis on mule and black–tailed deer. *Wildlife Society Bulletin* 29:99–115.
- 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.
- DelGiudice, G. D., M. R. Riggs, P. Joly, and W. Pan. 2002. Winter severity, survival, and cause–specific mortality of female white–tailed deer in north–central Minnesota. *Journal of Wildlife Management* 66:698–717.
- Hiller, T. L. 2007. Land-use patterns and population characteristics of white-tailed deer in an agro-forest ecosystem in south-central Michigan. Dissertation, Michigan State University, East Lansing, USA.
- Moen, A. N. 1976. Energy conservation by white–tailed deer in the winter. *Ecology* 57:192–198.
- Ozoga, J. and L. Gysel. 1972. Response of white–tailed deer to winter weather. *Journal of Wildlife Management* 36:892–896.
- Pusateri Burroughs, J., H. Campa, III, S. R. Winterstein, B. A. Rudolph, and W. E. Moritz. 2006. Cause–specific mortality and survival of white–tailed deer fawns in southwestern Lower Michigan. *Journal of Wildlife Management* 70:743–751.

Taillon, J., D. G. Sauve, and S. D. Cote. 2006. The effects of decreasing winter diet quality on foraging behavior and life–history traits of white-tailed deer fawns. *Journal of Wildlife Management* 70:1445–1454.

Table 1. Den check data for 9 black bears, Upper Peninsula of Michigan, USA, 14–17 December 2015.

ID	Den check date	Age	Sex	Body weight (kg)	Right ear tag	Left ear tag
BB175	14-Dec	Adult	M	15.7	337	336
BB146	15- Dec	Adult	M	112.9	407	344
BB112	16- Dec	Adult	F	79.4	220	219
BB169	16- Dec	Yearling of BB112	M	24.9	343	342
BB162	17-Dec	Adult	F	90.7	305	306
BB171	17-Dec	Yearling of BB162	F	14.0	355	362
BB172	17-Dec	Yearling of BB162	F	7.0	358	356
BB173	17-Dec	Yearling of BB162	M	12.0	360	359
BB174	17-Dec	Yearling of BB162	M	19.0	357	361

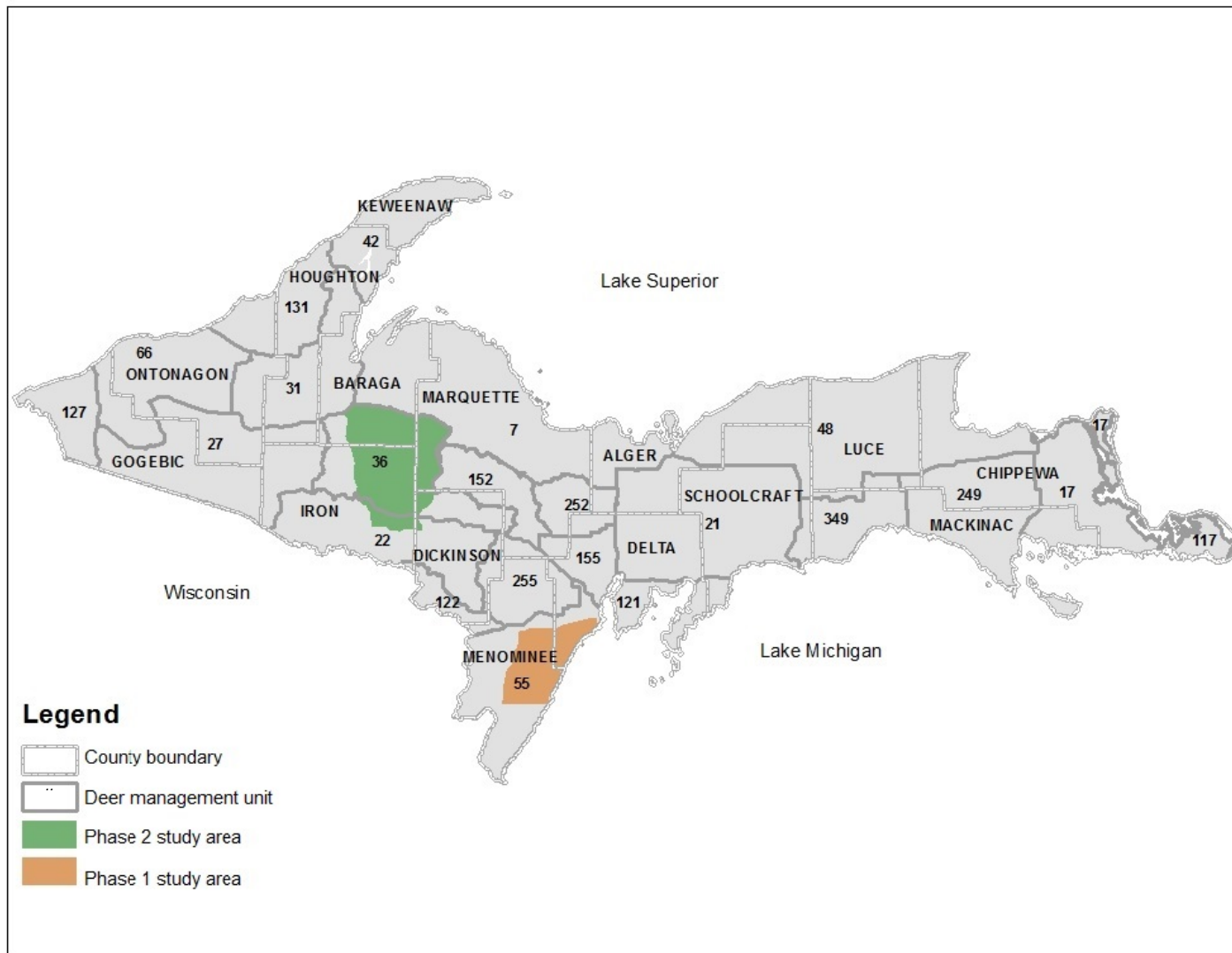


Figure 1. Location of phase 1 and 2 study areas and Michigan Department of Natural Resources Deer Management Units, Upper Peninsula of Michigan, USA, 2009–2015.

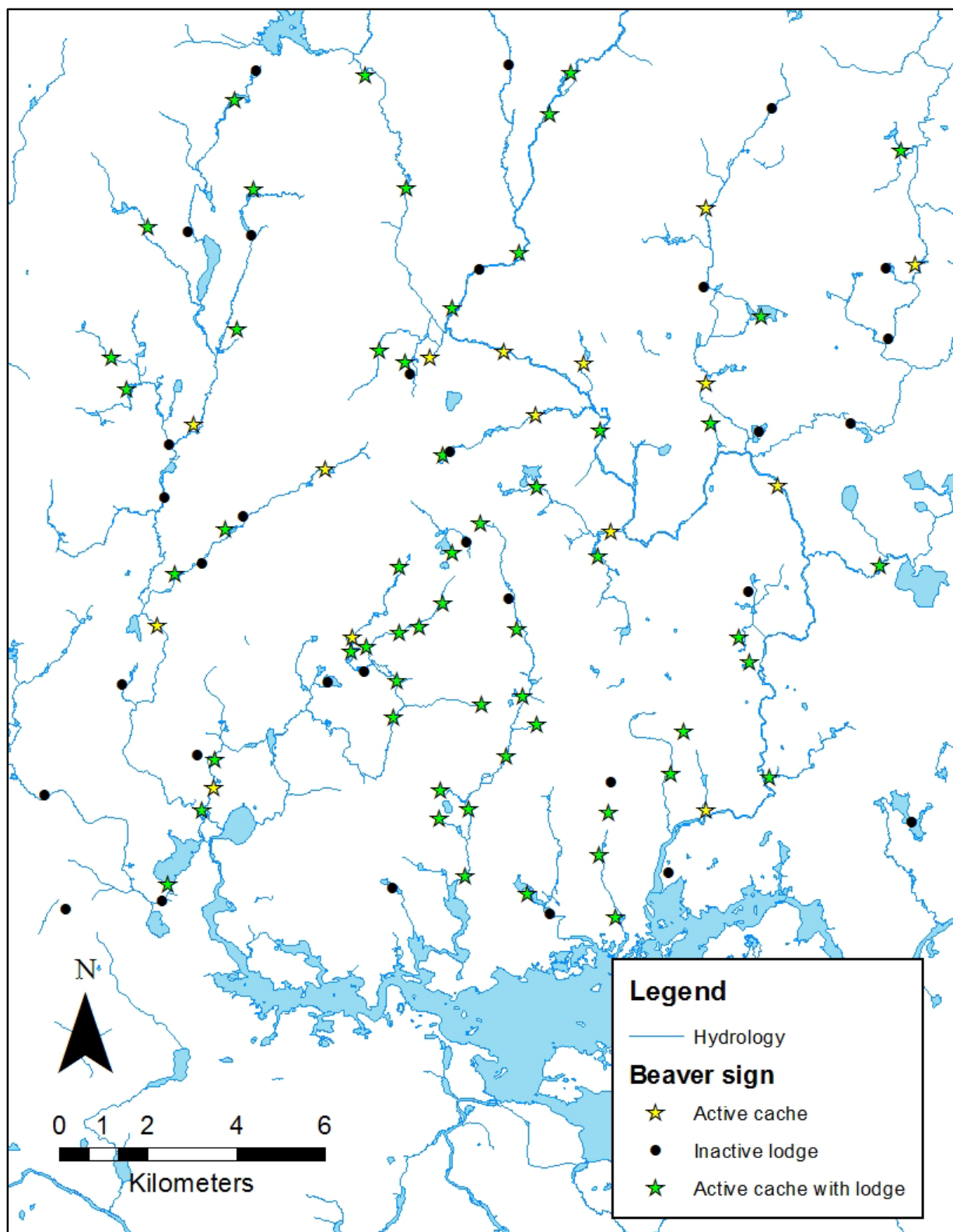


Figure 2. Locations of beaver caches and lodges detected aerially, Upper Peninsula of Michigan, USA, 30 October–03 November 2015.

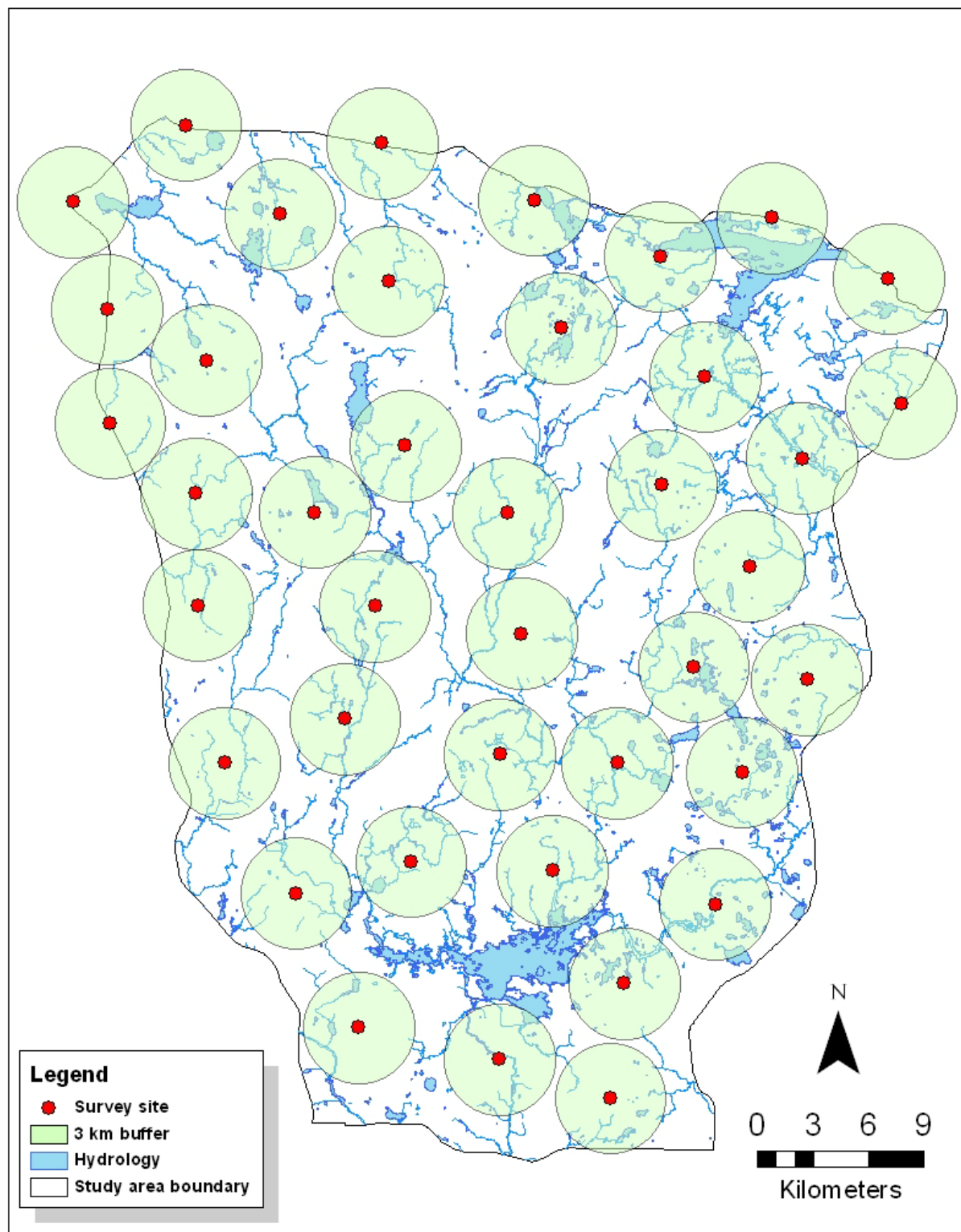


Figure 3. Locations of 40 howl survey sites to estimate coyote abundance, Upper Peninsula of Michigan, USA, July–October 2012–2015.