DEPARTMENT OF NATURAL RESOURCES

2019 Aerial Deer Survey of DPA 603 (Chronic Wasting Disease Area)

Introduction: As part of the CWD Response Plan, we conducted an aerial survey of deer in DPA 603 during 13-15 February 2019. We had previously surveyed DPA 603 during the winter of 2016-17. We did not have adequate snow conditions to survey the unit in 2017-18. In order to make meaningful comparisons among years, we surveyed the original DPA 603 boundary that was established in 2016, including a census of the original core area (12 Public Land Survey [PLS] sections around the first 2 CWD positive deer; **Figure 1**). However, because of additional positive animals detected since 2016, we added Forestville State Park (FSB) as a focal area and expanded the original core area to ~64 PLS sections (**Figure 1**). Thus, we allocated more survey effort to these new focal areas in 2019.

Sampling design: The survey designed followed standardized protocols for MNDNR aerial deer surveys in the agricultural and transitions zones of Minnesota as described by Haroldson (2009). These methods were recently reviewed by the Wildlife Management Institute (WMI) as part of the OLA deer audit. WMI found that "DNR's design and execution of aerial surveys, sample sizes and survey techniques were scientifically sound and met or exceeded accepted standards". The sampling unit (plots) was PLS sections (640 ac) with at least 50% of their area located within the original DPA 603 boundary. Highly developed PLS sections (urban areas) were excluded from the sampling frame. The final sampling frame consisted of 359 PLS sections totaling 357 mi^2, of which 100 (28%) were randomly selected for the survey. The delineated survey area had an aerial extent 371 mi^2. PLS sections were classified as 'high' or 'low' based on percentage of woody cover (cut point = 102 ac). Spatially balanced samples were selected using woody cover and geographic subunits as stratification variables (Stevens and Olsen 2004). The entire extent of Core 1 (original 12 PLS sections) and the FSP focal area were surveyed (**Figure 1**).

Visibility Surveys: The aerial crews used a double-sampling technique to estimate visibility bias (Eberhardt and Simmons 1987). The aerial crews surveyed 21 visibility plots and 18 of those plots provided useable data. The total count on useable visibility plots ranged from 17 to 95 deer/plot (mean = 34). The number of deer missed on the original survey ranged from 0 to 29 (mean = 7.9). The estimated mean probability of detection was 0.77 (SE = 0.017), which was similar to estimates from other aerial DPA surveys in southern MN (mean = 0.75) but lower than estimated detection rate in the 2017 DPA603 survey (pdet = 0.85, SE = 0.017).

Survey Results: The survey crews observed 1,958 deer on 74 of the 100 survey plots for an average of 19.6 deer/plot (range: 0 to 118 deer/plot). Deer were seen on 11 of 12 plots (92%) in Core 1, 13 of 20 plots (65%) in the buffer around Core 1, and 4 of 8 plots (50%) in FSP. Of the remaining survey area, deer were seen on 38 of 42 plots (90%) in the high-density stratum and 8 of 18 plots (44%) in the low-density stratum. Overall, only 26 plots (26%) had zero deer detections and 10 of these were in the "low density" strata. The mean count on plots with at least 1 deer detection was 26.5 deer/plot. Spatially, deer were well-distributed among the survey plots (**Figure 2**).

Adjusting for sampling and sightability yielded an estimated 8,806 deer (90% confidence interval: 7,865 – 9,747) in DPA 603 (**Table 1**). Within focal areas, we estimated there were 363 deer in Core 1 (12 mi^2), 1,056 deer in the buffer around Core 1, and 64 deer in FSP. And in the 2 remaining strata, we estimated there were 1,067 deer in the low-density stratum and 6,256 deer in the high-density stratum.

Translating populations into density estimates (deer/mi^2) provides a clearer understanding of deer numbers within each focal area (**Table 1**) and for comparing among years (**Figure 3**). Unfortunately, the take-home message is that average deer densities remain relatively high in DPA 603 (e.g., 25 deer/mi^2 in DPA 603, 30 deer/mi^2 in Core1, and 21 deer/mi^2 in the Core 1 buffer) despite aggressive strategies to lower them. The only focal area where we saw lower densities was in FSP (8 deer/mi^2).

Literature Cited

Eberhardt, L. L., and M. A. Simmons. 1987. Calibrating population indices by double sampling. Journal of Wildlife Management 51:665–675.

Haroldson, B. H. 2009. Estimating white-tailed deer abundance using aerial quadrat surveys. Pages 177-183 *in* J. S. Lawrence, R. O. Kimmel, M. S. Lenarz, editors. Summaries of research findings 2009. Minnesota Department of Natural Resources, Division of Wildlife, Saint Paul, Minnesota.

Stevens, D. L., Jr., and A. R. Olsen. 2004. Spatially balanced sampling of natural resources. Journal of the American Statistical Association 99:262-278.

Table 1. Population and density estimates from the aerial deer survey of DPA 603 in February 2019. Estimates are adjusted for sampling and sightability.

Survey areas	Plots Sampled	Plots Available	Percent	Population Estimate	Lower 90%	Upper 90%	Deer/mi^2	Lower 90%	Upper 90%
Core 1	12	12	1.00	363	350	376	30.2	29.1	31.3
Core 1B	20	51	0.39	1,056	806	1,306	20.8	15.9	25.8
FSP	8	8	1.00	64	62	66	8.1	7.8	8.3
Low	18	118	0.15	1,067	594	1,540	9.1	5.1	13.2
High	42	170	0.25	6,256	5,513	6,999	36.8	32.5	41.2
DPA 603	100	359	0.28	8,806	7,865	9,747	24.6	22.0	27.3

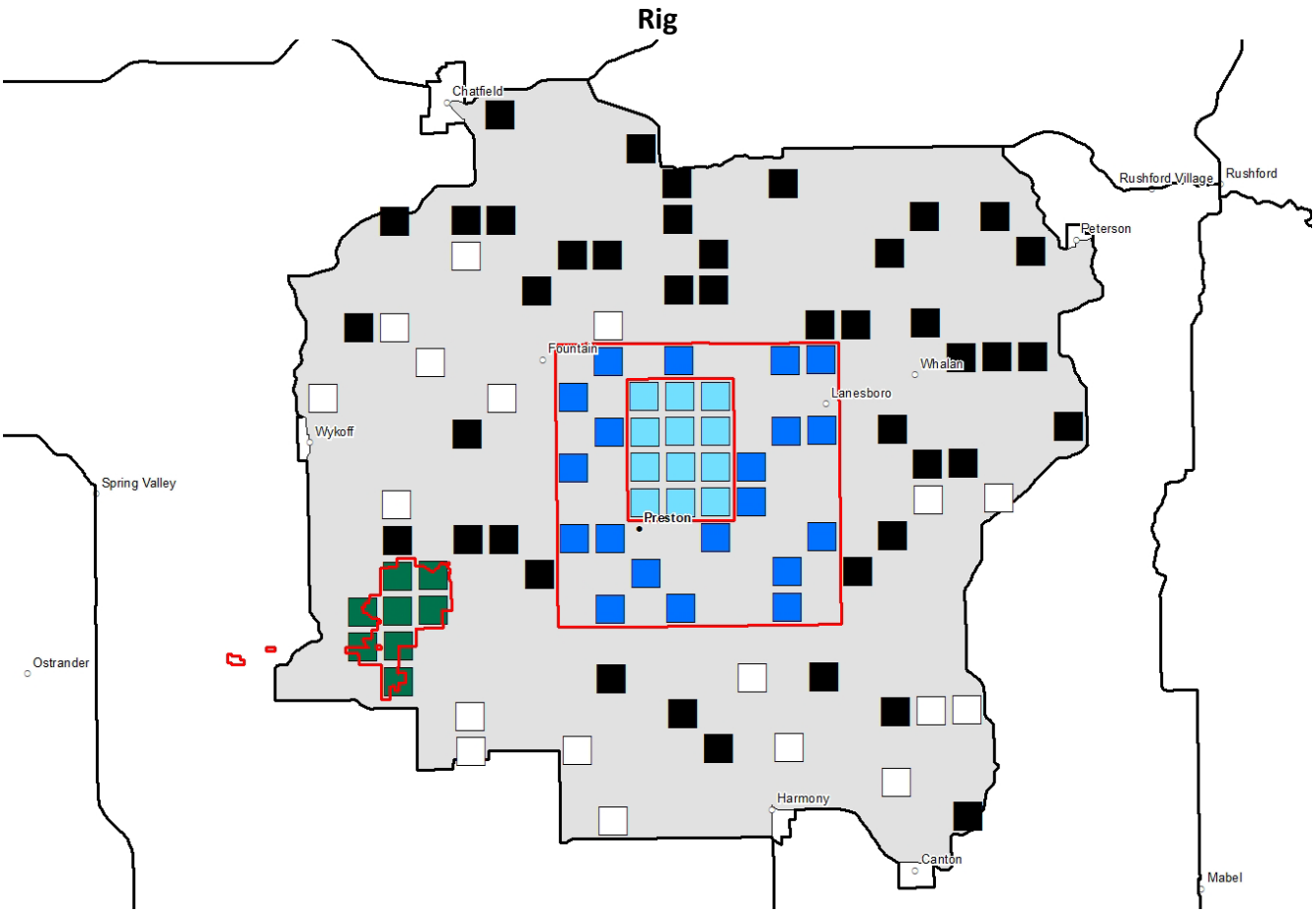

Figure. 1. Distribution of survey plots (PLS sections) and focal areas for the 2019 aerial deer survey in DPA 603 (gray area). Red lines denote focal areas, light-blue squares are survey plots in Core1, dark-blue squares are plots in Core1B (buffer), dark-green squares are plots in Forestville State Park, black squares are high-density plots (outside focal areas), and white squares are low-density plots (outside focal areas).

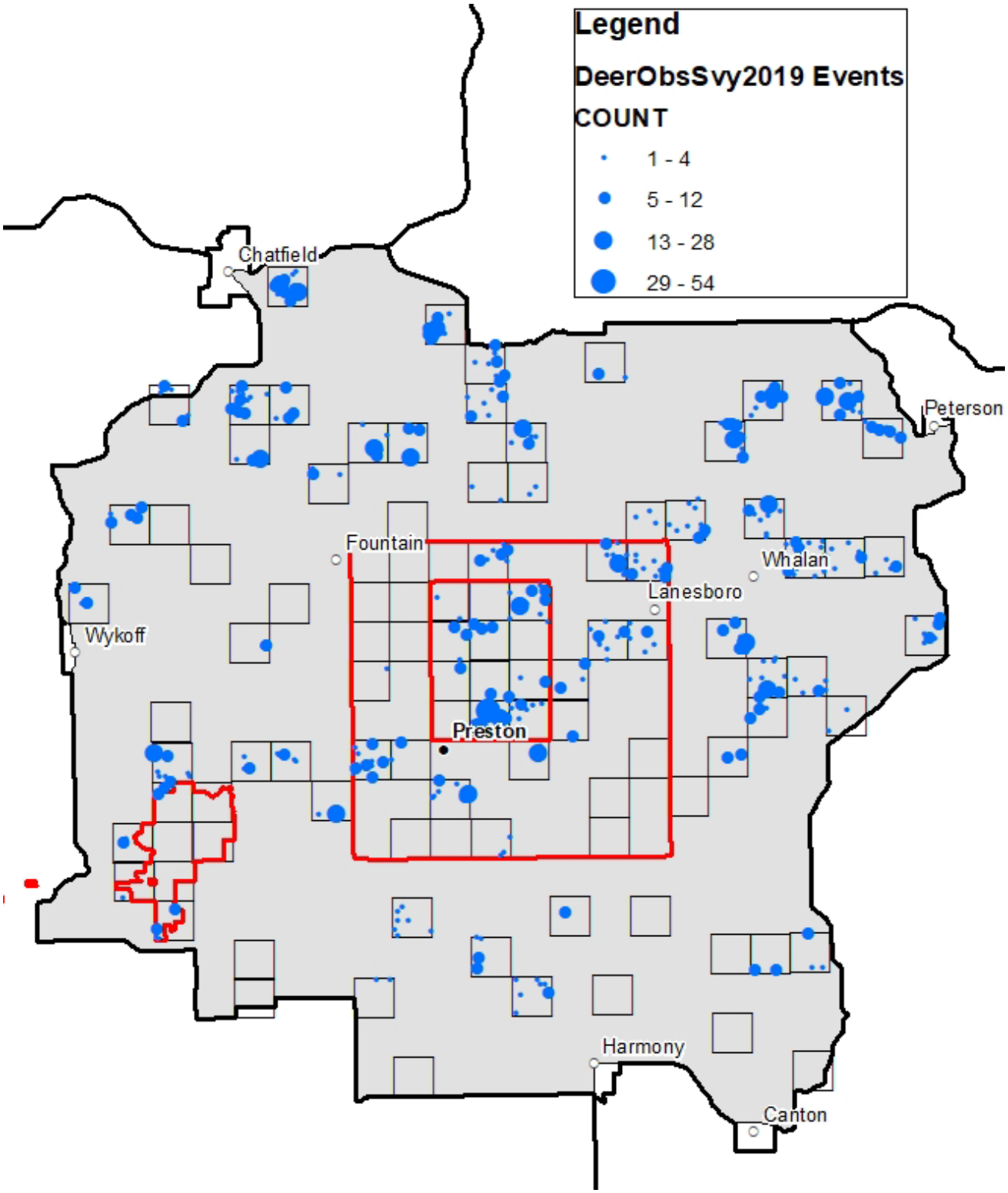

Figure 2. Spatial distribution of deer observed on survey plots during the 2019 aerial population survey. Blue dots denote deer observations, red lines denote focal areas, and black squares denote survey plots.

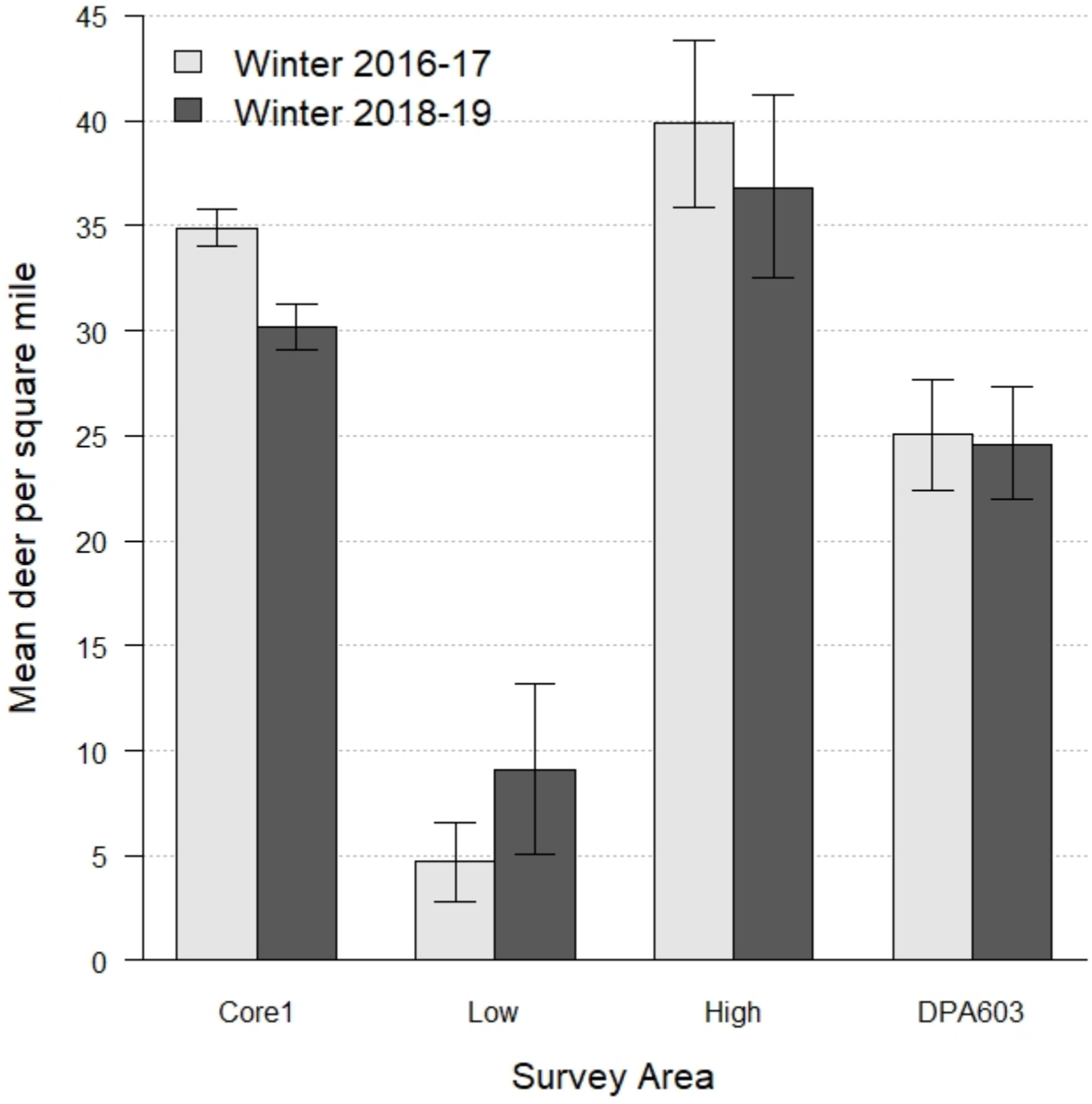

Figure 3. Mean deer density estimates (deer/mi^2) for DPA 603 survey areas that were surveyed in both the winters of 2016-17 and 2018-19. Error bars denote 90% confidence limits.