
TITLE: Upper Peninsula Deer Movement Project

Chronic wasting disease (CWD) occurs in free-ranging white-tailed deer (*Odocoileus virginianus*) in the Lower Peninsula of Michigan, and in neighboring Wisconsin, where the disease is endemic. At the time this study began, wildlife managers had not documented CWD in the Upper Peninsula (UP) of Michigan, though CWD was detected in deer from three Wisconsin captive cervid facilities and two wild deer near the Michigan border. While it was not possible to predict if or when CWD would be found in the UP, preparations seemed prudent. On 18 October 2018 CWD was confirmed in Dickinson County's Waucedah Township in a 4-year-old free ranging adult female white-tailed deer that was shot in September on a crop damage permit about 6 km from the Michigan-Wisconsin border. A scientifically based understanding of deer movements and estimates of population abundance is critical for developing management recommendations in response to CWD. Deer movements and abundance can influence the probability of disease occurrence, contact rates which can affect transmission rate, and geographic extent of an outbreak. Importantly, these data take time to gather and managers need this information to develop appropriate response plans.

During winter 2019 we captured ($n = 150$) and collared ($n=80$) deer using Stephenson box traps at 65 locations including feeding sites, along deer trails, or in timber sales in Little Girls Point (LGP), Lake Gogebic (LKG), and West Iron County (WIC) deer wintering complexes (DWC) and the newly established study area in the core CWD zone in southern Dickinson County (DNC). We also trapped and collared 17 deer in East Middle Branch (EMB) DWC using Clover traps with the Michigan Predator-Prey study. We affixed a LifeCycle 330 GPS collar (Lotek Wireless

Inc., NewMarket, Ontario, Canada) programmed to obtain a GPS location every 13 hours and attempt to transmit location data via the GlobalStar network every 26 hours, allowing data access using an online web service.

Overall, we captured and collared 167 and 97 deer, respectively. The age and sex of collared deer included 22 adult females, 21 adult males, 16 fawn females, and 38 fawn males. We were able to supplement collars lost due to mortality in each DWC during 2018 and deployed 19 collars in LGP, 12 in LKG, 18 in WIC, and 17 in EMB. Additionally, we reached our goal for collared deer in the newly established CWD zone with 31 collars deployed in DNC.

During 16 September 2018–7 September 2019 collars transmitted 13,625 (\bar{x} = 80.6, SD = 52.3) GPS location attempts, of which 9,893 (\bar{x} = 58.5, SD = 36.3) were successful fixes (success rate of transmitted GPS fixes = 72.6%). By mid-December 2018, 67% of migratory deer had started or completed their migration to their winter range, most of which were in high snowfall areas. The earliest migrations occurred in high snowfall DWCs (i.e., LKG and EMB) following snowstorms in November. During December, snow depths accumulated to sufficient depths (\geq 30 cm [$>$ 12 inches]) to reduce deer movement in the high snowfall zones initiating migration to DWCs whereas deer in areas of lower snowfall had relatively unrestricted movements from snow depth. Though some deer did not migrate, they exhibited small shifts in their range during summer and several moved back to privately held lands where people feed them, especially in WIC and southern LKG. All migratory deer returned to the same DWC they were captured in by 31 January.

Snow depths remained sufficiently deep (\geq 30 cm [$>$ 12 inches]) to inhibit deer from leaving the complexes until 16 April when deer began migrating, though some deer did not complete migration until 25 May, long after snow melt. Most deer from LGP, LKG, and EMB migrated from their winter to summer ranges during this time, but many individuals in WIC, the western part of LGP, and the southern part of LKG, and all but 1 deer in DNC appeared to be non-migratory. On average, deer movements for each wintering complex during 4 January–15 June 2019 encompassed 775.2 km² (299.3 mi², SD = 623.7 km² [240.8 mi²]) using a 100% minimum convex polygon to define the total wintering complex movements. Deer captured in the CWD core area in DNC encompassed a smaller area (249 km² [96.1 mi²]) than deer captured in DWCs of WIC (272 km² [105.0 mi²]), LGP (478 km² [184.6 mi²]), LKG (1269 km² [489.9 mi²]), and EMB (1608 km² [620.9 mi²]).

The greatest movements from each DWC or CWD core area were 15.5 km (9.6 mi) northwest along the Michigan-Wisconsin border in WIC (19WIC017, yearling male), 21.9 km (13.5 mi) northwest from DNC (19DNC014, adult female), 23.2 km (14.4 mi) south into Wisconsin from LGP (18LGP037, adult female), 43.7 km (27.2 mi) north from LKG (19LKG012, adult male), and 51.3 km (31.8 mi) northwest from EMB (D993, adult male).

We observed 6 collared deer that crossed into Wisconsin from Michigan during spring migration. Two adult female deer from LGP traveled 4.2 and 23.1 km (2.6 and 14.4 mi) from their winter range and crossed 1.3 and 16.7 km (0.8 and 10.4 mi), respectively, into Wisconsin. Two male deer, 1 fawn and 1 adult, from WIC traveled 15.2 and 15.3 km (9.5 and 9.6 mi), respectively, from their winter range and crossed into Wisconsin and established a summer range within 1 km (0.6 mi) of the Michigan-Wisconsin border. Two adult deer captured in DNC, 1 female and 1 male, traveled 1.8 and 13.8 km (1.1 and 8.6 mi), respectively, from their capture sites and crossed 1.2 and 11.0 km (0.7 and 6.8 mi), respectively, into Wisconsin. The adult male from DNC is currently near Pembine, WI, 34.5 km (21.4 mi) from the nearest CWD positive facility in

Wisconsin. These observations demonstrate that there is at least some risk of CWD entering the Upper Peninsula from Wisconsin simply by deer moving back and forth across the border.

The UP is somewhat unique in comparison to the Lower Peninsula in that the combination of high densities of deer in the wintering complexes and long-distance migrations increase the risk of CWD transmission across very large areas.

To estimate deer abundance on the respective summer ranges, we deployed 50 cameras in unbaited arrays in the area occupied by each population. In addition to the 4 populations surveyed during 2018 (LGP, LKG, WIC, EMB) we also added a camera array in southern Dickinson County to estimate deer abundance in the newly established CWD zone. We deployed cameras on secondary roads, off-road vehicle trails, or deer trails placed at least 1.2 km apart to ensure independence among sites. Additionally, Michigan DNR Wildlife Management staff deployed cameras ($n = 44$) in an array within Deer Foot Lodge (DFL) wintering complex.

Partners: Safari Club International-MIC, State University of New York College of Environmental Science and Forestry (SUNY ESF).

Timeframe and budget: The initial phase of this project is being conducted in the western UP with a duration of 4 years (FY2018-FY2021) with an estimated cost of \$613,000. After completing this research in the western UP, parallel projects in the central and eastern UP will be proposed to develop this information for the entire peninsula. Targeted funding request from SCI-MIC for FY2020: \$4,000.
