DEPARTMENT OF NATURAL RESOURCES

2016 Aerial Deer Survey of the Chronic Wasting Disease Area

Introduction: With the discovery of chronic wasting disease in 3 male white-tailed deer around Lanesboro, DNR implemented their CWD Response Plan. A component of that plan includes an aerial deer survey of the affected area when snow conditions allow. Typically, aerial deer surveys are conducted after the moose survey (late January) through snow melt. DNR typically does not conduct aerial deer surveys in December because of concerns related to disturbing late-season archery hunters. This year, adequate snow conditions occurred in December, so a decision was made to fly the survey. The survey was conducted from December 14 – 21, 2016 using the new MD 500E helicopter. Of note, this was the first deer survey conducted with this helicopter. When the survey began, DNR was aware of only 2 positives so the survey design was based on the 10 mile radius around those animals. Before the survey concluded, DNR was made aware of a third positive approximately 5 miles north of the first two. Since the helicopter was still in the area and acceptable snow conditions were present, the decision was made to fly an area north of the defined zone 603 boundary (hereafter referred to as the 'northern bump-out'). A fully defined deer permit area 603 will be established for the 2017 deer hunting season. For the purposes of this report, we summarized results by:

1) Core 1 – 12 mi^2 (3 x 4 section) area around the first 2 positive deer
2) Core 2 – 9 mi^2 area (3 x 3 section) around the third positive deer
3) DPA 603 – Originally described area that reflects the special hunt boundary, including Core 1 and 2
4) Northern Bump-Out – area flown after discovery of third positive.
5) CWD Survey Area-All – Combination of 3 and 4

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 Public Land Survey (PLS) sections (640 ac) with at least 50% of their area located within the survey boundary (both DPA603 and the north bump-out). Highly developed PLS sections (urban areas) were excluded from the sampling frame. The final sampling frame consisted of 497 PLS sections totaling 494 mi^2, of which 104 (21%) were randomly selected for the survey. The delineated survey area had an aerial extent of 497 mi^2 (DPA 603 = 360 mi^2, northern bump-out = 137 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 both Core 1 and Core 2 were surveyed (Figure 1).

We also surveyed the portion of DPA 348 located outside the CWD zone in order to have a basis for comparison with previous aerial survey and model estimates of deer abundance in DPA 348. Those results are not presented in this report.

Visibility Surveys: The aerial crew used a double-sampling technique to estimate visibility bias (Eberhardt and Simmons 1987). The aerial crew collected visibility data on 18 plots and 16 of those plots provided useable data. The total count on useable visibility plots ranged from 2 to 56 deer/plot (mean = 26.3). The number of

deer missed on the original survey ranged from 0 to 9 (mean = 3.9). The estimated mean probability of detection was 0.85 (SE = 0.017), which was higher, on average, than in previous aerial deer surveys in southern MN (mean = 0.75). This may reflect the increased observer visibility afforded by the new helicopter. However, more surveys must be conducted with this aircraft to validate this observation.

Survey Results: The survey crew observed 2,728 deer on 104 plots for an average of 26.2 deer/plot (range: 0 to 161 deer/plot). Deer were seen on 11 of 12 plots (91%) in Core 1, all 9 plots in Core 2, and all but 3 plots in the high-density strata. Overall, only 18 plots (17%) had zero deer detections and 15 of these were in the "low density" strata. The mean count on plots with at least 1 deer detection was 31.7 deer/plot. Spatially, deer were well-distributed throughout the survey plots (Figures 2 and 3).

Adjusting for sampling and sightability yielded an estimated 8,987 deer (90% confidence interval: 8,043 – 9,931) over the special hunt area DPA 603, including 419 and 320 deer within Core 1 and 2, respectively. In the northern bump-out, an estimated 2,669 deer (2,171 – 3,167) were present. This yielded a combined estimate of 11,656 deer (10,574 – 12,738) over the entire survey area (Table 1).

Translating populations into density estimates (deer/mi^2) provides a clearer understanding of deer numbers within each area. Of note, both core areas supported 35 – 36 deer/ mi^2. The northern bump-out had fewer deer per mi^2 (19.6 deer/mi^2) than the special hunt area DPA 603 (25.1 deer/mi^2). The average estimated deer density for the entire survey area was 23.6 deer/mi^2 (Table 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 estimates, standard error, and 90% confidence limits for CWD aerial deer survey. Estimates are adjusted for sampling and sightability.

Survey Area	Plots Sampled	Plots Available	Percent	Population Estimate	Standard Error	Lower 90%	Upper 90%
Core 1	12	12	1.00	419	9	408	430
Core 2	9	9	1.00	320	7	312	328
DPA 603[1]	79	360	0.22	8,987	736	8,043	9,931
Northern Bump-Out	25	137	0.18	2,669	389	2,171	3,167
CWD Survey Area - All	104	497	0.21	11,656	845	10,574	12,738

[1]Includes Core 1 and 2

Table 2. Estimates of deer/m^{i2} and 90% confidence limits for CWD aerial deer survey. Estimates are adjusted for sampling and sightability.

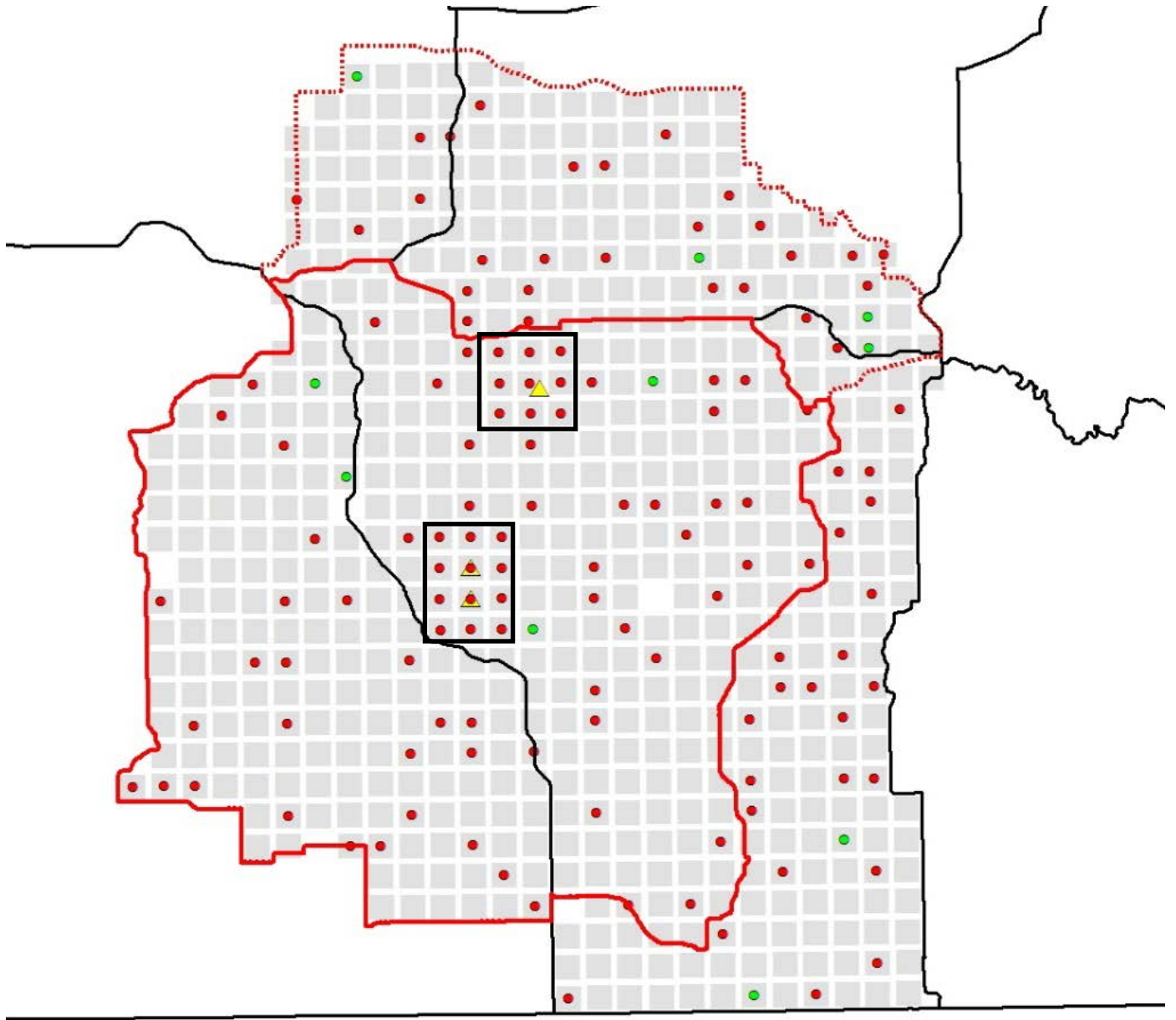| Survey Area	Plots Sampled	Plots Available	Percent	Density Estimate	Lower 90%	Upper 90%
Core 1	12	12	1.00	34.9	34.0	35.8
Core 2	9	9	1.00	35.9	35.0	36.8
DPA 603[1]	79	360	0.22	25.1	22.4	27.7
Northern Bump-Out	25	137	0.18	19.6	16.0	23.3
CWD Survey Area - All	104	497	0.21	23.6	21.4	25.8

[1]Includes Core 1 and 2

Figure. 1. Survey area. Red lines denote the original boundary for DPA603 (solid) and the north bump-out (dashed). Black lines denote old DPA boundaries. Yellow triangles denote locations of CWD positive animals. Red dots denote primary sample units (all of which were surveyed). Green dots denote alternate sample units (these were not surveyed).
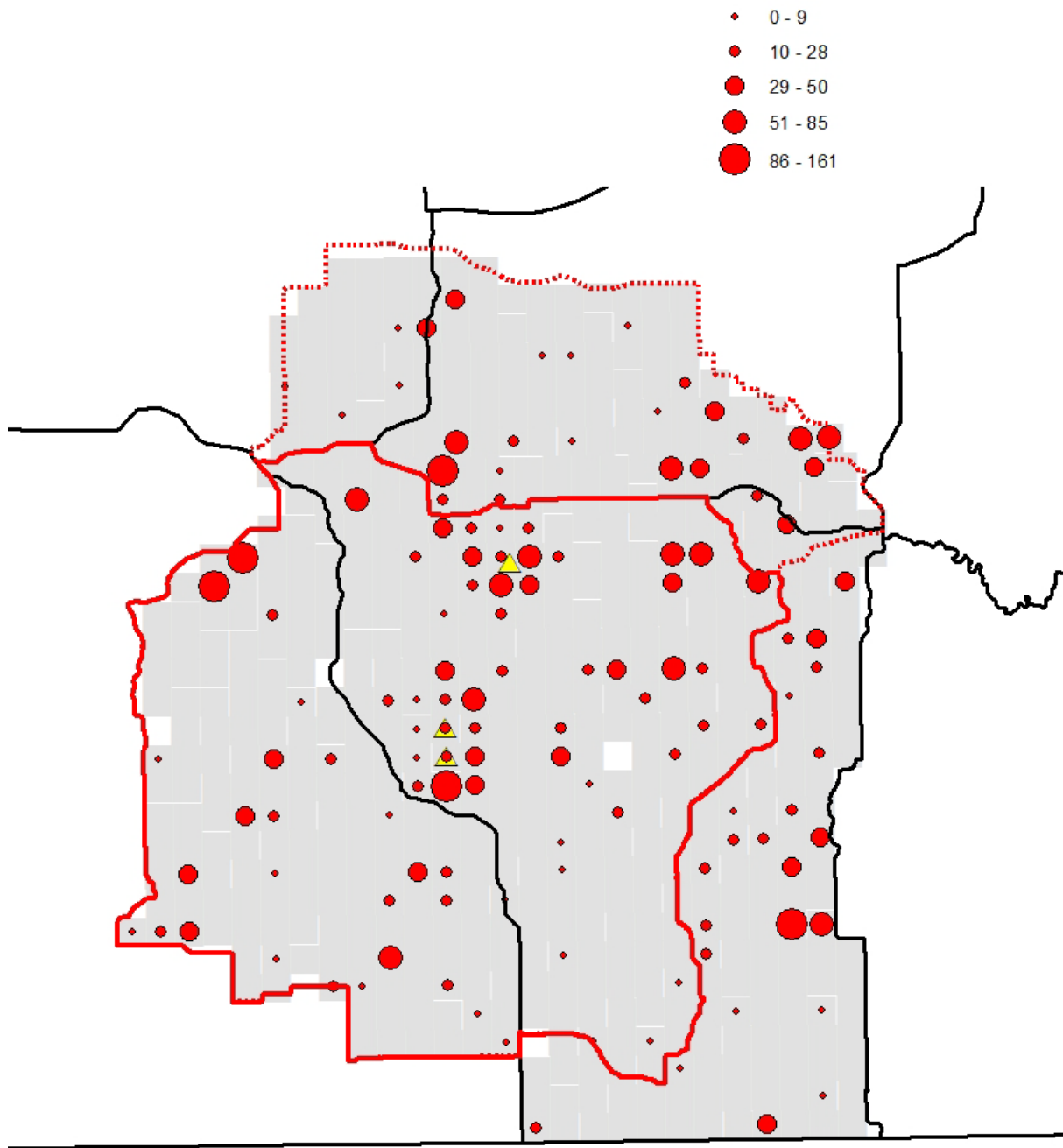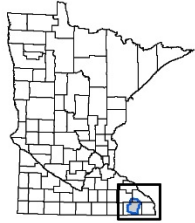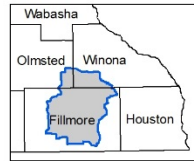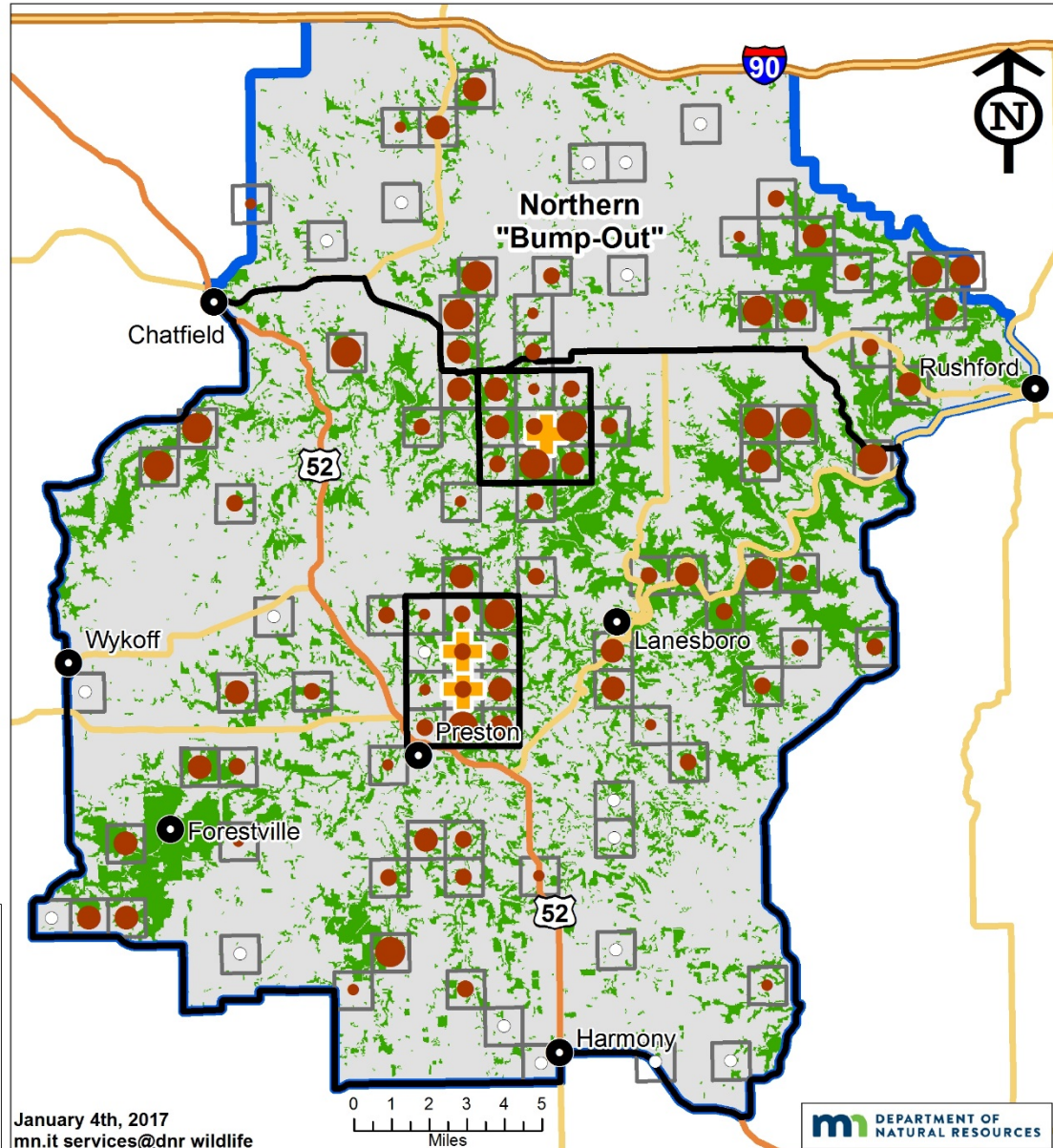
Figure 2. Spatial distribution of deer observed on plots.

Figure 3. Summary of 2016 CWD aerial deer survey.