Spring 2005 Prairie-Chicken Survey in Minnesota

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Introduction

Greater prairie-chickens (*Tympanuchus cupido pinnatus*) are a medium-sized grouse species (800–1000 g; 1.8–2.2 lbs). During spring they gather on communal breeding areas, or leks, where males display and compete for opportunities to mate. Prairie-chicken leks are also called booming grounds because males make a low-frequency, booming vocalization during their displays. Orange air sacs on the sides of a male's neck inflate and amplify the booming sound. Pinnae, the long feathers on the sides of the neck, stand erect above the male prairie-chicken's head during display (Schroeder and Robb 1993). Prairie-chickens are also called pinnated grouse.

During the early 1800s prairie-chickens were present along the southern edge of Minnesota. Following the planting of crops and clearing of forests by immigrants of European descent, the range of prairie-chickens expanded to cover most of the state by approximately 1900. As agriculture intensified, more prairies were tilled, and grassland openings in northeastern Minnesota succeeded back to forest, the range of prairie-chickens receded (Svedarsky *et al*. 1997). Currently, most prairie-chickens in Minnesota occur along the beach ridges of glacial Lake Agassiz in the west. The population of prairie-chickens there was expanded southward to the upper Minnesota River valley by a series of relocations during 1998–2005. A remnant population of prairie-chickens still exists in central Minnesota also (primarily Wadena and Cass counties).

From 1974 to 2003 the Minnesota Prairie Chicken Society (MPCS) coordinated annual counts of prairie-chickens at booming grounds. The MPCS surveys provided evidence to support the initiation in 2003 of a prairie-chicken hunting season, which had not occurred in Minnesota since 1942. The hunt has been limited to 100 participants, and fewer than 130 birds/year have been harvested. During 2003 and 2004 the Minnesota Department of Natural Resources (DNR) began coordinating the annual prairie-chicken surveys, and a standardized survey design was adopted (Giudice 2004). The objectives of the current survey are to monitor trends in the abundance of prairie-chickens in selected but widely distributed areas and to provide conservative information for making decisions about regulations for the fall hunting season.

Methods

During the few hours near sunrise from late-March until mid-May cooperating biologists from the DNR, U.S. Fish & Wildlife Service (FWS), and The Nature Conservancy (TNC) and numerous volunteers counted prairie-chickens at leks in western Minnesota. They attempted to locate and observe multiple times all prairie-chicken leks within 17 designated survey blocks (Figure 1). Each block was approximately 4 miles × 4 miles square (4,144 ha) and was selected nonrandomly based upon the spatial distribution of leks and the presence of relatively abundant grassland habitat. Ten survey blocks were located in what was considered the core of the prairie-chicken range in Minnesota. The other 7 blocks were located in the periphery of the range. The permit areas for the fall hunting season roughly coincide with the core of the range (Figure 1).

Observations of leks outside the survey blocks were also recorded. They contribute to the known minimum abundance of prairie-chickens and may be of historical significance. These observations,

however, were only incidental to the formal survey. Bird counts from areas outside the survey blocks cannot be used to make inferences about the relative abundance of prairie-chickens among different geographic areas (e.g., counties, permit areas) or points in time (e.g., years) because the amount of effort expended to obtain the observations was not standardized or recorded.

Observers counted prairie-chickens at leks from a distance using binoculars. If vegetation or topography obscured the view of a lek, the observer attempted to flush the birds to obtain an accurate count. Observed prairie-chickens were classified by sex as either male, female, or unknown. Male prairie-chickens were usually obvious due to their display behavior. Birds were classified as unknown sex when none of the birds at a lek were observed displaying or when the birds had to be flushed to be counted. Most birds classified as unknown likely were males because most birds at leks are males. Although most male prairie-chickens attend leks most mornings, female attendance at leks is much more limited and sporadic (Svedarsky 1983). Females are also more difficult to detect because they do not vocalize or display like males. Counts of males rather than females, therefore, were used to make comparisons between core and peripheral ranges and between years.

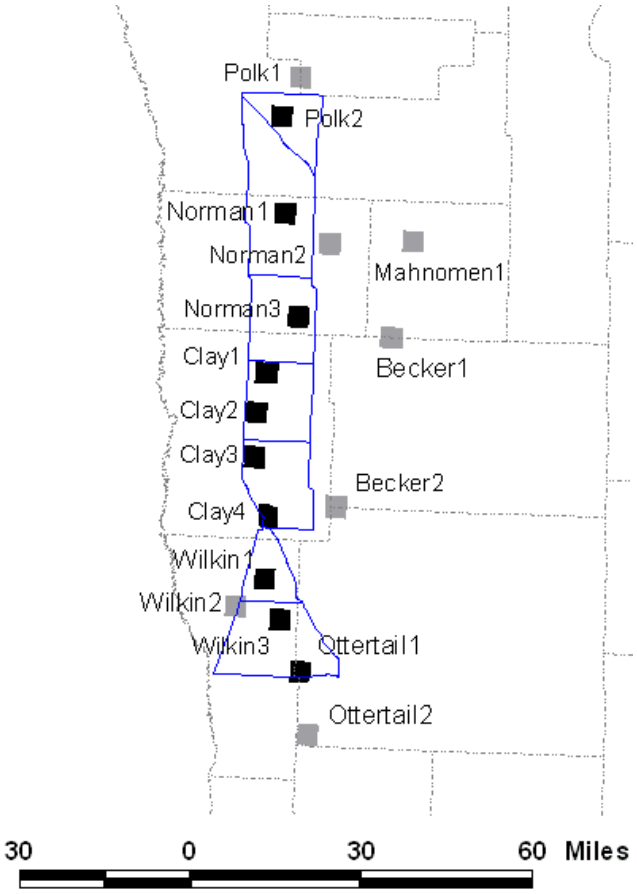

Figure 1. Survey blocks (labeled squares) and hunting permit area boundaries (solid lines) for prairie-chickens in western Minnesota. Survey blocks were designated as being in either the core (black) or periphery (gray) of the range. Blocks were named after the counties (dashed lines) in which they were primarily located. Permit areas are ordered from north to south: 405A, 407A, 407B, 407C, 420A, 420B, and 421A.

Results and Discussion

During spring 2005 there were a minimum of 2,958 male prairie-chickens in western Minnesota (Table 1). Within hunting permit areas there were a minimum of 0.13 leks/mi^2 (0.05 leks/km^2) and 1.7 males/mi^2 (0.7 males/km^2). Minimum counts in Table 1 and the densities calculated from them are not comparable among permit areas or years because they included surveys conducted outside of the survey blocks. It was likely that probabilities of detecting leks and individual males were substantially different among permit areas during 2005 and among years within most permit areas. Minimum counts of males summarized by permit area provide conservative information for setting quotas for the fall hunting season.

Table 1. Minimum abundance of prairie-chickens within and outside of hunting permit areas in western Minnesota during spring 2005. Counts of leks and birds are not comparable among permit areas or years.

Permit Area	Area (sq. mi.)	Leks	Males	Unk.[a]
405A	101.9	25	327	4
407A	295.1	16	128	13
407B	171.9	27	257	4
407C	161.1	27	531	0
420A	168.1	27	375	0
420B	101.3	24	304	35
421A	236.6	11	182	16
PA subtotal[b]	1,236.0	157	2,104	72
Outside PAs[c]	NA[d]	86	854	47
Grand total	NA	243	2,958	119

[a] Unk. = prairie-chickens of unknown sex. It is likely that most were males.
[b] Sum among the 7 permit areas.
[c] Counts from outside the permit areas.
[d] NA = not applicable. The size of the area outside permit areas was not defined.

Within survey blocks observers counted 1,319 male prairie-chickens on 98 booming grounds (Table 2). Each booming ground was observed on a median of 2 (mean = 1.9) different days, but 45% of leks were observed only once. Attendance of males at prairie-chicken leks varies among days and by time of day (Svedarsky 1983). Single counts of males at a booming ground, therefore, may be an unreliable indication of true abundance. Similar counts on multiple days, on the other hand, demonstrate that the counts may be a good indicator of true abundance. Even multiple counts, however, cannot overcome the problems associated with the failure to estimate the probability of detecting leks and individual birds at leks. Without estimates of detection probability, the prairie-chicken survey is an index to, not an estimate of, prairie-chicken abundance within the survey blocks. The credibility of the index for monitoring changes in abundance among years is dependent upon the assumption that a linear relationship exists between counts of male prairie-chickens and true abundance. In other words, we assume that (the expected value of) the probability of detection does not change among years (Yoccoz *et al*. 2001).

Table 2. Counts of prairie-chickens within survey blocks in Minnesota.

Range[a]	Survey Block	Area (sq. mi.)	2005 Leks	2005 Males	2005 Unk.[b]	Change from 2004[c] Leks	Change from 2004[c] Males
Core	Polk 2	16.2	9	119	0	2	14
	Norman 1	16.1	5	22	7	4	14
	Norman 3	16.0	5	66	2	-1	-2
	Clay 1	17.6	8	145	0	0	-14
	Clay 2	16.0	3	108	0	1	-16
	Clay 3	16.1	9	168	0	1	-59
	Clay 4	14.9	6	68	0	0	-26
	Wilkin 1	15.4	10	145	35	0	-70
	Wilkin 3	16.1	6	85	16	1	-29
	Otter Tail 1	15.9	2	31	0	-1	-16
	Core subtotal	160.2	63	957	60	7	-204
Periphery	Polk 1	15.9	10	89	0	3	-8
	Norman 2	16.3	8	88	11	-6	-20
	Mahnomen	16.1	5	67	0	2	44
	Becker 1	16.0	4	41	0	0	20
	Becker 2	16.1	4	43	0	-2	-20
	Wilkin 2	16.1	2	23	0	0	-5
	Otter Tail 2	15.7	2	11	17	-1	-54
	Periphery subtotal	112.2	35	362	28	-4	-43
Grand total		272.4	98	1,319	88	3	-247

[a] Survey blocks were classified as either mostly within the hunting permit areas (core) or mostly outside the permit areas (periphery).

[b] Unk. = prairie-chickens of unknown sex. It is likely that most were males.

[c] The 2004 count was subtracted from the 2005 count, so a negative value indicates a decline.

In survey blocks in the core of the range we observed 0.39 leks/mi^2 (0.15 leks/km^2) and 15.2 males/lek, whereas in peripheral blocks we observed 0.31 leks/mi^2 (0.12 leks/km^2) and 10.3 males/lek (Table 2). Counts of males in survey blocks during 2005 were 16% less than during 2004, with declines of 18% and 11% in the core and periphery, respectively. Eight of 10 core blocks and 5 of 7 peripheral blocks experienced declines in counts. The number of leks observed in survey blocks during 2005 was 3% greater than during 2004, with an increase of 13% and a decrease of 10% in the core and periphery, respectively.

It is premature to infer a population trend from 2 annual surveys. The apparent decline in the abundance of male prairie-chickens in survey blocks between the springs of 2004 and 2005, however, has 2 possible explanations. First, if the decline in abundance was real, it was likely part of normal fluctuations experienced by wildlife populations. Such fluctuations may be caused by weather patterns, random variations in the rates of survival and reproductive success, or fluctuations in habitat quality or predator populations. The hunting season alone could not have caused a decline in the prairie-chicken population. Only approximately 55 birds were killed during the fall 2004 hunting season (Larson 2005), and the harvest allowed under the prairie-chicken hunting regulations (i.e., a maximum of 200 birds) is conservative and unlikely to affect the abundance of prairie-chickens the following spring. The second possible explanation for the decline in counts is that the probability of detecting leks or individual males

during the 2005 survey may have been less than the probabilities of detection during 2004. The ratio of detection probabilities during the 2 surveys is unknown, so inferences about changes in true abundance should be made cautiously. Overall, the abundance of prairie-chickens in western Minnesota appears to have been increasing steadily from 1997 to 2004 (Giudice 2004).

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