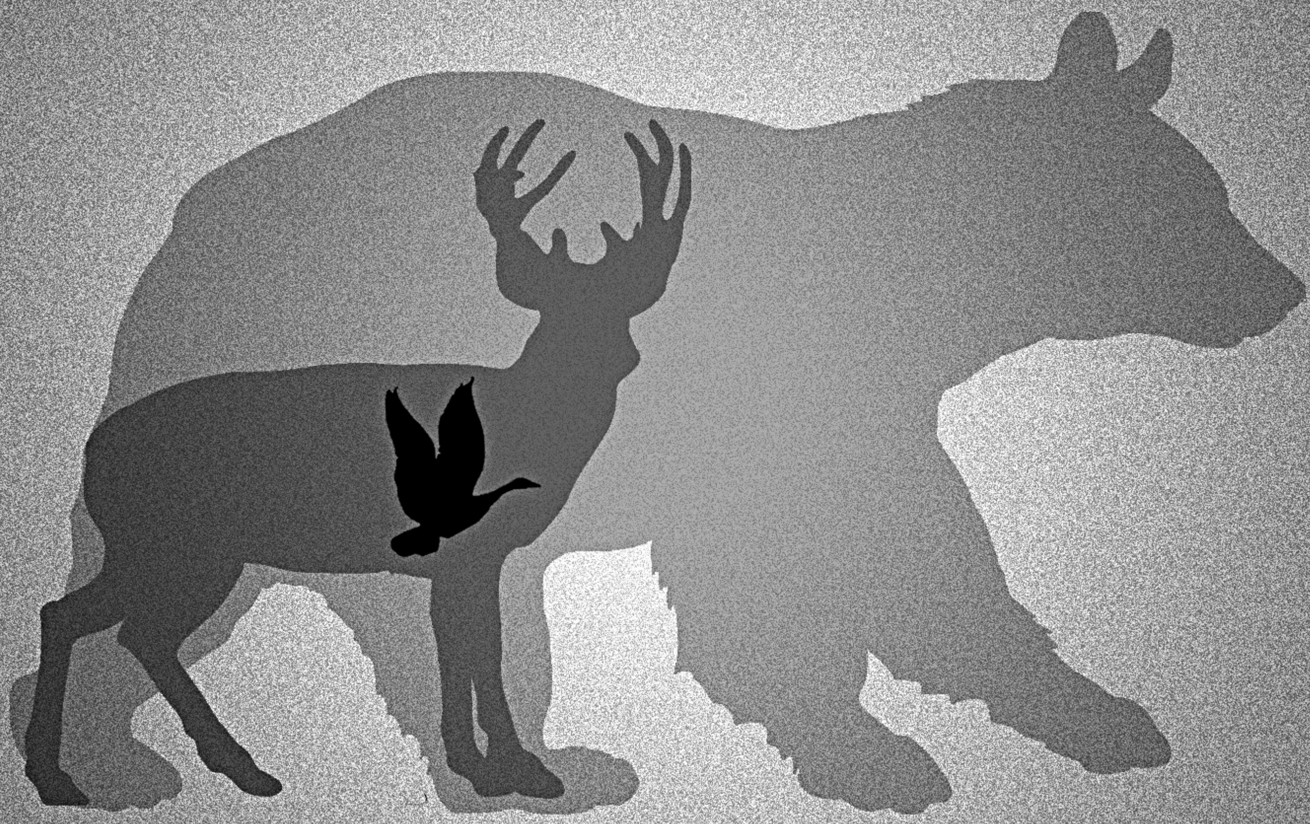

Status of Wildlife Populations

Fall 2011

Minnesota Department of Natural Resources
Division of Fish and Wildlife
St. Paul, Minnesota

Status of Wildlife Populations, Fall 2011

(Including 2001-2011 Hunting and Trapping Harvest Statistics)

edited by
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Note: Data in this report may change as a result of future verification and more comprehensive analysis.

Status of Wildlife Populations, Fall 2011

(Including 2001-2011 Hunting and Trapping Harvest Statistics)

This is the 35th year that the DNR has compiled this booklet; it is primarily an administrative document intended for DNR personnel. Since 1984 we have also generated a companion volume, *Summaries of Wildlife Research Findings*, containing annual summaries of activities and findings from ongoing research projects in the Wildlife Policy and Research Unit. This publication will be posted on the DNR website and available in other formats upon request. In the on-line format links are available to the U.S. Fish and Wildlife Service Division of Migratory Bird Management to access their reports for Waterfowl Population Status; Migratory Bird Harvest Information Preliminary Estimates; American Woodcock Population Status; and Mourning Dove Population Status.

Most of the fieldwork associated with collection of census and survey data for farmland, wetland, and forest wildlife is performed by wildlife biologists and managers (conservation officers also participate in August roadside counts). The Farmland, Wetland, and Forest Wildlife Population and Research groups coordinate these activities, analyze and interpret data, and prepare recommendations for harvest regulations and season setting.

Most of the hunting and trapping harvest estimates are calculated and summarized by St. Paul central office personnel.

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FARMLAND WILDLIFE POPULATIONS

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2011 MINNESOTA AUGUST ROADSIDE SURVEY

Kurt J. Haroldson, Farmland Wildlife Populations & Research Group

ABSTRACT

Population indices for ring-necked pheasants and mourning doves fell significantly from last year, and population indices for gray partridge, cottontail rabbits, and white-tailed jackrabbits were similar to 2010 but below the 10-year and long-term averages. The population index for white-tailed deer was similar to 2010 and the 10-year average. Sandhill crane indices were also unchanged from last year. Conservation Reserve Program (CRP) enrollment in Minnesota declined by 21,000 acres from 2010, including 9,000 acres from the pheasant range, but increases in enrollment of other farm programs and acquisition of public lands exceeded CRP losses, yielding a net gain of about 8,000 acres of protected habitat in the pheasant range. The winter of 2010-11 was the second consecutive severe winter for much of the farmland region, and it was followed by a cold, wet spring. Thus, conditions for overwinter survival of farmland wildlife in 2011 were below average, and reproductive conditions were similarly poor.

The 2011 pheasant index (23.0 birds/100 mi) fell 64% from 2010, and was 71% below the 10-year average, 77% below the long-term average, and 79% below the benchmark years of 1955-64 (soil-bank years with marginal cropland in long-term set-aside, a diversified agricultural landscape, more small grains and tame hay, and less pesticide use). The 2011 hen pheasant index was 63% below last year and 72% below the 10-year average, reflecting poor over-winter survival. The number of broods observed was 69% below last year and 75% below the 10-year average, which reflected fewer hens available for nesting and poor reproductive conditions. Projecting from the roadside index, an estimated 249,000 roosters may be harvested this fall, similar to 2001, another year with a severe winter followed by a cold, wet spring. The best opportunity for harvesting pheasants appears to be in the East Central region, where winter weather was slightly less severe than in western Minnesota.

The gray partridge index was similar to last year, but 75% below the 10-year mean and 76% below the long-term average. Observed regional changes were not significant, but were based on small samples. Gray partridge counts were highest in the South Central, Southwest, and Southeast regions.

The cottontail rabbit index was similar to last year, but 42% below the 10-year average and 24% below the long-term average. Counts of cottontail rabbits were highest in the East Central, Southeast, and South Central regions. The jackrabbit index did not change significantly in 2011, but was 96% below the long-term average. The range-wide jackrabbit population peaked in the late 1950's and declined to low levels in the 1980s, from which populations have not recovered. Counts of white-tailed jackrabbits were highest in the Southwest region.

The number of mourning doves observed in 2011 was below last year, the 10-year average, and the long-term average. In contrast, the white-tailed deer index was similar to last year and the 10-year average, but significantly higher than the long-term average. Sandhill crane indices were unchanged from 2010 except in the Northwest region, where they declined by 43%.

INTRODUCTION

This report summarizes the 2011 Minnesota August roadside survey. The annual survey is conducted annually during the first half of August by Minnesota Department of Natural Resource (MNDNR) enforcement and wildlife personnel throughout the farmland region of Minnesota (Figure 1). The August roadside survey consists of 171 25-mile routes (1-4 routes/county); 152 routes are located in the ring-necked pheasant range.

Observers drove each route in the early morning at 15-20 miles/hour and recorded the number of pheasants, gray (Hungarian) partridge, cottontail rabbits, white-tailed jackrabbits, and other wildlife they saw. Counts conducted on cool, clear, calm mornings with heavy dew yield the most consistent results because wildlife, especially pheasants, gray partridge, and rabbits, move to warm, dry areas (e.g., gravel roads) during early-morning hours. These data provide an **index of relative abundance** and have been used to monitor annual changes and long-term trends in regional and range-wide populations. Results were reported by agricultural region (Figure 1) and range-wide; however, population indices for species with low detection rates are imprecise and should be interpreted cautiously.

ACKNOWLEDGMENTS

I thank all cooperators for their efforts in completing routes in 2011; without their help the survey would not be possible. Tonya Klinkner provided assistance with data entry. John Giudice and Marrett Grund reviewed an early draft of this report. Tabor Hoek of the Minnesota Board of Water & Soil Resources (BWSR) provided enrollment data on cropland-retirement programs in Minnesota.

WEATHER SUMMARY

The winter of 2010-11 was the second consecutive severe winter for much of the farmland region of Minnesota. Snow cover exceeded 6 inches throughout most of the farmland zone from early-December through late March, and snow depths exceeded 18 inches for 12 consecutive weeks in many areas (Minnesota Climatology Working Group [MCWG], http://climate.umn.edu/doc/snowmap.htm). In addition, monthly temperatures averaged 3°F below normal (range -1°F to -7°F, MCWG, http://climate.umn.edu/cawap/monsum/monsum.asp) in all farmland regions from December through March. Cold, wet conditions continued through April, May, and June in most farmland regions. Thus, conditions for over-winter survival of farmland wildlife and production of young were poor throughout most of the farmland region in 2011.

HABITAT CONDITIONS

CRP enrollment continued a declining trend with losses from 2010 of 9,000 acres in Minnesota's pheasant range, 16,000 acres in the prairie-chicken range, and 21,000 acres statewide. In addition, 17,000 acres of Reinvest in Minnesota (RIM) enrollments were lost statewide. However, gains in RIM-Wetlands Reserve Program (RIM-WRP) enrollments and acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) in the pheasant range exceeded CRP and RIM losses, yielding a net gain of about 8,000 acres of protected habitat since 2010. Habitat enrolled in farm programs (e.g., CRP, CREP, RIM, WRP) declined from a 2007 peak of 1.1 million acres to 948,000 acres in the pheasant range, whereas habitat protected as WMAs and WPAs increased to 719,000 acres. Within the pheasant range, protected grasslands account for about 6.4% of the landscape (range: 3.0-10.1%; Table 1).

Farm programs make up the largest portion of protected grasslands in the state. The expiration of a large proportion of existing CRP contracts is still a major concern for future wildlife populations, with over 550,000 acres in Minnesota scheduled to expire in the next 3 years. Furthermore, the 41st general CRP signup held during spring, 2011, enrolled far fewer acres (33,180) than are expiring on September 30, 2011 (127,535 acres). The future of farmland retirement programs remains under threat due to competing economic opportunities (e.g., high land rental rates, ethanol production).

The MNDNR continues to expand the habitat base through accelerated WMA acquisition with 4,585 acres of new WMAs in the pheasant range in the last year. New funding from the Lessard-Sams Outdoor Heritage account has accelerated acquisition of WMAs and WPAs throughout Minnesota's farmland zone. In addition, the Working Lands Initiative (http://www.dnr.state.mn.us/workinglands/index.html) will attempt to protect and expand large wetland-grassland complexes in 12 counties in western Minnesota.

SURVEY CONDITIONS

Observers completed 166 of the 171 routes in 2011. Weather conditions during the survey ranged from excellent (calm, heavy dew, clear sky) to medium (light dew and overcast skies). Medium-to-heavy dew conditions were present at the start of 96% of the survey routes, which was similar to 2010 (95%) but better than the 10-year average (92%). Clear skies (<30% cloud cover) were present at the start of 76% of routes, with wind speeds <7 mph recorded for 96% of routes. The survey period was extended to July 28th - August 19th to allow most routes to be completed.

RING-NECKED PHEASANT

The average number of pheasants observed (23.0/100 mi) fell 64% (Table 2) from 2010 and was 71% below the 10-year average (Table 2; Figure 2A), 77% below the long-term average (Table 2), and 79% below the benchmark years of 1955-64. Total pheasants observed per 100 miles ranged from 5.3 in the Southeast to 50.8 in the East Central region (Table 3). Declines from last year were significant in the West Central (-62%), Central (-75%), Southwest (-82%), and South Central regions (-59%; Table 3).

The range-wide hen index (3.4 hens/100 mi) was 63% below last year, and 72% below the 10-year average (Table 2). The hen index varied from 0.8 hens/100 miles in the Southeast to 8.3 hens/100 miles in the East Central region, and was lower than last year for the West Central (-60 ± 26% [95% CI]), Central (-77 ± 47%), Southwest (-82 ± 40%), and South Central regions (-59 ± 41%). The range-wide cock index (5.2 cocks/100 mi) declined 36% from 2010 and 39% from the 10-year average (Table 2). The cock index was significantly lower than last year in the Central (-48 ± 34%), Southwest (-48 ± 40%), and Southeast regions (-88 ± 57%). The 2011 hen:cock ratio was 0.65, which was the second lowest ratio on record and far below average (1.47 ± 0.33 [SD]) for the CRP years (1987-2010). A low sex ratio may reflect a delayed nesting effort, or greater mortality for hens than cocks.

The number of pheasant broods observed (3.2/100 mi) was 69% below last year, 75% below the 10-year average, and 76% below the long-term average (Table 2). The brood index remains far below the benchmark years of 1955-64 (34.9 broods/100 mi). Regional brood indices ranged from 0.8 broods/100 miles in the Southeast to 7.1 broods/100 miles in the East Central region. Average brood size in 2011 (4.6 ± 0.2 [SE] chicks/brood) was similar to last year (4.5 ± 0.2 [SE] chicks/brood), but below the 10-year mean (4.8 ± 0.1 [SE] chicks/brood) and the long-term average (5.5 ± 0.1 [SE] chicks/brood; Table 2). The median hatch date for pheasants was June 9 (n = 116), the same as the 10-year average (Table 2). The distribution of estimated hatch dates for observed broods was unimodal but skewed to the right, which suggests that many early nesting attempts were unsuccessful. Successful late-season nests tend to be underrepresented in roadside data. Median age of broods observed was 8 weeks (range: 2-16 weeks).

A severe winter throughout the pheasant range (the second consecutive severe winter) was expected to result in reduced hen counts, and this was observed in the survey data. In addition, cool, wet weather during April - June likely contributed to reduce brood survival rates. Thus, a decline in the range-wide pheasant index due to weather was expected, but the magnitude of the decline was disappointing.

Projecting from the roadside index, an estimated 249,000 roosters may be harvested this fall, similar to 2001 (Figure 2A), another year with a severe winter followed by a cold, wet spring. The best opportunity for harvesting pheasants appears to be in the East Central region, where winter weather was slightly less severe than in western Minnesota.

GRAY PARTRIDGE

Range-wide, the gray partridge index (1.7 partridge/100 miles) was similar to last year but 75% below the 10-year average and 76% below the long-term average (Table 2, Figure 2B). Within regions, the partridge index ranged from 0.0/100 miles in the Northwest, Central, and East Central regions to 4.3/100 miles in the South Central region (Table 3). There were no significant regional changes from last year (Table 3). Observations of gray partridge were too few for analysis by age class (n=7 broods statewide).

Conversion of diversified agricultural practices to more intense land-use with fewer haylands, pastures, small grain fields, and hedgerows have reduced the amount of suitable habitat for the gray partridge in Minnesota. Gray partridge in their native range (southeastern Europe and northern Asia) are associated with arid climates and their reproductive success is limited in the Midwest except during successive dry or drought years. Consequently, gray partridge are more strongly affected by weather conditions during nesting and brood rearing than are pheasants. The Southwest, Southeast, and South Central regions offer the best opportunity for harvesting gray partridge in 2011.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (3.6 rabbits/100 mi) was similar to last year, but 42% below the 10-year average and 24% below the long-term average (Table 2, Figure 3A). The cottontail rabbit index ranged from 0.0 rabbits/100 miles in the Northwest to 8.9 rabbits/100 miles in the East Central region (Table 3). Among regions, cottontail indices declined significantly from last year only in the Central region (-55%; Table 3). The best opportunities for harvesting cottontail rabbits are in the East Central, Southeast, and South Central regions.

The index of white-tailed jackrabbits did not change significantly from 2010, but was 53% below the 10-year average and 96% below the long-term average (Table 2, Figure 3B). The range-wide jackrabbit population peaked in the late 1950’s and declined to low levels in 1980s (Figure 3B). The long-term decline in jackrabbits reflects the loss of their preferred habitats (i.e., pasture, hayfields, and small grains). The greatest potential for white-tailed jackrabbit hunting is likely in the Southwest region (Table 3). However, indices of relative abundance and annual percent change should be interpreted cautiously because estimates are based on a small number of sightings.

WHITE-TAILED DEER

The index for white-tailed deer (14.8 deer/100 mi) was similar to last year and the 10-year average, but 69% above the long-term average (Table 2, Figure 4A). Among regions, deer indices were significantly different from 2010 only in the Southwest (Table 3).

MOURNING DOVE

The number of mourning doves observed (158.8 doves/100 mi) in 2011 was below last year, the 10-year average, and the long-term average (Table 2, Figure 4B). The mourning dove index ranged from 99.4 doves/100 miles in the Northwest region to 201.7 doves/100 miles in the West Central Region (Table 3). The number of mourning doves heard along U.S. Fish and Wildlife Service call-count survey (CCS) routes (n = 14) in Minnesota was similar to last year. Trend analyses indicated the number of mourning doves heard along the CCS routes declined 1.6% per year (95% CI: -3.7 to 0.3%) during 2002-2011 and declined 1.4% per year (95% CI: -2.2 to -0.6%) during 1966-2011 (Seamans et al. 2011).

SANDHILL CRANE

For only the third consecutive year, observers were asked to report the number of adult and juvenile sandhill cranes observed on the August Roadside Survey. Range-wide, the 2011 index averaged 9.9 cranes/100 miles of survey, including 2.5 juveniles/100 miles (Table 2). Compared to 2010, we detected no change in the total number of cranes observed or the number of juvenile cranes observed (Table 2). Among regions, crane indices ranged from 0.0/100 miles in the Southwest and Southeast regions to 45.2 cranes/100 miles in the East Central region (Table 3). Regional crane indices were significantly different from last year only in the Northwest, where they declined 43% (Table 3). Juvenile cranes were observed in the Central (3.3/100 mi), East Central (16.9/100 mi), South Central (0.1/100 mi), and Northwest (4.5/100 mi) regions.

OTHER SPECIES

Notable incidental sightings: bald eagle (Wright County), Coopers hawk (Redwood County), great blue heron (Stevens County), belted kingfishers (Dodge and Douglas Counties), trumpeter swan (Pine County), magpies (Polk and Red Lake Counties), indigo bunting (Stevens County), upland sandpiper (Watonwan County), prairie chickens (Clay and Norman Counties), sharp-tailed grouse (Kittson, Polk, and Red Lake Counties), wild turkeys (Big Stone, Chippewa, Chisago, Dodge, Fillmore, Freeborn, Kandiyohi, Le Sueur, Marshall, Morrison, Mower, Polk, Pope, Red Lake, Sherburne, Sibley, Stearns, Steele, Todd, Traverse, Washington, and Wright Counties), coyotes (Lac Qui Parle, Le Sueur, Roseau, and Traverse Counties), badger (Lincoln County), and red fox (Traverse County).

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SEAMANS, M. E., K. PARKER, and T. A. SANDERS. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

[MCWG] MINNESOTA CLIMATOLOGY WORKING GROUP. 2011. MCWG Home Page http://climate.umn.edu/. Accessed on August 3, 2011.

Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within Minnesota's pheasant range, 2011[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi^2
WC[b]	313,629	39,203	18,458	9,139	18,453	181,062	109,080	689,023	10.1	64.9
SW	100,364	25,286	14,619	1,094	766	19,519	57,462	219,109	5.8	37.1
C	137,655	15,320	17,154	2,594	3,100	86,094	46,898	308,817	5.1	32.7
SC	85,750	28,181	11,192	5,846	8,791	8,515	31,721	179,996	4.5	28.5
SE	75,321	2,718	6,770	570	771	36,240	52,161	174,550	4.7	30.1
EC	4,515	0	1,127	0	4	4,720	85,832	96,198	3.0	19.2
Total	717,233	110,707	69,319	19,243	31,886	336,151	383,154	1,667,693	6.4	40.9

[a] Unpublished data, Tabor Hoek, BWSR, 23 August 2011.

[b] Does not include Norman County.

[c] Includes Waterfowl Production Areas (WPA) and USFWS refuges.

[d] MNDNR Wildlife Management Areas (WMA).

Table 2. Range-wide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2011.

Species	Change from 2010[a]					Change from 10-year average[b]				Change from long-term average[c]			
Subgroup	*n*	2010	2011	%	95% CI	*n*	2001-10	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	146	64.1	23.0	-64	±18	146	81.4	-71	±13	146	101.5	-77	±8
Cocks	146	8.2	5.2	-36	±17		8.6	-39	±14		11.5	-54	±12
Hens	146	9.1	3.4	-63	±19		12.4	-72	±14		14.7	-77	±10
Broods	146	10.3	3.2	-69	±18		12.7	-75	±14		13.3	-76	±9
Chicks per brood	116	4.5	4.6	2			4.8	-5			5.5	-18	
Broods per 100 hens	116	112.9	92.1	-19			103.5	-11			101.4	-9	
Median hatch date	113	Jun 9	Jun 9				Jun 09						
Gray partridge													
Total partridge	163	3.0	1.7	-42	±72	163	7.0	-75	±30	148	16.1	-76	±18
Eastern cottontail	163	4.7	3.6	-23	±26	163	6.3	-42	±15	148	6.8	-24	±17
White-tailed jackrabbit	163	0.1	0.2	74	±178	163	0.4	-53	±41	148	1.8	-96	±13
White-tailed deer	163	14.8	14.8	0	±24	163	14.4	2	±22	167	9.2	69	±34
Mourning dove	163	213.8	158.8	-26	±16	163	222.7	-29	±10	148	273.2	-16	±13
Sandhill Crane													
Total cranes	163	10.3	9.9	-4	±47								
Juveniles	163	2.0	2.5	25	±64								

[a] Includes Northwest region, except for pheasants. Estimates based on routes (*n*) surveyed in both years.

[b] Includes Northwest region, except for pheasants. Estimates based on routes (*n*) surveyed at least 9 of 10 years.

[c] LTA = 1955-2010, except for deer = 1974-2010. Estimates for all species except deer based on routes (*n*) surveyed $\geq$40 years; estimates for deer based on routes surveyed $\geq$25 years. Thus, Northwest region (8 counties in Northwest were added to survey in 1982) included only for deer.

Table 3. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2011.

Region	Change from 2009[a]					Change from 10-year average[b]				Change from long-term average[c]			
Species	*n*	2010	2011	%	95% CI	*n*	2001-10	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	17	0.0	0.0			17	0.4	-100	±104	17	4.0	-100	±70
Eastern cottontail		0.2	0.0	-100	±212		1.0	-100	±81		1.0	-100	±63
White-tailed jackrabbit		0.2	0.0	-100	±212		0.5	-100	±47		0.7	-100	±46
White-tailed deer		41.2	31.8	-23	±66		44.1	-28	±44		26.9	18	±78
Mourning dove		77.7	99.4	28	±146		83.6	19	±123		129.1	-23	±67
Sandhill Crane		46.8	26.9	-43	±41								
West Central													
Ring-necked pheasant	33	74.7	28.2	-62	±33	33	85.2	-67	±30	33	105.0	-73	±18
Gray partridge		2.4	0.0	-100	±204		2.7	-100	±58		10.0	-100	±23
Eastern cottontail		0.8	0.7	-14	±135		3.2	-77	±27		4.3	-83	±18
White-tailed jackrabbit		0.1	0.1	0	±293		0.5	-74	±82		2.1	-94	±22
White-tailed deer		17.6	18.2	3.5	±37		12.8	42	±46		9.1	99	±75
Mourning dove		342.1	201.7	-41	±36		267.7	-25	±21		371.3	-46	±12
Sandhill Crane		0.0	1.2										
Central													
Ring-necked pheasant	30	76.4	18.9	-75	±35	29	70.2	-72	±22	29	76.2	-74	±19
Gray partridge		0.0	0.3				3.5	-92	±64		9.9	-97	±42
Eastern cottontail		6.1	2.7	-57	±55		6.5	-57	±36		6.4	-57	±21
White-tailed jackrabbit		0.0	0.0				0.2	-100	±74		1.3	-100	±22
White-tailed deer		9.0	12.7	41	±45		7.2	83	±70		4.3	204	±123
Mourning dove		183.2	155.5	-15	±34		196.5	-19	±27		235.5	-32	±23
Sandhill Crane		10.8	17.2	59	±112								
East Central													
Ring-necked pheasant	13	49.8	50.8	1.9	±81	14	55.5	-9	±57	14	85.9	-41	±36
Gray partridge		0.0	0.0				0.0				0.1	-100	±133
Eastern cottontail		12.0	8.9	-26	±77		10.1	-10	±70		8.7	5	±68
White-tailed jackrabbit		0.0	0.0				0.0				0.2	-100	±57
White-tailed deer		10.4	20.3	95	±152		16.0	20	±127		8.1	137	±248
Mourning dove		97.8	101.9	4	±32		100.1	-1	±30		127.1	-22	±36
Sandhill Crane		40.9	45.2	11	±133								

Table 3. Continued.

Region / Species	Change from 2009 *n*	2010	2011	%	95% CI	Change from 10-year average *n*	2001-10	%	95% CI	Change from long-term average *n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	104.2	19.2	-82	±38	19	159.8	-88	±20	19	119.5	-84	±15
Gray partridge		8.2	4.0	-51	±145		23.3	-83	±46		42.4	-91	±27
Eastern cottontail		3.4	3.8	13	±104		7.6	-50	±40		8.2	-54	±33
White-tailed jackrabbit		0.4	0.6	51	±286		1.0	-39	±93		3.9	-84	±30
White-tailed deer		20.0	9.7	-52	±39		14.5	-33	±38		8.2	17	±58
Mourning dove		238.7	189.6	-21	±27		334.1	-43	±18		314.9	-40	±18
Sandhill Crane		0.0	0.0										
South Central													
Ring-necked pheasant	32	56.5	23.1	-59	±42	32	85.1	-73	±26	32	133.3	-83	±13
Gray partridge		5.7	4.3	-26	±88		12.4	-66	±49		19.3	-78	±28
Eastern cottontail		5.4	4.6	-14	±44		9.0	-48	±21		7.7	-40	±23
White-tailed jackrabbit		0.0	0.4				0.2	73	±158		1.8	-79	±32
White-tailed deer		3.4	6.0	79	±116		5.5	9	±62		3.4	79	±98
Mourning dove		294.4	177.4	-40	±29		278.3	-36	±15		259.0	-32	±16
Sandhill Crane		1.0	0.6	-37	±170								
Southeast													
Ring-necked pheasant	19	8.6	5.3	-39	±94	19	26.6	-80	±30	19	73.7	-93	±27
Gray partridge		3.4	3.2	-6	±277		5.7	-44	±133		13.9	-77	±59
Eastern cottontail		8.0	7.6	-5	±60		8.0	-5	±51		7.7	-2	±51
White-tailed jackrabbit		0.0	0.0				0.1	-100	±90		0.6	-100	±43
White-tailed deer		12.8	12.9	0	±61		15.9	-19	±47		10.2	26	±47
Mourning dove		79.9	119.7	50	±36		194.6	-39	±19		225.1	-47	±17
Sandhill Crane		0.0	0.0										

[a] Based on routes (*n*) surveyed in both years.

[b] Based on routes (*n*) surveyed at least 9 of 10 years.

[c] LTA = 1955-2010, except for Northwest region (1982-2010) and white-tailed deer (1974-2010). Estimates based on routes (*n*) surveyed ≥40 years (1955-2010), except for Northwest (≥20 years) and white-tailed deer (≥25 years).

[d] Eight Northwestern counties (19 routes) were added to the August roadside survey in 1982.

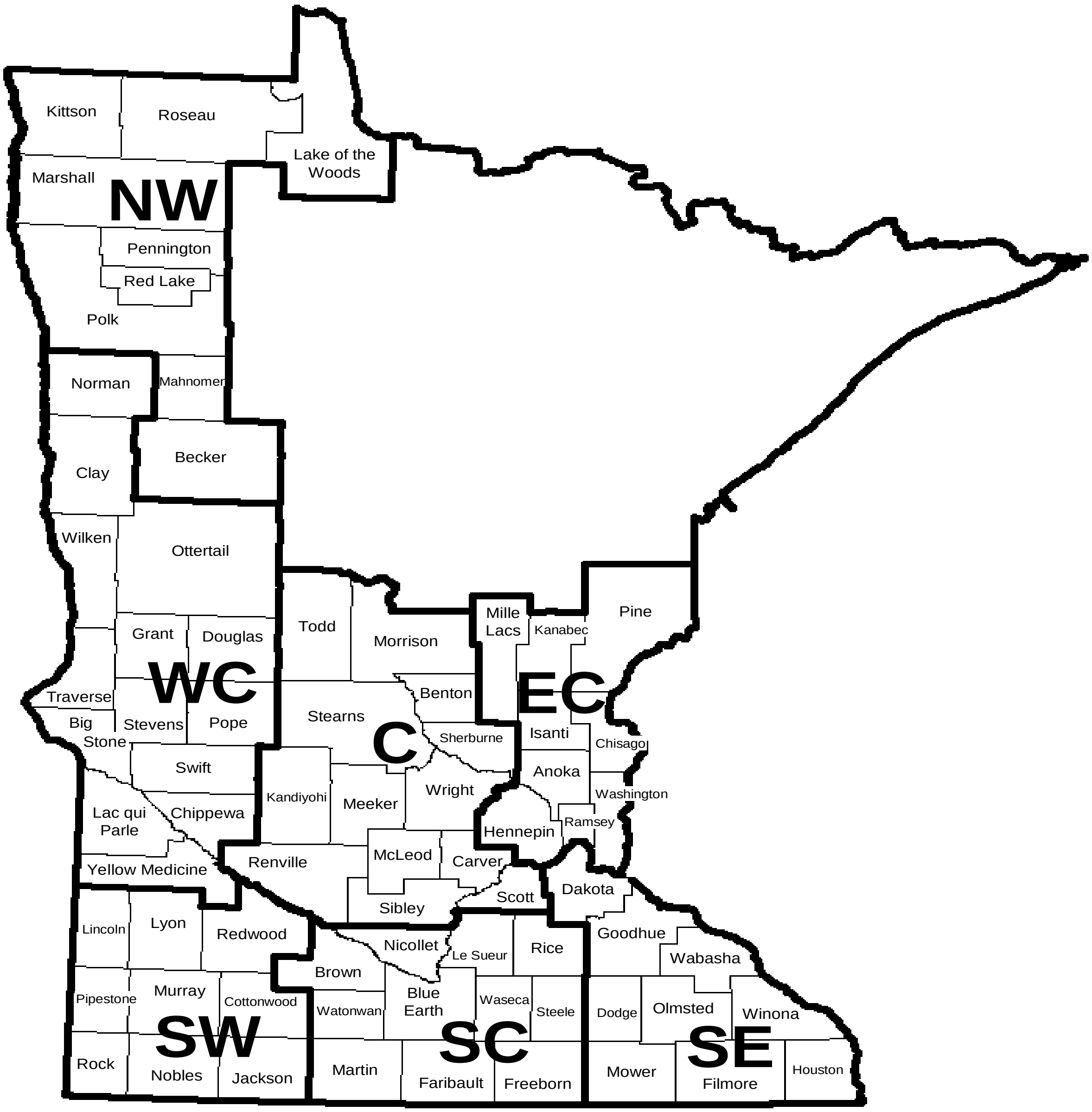

Figure 1. Survey regions for Minnesota's August roadside survey, 2011.

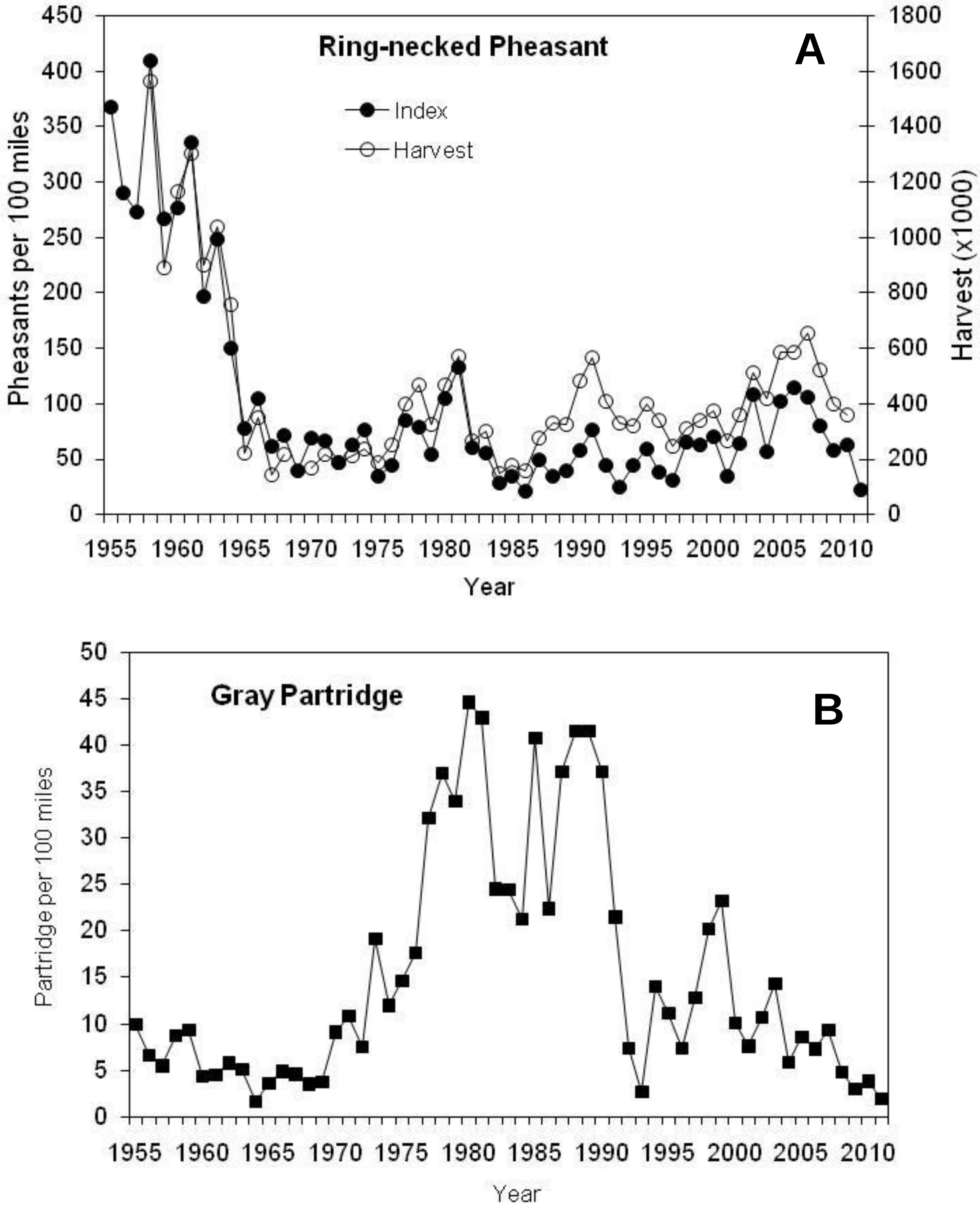

Figure 2. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 1955-2011. Does not include the Northwest region. Based on all survey routes completed.

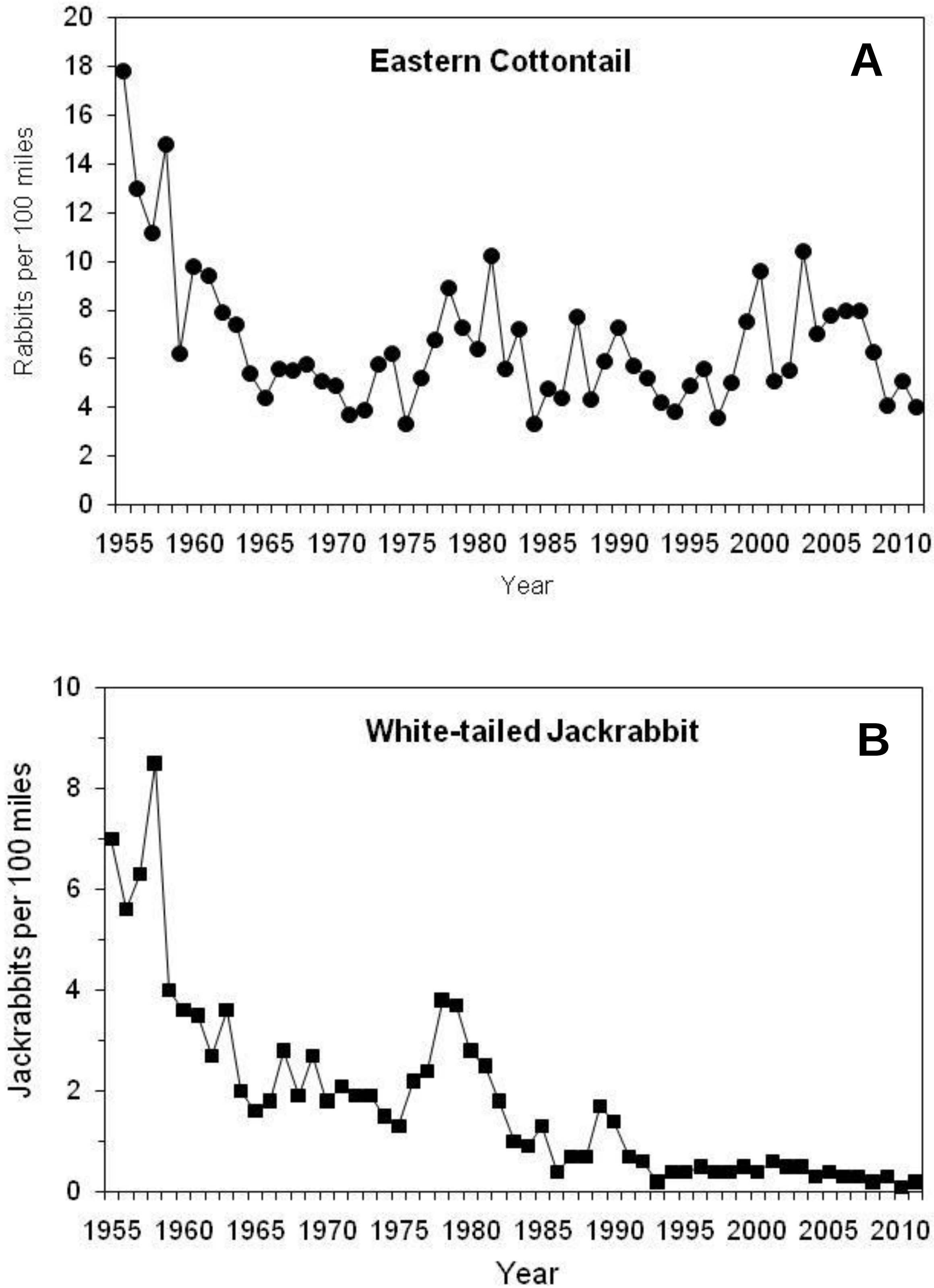

Figure 3. Range-wide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven in Minnesota, 1955-2011. Does not include the Northwest region. Based on all survey routes completed.

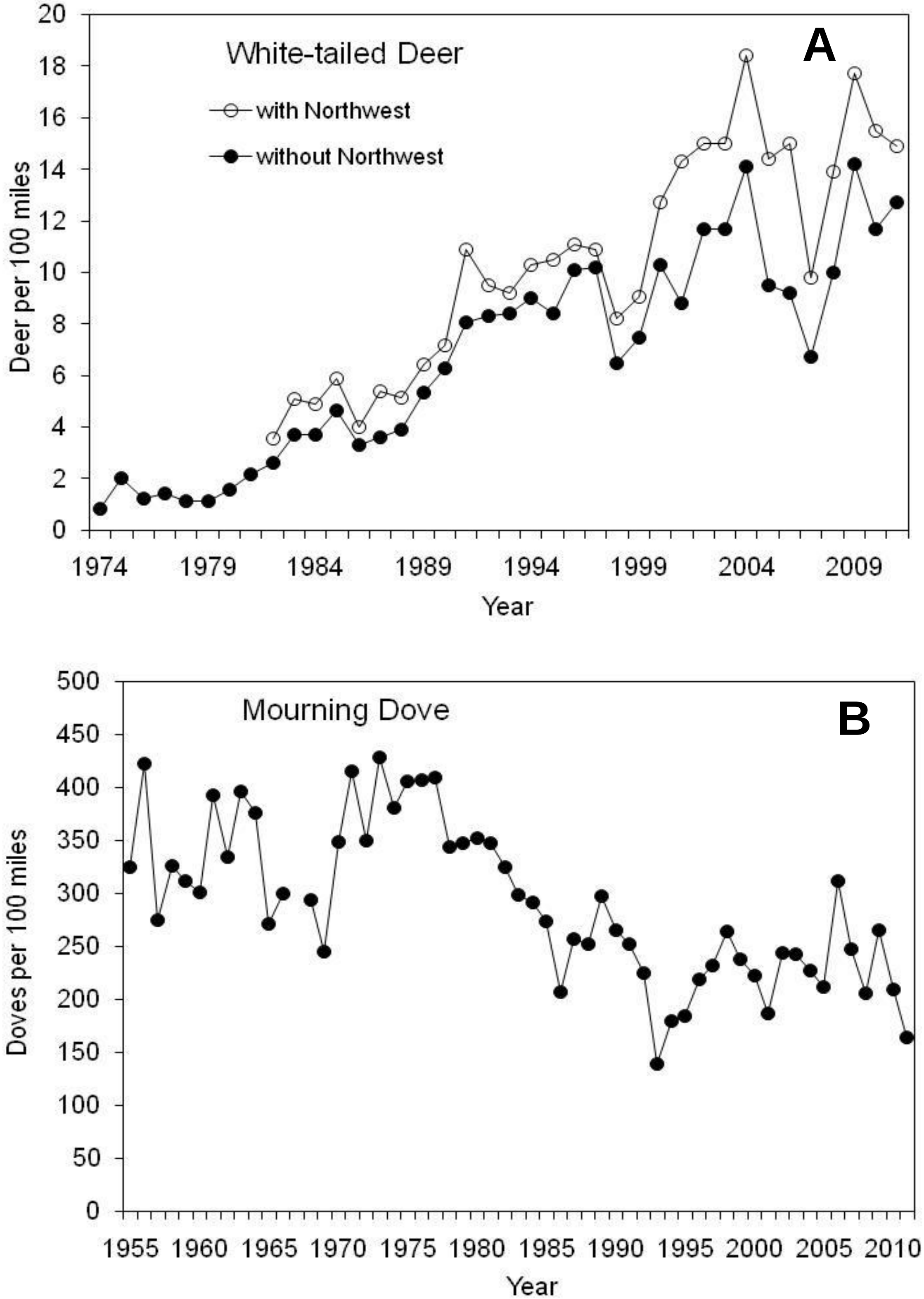

Figure 4. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2011. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA'S FARMLAND/TRANSITION ZONE – 2011

Marrett Grund, Farmland Wildlife Populations and Research Group

INTRODUCTION

White-tailed deer (*Odocoileus virginianus*) represent one of the most important big game mammals in Minnesota. Although viewed as being important by both hunters and non-hunters, deer also pose serious socioeconomic and ecological challenges for wildlife managers, such as deer-vehicle collisions, crop depredation, and forest regeneration issues. Thus, monitoring the status of deer populations is critical to determine appropriate harvest levels based on established management goals.

This document 1) identifies where the farmland population model was applied to model deer population dynamics in Minnesota, 2) describes the structure of and data inputs for the farmland population model, and 3) discusses general trends of deer density and current abundance.

METHODS

Minnesota Farmland/Transition Zone

The farmland/transition zone encompasses >46,000 square miles and 87 permit areas (PAs). I arbitrarily pooled PAs into 11 geographic units to describe general population trends and management issues at a broader scale (Figure 1). Several management strategies were available in 2011 including: 1) lottery with varying number of antlerless permits, 2) hunter's choice, 3) managed, and 4) intensive (Figure 2). The strategy employed during a given year depended upon where the population density was in relation to the population density goal (Figs. 3 and 4). The Twin Cities metro region (PA 601) was not modeled due to limited hunting opportunities, and PAs 224, 235 and 238 were not modeled due to demographic stochastic error associated with their small population sizes (Grund and Woolf 2004).

Population Modeling

The population model used to analyze past population trends and test harvest strategies can be best described as an accounting procedure that subtracts losses, adds gains, and keeps a running total of the number of animals alive in various sex-age classes during successive periods of the annual cycle. The deer population is partitioned into 4 sex-age classes (fawns, adults, males, and females). The 12-month year is divided into 4 periods representing important biological events in the deer's life (hunting season, winter, reproduction, and summer). The primary purposes of the farmland model were to 1) organize and synthesize data on farmland deer populations, 2) advance the understanding of farmland deer populations through population analysis, 3) provide population estimates and simulate vital rates for farmland deer populations, and 4) assist with management efforts through simulations, projections, and predictions of different management prescriptions (Figure 2).

The 3 most important parameters within the model reflect the aforementioned biological events, which include reproduction, harvest, and non-hunting mortality. Fertility rates were typically estimated at the regional level via fetal surveys conducted each spring (for details, see Dunbar 2005). Fertility rates were then used to estimate population reproductive rates for each deer herd within a particular region. The deer population increased in size after reproduction was simulated. Non-hunting mortality rates occurring during summer months (prior to the hunting season) were estimated from field studies conducted in Minnesota and other agricultural regions. Although summer mortality rates were low, they did represent a reduction in the annual deer population. In farmland deer herds, previous research suggests virtually all mortality occurring during the year can be attributed to hunter harvests. Annual harvests were simulated in the model by subtracting the numerical harvest (adjusted for crippling and non-registered deer) from the pre-hunt population for each respective sex-age class. In heavily hunted deer populations, like those in the farmland/transition region, the numerical harvest data “drive” the population model by substantially reducing the size of the deer herd (Grund and Woolf 2004). Winter mortality rates were estimated from field studies conducted in Minnesota and other farmland regions, similar to summer mortality. After winter mortality rates were simulated, the population was at its lowest point during the 12-month period and the annual cycle began again with reproduction.

RESULTS

Population Trends and Densities

Northwest Management Units

Karlstad Unit – Deer numbers have declined 25-30% in this unit since 2007 and most populations are at or slightly below the goal density (Figs. 3 and 4). Thus, management strategies applied during the 2011 hunting season were more conservative than those used over the past 5-7 years. However, deer populations immediately to the west of PA 101 were managed more aggressively than what would have been used if Bovine TB was not a concern. Spring deer densities were 3.5-4.0 deer per square mile in this unit, which is substantially lower than the Spring 2007 deer density (>5.0 deer per square mile).

Crookston/TRF Unit – Deer densities have declined 15-20% in this unit due to the use of early antlerless seasons in 5 consecutive years (Table 1). Consequently, most of these herds are at goal and the PAs were designated as hunter’s choice, managed or intensive; the early antlerless season was not used during the 2011 hunting season. These more conservative management strategies will reduce the antlerless harvest by >40% and will allow the populations to stabilize or increase toward goal densities. The unit deer density was 6-7 deer per square mile in Spring 2011.

Mahnomen Unit – Deer herd dynamics in this unit have been very stable over the last 5 years with deer densities varying between 4.5-5.5 deer per square mile (Table 1). All populations are at goal densities (Figs. 3 and 4) and hunter’s choice was used throughout the unit (Figure 2) in attempt of maintaining a stable deer density.

Central Management Units

Morris Unit – Deer densities have increased from about 3 deer per square mile to just under 5 deer per square mile over the last 5 years (Table 1) and are now at goal densities (Figs. 3 and 4). Most 2011 management strategies used in this unit were designed to maintain stable deer densities through 2012 (Figure 2).

Osakis Unit – Deer densities have been very stable in the Osakis unit over the past 5 years with deer densities fluctuating between 13-14 deer per square mile (Table 1). All populations were at or near goal densities in 2011 (Figures 3 and 4). Management strategies used in 2011 were slightly more liberal than in 2010 for some permit areas where deer densities may be considered on the high side of the goal density (Figure 2).

Cambridge Unit – Deer densities have been very stable with about 13 deer per square mile over the last 5 years (Table 1). However, almost all deer populations remain well above goal in 2011 (Figs. 3 and 4). This unit was an active participant in the ADM study and 3 of the PAs were managed with early antlerless seasons for 5 consecutive years. Aerial surveys conducted in 2010 confirmed deer densities did not decline as a result of the early antlerless seasons, however.

Hutchinson Unit – Deer densities have increased about 30% over the last 5 years in this unit. Deer densities were approximately 4 deer per square mile 5 years ago and they are now 5-5.5 deer per square mile in 2011. Most deer populations are at goal and management strategies used in 2011 were more liberal than those used in 2010 (Figure 2). Bucks-only management strategies were no longer needed in this unit and antlerless permit quotas were increased this year in attempt to slow population growth rates.

Southern Management Units

Minnesota River Unit – Deer densities have increased from about 4 deer per square mile in 2007 to approximately 6 deer per square mile in 2011 (Table 1). All deer populations are on the high side of goal (Figs 3 and 4) and management strategies used in 2011 were designed to stabilize or slightly decrease deer numbers (Figure 2).

Slayton Unit – Deer densities have increased approximately 30% over the past 5 years and were approximately 3 deer per square mile in Spring 2011. About half of the deer populations have deer densities at goal levels, the other half are still slightly below goal. Despite having densities below goal, all permit areas were designated as lottery and bucks-only strategies were not used in 2011. In all situations where the deer density remains below goal, the antlerless permit allocation remained conservative and the populations will continue to grow towards goal.

Waseca Unit – Population densities have been very stable over the past 5 years in this unit and most deer populations are at or near density goals (Table 1, Figs. 3 and 4). Hunter's choice was used in most PAs in attempt to maintain stable deer numbers. It is very likely that the PAs along the eastern side of the unit will return to using a managed strategy at some point in the future so that populations are managed according to goal levels.

Rochester Unit – Deer densities have been stable across the entire unit (Table 1). However, densities have grown in some PAs (e.g., PA 344) and have declined in others (e.g., PAs 346 and 349). Due to the excellent habitat available in this unit, higher deer numbers can be supported and using aggressive management strategies are needed just to maintain stable deer numbers (Figure 2). Most populations are at goal, but densities in PAs 346 and 349 remain above goal (Figs. 3 and 4). However, deer numbers are declining in both PAs and the early antlerless season was discontinued because modeling suggested the populations would continue to decline by simply designating each PA as intensive. Chronic Wasting Disease was discovered last winter along the western portion of PA 343 and a disease management unit was created similar to PA 101 where Bovine TB was discovered in northwest Minnesota (Figure 2).

LITERATURE CITED

DUNBAR, E. J. 2005. Fetus survey data result of white-tailed deer in the farmland/transition zone of Minnesota—2005 *in* Dexter, M. H., editor, Status of wildlife populations, fall 2005. Unpublished report, Division of Fish and Wildlife, Minnesota Department of Natural Resources, St. Paul, Minnesota, USA. 270pp.

GRUND, M. D., and A. WOOLF. 2004. Development and evaluation of an accounting model for estimating deer population sizes. Ecological Modeling 180:345-357.

Figure 1. Deer management units in the farmland zone of Minnesota, 2011.

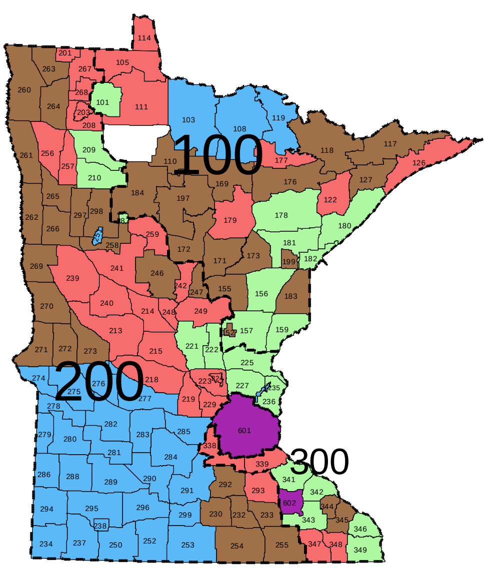

Figure 2. Deer management strategies used in permit areas throughout Minnesota, 2011. Permit areas are numbered and management strategies are color-coded. Permit areas are designated as: 1) lottery if colored blue, 2) hunter's choice if colored brown, 3) managed if colored red, and 4) intensive if colored green.

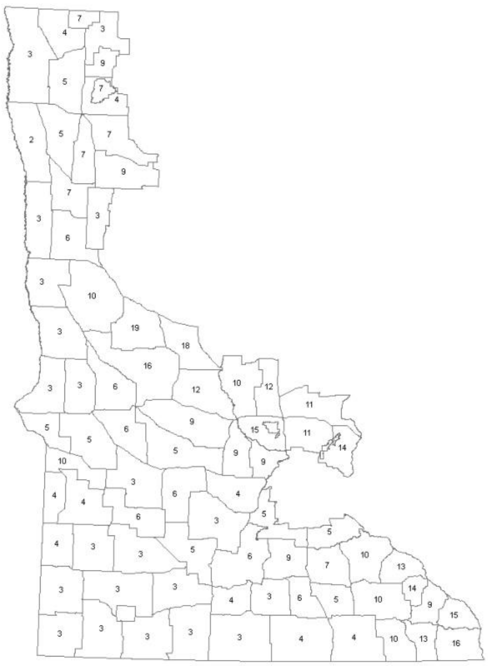

Figure 3. Population density goals in farmland deer permit areas in Minnesota, 2011.

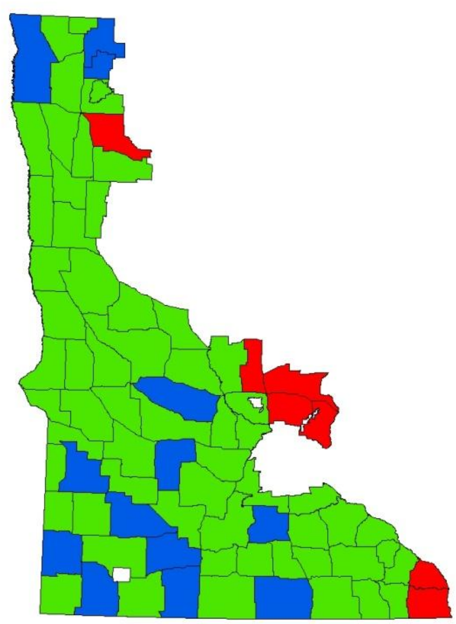

Figure 4. Population density relative to goal density in the farmland region of Minnesota, 2011. Permit areas colored in blue were below goal, permit areas colored in green were at goal, and permit areas colored in red were above goal.

Table 1. Pre-fawn deer density (deer/mi^2) as simulated from population modeling in each permit area of Minnesota's Farmland/Transition Zone, 1999-2011.

Region		Pre-fawning Density												
Permit Area	Area (mi^2)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Karlstad														
201	161	3	4	4	5	5	4	5	6	6	6	6	6	6
260	1249									4	3	3	2	2
263	512									5	5	5	5	4
203	118	4	5	5	6	8	7	7	5	6	6	7	7	8
208	379	3	4	4	4	5	4	4	4	4	4	4	4	4
267	472									4	3	3	2	2
268	229									9	8	9	8	7
264	669									7	7	7	6	5
Total	3789	3	4	4	5	6	5	4	4	5	5	5	4	4
Crookston														
261	795									2	2	2	2	2
256	653	6	6	7	8	8	8	7	7	7	6	6	5	5
257	413	8	8	8	8	7	8	9	8	8	8	7	7	7
209	639	6	6	7	7	7	8	9	9	9	9	9	9	9
210	615	11	11	11	12	11	12	13	12	13	12	12	11	10
Total	3115	8	8	8	9	8	8	8	8	7	7	7	7	6
Mahnomen														
262	677									2	2	2	2	2
265	494									10	9	10	8	7
266	617									5	6	7	7	7
297	438								4	3	3	2	3	3
Total	2226									6	6	6	6	6

Morris														
269	650	3	3	4	4	4	4	4	3	2	2	2	3	4
270	748	3	3	3	3	4	4	2	1	1	1	2	2	3
271	632	2	2	2	2	3	3	4	2	1	2	2	3	3
272	531	3	3	3	4	4	2	2	2	1	2	2	2	3
273	572								4	4	5	5	6	7
274	360	6	5	4	4	4	4	4	4	3	3	5	6	7
275	764	4	4	3	3	3	3	4	4	4	3	4	5	6
276	543	9	8	8	8	8	7	7	6	4	4	4	5	7
282	779	1	1	1	1	1	1	2	1	1	2	2	3	4
Total	5579	4	4	4	4	4	4	4	3	2	3	3	4	5
Osakis														
239	922	15	16	16	15	14	13	12	12	10	10	9	10	11
240	642	23	25	26	27	26	21	20	19	19	18	18	18	19
213	1057								13	12	12	13	15	15
214	557	18	18	19	19	19	20	19	18	20	20	19	19	19
215	701	9	9	9	10	10	9	8	9	9	9	10	10	10
Total	3879	16	17	18	18	17	16	15	15	13	13	13	13	14
Cambridge														
221	642	11	12	11	12	13	13	12	13	13	12	12	12	11
222	413	14	14	14	15	15	14	14	15	16	15	15	15	15
223	377	8	11	10	9	11	9	8	11	11	10	11	12	14
225	618	15	18	19	16	16	15	13	13	15	16	16	16	15
227	471	13	13	12	11	11	10	9	13	14	13	14	14	14
229	287	5	6	6	6	7	7	6	7	6	6	6	7	8
236	372	17	17	16	17	17	18	18	18	17	16	16	16	16
Total	3180	12	13	13	12	13	12	11	13	14	13	13	13	13

Hutchinson														
218	884								7	6	6	6	7	7
277	813								3	3	3	4	4	5
219	392	8	9	7	7	8	7	7	7	7	7	8	9	10
229	287	5	6	6	6	7	7	6	7	6	6	6	7	8
285	550	4	4	4	4	5	6	4	3	3	3	4	4	4
283	614	3	3	3	4	4	3	3	3	4	2	3	3	4
284	838	1	2	2	2	2	2	3	2	2	2	2	3	3
Total	4378	4	5	4	5	5	5	5	5	5	5	6	6	6
Minnesota River														
278	401	8	8	8	8	9	10	8	8	6	6	7	8	10
281	575	5	5	4	4	5	5	6	4	4	4	4	5	6
290	662	4	4	4	4	4	4	4	4	3	3	3	4	5
291	802	4	4	4	4	5	5	5	4	4	4	4	5	5
Total	2440	5	5	5	5	6	6	6	5	4	4	4	5	6
Slayton														
237	729	2	2	3	3	4	3	2	2	1	1	2	2	2
279	344	7	7	6	6	6	5	5	4	3	3	4	4	5
280	675	2	2	2	2	2	2	3	2	3	2	2	3	3
286	446	2	3	4	4	4	4	4	4	3	3	3	4	5
288	625	2	3	4	4	4	4	4	3	2	2	1	2	2
289	816	2	1	1	1	2	2	1	2	2	2	1	2	2
294	686	3	3	3	3	3	4	2	2	2	1	2	2	2
295	840	3	3	3	3	4	4	4	3	2	2	2	3	3
296	666	3	3	3	3	3	3	3	2	2	2	2	2	2
234	636	3	4	4	4	4	5	4	3	2	2	2	2	3
250	712	3	3	4	4	4	5	4	4	2	2	2	2	3
Total	5734	3	3	3	3	4	4	4	3	2	2	2	2	3

Waseca														
292	480	8	8	7	7	8	7	7	8	8	8	7	7	7
293	511	8	8	8	8	7	7	8	8	7	7	7	6	6
299	386	5	5	5	5	5	5	5	3	4	4	4	4	5
230	452	3	3	3	3	4	4	4	4	3	2	3	3	3
232	377	4	4	4	4	4	4	4	5	5	5	4	5	5
233	385	4	4	4	4	5	5	4	4	4	4	4	4	4
252	715	2	2	2	2	2	3	2	2	2	2	2	2	2
253	974	3	3	3	3	3	4	3	2	2	2	2	2	3
254	930	4	4	4	4	4	4	5	4	3	3	3	3	3
255	774	4	4	4	4	4	4	4	4	3	3	3	3	4
Total	5269	5	5	5	5	5	5	5	5	4	4	4	4	4
Rochester														
338	454	4	4	4	5	5	4	4	4	4	4	5	5	6
339	394	5	4	5	5	4	4	5	5	4	5	5	6	6
341	611	9	9	9	10	10	9	10	9	10	10	10	10	10
342	350	11	12	11	13	15	17	13	13	12	13	13	13	14
343	662	8	9	9	11	13	11	13	10	11	11	11	10	10
344	189	14	14	14	15	15	13	12	11	11	12	12	15	16
345	326	11	11	10	10	11	12	11	12	10	10	9	8	8
346	319	18	19	19	19	20	20	21	22	22	21	20	19	19
347	434	9	9	9	10	11	12	13	13	11	10	10	10	12
348	332	17	16	15	15	16	17	18	20	18	17	14	14	13
349	492	16	17	17	18	21	20	21	23	23	22	21	20	19
Total	4563	11	11	11	12	13	13	13	13	12	12	12	11	12

2010 MINNESOTA SPRING TURKEY HUNTER SURVEY REPORT

Eric Dunton, Farmland Wildlife Populations and Research Group

In Minnesota, the spring wild turkey hunting season is designed to regulate harvest and distribute hunting pressure by allocating permits across 77 permit areas (PAs) and 8 time periods (6, 5-day [Time Periods A – F] and 2, 7-day [Time Periods G – H]) using a quota system. The Minnesota Department of Natural Resources (MNDNR) attempts to issue the optimum number of permits to satisfy hunter demands while maintaining sustainable turkey populations and quality of hunting (Kimmel 2001, MNDNR 2007).

The objective of the spring turkey-hunter survey is to monitor hunter satisfaction and associated factors, including interference rates (between hunters), and relative ease of access to hunting land. We also used the 2010 spring turkey-hunter survey as a pilot study to evaluate the feasibility of collecting response data via the internet (vs. mail-back surveys).

METHODS

We randomly selected 2,421 hunters (resident and non-resident) that purchased a 2010 spring turkey-hunting license from 5 PAs (344, 345, 346, 348, and 349) based on Electronic Licensing System (ELS) database. Hunter samples were randomly selected for all 8 time periods (i.e., April 14 – May 27, 2010). To evaluate the feasibility of using the internet to collect response data, hunters were randomly assigned to 1 of 3 treatment groups based on the method of response: mailback, mixed-mode, and internet. The mailback group received a postage-paid paper survey that could be completed and returned via U.S. mail. The mixed-mode and internet groups received a postcard with a Uniform Resource Locator (URL) address for the survey website and were instructed to go to the website to complete the survey. Internet respondents (mixed-mode and internet treatment groups) were required to enter a unique identification number to prevent multiple responses by the same respondent or unverifiable responses (unknown respondents). The first mailing (to all 3 groups) was sent out on 7 June 2010. One follow-up mailing was sent to non-respondents (for all 3 groups) on 26 July 2010. Non-respondents from the mailback and mixed-mode groups received a postage-paid mailback survey for the second mailing, whereas the internet group received a second postcard reminding them to visit the website to complete the survey.

We also conducted a follow-up survey (postage-paid mailback survey) of non-respondents from the internet-only treatment group. The objective of the follow-up survey was to determine reasons for not responding (e.g., did not want to participate, did not own a computer or have access to internet, security concerns over using the internet, technical problems that precluded them from responding). Follow-up surveys were mailed on 26 August 2010.

RESULTS

The overall response rate after 2 mailings was 61%, but it varied by permit area, and especially, treatment group (Table 1). The lowest per-mailing response rates (range: 20–34%) were from hunters that received postcards directing them to a website (i.e., internet group and first mailing to mixed-mode group; Table 1). Conversely, per-mailing response rates in mail-back surveys ranged from 39–61%. Likewise, the overall response rate was lowest for the internet group (44%, 95% CI: 42–46%), highest for the mailback group (74%, 95% CI: 72–76%), and intermediate for the mixed-mode group (65%, 95% CI: 63–67%). Response rate by time period ranged from 7% (time period H) to 17% (time period E). Sixteen surveys were undeliverable due incorrect address in the ELS database.

Mean hunt- quality scores, interference rates, and ease of access (to hunting land) ratings were similar among treatment groups (Table 2). Therefore, we pooled data for the 3 treatment groups. The overall mean hunt-quality score was 3.3 (scale: 1 = poor to 5 = excellent) and ranged from 3.2 (PA 345) to 3.4 (PA 344). The most important factor in determining hunt quality was "seeing turkeys/calling birds in/hearing gobbling" (PAs 345, 346, 348, 349) or "spending time with family and friends" (PA 344; Table 3). Twenty-three percent of hunters responded "definitely yes" or "somewhat" that another hunter kept them from hunting where they intended (Table 4). Eighty-nine percent of hunters stated that another hunter did not interfere with their chance to harvest a turkey (Table 5). Interference rates (i.e., proportion of hunters reporting that another hunter interfered with their ability to harvest a turkey) were 10% (PAs 345, 346, 348, and 349) and 18% (PA 344). The majority (56%) of interference that was reported occurred on private land and with an average of < 1 day of interference occurring (Table 5). Of the 44% of interference reported on public land, 55% occurred in PA 344, which primarily consist of Whitewater Wildlife Management Area. Seventy-four percent of hunters reported access to hunting land as "somewhat easy" or "very easy" with 70% of hunters indicating they hunted private land, 16% public land, and 13% hunted private and public land (Table 6). Thirteen percent of private land hunters were landowners, 3% tenants, and 84% did not identify themselves as a landowner or tenant (Table 7). Thirty-four percent of hunters who hunted exclusively public land indicated they hunted public land because they could not gain access to private land. Eleven percent of hunters felt turkey numbers increased, 35% thought they decreased, 47% about the same, and 7% hunted a different PA (Table 8).

Mean respondent age ranged from 49 (PA 344) to 52 (PA 349) and was similar among treatment group; 50 (mailback), 50 (mixed-mode), and 51 (internet).
Seventy-five percent of respondents purchased a spring turkey lottery license (i.e., general lottery or landowner), 23% surplus, 2% non-resident general lottery, and < 1% non-resident surplus permits. Ninety-eight percent of respondents reported that they hunted (mean days hunted = 3) and 30% reported successfully harvesting a turkey Seventy-seven percent of respondents indicated they do not live in the PA they generally hunt, 52% applied or hunted in the same area they hunted in 2010; 18% 2 of the last 3 seasons; 18% 1 of the last 3 seasons; and 12% didn't apply or hunt in the same areas as they applied or hunted in 2010 (Table 9). Forty seven percent of respondents reported hunting each of the last 3 season (2007 – 2009), 20% 2 of the last 3 seasons, 22% 1 of the last 3 seasons, and 11% didn't hunt any of the last 3 seasons (Table 9).

Twenty-nine percent of the 492 "internet" non-respondents answered our follow-up survey about why they did not complete an internet survey. Hunters listed the following reasons for not responding to the "internet" survey (n = 142): do not own a computer or have access to the internet (41%), other (32%), did not want to participate in survey (16%), encountered technical problems trying to access the survey site (13%), concerned about privacy issues associated with using the internet (6%). Of those who indicated "other" as a reason for not responding (n = 50), 54% intended to respond but forgot to complete it, 16% did not notice survey card in the mail, 8% lost or misplaced the survey card (containing the web address and survey id), 6% state their computer was not working at the time they received the survey card, 4% did not hunt during 2010, 4% stated that they were not "good" with using computers, 2% did not want to admit they were unsuccessful in harvesting a turkey.

Of those respondents that indicated they experienced technical problems accessing the survey site,13 respondents stated they could not find the survey site, 1 respondent could not complete the survey, and 1 reported their survey ID did not work. Of the respondents who attempted to respond but failed, 8 respondents tried to access the survey site using an internet based search engine (i.e., Google, Yahoo, Aol, Bing, etc), 6 used the browser address bar, 1 respondent had the DNR website saved in their internet favorites and tried to find the survey site on the DNR homepage.

Respondents were also given the opportunity to provide comments or suggestions on how to make an internet-based survey easier to use. Seventeen hunters stated they simply prefer mailback surveys, 2 stated the DNR should ask for e-mail addresses from hunters and conduct e-mail based surveys, 1 suggested making it similar to the Harvest Information Program (HIP) used for migratory bird data collection (i.e., ask survey questions when the buy a license the following year), 1 reported survey fatigue (i.e., asked to complete too many surveys), and 1 suggested making the survey phone-based rather than internet- based.

DISCUSSION

Minnesota's harvest-management strategy is to maximize the amount of turkey hunting across each permit area while providing a safe, quality hunting experience. The factors most often cited as contributing to a quality hunt include ease of access to hunting lands, a feeling of safety, proper distribution of hunters (i.e., lack of interference from other hunters), observing turkeys while hunting, having the opportunity to get a shot, and success in harvesting a turkey (Smith et al. 1992, Dingman 2003). Success is the most often cited factor influencing a quality hunting experience (Stankey et al. 1973, Hende 1974, Dingman 2003). Based on the results from this survey, hunters in the surveyed permit areas generally are experiencing a quality hunt (mean score = 3.3), which is characterized by relatively high success (mean = 30%), low interference rates (mean = 11%), relatively easy access to hunting land (74% of hunters reported finding a place to hunt as "somewhat easy" or "very easy"), and the majority of hunters (70%) hunted private land, indicating that access to hunting land does not appear to be an issue for most hunters.

The survey area covered southeastern Minnesota, which is where wild turkeys were initially reintroduced and where the first spring season was held in 1978. This area has the highest hunter density (mean = 0.7 permits/mi^2 of PA; Time Periods A-F) in the State, which is one factor that can contribute to increased interactions among hunters. Although hunter density is relatively high (compared to other PAs in the state), 89% of respondents reported that another hunter did not interfere with their chance to harvest a turkey. Furthermore, 84% of hunters reported that interference did not occur and over half of the interference that was reported occurred mostly on private land. Interference occurring on privately owned land would seem to be a hunter-landowner issue (i.e., landowner allowing multiple hunters on their land at the same time or hunters choosing to hunt land that they know other hunters are hunting). In PA 344, which contains a large tract of publicly owned land (i.e., Whitewater Wildlife Management Area), 77% of hunters reported that interference did not occur and only 7% indicated that interference was the most important factor in determining a quality hunting experience for them. Overall, respondents indicated that the most important factor in determining a quality turkey hunting experience was "seeing turkeys/calling birds in/hearing gobbling." Hunters reported quality as slightly above average (mean score = 3.3) across all PAs and treatment groups, and hunters that successfully harvested a turkey rated quality slightly higher (mean score = 4.0), which is consistent with previous surveys that found success to be the most important factor in determining a quality turkey-hunting experience (Dingman 2003).

We also found a high level of turkey-hunter retention (i.e., 87% of respondents hunted in 2 of the last 3 years) and high fidelity to a turkey permit area (e.g., 70% of respondents applied or hunted 2 of the last 3 years in the same area they hunted in 2010). The southeast region also appears to be drawing hunters from other areas of the state (e.g., 77% of respondents indicated they did not live in the area they hunt).

There was a notable difference in the overall response rate among the 3 treatment groups (74% mail-back, 65% mixed-mode, and 44% internet only), but there was an inverse relationship in terms of the cost of conducting each survey. The estimated cost per useable return was $1.96 for the internet-only survey, $2.24 for the mixed-mode survey, and $2.75 for the mail-back survey. We included costs for printing services, postage, envelopes, and data entry services, but we did not include programming cost ($420) for the internet database because we used the same database to store returns from all 3 treatment groups. Although the cost per useable return was lowest for the internet-only survey, we caution that cost is only one of several factors that should be considered when choosing a survey design. For example, the low response rate in the internet-only survey and information from the follow-up survey (security concerns, technical difficulties, no computer) raises concerns about the potential for non-response bias in the internet-only survey. Likewise, the low response rate in the internet-only survey means that more effort would be needed to obtain a similar sample size and level of precision as in the mail-back survey, and whether such additional costs would be linear with respect to estimated cost/useable return is not clear. For example, you would likely need to mail out more surveys initially and conduct >1 follow-up survey, both of which would increase mailing and non-respondent costs.

Within the internet treatment there were some hunters that reported an inability to access the survey site. In follow-up phone conversations with hunters who called looking for assistance in locating the website, it was discovered that the problem was due to hunters using an internet search engine (i.e., Google, Bing, Yahoo, etc) to type the web address provided on the survey card rather than using browser address bar. The survey website was not indexed on search engines and consequently hunters were unable to find the site. A link to the survey website was placed on the MNDNR Farmland Wildlife Populations and Research Group and the MNDNR Wild Turkey web pages (the 2 most common sites visited by hunters looking for the survey website), which re-directed respondents to the correct URL. Undoubtedly this contributed to the lower response rate in the internet treatment group (e.g., additional hunters tried to access the internet survey, could not, and disposed of survey postcard). We also asked hunters that received a mailback survey if they would respond to the survey if they received a postcard directing them to a computer website; 77% indicated “yes” they would respond, 22% “no”, and 1% did not answer the question. This suggests that most hunters are willing to respond to an internet-based survey, but technical problems must be resolved and tradeoffs involving non-response bias, precision, and costs should be more carefully evaluated before committing to an internet-only survey design.

ACKNOWLEDGEMENTS

J. Giudice and K. Haroldson provided valuable input on survey design and analysis. J. Giudice reviewed an earlier draft of this report. B. Pellinen programmed the survey database. I would like to thank T. Klinkner who provided data entry and survey logistics assistance.

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Table 1. Spring wild turkey hunter's surveyed (*n*) and response rate (%) by permit area, mailing, and treatment group for the 2010 spring wild turkey season, Minnesota.

	Mailback[a]		Mixed-mode[b]		Internet[c]	
Permit area	*n*	%	*n*	%	*n*	%
1st mailing						
344	151	58	154	23	154	30
345	163	51	161	27	161	21
346	156	51	155	23	157	22
348	160	61	161	25	161	29
349	177	60	175	34	175	24
Total	807	56	806	27	808	25
2nd mailing						
344	62	39	119	50	108	28
345	79	41	117	53	125	20
346	75	39	119	48	119	24
348	60	48	121	64	113	24
349	69	39	114	48	133	28
Total	345	41	590	53	598	25
Overall						
344	151	74	154	62	154	49
345	163	71	161	66	161	37
346	156	70	155	60	157	41
348	160	79	161	73	161	46
349	177	76	175	66	175	45
Total	807	74	806	65	808	44

[a] Hunters received a postage-paid paper mailback survey for both mailings.
[b] Hunters received a postcard with a website address and unique survey identification number on the first mailing. Non-respondents received a postage-paid mailback survey for the second mailing.
[c] Hunters received a postcard with a website address and a unique survey identification number and were asked to go to the website to complete the survey.

Table 2. Mean hunt-quality scores, interference rates, and ease of access (to hunting land) by treatment group for the 2010 spring wild turkey season, Minnesota.

			Ease of access to hunting land (%)				
Treatment group	Mean hunt quality score	Interference rates (%)	Very difficult	Somewhat difficult	Somewhat easy	Very easy	Total(*n*)
Mailback	3.2	11	4	22	31	43	592
Mixed-Mode	3.4	13	4	23	33	40	518
Internet	3.4	10	4	20	30	46	352

Table 3. The most important factors hunters selected in determining a quality spring turkey hunt by permit area during the 2010 spring wild turkey season, Minnesota.

	Permit area				
Most important factor in determining quality	344	345	346	348	349
An opportunity to kill a turkey	18%	10%	10%	9%	14%
Seeing turkeys/calling birds in/hearing gobbling	1%	53%	63%	56%	56%
Killing a turkey (Tom, Jake, Bearded hen)	1%	1%	2%	1%	1%
Killing a mature Tom	4%	4%	2%	3%	3%
Weather	3%	6%	3%	5%	4%
Not seeing other hunters	3%	1%	1%	2%	2%
Not being interfered with by other hunters	7%	5%	3%	3%	2%
Spending time with family and friends	54%	10%	9%	12%	10%
Access to private hunting land	1%	3%	3%	2%	3%
Being successfully drawn to hunt an early time period	9%	6%	4%	7%	5%
Total (*n*)	253	277	258	313	325

Table 4. Number of hunters that indicated another hunter kept them from hunting where they wanted by permit area during the 2010 spring wild turkey season, Minnesota.

Permit area	Definitely Yes	Somewhat	Not Much	Not at All
344	29	63	72	116
345	20	37	59	161
346	17	39	53	150
348	23	39	61	191
349	19	48	61	197
Total (*n*)	108	226	306	815

Table 5. Hunters who indicated another hunter interfered with their chance to harvest a turkey, type of land where interference occurred, and number of days interference occurred by permit area during the 2010 spring wild turkey season, Minnesota.

	Another hunter interfered with chance to harvest a turkey		Type of land interference occurred on			Number of days interference occurred		
Permit area	Yes	No	Public	Private	Interference didn't occur	Mean	Range	# reporting zero days
344	49	231	58	7	215	0.65	0 - 7	172
345	28	249	11	33	233	0.38	0 - 4	202
346	27	232	7	31	221	0.33	0 - 7	206
348	30	285	16	33	264	0.39	0 - 5	235
349	32	294	13	29	284	0.34	0 - 4	256
Total (*n*)	166	1291	105	133	1217			1051

Table 6. Ease of access to hunting land and type of land hunted by permit area during the 2010 spring wild turkey season, Minnesota.

	Ease of access to hunting land				Type of land hunted		
Permit area	Very difficult	Somewhat difficult	Somewhat easy	Very easy	Private	Public	Both
344	7	61	102	111	59	165	57
345	15	66	83	114	244	10	24
346	8	54	84	115	233	5	23
348	11	70	94	141	232	35	50
349	15	70	99	142	264	26	37
Total (*n*)	56	321	462	623	1032	241	191

Table 7. Number of private land hunters who indicated they were the landowner or tenant of the land they hunted, and number of public land hunters who indicated they hunted public land exclusively because they could not gain access to private land during the 2010 spring wild turkey season, Minnesota.

	Private land hunters			Public land hunters[a]	
Permit area	Landowner	Tenant	Neither	Yes	No
344	6	4	106	83	134
345	35	5	228	10	35
346	39	8	210	9	23
348	37	11	233	30	58
349	39	9	253	23	52
Total (*n*)	156	37	1030	155	302

[a] Respondents were asked "yes" or "no" if they hunted public land exclusively because they could not access private land

Table 8. Hunters perception of changes in turkey numbers by permit area over the last 3 spring wild turkey seasons, Minnesota.

Permit area	Increased	Decreased	About the same	Didn't hunt the Same PA
344	31	64	151	34
345	32	95	129	20
346	24	100	126	10
348	46	96	150	23
349	20	154	134	18
Total (*n*)	153	509	690	105

Table 9. Respondents that live in the permit area they hunted in 2010, number of seasons respondents applied or hunted in the area they hunted in 2010, and total number of spring wild turkey seasons hunted by permit area during the previous 3 (2007-2009) seasons.

Permit area	Live in PA they hunted		# of seasons (2007-2009) applied or hunted in PA they hunted in 2010				# of seasons hunted in last 3 spring seasons (2007- 2009)			
	Yes	No	0	1	2	3	0	1	2	3
344	45	236	43	65	49	120	46	87	40	102
345	107	171	42	35	54	143	35	33	58	149
346	65	196	21	36	40	159	18	36	46	156
348	52	265	39	82	61	135	34	102	70	108
349	65	262	32	45	53	191	29	63	66	161
Total (*n*)	334	1130	177	263	257	748	162	321	280	676

Appendix A.

Minnesota Spring Turkey Hunter Survey

Please respond to all the questions based on the spring 2010 turkey season

1. Did you hunt turkeys in Minnesota during the spring 2010 season?
   Yes____ No*____

   * If you did not hunt during the 2010 spring turkey season please do not continue

2. Did you successfully harvest a turkey during the 2010 spring wild turkey season?
   Yes____ No____

3. How many days did you hunt during the 2010 spring wild turkey season (check only one)?
   1____ 2____ 3____ 4____ 5____ 6____ 7____

4. In which of the past 3 spring turkey hunting seasons did you hunt in Minnesota (check all that apply)?
   2007____ 2008____ 2009____

5. During which of the 3 past spring turkey seasons (2007-2009) did you apply and/or hunt in the permit area where you hunted in 2010 (check all that apply)?
   2007____ 2008____ 2009____

6. Do you live in the permit area in which you generally apply and hunt?
   Yes____ No____

7. How difficult was it to find a place to hunt during the 2010 spring turkey season (check only one)?
   Very difficult____ Somewhat difficult____ Somewhat easy____ Very easy____

8. What type of land did you hunt during the 2010 spring season (check only one)?
   Private land____ Public land____ Both____

9. If you hunted private land, were you the landowner or the tenant of the land (check only one)?
   Landowner____ Tenant____ Neither____ I did not hunt on private land____

10. If you hunted public land exclusively was it because you could not gain access to private land (check only one)?
    Yes____ No____ I did not hunt on public land____

11. Over the last 3 spring turkey seasons do you feel turkey numbers have changed in the permit area you hunt (check only one)?
    Increased____ Decreased____ About the same____ Did not hunt same PA____

12. During the 2010 spring turkey season, did other hunters keep you from hunting where you wanted to hunt (check only one)?
    Definitely Yes____ Somewhat____ Not Much____ Not at All____

13. Did another hunter interfere with your chance to harvest a turkey?
    Yes____ No____

14. If yes, what type of land were you hunting when another hunter interfered with your chance to bag a turkey (check only one)?
    Public____ Private____ Interference did not occur____

15. How many days did you experience interference from another turkey hunter while hunting during the 2010 spring turkey season (check only one)?
    0____ 1____ 2____ 3____ 4____ 5____ 6____ 7____

16. Rate the quality of your turkey hunting experience during spring 2010 on a scale of 1- 5 (check only one number):

    Poor Quality Average Quality Excellent Quality

    1____ 2____ 3____ 4____ 5____

17. What is the most important factor in determining a quality spring turkey hunting experience in Minnesota for you (check only one)?
    An opportunity to kill a turkey____
    Seeing turkeys/calling birds in/hearing gobbling____
    Killing a turkey (Tom, Jake, Bearded hen)____
    Killing a mature Tom____
    Weather____
    Not seeing other hunters____
    Not being interfered with by other hunters____
    Spending time with family and friends____
    Access to private hunting land____
    Being successfully drawn to hunt an early time period____

18. In the future, would you respond to this survey if you received a postcard directing you to a computer website to fill out the survey?
    Yes____ No____

Appendix B.

Minnesota Spring Wild Turkey Hunter
Follow-Up Survey

1. What were your reasons for not responding to the initial survey? (*check all that apply*)

   a. Did not want to participate in the survey______

   b. Do not own a computer or have access to the internet______

   c. Concerned about privacy issues associated with using the internet______

   d. Encountered technical problems trying to access the survey site______

   e. Other (please state)____

2. If you checked item *d* above, please describe the problems you encountered.

   ____
   ____
   ____

3. If you attempted to access the survey web site through the internet, which of the methods listed below did you use? (*check only one*)

   a. Typed web address provided on postcard into the browser address bar______

   b. Typed web address on the postcard into a search engine (e.g., Google, Yahoo, Bing, etc)_____

   c. Other (please state)____

   d. Did not try to complete the survey______

4. Do you have comments or suggestions on how to make the internet–based survey easier to use?

WILDLIFE DAMAGE COMPLAINTS

NOTE: Wildlife damage complaint information is collected statewide from wildlife managers. The data is compiled and summarized at the Farmland Wildlife Research Station, 35365 800th Avenue, Madelia, MN 56062-9744

WILDLIFE DAMAGE COMPLAINTS

Nick Reindl, Wildlife Damage Program Coordinator
Steve Benson, Wildlife GIS Coordinator

Wildlife damage complaint information is collected statewide from wildlife managers. The 2010 information was compiled by MIS – GIS and summarized by the Wildlife Damage Program Coordinator, 1601 Minnesota Drive, Brainerd, MN 56401.

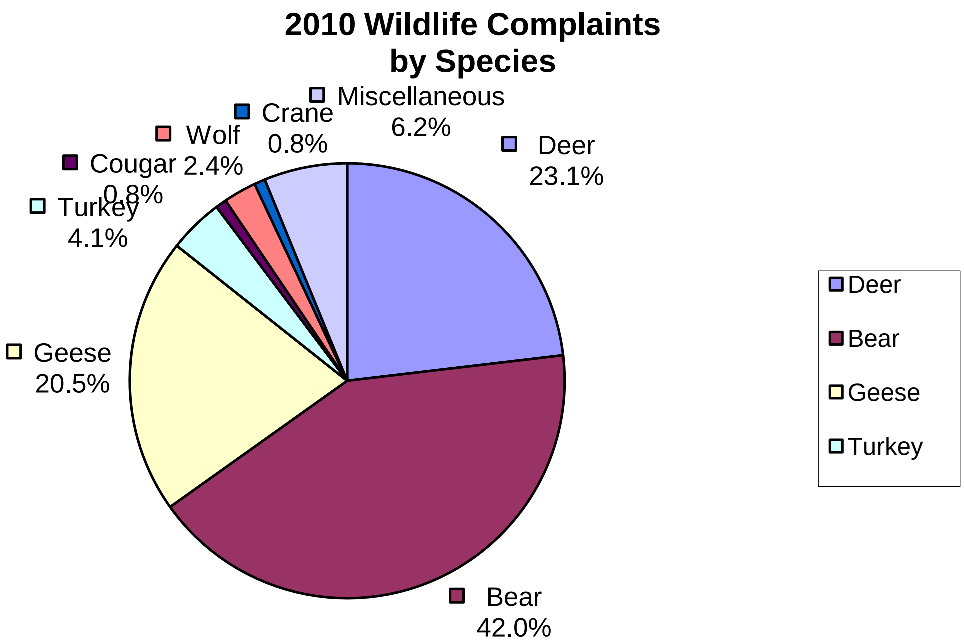

Figure 1. Wildlife complaints by species for the year 2010, in Minnesota.

Wildlife managers recorded a total of 614 wildlife complaints in 2010, down 1% from the 2009 total of 620 complaints. Three species; black bear, white-tailed deer, and Canada geese account for 86% (n=526) of the complaints received (Figure1). Five other species of special interest for wildlife damage; cougar, elk, turkey, sandhill crane, and wolf comprise an additional 8% (n=50) of the recorded complaints. Fourteen species are represented in 6% (n=38) of the miscellaneous complaints received, fifteen of those were for beaver.

During calendar year 2010 materials and assistance were provided for permanent, woven wire, deer exclusion fences to 16 specialty crop producers. Crops protected included mixed vegetable (n=5), apple orchard (n=3), blueberries (n=1), Christmas trees (n=2), vineyards (n=2), nursery (n=1) and hay yard (n=2). In addition, materials were provided to upgrade one energized slant fence for an orchard and technical assistance was provided to eight growers that built, or expanded, permanent fencing at their own cost, including two community gardens.

The number of deer shooting permits (n=56) was down 19% in 2010 compared to 2009 when 69 were issued. No landowner permits were issued for tuberculosis control and only one permit was issued for control of chronic wasting disease (Figure 9).

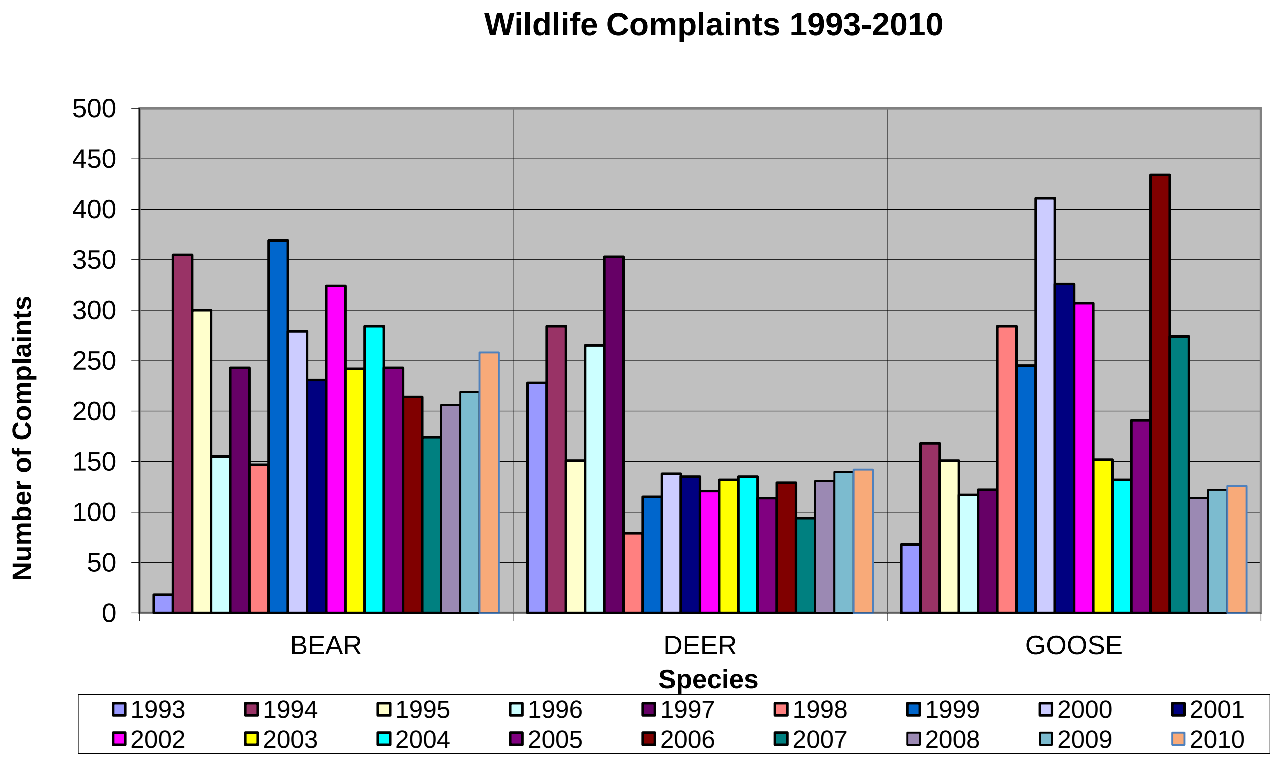

Figure 2. Number of wildlife complaints recorded for bear, deer and geese from 1993-2009, in Minnesota.

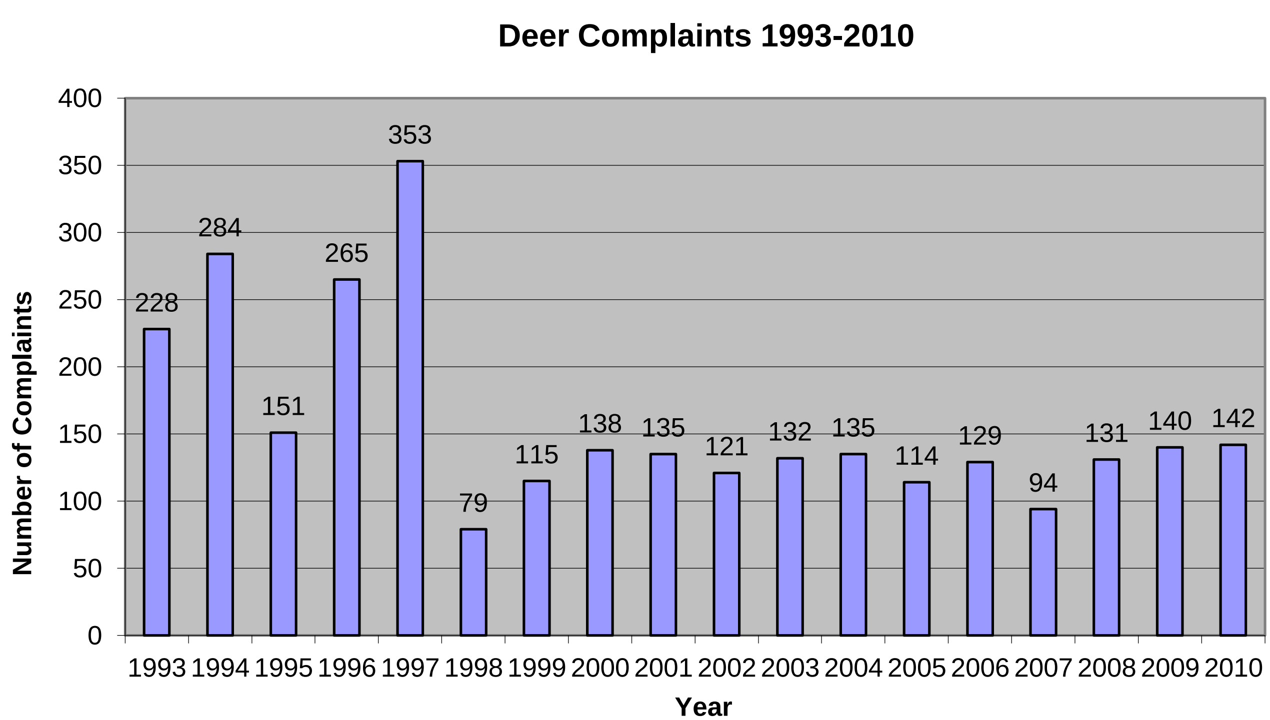

Figure 3. Number of deer complaints from 1993-2010, in Minnesota.

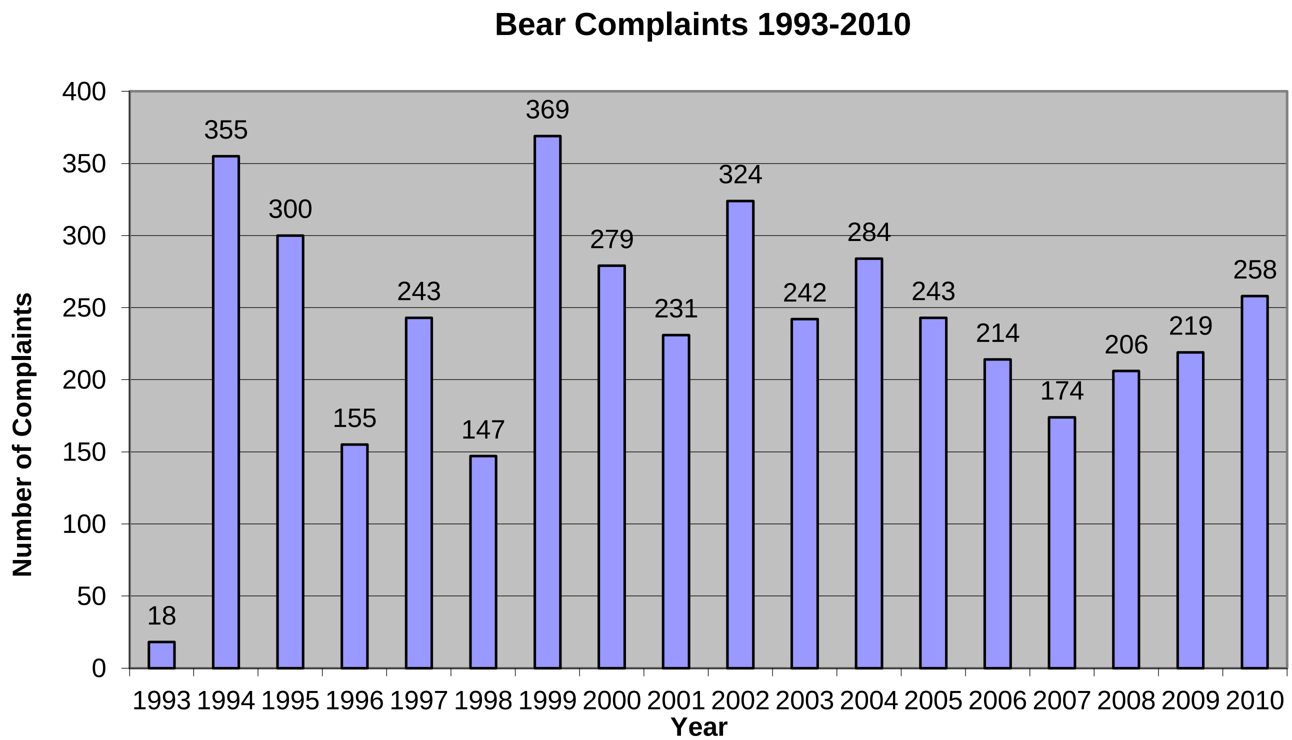

Figure 4. Number of bear complaints from 1993-2010 in Minnesota.

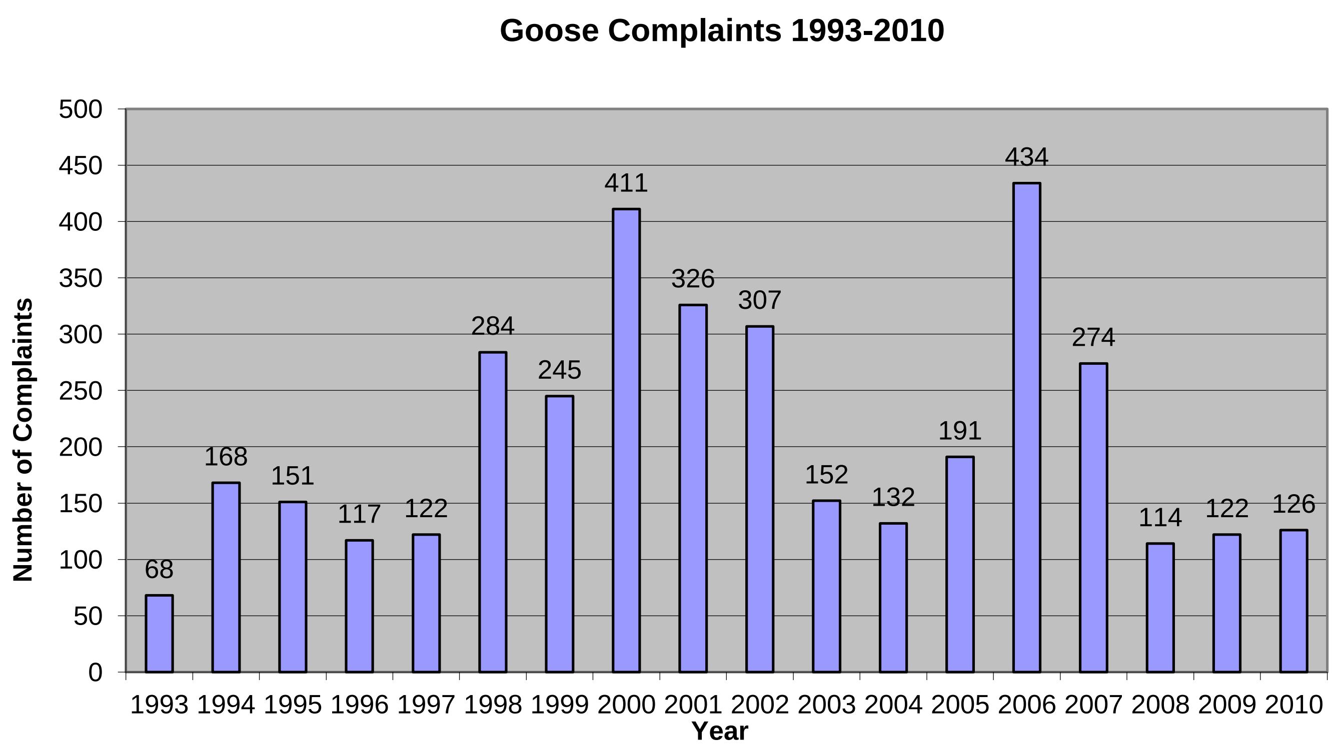

Figure 5. Number of goose complaints from 1993-2010, in Minnesota.

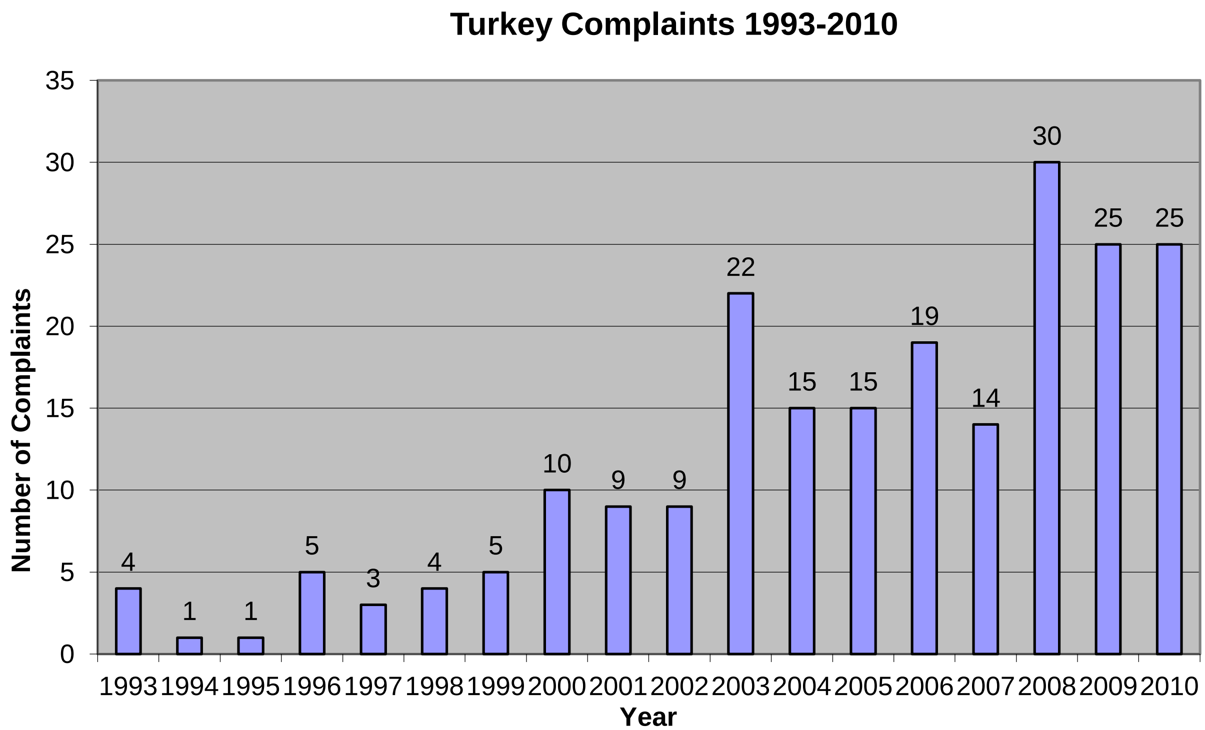

Figure 6. Number of turkey complaints from 1993-2010, in Minnesota.

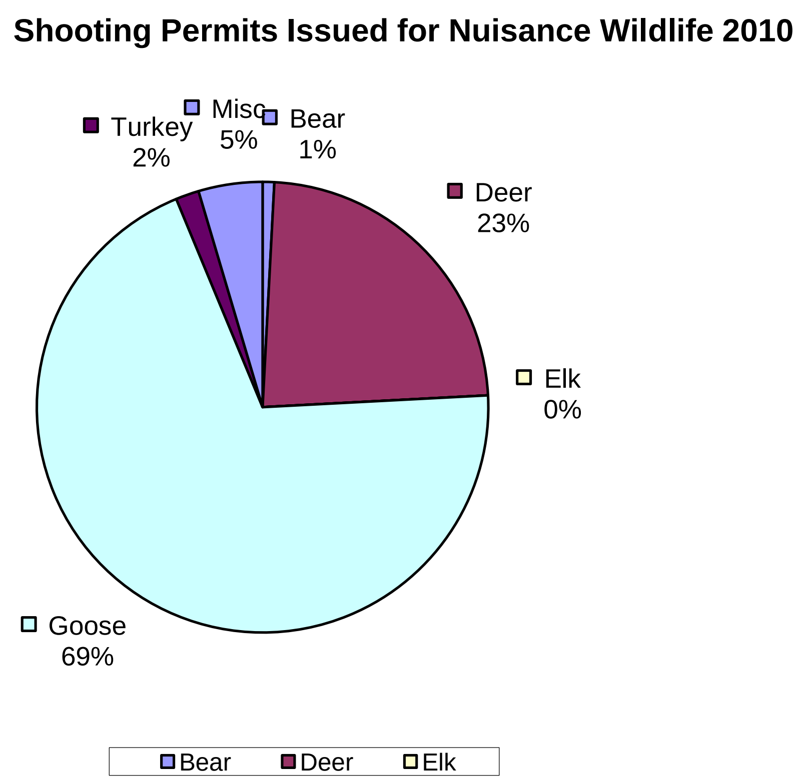

Figure 7. Shooting permits issued for nuisance wildlife control in Minnesota for 2010.

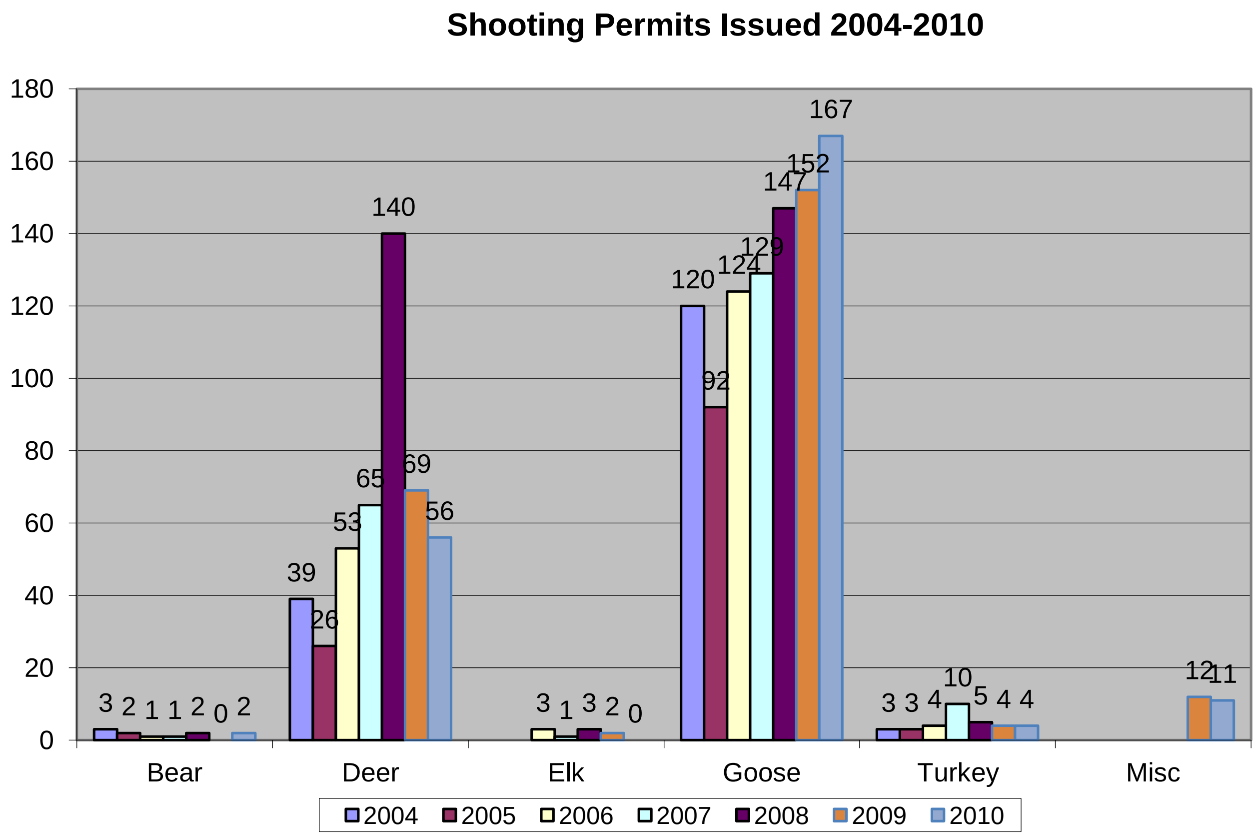

Figure 8. Shooting permits issued for nuisance wildlife control in Minnesota for 2004-2010.

The twelve miscellaneous permits issued in 2010 represent multi-species permits that were issued primarily to airport authorities for the control of birds posing a hazard to air traffic and one permit for river otter.

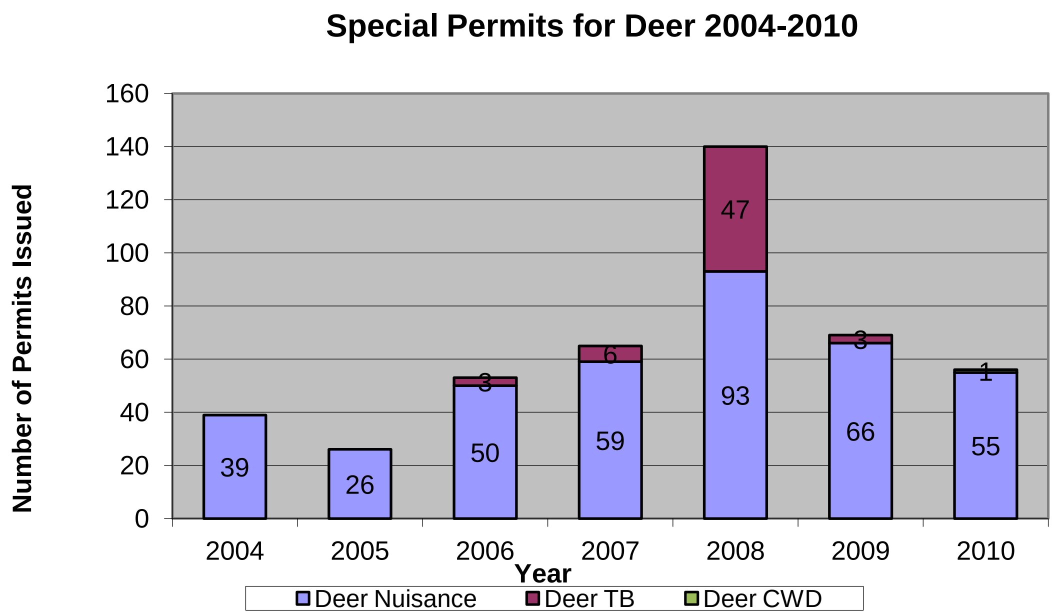

Figure 9. Shooting permits issued showing the portion related to tuberculosis (TB) and chronic wasting disease (CWD) control efforts in Minnesota for the period 2006-2010.

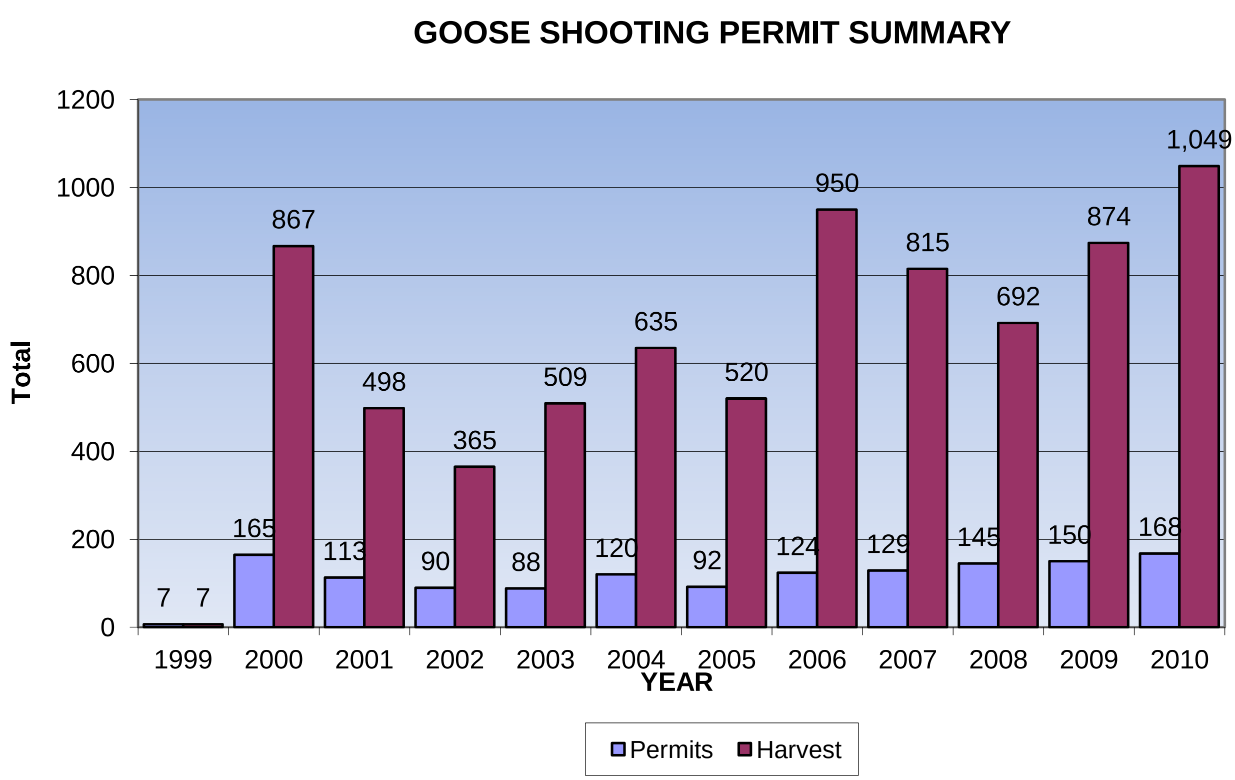

Figure 10. Comparison of nuisance goose shooting permits and harvest in Minnesota 1999-2010.

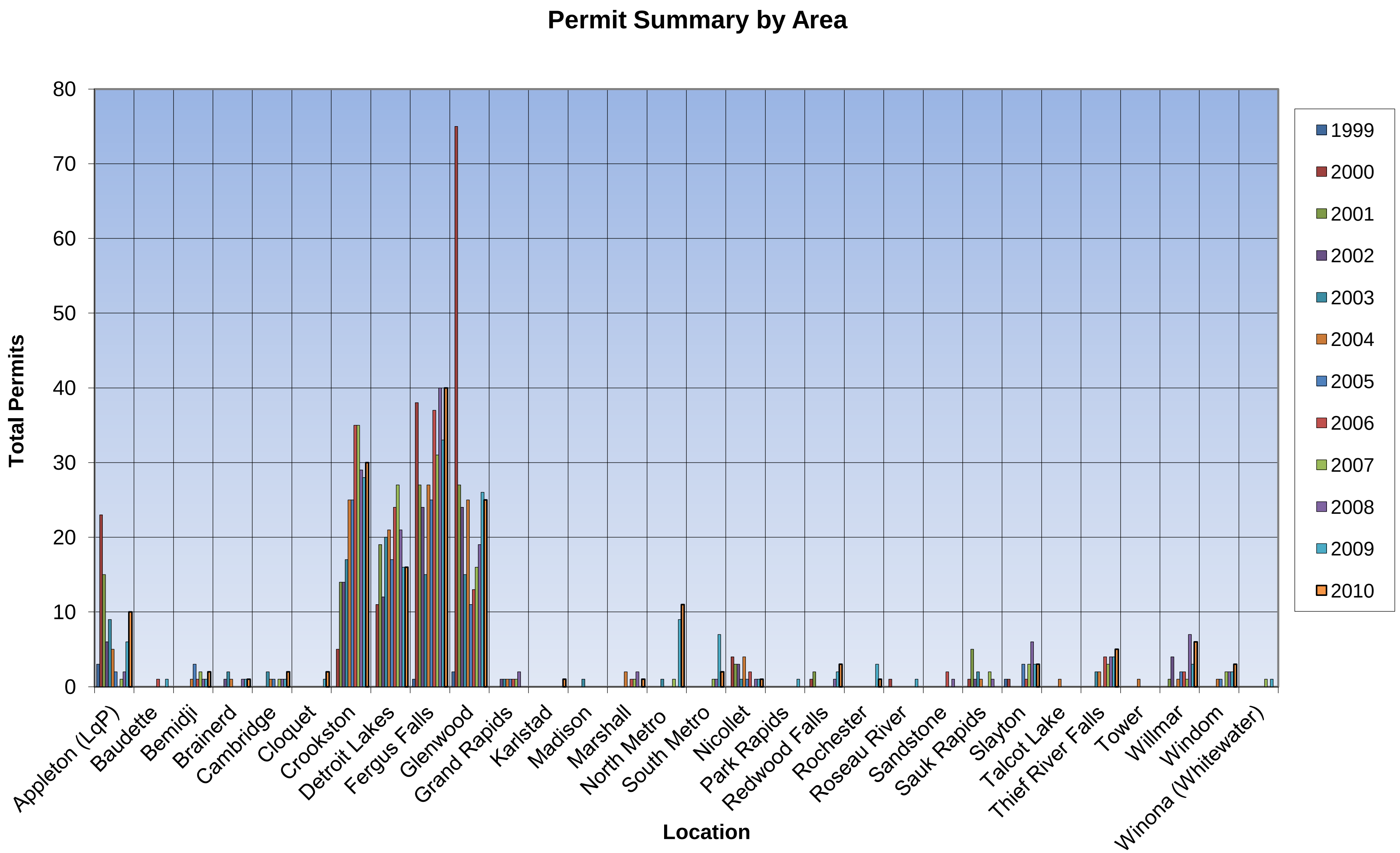

Figure 11. Nuisance goose permits issued by area wildlife offices in Minnesota 1999-2010.

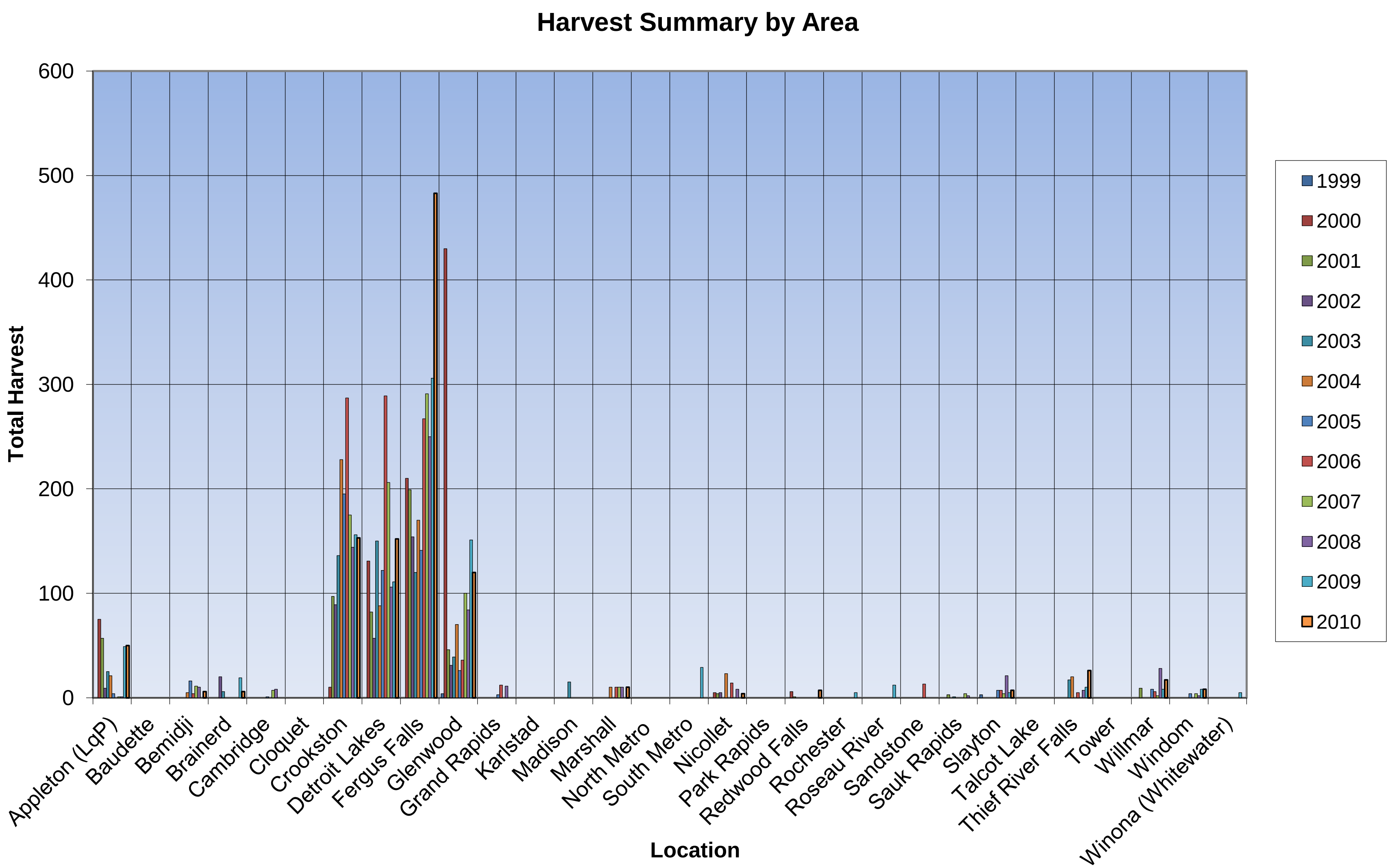

Figure 12. Nuisance goose harvest by area wildlife office in Minnesota 1999-2010.

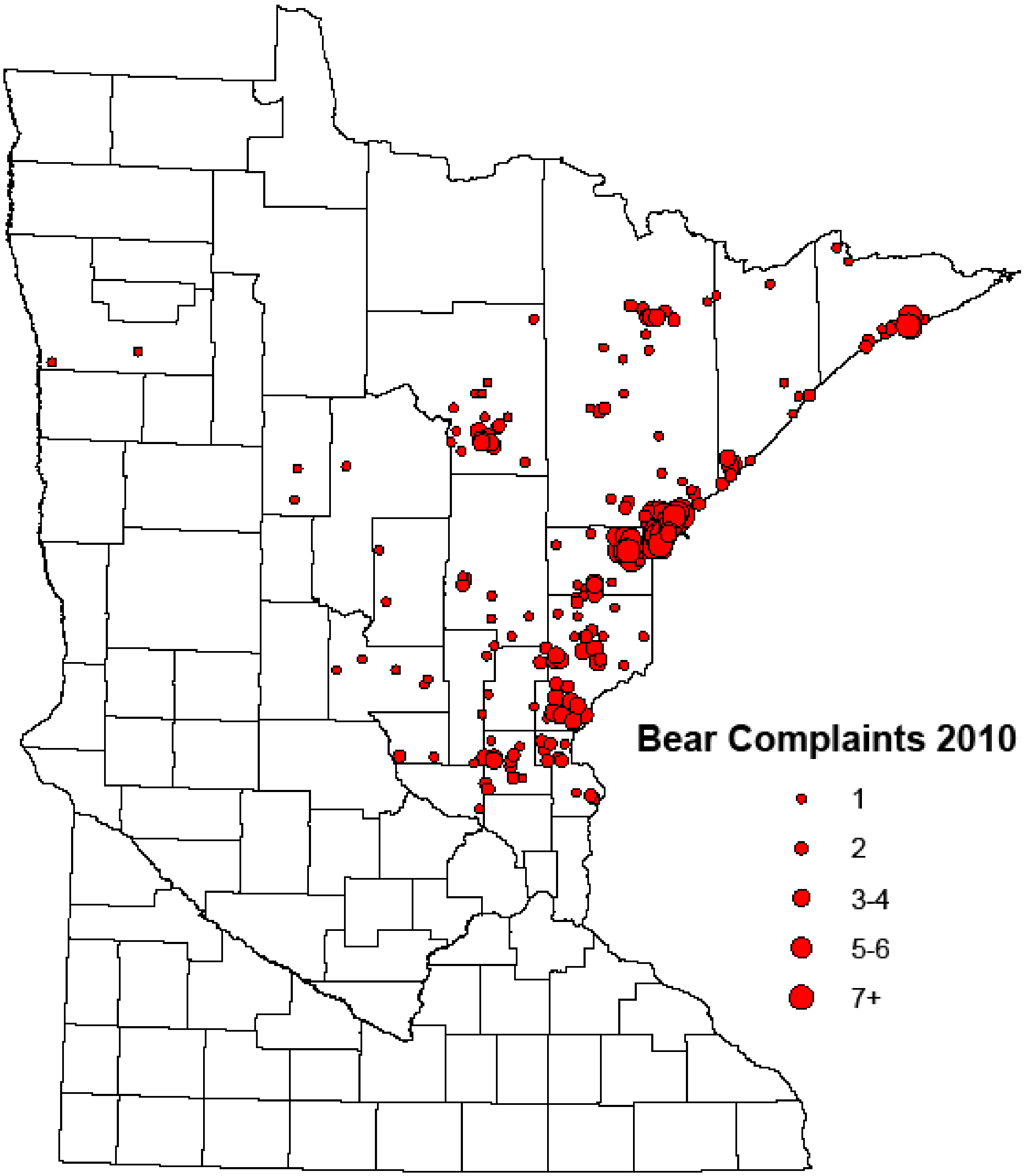

Figure 13. Location of bear damage complaints in 2010 (n= 256). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

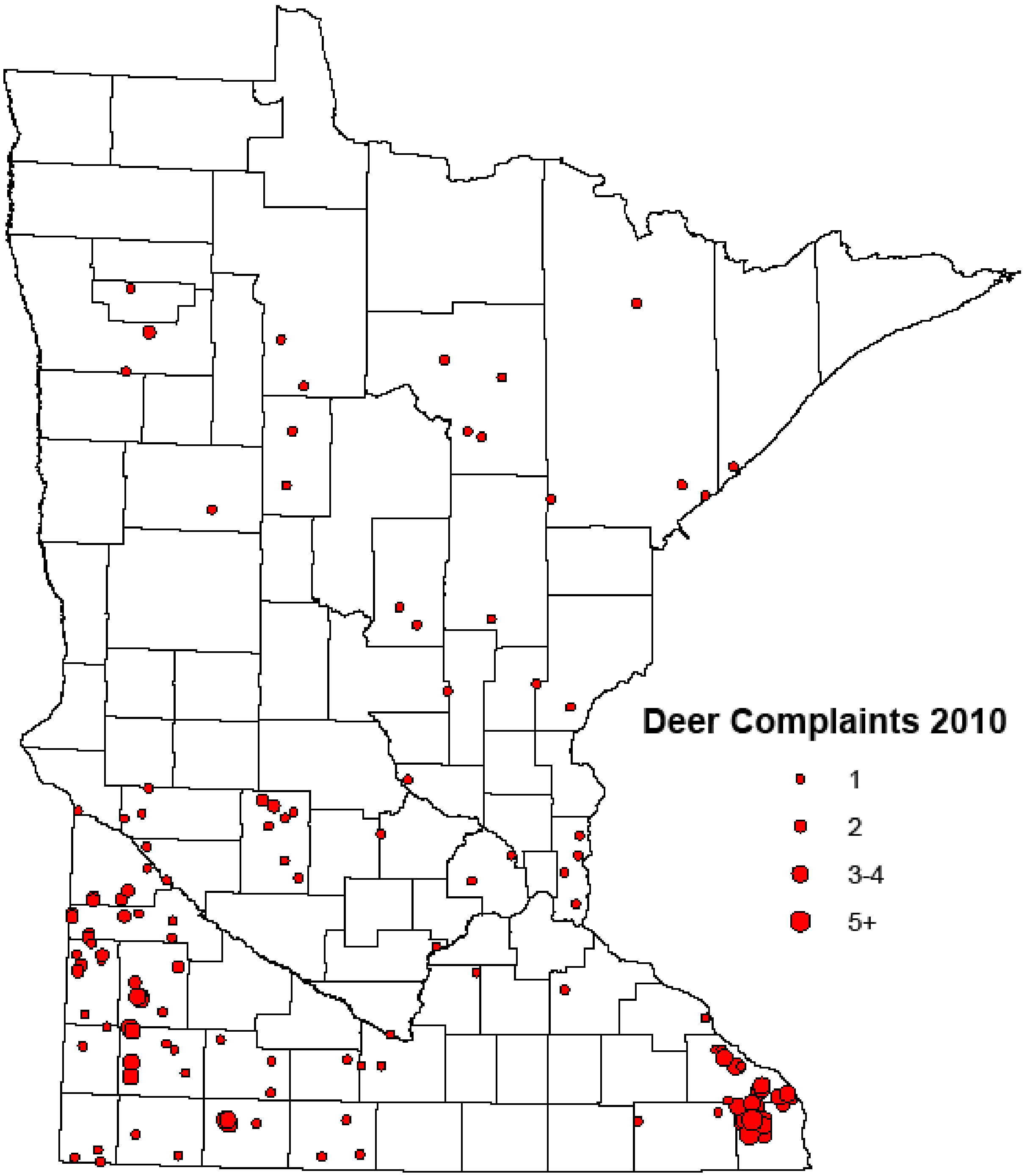

Figure 14. Location of deer damage complaints in 2010 (n= 142). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

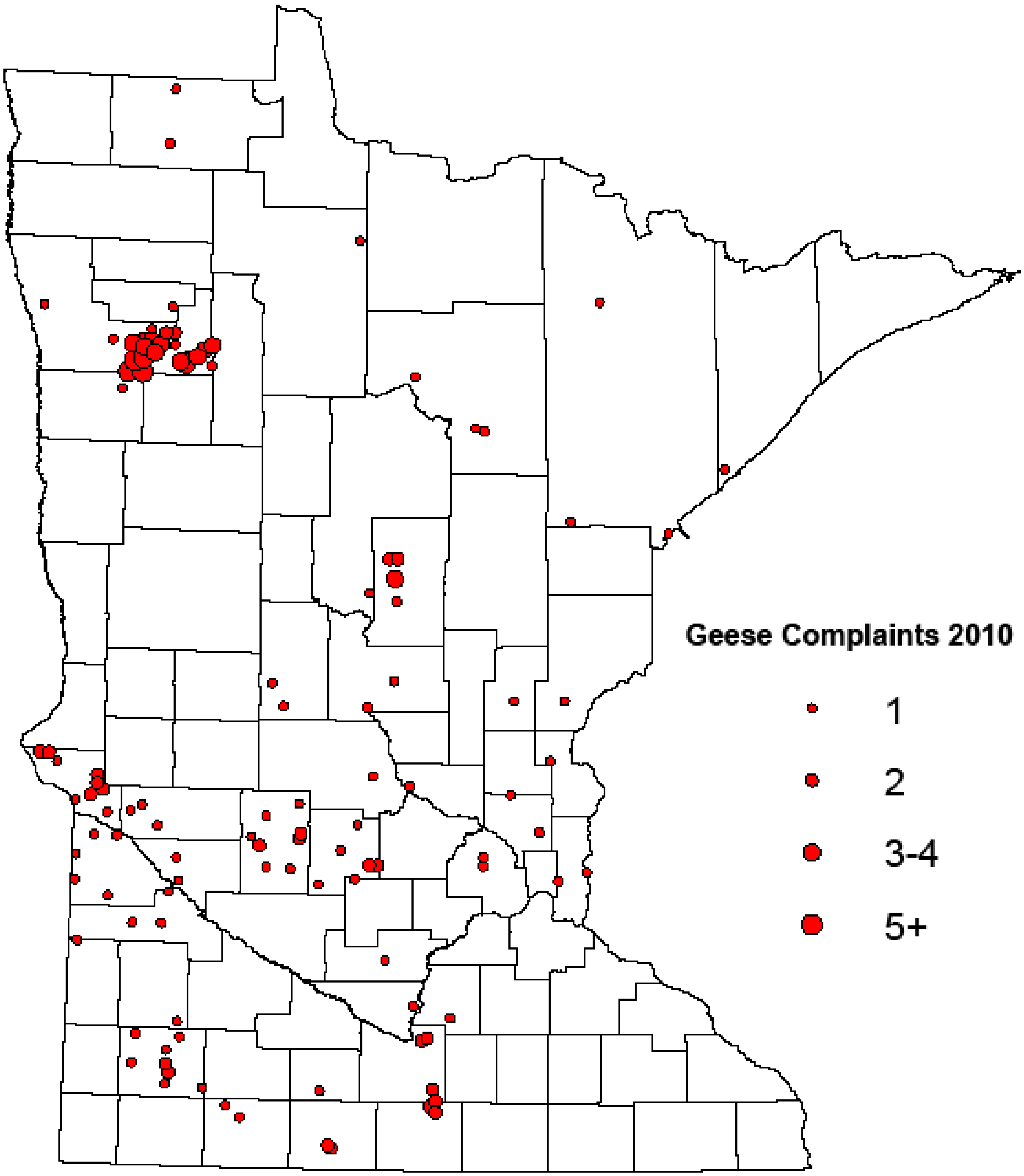

Figure 15. Location of goose damage complaints in 2010 (n= 125). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

CARNIVORE SCENT STATION SURVEY

AND

WINTER TRACK INDICES

NOTE: This survey is organized and coordinated by the Forest Wildlife Populations and Research Group, 1201 E. Hwy 2, Grand Rapids, MN 55744. Results are presented at this location in the book because of the statewide nature of the data.

CARNIVORE SCENT STATION SURVEY SUMMARY, 2010

John Erb, Minnesota Department of Natural Resources, Forest Wildlife Research Group

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on these populations. However, many carnivores are highly secretive, difficult to repeatedly capture, and naturally occur at low to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g., mark-recapture, distance sampling, etc.). Hence, indices of relative abundance are often used to monitor such populations over time (Sargeant et al. 1998, 2003, Hochachka et al. 2000, Wilson and Delahay 2001, Conn et al. 2004).

In the early 1970's, the U.S. Fish and Wildlife Service initiated a carnivore survey designed primarily to monitor trends in coyote populations in the western U.S. (Linhart and Knowlton 1975). In 1975, the Minnesota DNR began to utilize similar survey methodology to monitor population trends for numerous terrestrial carnivores within the state. This year marks the 35th anniversary of the carnivore scent station survey.

METHODS

Scent station survey routes are composed of tracking stations (0.9 m diameter circle) of sifted soil with a fatty-acid scent tab placed in the middle. Scent stations are spaced at 0.5 km intervals on alternating sides of a road or trail. During the initial years (1975-82), survey routes were 23.7 km long, with 50 stations per route. Stations were checked for presence/absence of tracks on 4 consecutive nights (old tracks removed each night), and the mean number of station visits per night was the basis for subsequent analysis. Starting in 1983, following suggestions by Roughton and Sweeny (1982), design changes were made whereby routes were shortened to 4.3 km, 10 stations/route (still with 0.5 km spacing between stations), and routes were surveyed only once on the day following route placement. The shorter routes and fewer checks allowed for an increase in the number and geographic distribution of survey routes. In either case, the design can be considered two-stage cluster sampling.

Survey routes were selected non-randomly, but with the intent of maintaining a minimum 5 km separation between routes, and encompassing the variety of habitat conditions within the work area of each survey participant. Most survey routes are placed on secondary (unpaved) roads/trails, and are completed from September through October. Survey results are currently stratified based on 3 'habitat zones' within the state (forest, farmland, and transition).

Track presence/absence is recorded at each station, and track indices are computed as the percentage of scent stations visited by each species. Confidence intervals (95%) are computed using bootstrap methods (percentile method; Thompson et al. 1998). For each of 1000 replicates, survey routes are randomly re-sampled according to observed zone-specific route sample sizes, and station visitation rates are computed for each replicate sample of routes. Replicates are ranked according to the magnitude of the calculated index, and the 25th and 975th values constitute the lower and upper bounds of the confidence interval.

RESULTS AND DISCUSSION

A total of 299 routes were completed this year (Figure 1). There were 2,738 operable scent stations examined on the 299 4.3 km routes. Route density varied from 1 route per 549 km^2 in the Forest zone to 1 route per 1,016 km^2 in the Farmland zone (Figure 1).

Statewide, route visitation rates (% of routes with detection) were highest for skunk (39%), followed by red fox (38%), raccoon (34%), domestic cat (28%), coyote (24%), and dog (21%). Regionally, route visitation rates were as follows: red fox – Farmland (FA) 22%, Transition (TR) 47%, Forest (FO) 40%; coyote – FA 37%, TR 37%, FO 11%; skunk – FA 41%, TR 48%, FO 33%; raccoon – FA 69%, TR 41%, FO 16%; domestic cat – FA 52%, TR 35%, FO 14%; and dog – FA 42%, TR 22%, FO 11%.

Figures 2-5 show station visitation indices (% of stations visited) from the survey's inception through the current year. Although the survey is largely intended to document long-term trends in populations, confidence intervals improve interpretation of the significance of annual changes. Based on the presence/absence of confidence interval overlap, the only significant change was a decline in the Forest zone red fox index (Figure 4). In addition, several changes occurred that approached significance, including increases in the Transition zone skunk index (Figure 2) and Forest zone wolf index (Figure 4). Both wolf and bobcat indices reached their highest level since the survey began, though confidence intervals, particularly for bobcats, are quite large (Figure 5).

Red fox indices remain well below their long-term mean in the Farmland zone (Figure 2), but appear to be, at least temporarily, rebounding in the Transition zone (Figure 3). The difference does not appear to be attributable to differences in coyote numbers, given similar and above-average coyote indices in the Farmland and Transition zones. However, coyote indices remain comparatively low in the Forest zone (Figure 4), likely attributable to the presence of wolves. While not significantly different from previous years, the point estimate for the Farmland zone raccoon index reached its highest level since the survey began.

ACKNOWLEDGEMENTS

I wish to thank all of the cooperators who participated in the 2010 survey: DNR Division of Wildlife staff; Superior National Forest Aurora District; Agassiz, Rydell, Sherberne, and Tamarac National Wildlife Refuges; USFWS Detroit Lakes Wetland Management Districts; 1854 Treaty Authority, White Earth and Leech Lake Tribal Natural Resource Departments; St. Croix National Scenic Waterway; Vermillion Community College; Cass and Beltrami County Land Departments; Marshall County Central High School; and Richard Nelles and Tom Stuber.

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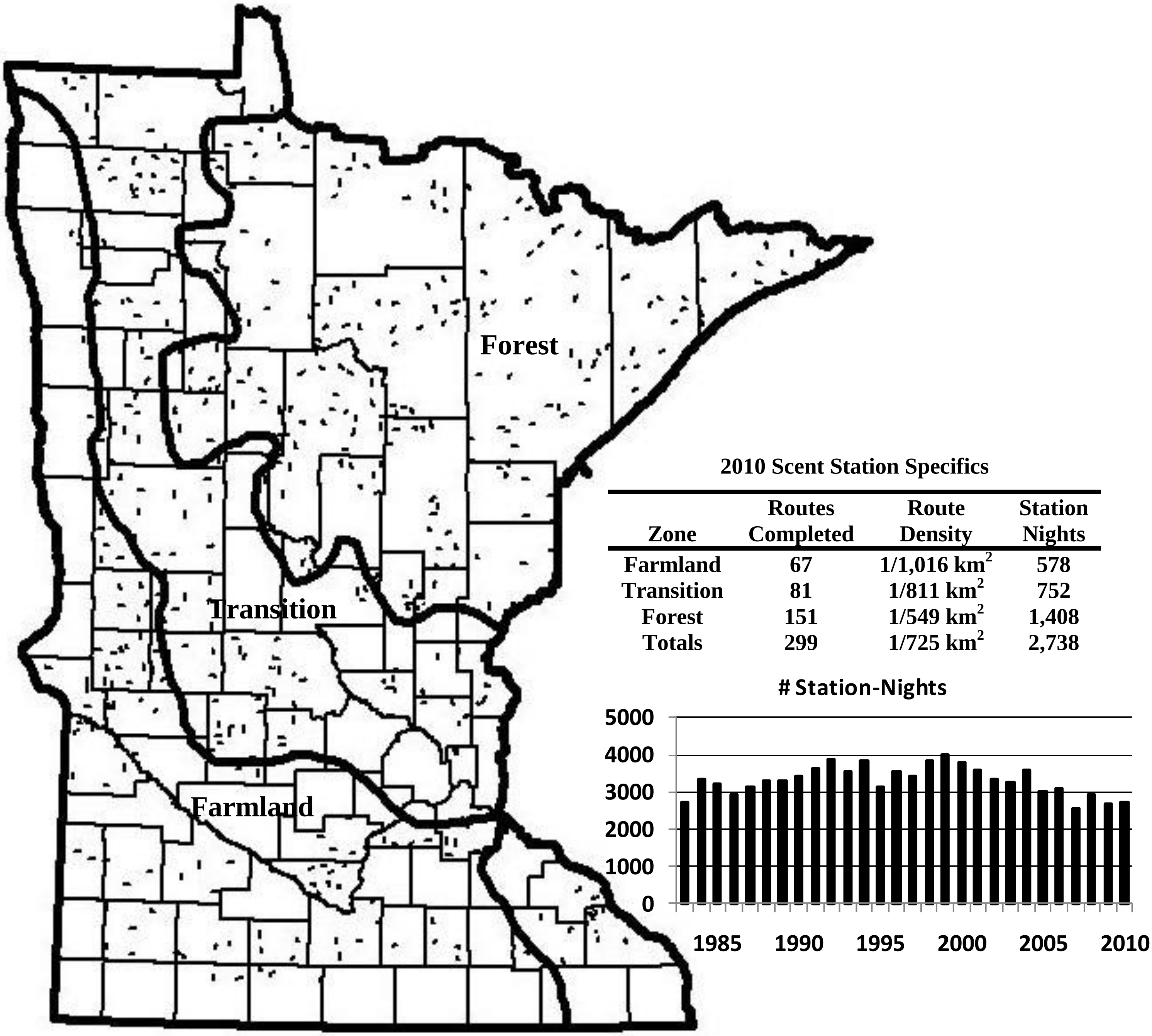

2010 Scent Station Specifics

Zone	Routes Completed	Route Density	Station Nights
Farmland	67	1/1,016 km^2	578
Transition	81	1/811 km^2	752
Forest	151	1/549 km^2	1,408
Totals	299	1/725 km^2	2,738

Figure 1. Locations of scent station routes. Insets show 2010 route specifics and the number of station-nights per year since 1983.

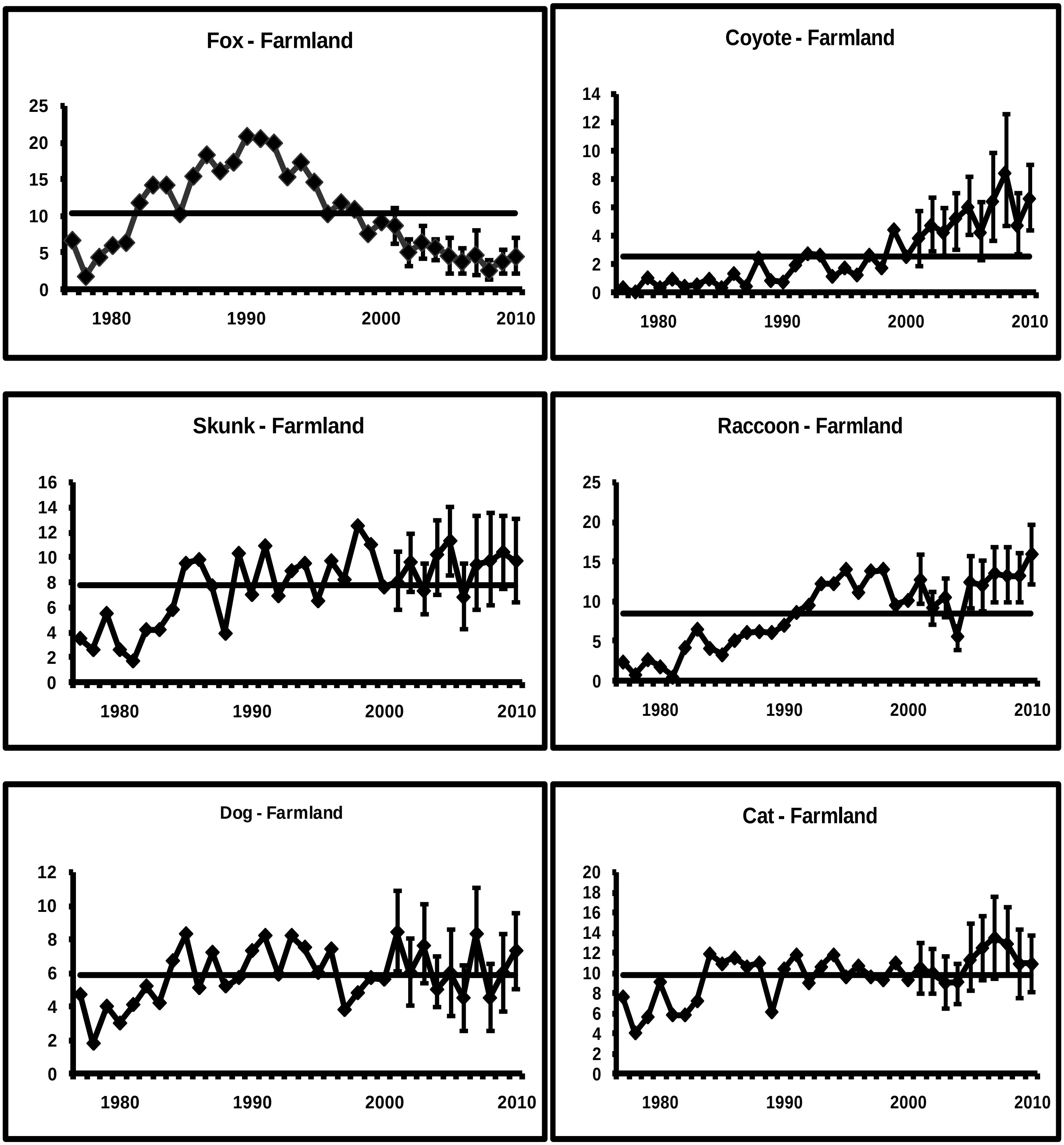

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2010. Horizontal line represents long-term mean.

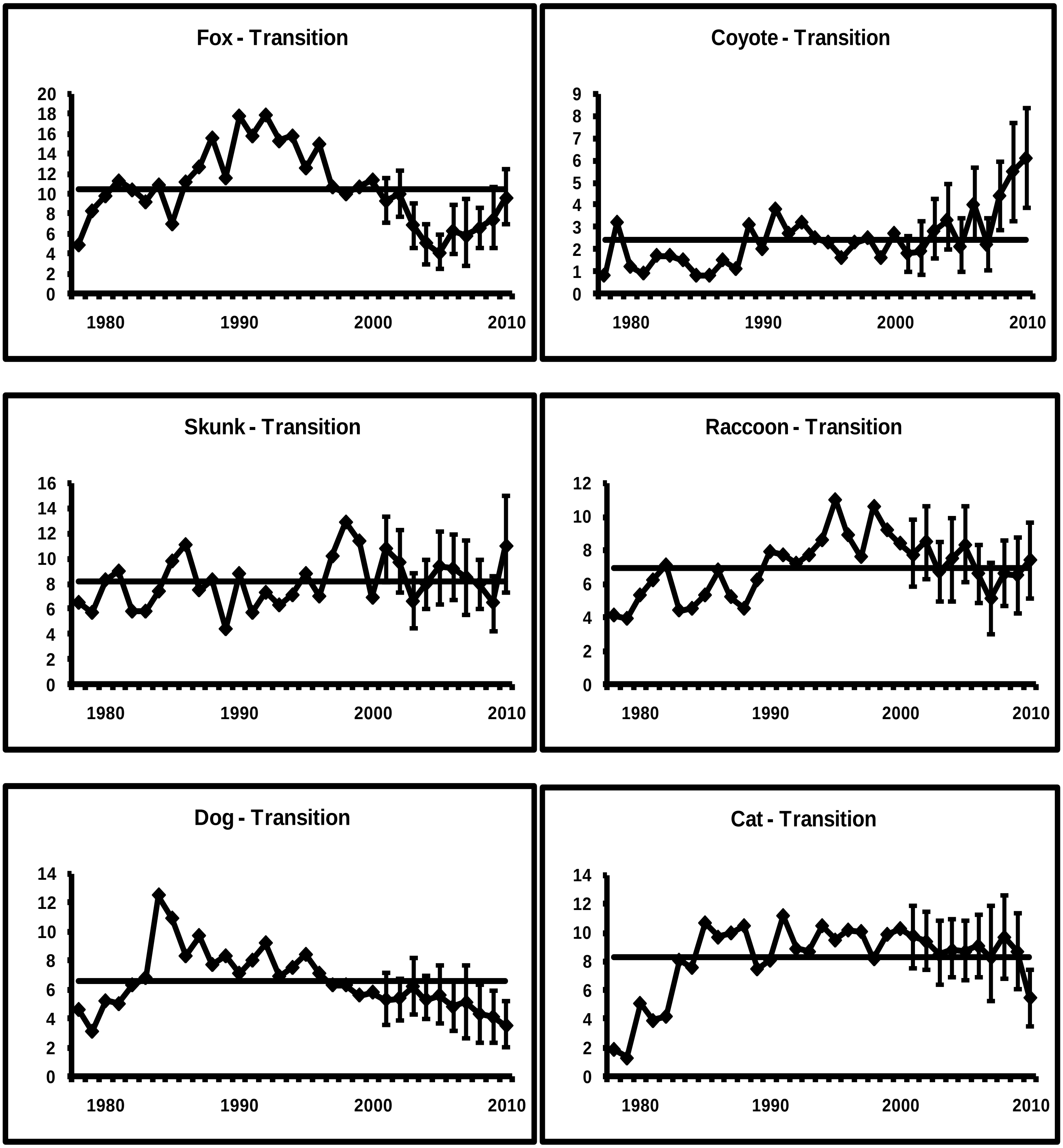

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2010. Horizontal line represents long-term mean.

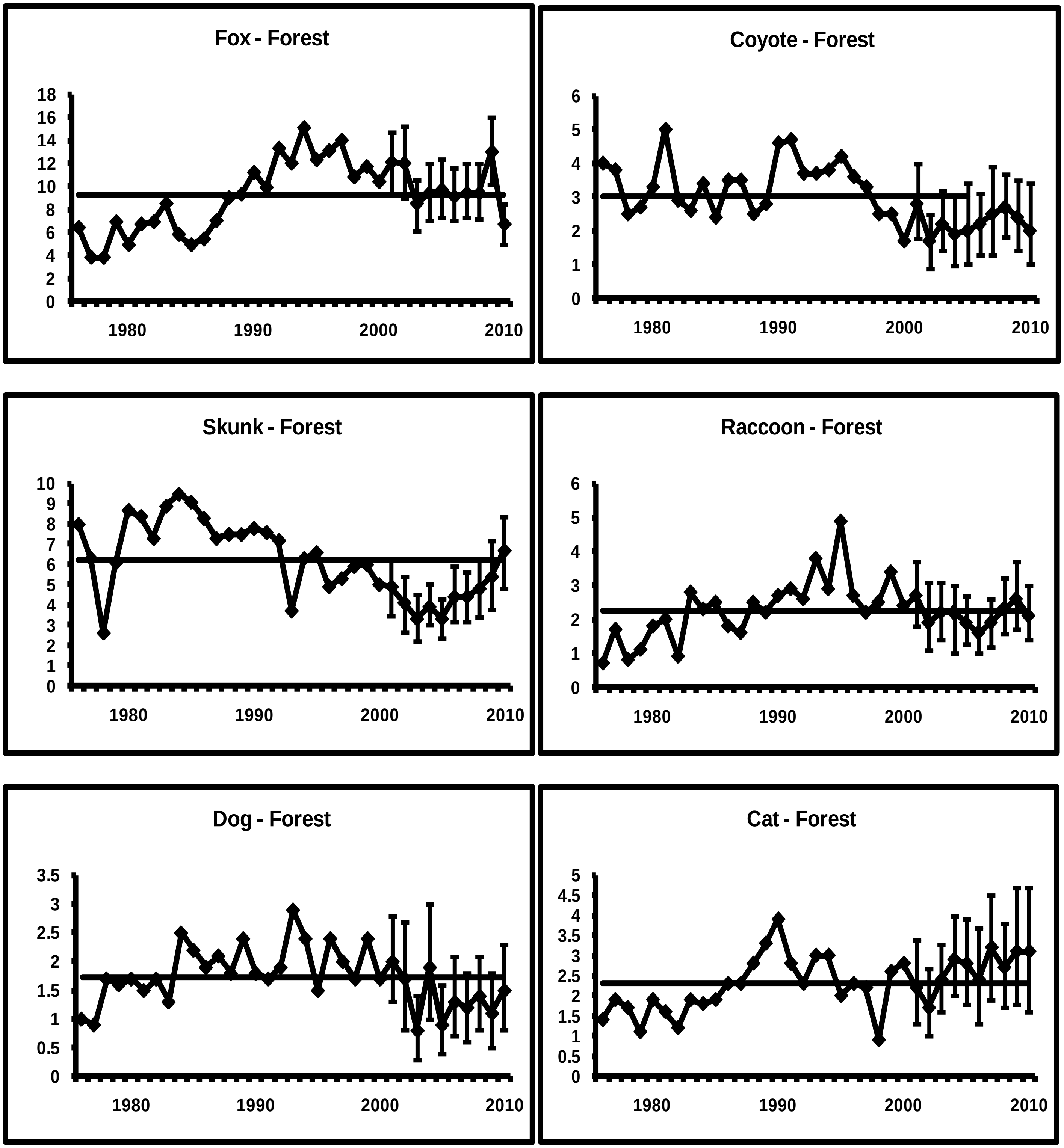

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2010. Horizontal line represents long-term mean.

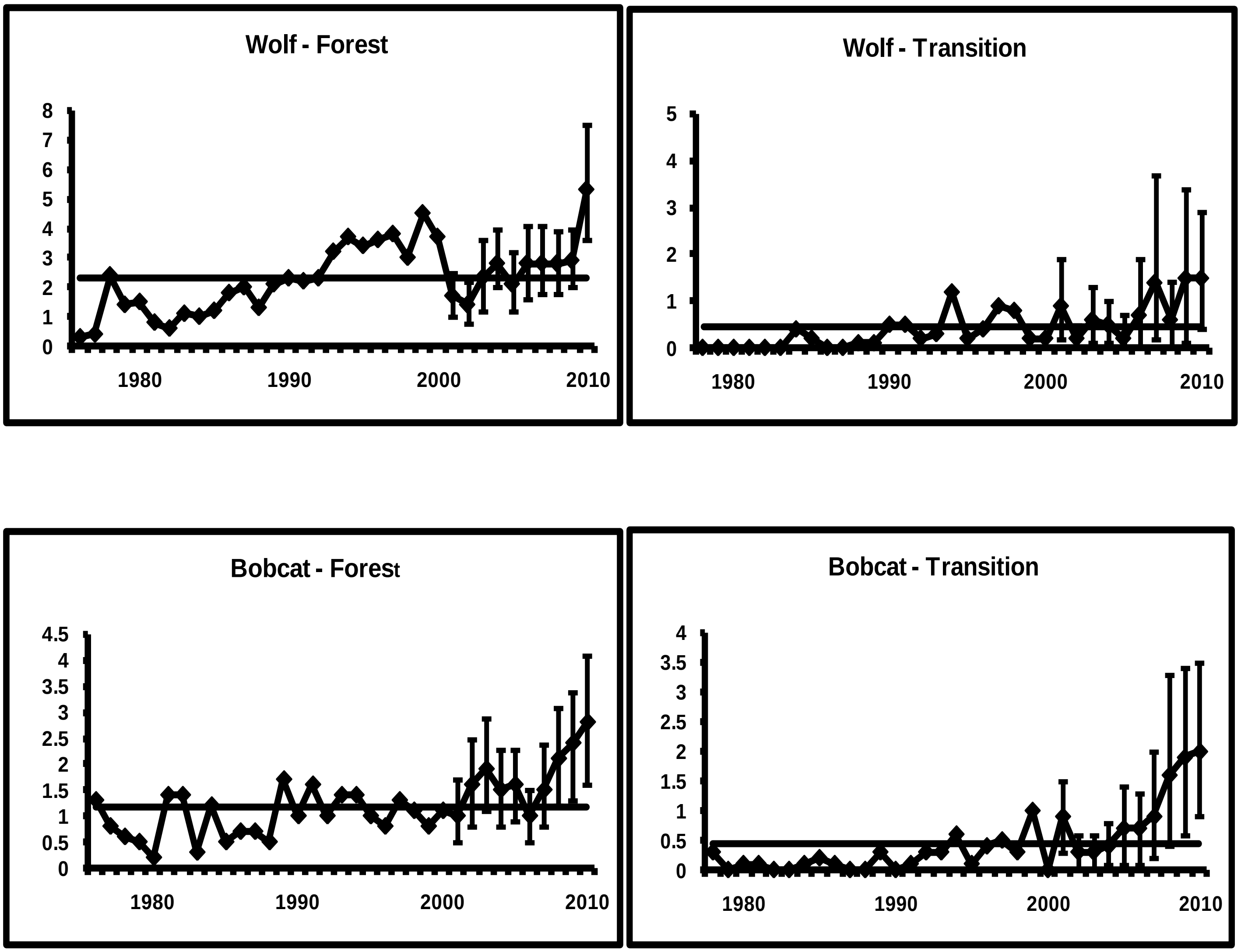

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2010. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2010

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on these populations. However, many carnivores are highly secretive, difficult to repeatedly capture, and naturally occur at low to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g., mark-recapture, distance sampling, etc.). Hence, indices of relative abundance are often used to monitor such populations over time (Hochachka et al. 2000, Wilson and Delahay 2001, Conn et al. 2004).

In winter, tracks of carnivores are readily observable following snowfall. Starting in 1991, Minnesota initiated a carnivore snow track survey in the northern portion of the State. The survey's primary objective is to use a harvest-independent method to monitor distribution and population trends of fisher (*Martes pennanti*) and marten (*Martes americana*), 2 species for which no other survey data was available. Because sign of other carnivores is readily detectable in snow, participants also record tracks for other selected species. After 3 years of evaluating survey logistics, the survey became operational in 1994.

METHODS

Presently, 60 track survey routes are distributed across the northern portion of the state (Figure 1). Each route is a total of 10 miles long and follows secondary roads or trails. A majority of routes are continuous 10-mile stretches of road/trail, but a few are composed of multiple discontinuous segments. Route locations were subjectively determined based on availability of suitable roads/trails, but were chosen, where possible, to represent the varying forest habitat conditions in northern Minnesota. For data recording, each 10-mile route is divided into 20 0.5-mile segments.

Each route is surveyed once following a fresh snow typically from December through mid-February, and track counts are recorded for each 0.5-mile segment. When it is obvious the same animal crossed the road multiple times within a 0.5-mile segment, the animal is only recorded once. If it is obvious that an animal ran along the road and entered multiple 0.5 mile segments (which often occurs with canids), its tracks are recorded in all segments, but circled to denote it was the same animal. While such duplicate tracks are not included in calculation of track indices (see below), recording data in this manner allows for future analysis of animal activity in relation to survey 'plot' size and habitat. Snowshoe hare (*Lepus americanus*) are recorded only as present or absent in the first 0.1 miles of each 0.5-mile segment. While most routes are surveyed 1 day after the conclusion of a snowfall (ending by 6:00 pm), thereby allowing 1 night for track 'registry', a few routes are usually completed 2 nights following snowfall. In such cases, track counts on those routes are divided by the number of days post-snowfall.

Currently, 3 summary statistics (2 graphs) are presented for each species. First, I compute the percentage of 0.5-mile segments with species presence after removing any duplicates (e.g., if the same fox clearly traverses 2 adjacent 0.5-mile segments along the road, and it was the only 'new' red fox (*Vulpes vulpes*) in the second segment, only 1 of the 2 segments is considered independently occupied). In addition to this metric, but on the same graph, the average number of tracks per 10-mile route is presented after removing any obvious duplicate tracks across segments. For wolves (*Canis lupus*) traveling through adjacent segments, the maximum number of pack members recorded in any 1 of those segments is used as the track total for that particular group, though this is likely an underestimate of true pack size. Because individuals from many of the species surveyed tend to be solitary, these 2 indices (% segments occupied and # tracks per route) will often yield mathematically equivalent results (i.e., on average, one tends to differ from the other by a constant factor). In the case of wolf packs, and to a lesser extent red fox and coyotes (*Canis latrans*) which may start traveling as breeding pairs in winter, the approximate equivalence of these 2 indices will still be true if average (detected) group sizes are similar across years. However, the solitary tendencies in some species are not absolute, potential abundance (in relation to survey plot size) varies across species, and for wolves, pack size may vary annually. For these reasons, as well as to provide an intuitive count metric, both indices are currently presented. Because snowshoe hares are tallied only as present/absent, the 2 indices will by definition be equivalent. Hare survey data is also obtained via counts of animals observed on grouse drumming count surveys conducted in spring. Data for both the spring and winter indices are presented for comparison.

In the second graph for each species, I illustrate the percentage of <u>routes</u> where each species was detected (hereafter, the 'distribution index'). This measure is computed to help assess whether any notable changes in the above track indices are a result of larger-scale changes in distribution (more/less routes with presence) and/or finer-scale changes in density along routes.

Using bootstrap methods, I compute confidence intervals (90%) for the percent of segments with species presence and the percent of routes with species presence. For each of 1000 replicates, survey routes are randomly re-sampled according to the observed route sample size. Replicates are ranked according to the magnitude of the calculated index, and the 50th and 950th values constitute the lower and upper bounds of the confidence interval.

RESULTS

Thirty-eight of the 60 routes were completed this year (Figure 2). Survey routes took an average of 2.1 hours to complete. Total snow depths averaged 14" for completed routes, the second deepest since 1995 (Figure 3). Mean overnight low temperature the night preceding the surveys was -2°F, well below the long-term average (Figure 3). Survey routes were completed between November 23rd and March 7th, with a mean survey date of December 24th (Figure 3).

Though not a statistically significant change, the fisher track index (% of segments with detection) increased for the first time in numerous years, but remains well below the long-term average (Figure 4). Fishers were detected on 7% of the route segments, and on 66% of the routes (Figure 4). While also a non-significant change, marten track indices rebounded for the second year in a row, though they also remain below the long-term average (Figure 4). Marten were detected on 7% of the route segments, and 58% of the survey routes.

Compared to last year, little change was observed in bobcat (*Lynx rufus*), wolf, red fox, and coyote (*Canis latrans*) indices (Figure 4). Red fox remain below their long-term average, while bobcats, wolves, and coyote indices are slightly above their long-term averages. Wolves were detected on 68% of survey routes, while bobcats were detected on 45% of survey routes. The weasel (*Mustela* spp.) index increased significantly this year, and through time is best characterized as exhibiting a slow downward trend with periodic irruptions. While hare indices do not currently appear cyclic, and changes this year were not significant, both the spring and winter hare indices reached peak levels since data for both surveys are available for comparison (post-1993) (Figure 4). However, pre-1994 cyclic peaks (~ 1980, 1990) in spring hare data (not presented here) show that the current index value is similar to the 1990 spring peak, but significantly lower than the 1980 peak.

DISCUSSION

Reliable interpretation of changes in track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000) Because this remains an untested assumption, caution is warranted when interpreting changes, particularly annual changes of low to moderate magnitude, or short-term trends. Of note this year, average snow depth during the survey was above the long-term average, while average temperature was below the long-term mean. Both factors could lead to reduced activity of some species, potentially reducing detection rates.

Based on confidence intervals, the only statistically significant change from last year was an increase in the weasel index. While there is some indication that fisher and marten indices may be rebounding, it is premature to draw any conclusions regarding the beginning of any longer temporal trend.

Confidence interval data for previous years will continue to be incorporated over the next couple years. I continue to review the adequacy of survey route sample size and distribution and hope that additional routes can be added in future years. We have also initiated fisher and marten research that, among other things, may provide some evaluation of track survey assumptions and possible approaches for estimating, and hence correcting for, any differences in the probability of detecting animals across years (e.g., MacKenzie et al. 2004). In particular, I hope to initiate repeat surveys on a subset of survey routes each winter, thereby allowing for estimation of year-specific detection rates.

ACKNOWLEDGEMENTS

I wish to thank all those who participated in this year's survey, including DNR field staff, Superior National Forest staff (Ely District), Tamarac National Wildlife refuge, and staff from the Fond-du-Lac and Red Lake Bands, and the 1854 Treaty Authority.

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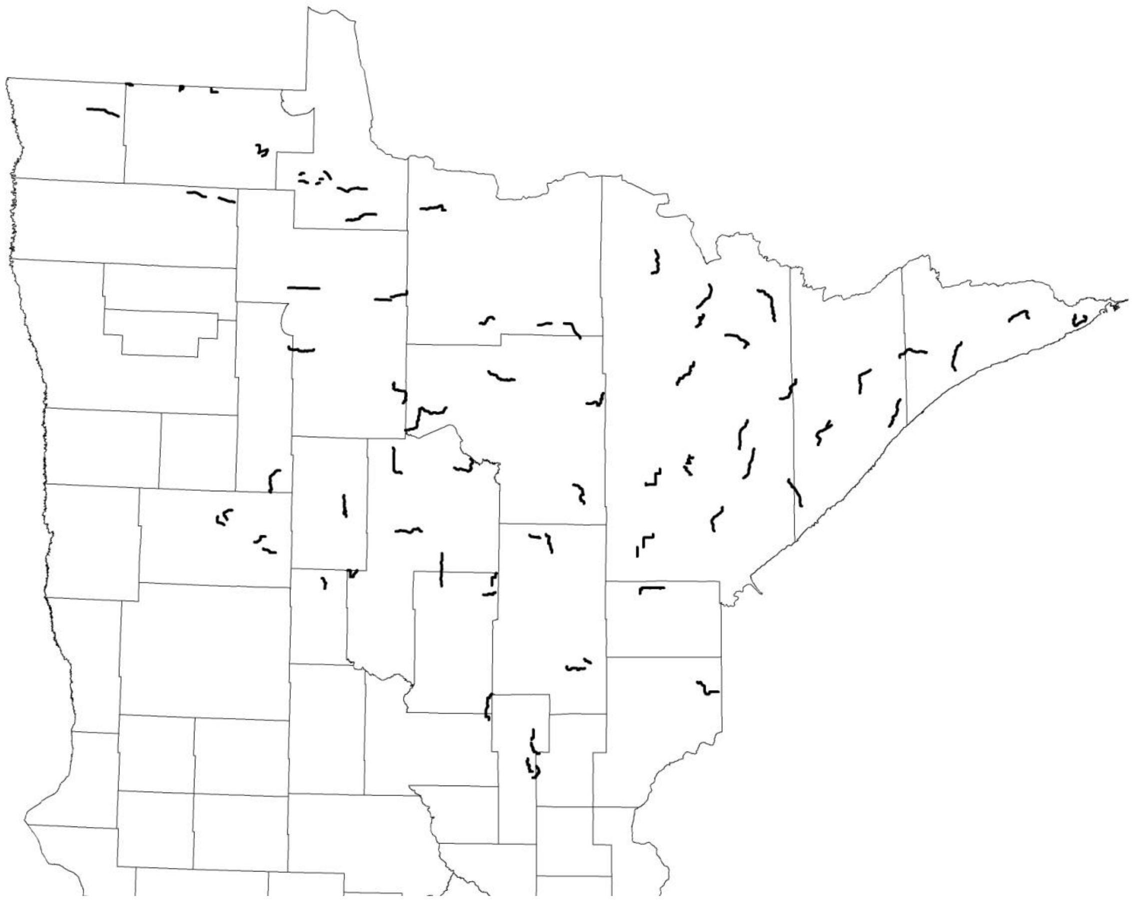

Figure 1. Locations of established furbearer winter track survey routes.

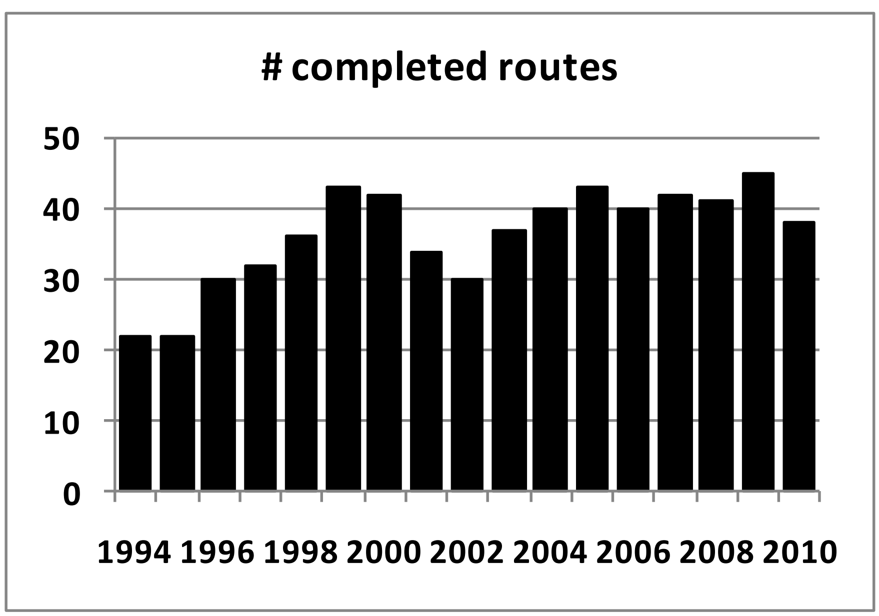

Figure 2. Number of winter track routes surveyed, 1994-2010.

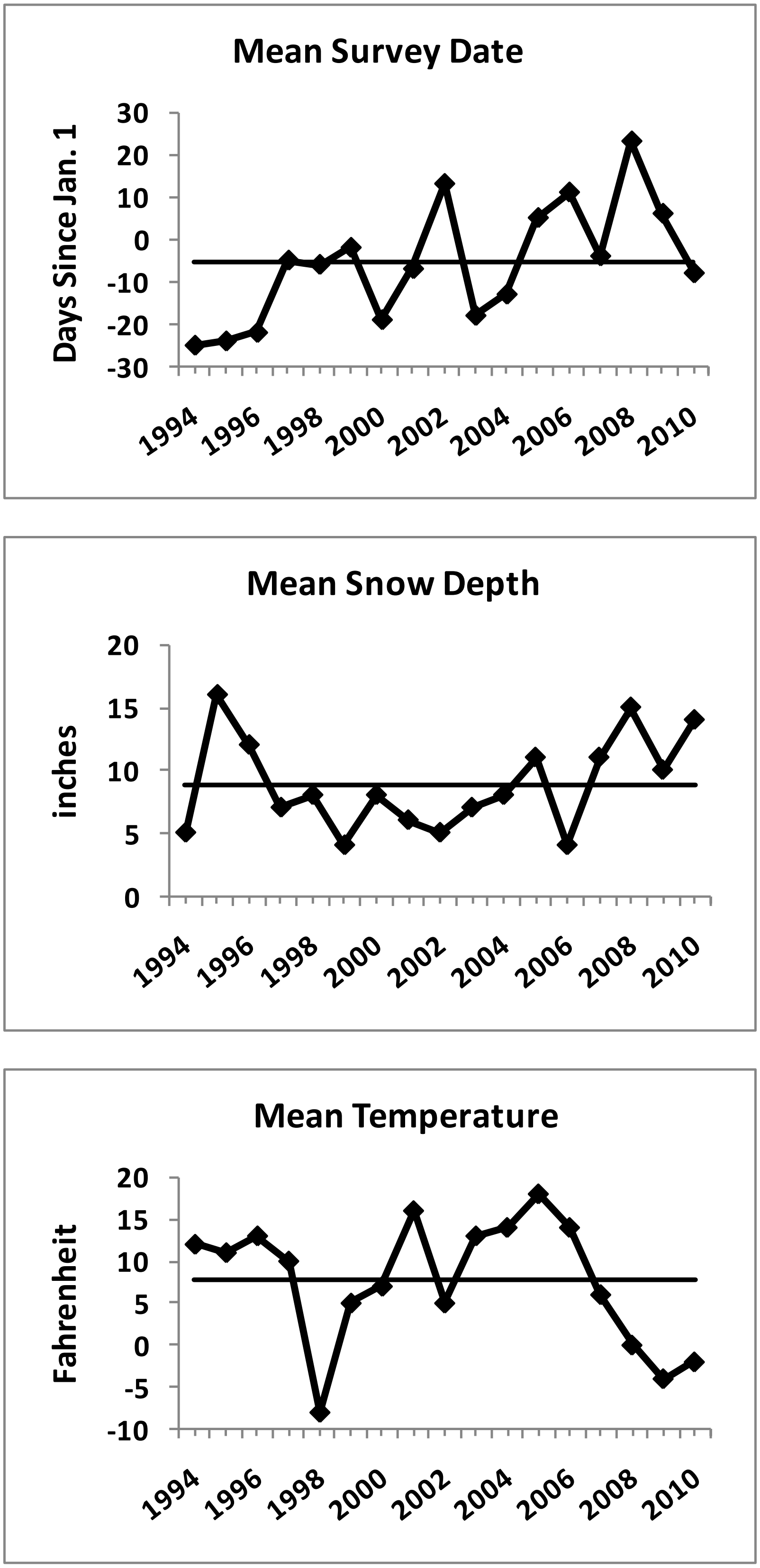

Figure 3. Average winter track survey date, snow depth, and temperature, 1994-2010. Horizontal line represents long-term mean.

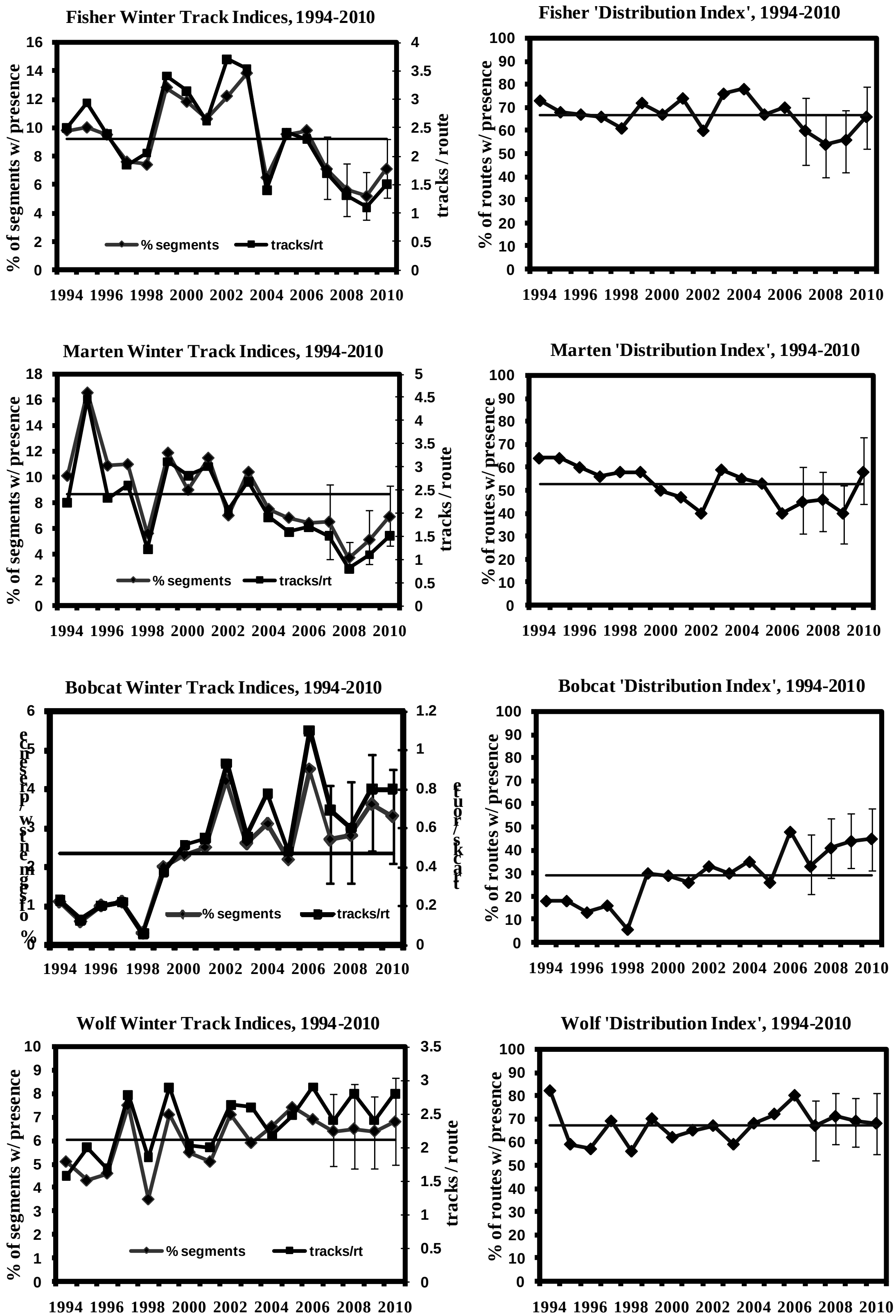

Figure 4. Winter track indices for selected species in Minnesota, 1994-2010. Confidence intervals only presented for % segments and % routes with track presence. Horizontal lines represent long-term average for percentage of segments and routes with presence.

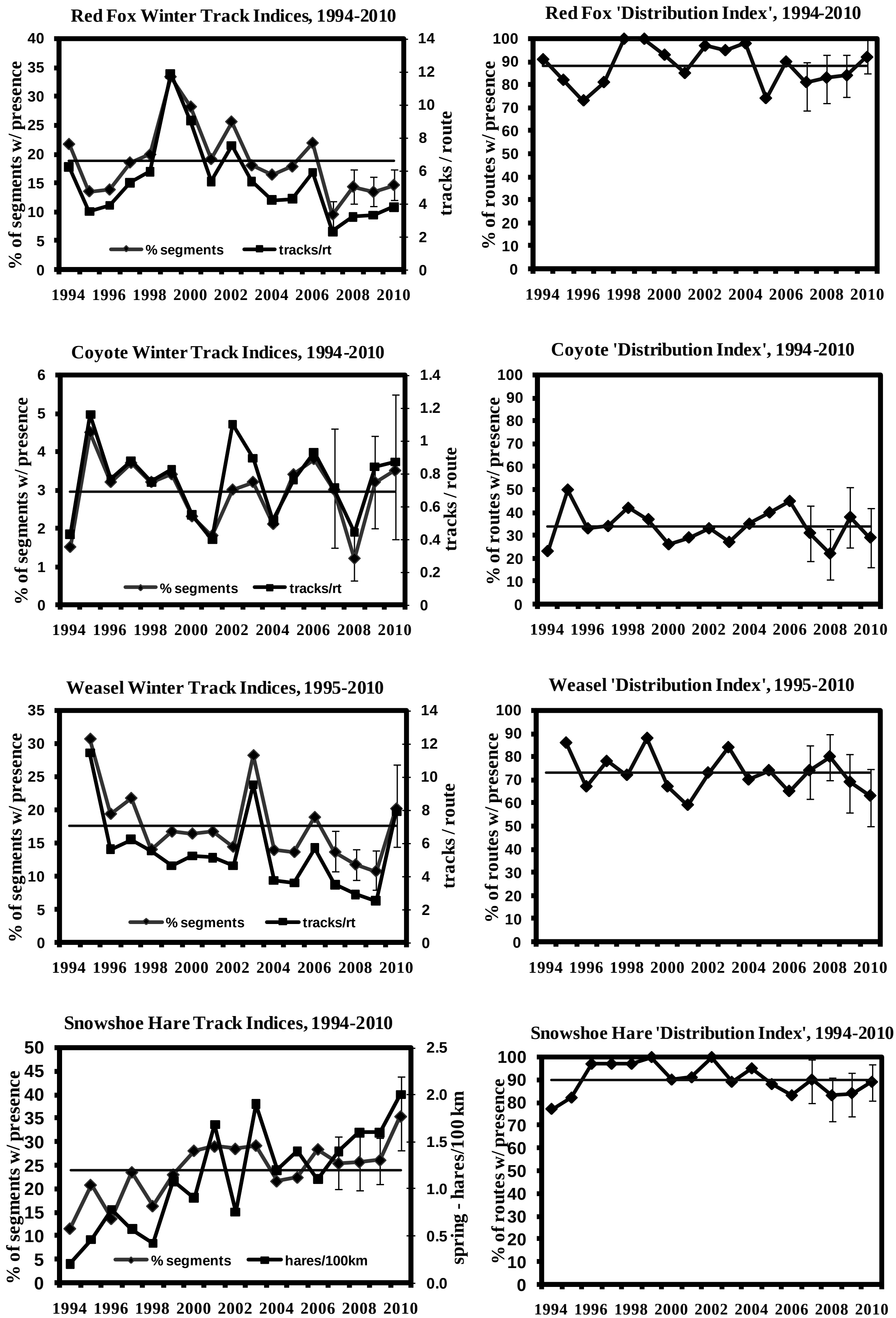

Figure 4 (continued). Winter track indices for selected species in Minnesota.

FOREST WILDLIFE POPULATIONS

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GROUSE SURVEYS IN MINNESOTA DURING SPRING 2011

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SUMMARY OF FINDINGS

Surveys for ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) were conducted during April and May 2011. Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.7 (95% confidence interval = 1.5–1.9) drums per stop (dps). That was between the mean counts of 2.0 (1.8–2.3) and 1.5 (1.3–1.7) dps observed during 2009 and 2010, respectively, indicating that densities of ruffed grouse likely remain high relative to the 10-year population cycle in Minnesota.

During the spring 2011 survey 2,212 sharp-tailed grouse were observed at 216 dancing grounds. The mean number of sharp-tailed grouse per dancing ground was 7.8 (6.7–8.9) in the East Central survey region, 11.2 (10.2–12.2) in the Northwest region, and 10.2 (9.5–11.1) statewide. Counts among dancing grounds observed during both 2010 and 2011 declined 17% (8–25%), but the statewide index value for 2011 was similar to the long-term average observed since 1980.

INTRODUCTION

Index Surveys

The purpose of surveys of grouse populations in Minnesota is to monitor changes in the densities of grouse over time. Estimates of density, however, are difficult and expensive to obtain. Simple counts of animals, on the other hand, are convenient and, assuming that changes in density are the major source of variation in counts among years, they can provide a reasonable index to long-term trends in populations. Other factors, such as weather and habitat conditions, observer ability, and grouse behavior, vary over time and also affect simple counts of animals. These other factors make it difficult to make inferences about potential changes in wildlife populations over short periods of time (e.g., a few annual surveys) or from small changes in index values. Over longer periods of time or when changes in index values are large, assumptions upon which grouse surveys in Minnesota depend are more likely to be valid, thereby making inferences about grouse populations more valid. For example, index values from the ruffed grouse drumming count survey have documented what is believed to be true periodic fluctuations in ruffed grouse densities (i.e., the 10-year cycle).

Ruffed Grouse

The ruffed grouse (*Bonasa umbellus*) is Minnesota's most popular game bird. It occurs throughout the forested regions of the state. Annual harvest varies from approximately 150,000 to 1.4 million birds and averages >500,000 birds. Information derived from spring drumming counts and hunter harvest statistics indicates that ruffed grouse populations fluctuate cyclically at intervals of approximately 10 years.

During spring there is a peak in the drumming behavior of male ruffed grouse. Ruffed grouse drum to communicate to other grouse the location of their territory. The purpose is to attract females for breeding and deter encroachment by competing males. Drumming makes male ruffed grouse much easier to detect, so counts of drumming males is a convenient basis for surveys to monitor changes in the densities of ruffed grouse. Ruffed grouse were first surveyed in Minnesota during the mid-1930s. Spring drumming counts have been conducted annually since the establishment of the first survey routes in 1949.

Sharp-tailed Grouse

Sharp-tailed grouse (*Tympanuchus phasianellus*) in Minnesota occur in brushlands, which often form transition zones between forests and grasslands. Sharp-tailed grouse are considered a valuable indicator of the availability and quality of brushlands for wildlife. Although sharp-tailed grouse habitat was more widely distributed in Minnesota during the early- and mid-1900s, the range of sharp-tailed grouse is now limited to areas in the Northwest (NW) and East Central (EC) portions of the state (Figure 1). Since the early-1990s annual harvest of sharp-tailed grouse by hunters has varied between 6,000 and 22,000 birds, and the number of hunters has varied between 5,000 and 10,000.

During spring male sharp-tailed grouse gather at dancing grounds, or leks, in grassy areas and fields where they defend small territories and make displays to attract females for breeding. Surveys of sharp-tailed grouse populations are based on counts of grouse at dancing grounds. The first surveys of sharp-tailed grouse in Minnesota were conducted between the early 1940s and 1960. The current sharp-tailed grouse survey was initiated in 1976.

METHODS

Ruffed Grouse

Roadside routes consisting of 10 semipermanent stops approximately 1.6 km (1 mile) apart have been established. Routes were originally located along roads with little automobile traffic that were also near apparent ruffed grouse habitat. Therefore, route locations were not selected according to a statistically valid spatial sampling design, which means that data collected along routes is not necessarily representative of the larger areas (e.g., counties, regions) in which routes occur. Approximately 50 routes were established by the mid-1950s, and approximately 70 more were established during the late-1970s and early-1980s.

Observers from the Department of Natural Resources (DNR) Area Wildlife Offices and a variety of other organizations drove along each survey route once just after sunrise during April or May. Observers were not trained but often were experienced with the survey. At each designated stop along the route the observer listened for 4 minutes and recorded the number of ruffed grouse drums (not necessarily the number of individual grouse) he or she heard. Attempts were made to conduct surveys on days near the peak of drumming activity that had little wind and no precipitation.

The survey index value was the number of drums heard during each stop along a route. The mean number of drums per stop (dps) was calculated for each of 4 survey regions and for the entire state (Figure 2). As an intermediate step to summarizing survey results by region, I calculated the mean number of dps for each route. Mean index values for survey regions were calculated as the mean of route-level means for all routes occurring within the region. Some routes crossed regional boundaries, so data from those routes were included in the means for both regions. The number of routes within regions was not proportional to any meaningful characteristic of the regions or ECS section upon which they were based. Therefore, mean index values for the Northeast region and the state were calculated as the weighted mean of index values for the 4 and 7 ECS sections, respectively, that they included. The weight for each section mean was the geographic area of the section (i.e., AAP = 11,761 km^2, MOP = 21,468 km^2, NSU = 24,160 km^2, DLP = 33,955 km^2, WSU = 14,158 km^2, MIM = 20,886 km^2, and PP = 5,212 km^2). Only approximately half of the Minnesota and Northeast Iowa Morainal (MIM) and Paleozoic Plateau (PP) sections were within the ruffed grouse range, so the area used to weight drum index means for those sections was reduced accordingly using subsection boundaries.

Stops along survey routes are a small sample of all possible stops within the range of ruffed grouse in Minnesota. Survey index values based on the sample of stops are not the same as they would be if drum counts were conducted at a different sample of stops or at all possible stops. To account for the uncertainty in index values because they are based on a sample, I calculated 95% confidence intervals (CI) for each mean. A 95% confidence interval is a numerical range in which 95% of similarly estimated intervals (i.e., from different hypothetical samples) would contain the true, unknown mean. I used 10,000 bootstrap samples of route-level means to estimate percentile CIs for mean index values for survey regions and the whole state. Limits of each CI were defined as the 2.5^{th} and 97.5^{th} percentiles of the bootstrap frequency distribution. I calculated mean index values and CIs for all years since 1982. Data from earlier years were not analyzed because they were not available in a digital form.

Sharp-tailed Grouse

Over time, DNR Wildlife Managers have recorded the locations of sharp-tailed grouse dancing grounds in their work areas. As new dancing grounds were located, they were added to the survey list. Known, accessible dancing grounds were surveyed by Wildlife Area staff and their volunteers between sunrise and 2.5 hours after sunrise during April and early-May to count sharp-tailed grouse. When possible, surveys were conducted when the sky was clear and the wind was <16 km/hr (10 mph). Attempts were made to conduct surveys on >1 day to account for variation in the attendance of male grouse at the dancing ground. Survey data consist of the maximum of daily counts of sharp-tailed grouse at each dancing ground.

The dancing grounds included in the survey were not selected according to a statistically valid spatial sampling design. Therefore, data collected during the survey were not necessarily representative of the larger areas (e.g., counties, regions) in which the dancing grounds occur. It was believed, however, that most dancing grounds within each work area were included in the sample, thereby minimizing the limitations caused by the sampling design.

I calculated the mean number of sharp-tailed grouse per dancing ground (i.e., index value), averaged across dancing grounds within the NW and EC regions and statewide. The number of grouse included those recorded as males and those recorded as being of unknown sex, and only leks with ≥2 grouse were included when calculating mean index values. It was not valid to compare the full survey data and results from different years because survey effort and success in detecting and observing sharp-tailed grouse was different between years and the survey samples were not necessarily representative of other dancing grounds. To estimate differences in sharp-tailed grouse index values between 2 consecutive years, therefore, I analyzed separately sets of data that included counts of birds only from dancing grounds that were surveyed during both years. Although the dancing grounds in the separate data sets were considered comparable, the counts of birds at the dancing grounds still were not. Many factors can affect the number of birds counted, so inferences based upon comparisons of survey data between years are tenuous.

To account for the uncertainty in index values because they are based on a sample of dancing grounds rather than all dancing grounds, I calculated 95% confidence intervals (CI) for each mean. I used 10,000 bootstrap samples of dancing ground counts to estimate percentile confidence intervals for mean index values for the NW and EC regions and the whole state.

The current delineation between the NW and EC survey regions was based on ECS section boundaries (Figure 1), with the NW region consisting of the Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley sections and the EC region consisting of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior

Uplands sections. The 2005 Grouse Survey Report detailed the transition from the former to the current delineation of regions.

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 15 cooperating organizations surveyed 125 routes between 12 April and 17 May 2011. Most routes (95%) were run between 21 April and 11 May. The median date this year (3 May) was 10 days later than during 2010 but only 2 days later than during 2009, which was consistent with much spring phenology occurring relatively early during 2010. Observers reported survey conditions as Excellent, Good, and Fair on 60%, 34%, and 6% of 124 routes, respectively. The distribution of survey conditions has been consistent for at least the last 5 years. Survey cooperators included the DNR Divisions of Fish & Wildlife, Forestry, and Parks and Trails; Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Leech Lake, Red Lake, and White Earth Reservations; 1854 Treaty Authority; Agassiz and Tamarac National Wildlife Refuges (U.S. Fish & Wildlife Service); Vermilion Community College; Cass and Beltrami counties; and UPM Blandin Paper Mill.

Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.7 (95% confidence interval = 1.5–1.9) drums per stop (dps) during 2011. Drum counts by survey region during 2011 were 1.9 (1.6–2.2) dps in the Northeast (n = 104 routes), 2.1 (1.9–2.4) dps in the Northwest (n = 8), 0.8 (0.5–1.2) dps in the Central Hardwoods (n = 14), and 0.4 (0.1–0.8) dps in the Southeast (n = 7) (Figures 3 and 4). Median index values for bootstrap samples were similar to observed means (i.e., within 0.02 dps), so no bias-correction was necessary.

The statewide mean of drum counts this spring was between the mean counts of 2.0 (1.8–2.3) and 1.5 (1.3–1.7) dps observed during 2009 and 2010, respectively, indicating that the grouse population likely remains high relative to the 10-year population cycle. Similar inconsistent fluctuations in drum counts during years near the peak of the population cycle have occurred in the past (e.g., late-1950s and late-1970s; Figure 3). Given that factors other than changes in grouse density may influence counts and the resulting index values, emphasis when interpreting results from index surveys like the drum count survey should be on large and long-term changes in counts, not on small or short-term changes.

Observations from 8 weeks of daily surveys of drumming grouse for a research project in northern Minnesota during the springs of 2009 and 2010 provided additional insight about survey conditions and the status of the grouse population during those years. The research observations indicated that during the unusually warm weather of April 2010 drumming activity declined during weeks when typically it would be high (Meadow Kouffeld, University of Minnesota, unpublished data). That could have resulted in a lower proportion of male grouse being detected during DNR surveys in 2010 compared to other years. The estimated densities of male grouse on the study area was lower during 2010 than 2009, but the difference was not statistically significant. Estimates of ruffed grouse harvest from the Small Game Hunter Survey, when they are available in late-summer, also may provide insights about the relative status of the grouse population during 2010 compared to 2009.

Sharp-tailed Grouse

A total of 2,212 sharp-tailed grouse was observed at 216 dancing grounds with ≥2 male grouse (or grouse of unknown sex) during spring 2011. Leks with ≥2 grouse were visited a mean of 1.6 times. There were 468 grouse on 60 leks in the EC survey region and 1,744 grouse on 156 leks in the NW region. The index value (i.e., grouse/lek) in both regions declined slightly from 2010 (Table 1), and counts at leks observed during both years declined 17% (8–25%, Table 2). The statewide index value of 10.2 (9.5–11.1) was near the middle of values observed since 1980 (Figure 5). The peak in population index values for sharp-tailed grouse that occurred in 2009 coincided with the peak in the abundance of ruffed grouse in Minnesota. The spring index values for both species have followed an approximately 10-year cyclical pattern, with peaks in the sharp-tailed grouse index occurring up to 2 years after peaks in the ruffed grouse index.

ACKNOWLEDGEMENTS

I sincerely appreciate the efforts of all the DNR staff, partners, and volunteer cooperators who conducted and helped coordinate the grouse surveys. The ruffed grouse survey data for 1982–2004 were entered into a database by Doug Mailhot and another volunteer through a special effort organized by Gary Drotts, John Erb, and Rick Horton. I also thank Laura Gilbert for helping with data entry and archiving and Glenn DelGiudice and Mark Lenarz for reviewing a draft of this report and suggesting revisions that improved it.

Table 1. Number of sharp-tailed grouse observed per active lek (≥2 males) during spring in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Year	Mean	95% CI[b]	*n*[c]	Mean	95% CI[b]	*n*[c]	Mean	95%CI[b]	*n*[c]
2004	11.2	10.1–12.3	183	12.7	11.3–14.2	116	8.5	7.2– 9.9	67
2005	11.3	10.2–12.5	161	13.1	11.5–14.7	95	8.8	7.3–10.2	66
2006	9.2	8.3–10.1	161	9.8	8.7–11.1	97	8.2	6.9– 9.7	64
2007	11.6	10.5–12.8	188	12.7	11.3–14.1	128	9.4	8.0–11.0	60
2008	12.4	11.2–13.7	192	13.6	12.0–15.3	122	10.4	8.7–12.3	70
2009	13.6	12.2–15.1	199	15.2	13.4–17.0	137	10.0	8.5–11.7	62
2010	10.7	9.8–11.7	202	11.7	10.5–12.9	132	8.9	7.5–10.5	70
2011	10.2	9.5–11.1	216	11.2	10.2–12.2	156	7.8	6.7–8.9	60

[a] Survey regions; see Figure 1.
[b] 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.
[c] *n* = number of leks in the sample.

Table 2. Difference in the number of sharp-tailed grouse per lek on dancing grounds that were observed during consecutive spring surveys in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Comparison[b]	Mean	95% CI[c]	*n*[d]	Mean	95% CI[c]	*n*[d]	Mean	95%CI[c]	*n*[d]
2004 - 2005	-1.3	-2.2– -0.3	186	-2.1	-3.5– -0.8	112	0.0	-1.0– 1.1	74
2005 - 2006	-2.5	-3.7– -1.3	126	-3.6	-5.3– -1.9	70	-1.1	-2.6– 0.6	56
2006 - 2007	2.6	1.5– 3.8	152	3.3	1.7– 5.1	99	1.2	0.1– 2.3	53
2007 - 2008	0.4	-0.8– 1.5	166	0.0	-1.6– 1.6	115	1.2	0.1– 2.5	51
2008 - 2009	0.9	-0.4– 2.3	181	1.8	-0.1– 3.8	120	-0.8	-2.1– 0.6	61
2009 - 2010	-0.6	-1.8– 0.6	179	-0.8	-2.6– 1.0	118	-0.1	-1.2– 1.0	61
2010 - 2011	-1.7	-2.7– -0.8	183	-1.8	-3.1– -0.5	124	-1.5	-2.8– -0.3	59

[a] Survey regions; see Figure 1.
[b] Consecutive years for which comparable leks were compared.
[c] 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.
[d] *n* = number of dancing grounds in the sample.

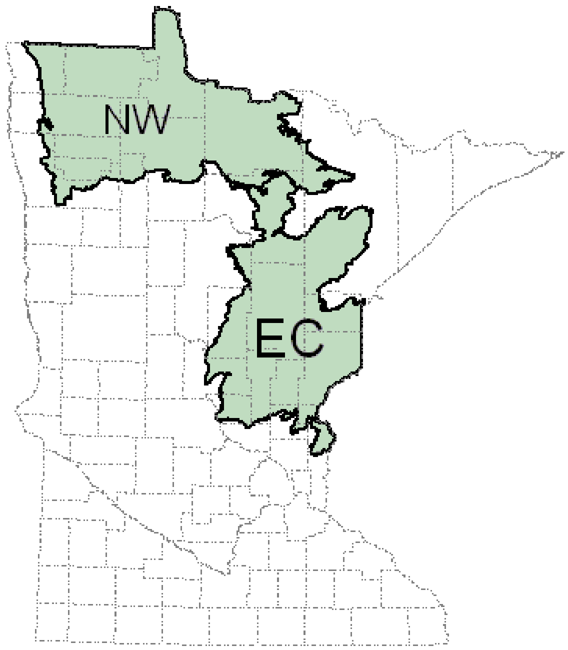

Figure 1. Northwest (NW) and East Central (EC) survey regions for **sharp-tailed grouse** relative to county boundaries in Minnesota. The regions were based largely on boundaries of ECS Subsections.

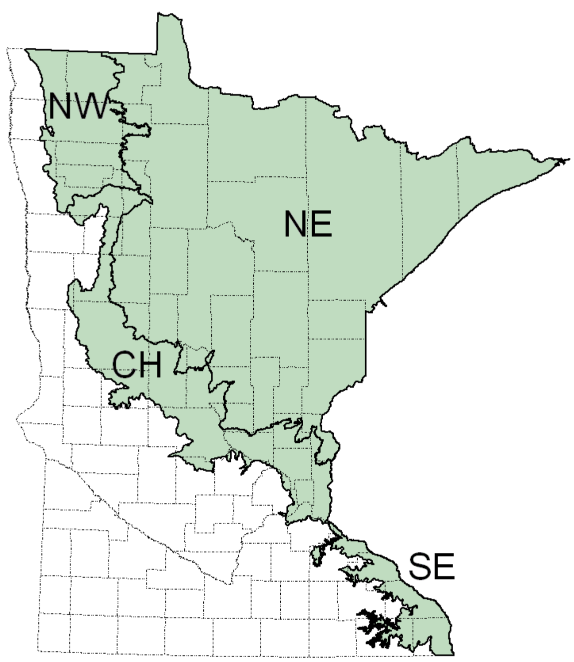

Figure 2. Survey regions for **ruffed grouse** (shaded, curved boundaries) relative to county boundaries (dashed lines) in Minnesota. The regions are based on the Ecological Classification System.

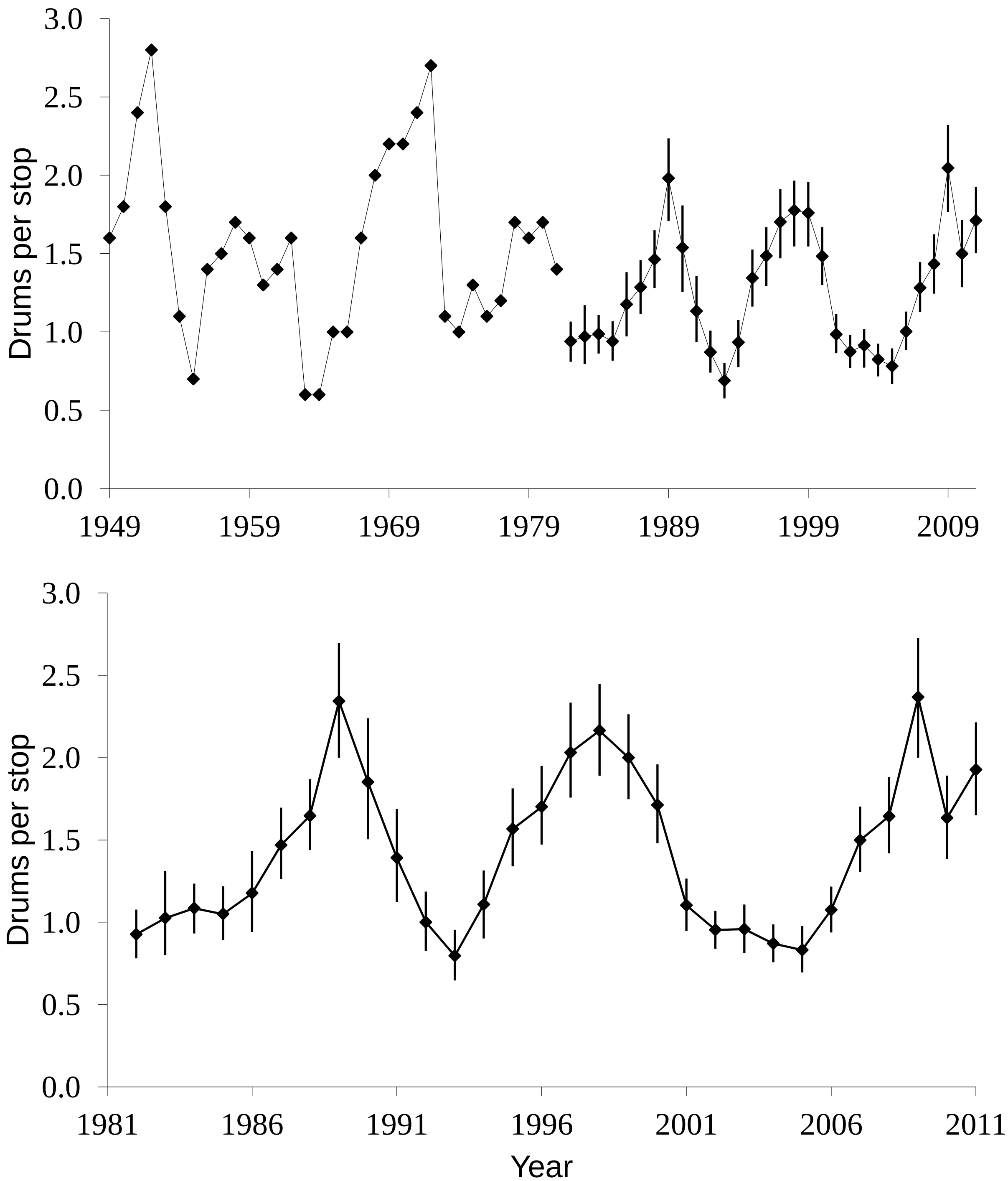

Figure 3. Ruffed grouse drum count index values in **Minnesota** (top) and just the **Northeast** region (bottom). Vertical error bars represent 95% confidence intervals based on bootstrap samples. Statewide means before 1982 were not re-analyzed with the current weighted average and bootstrapping methods, so confidence intervals were not available. The difference in index values between 1981 and 1982 reflected a real decrease in drums counted, not an artifact of the change in analysis methods.

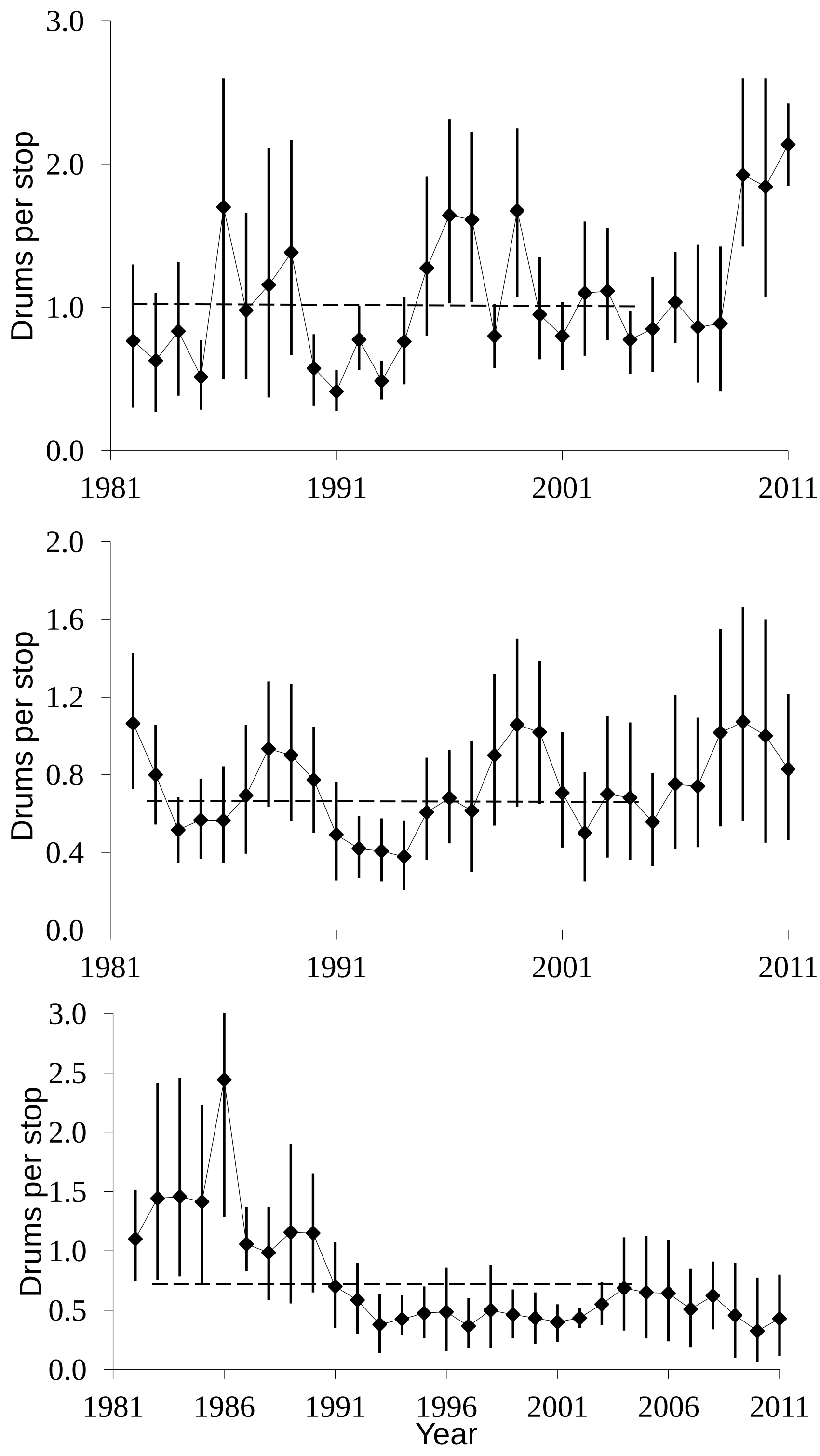

Figure 4. Ruffed grouse drum count index values in the **Northwest** (top), **Central Hardwoods** (middle), and **Southeast** (bottom) survey regions of Minnesota. Dashed horizontal lines indicate the mean from 1984 to 2004. Vertical error bars represent 95% confidence intervals based on bootstrap samples. The highest error bar in the bottom panel was truncated.

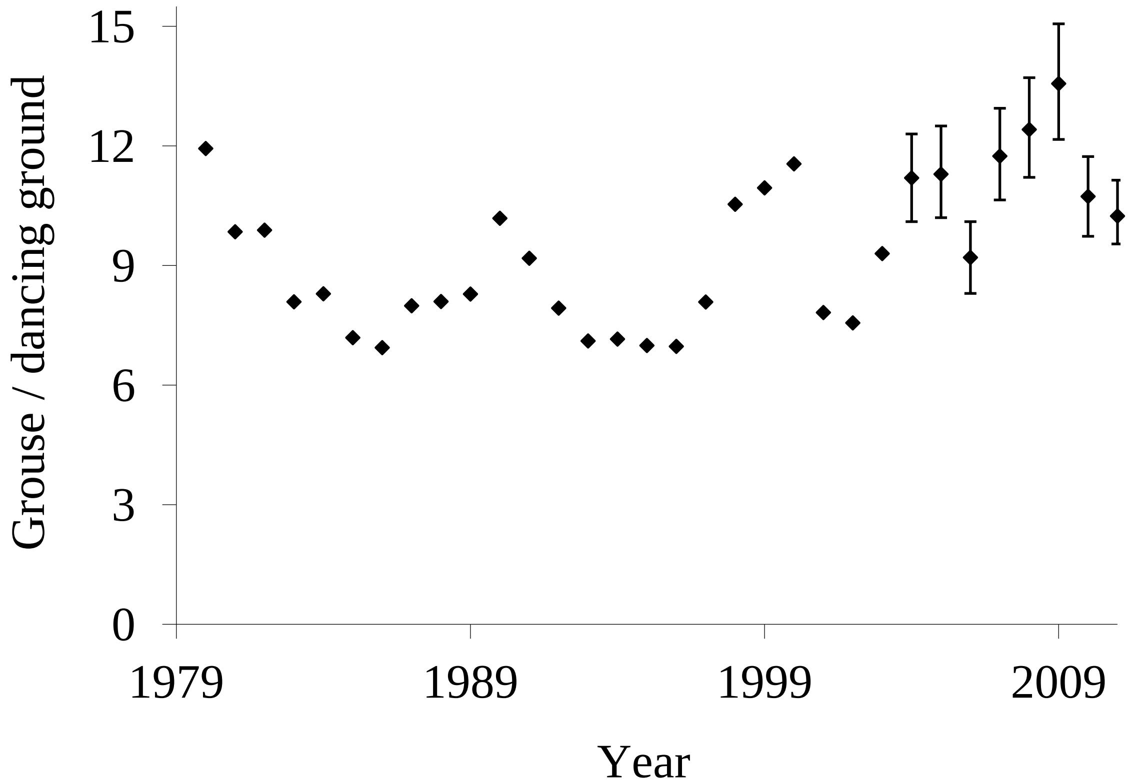

Figure 5. Mean number of **sharp-tailed grouse** observed in Minnesota during spring surveys of dancing grounds, 1980–2011. Vertical error bars, which were calculated only for recent years, represent 95% confidence intervals based on bootstrap samples. No line connects the annual means because they are not based on comparable samples of leks.

PRAIRIE-CHICKEN SURVEY IN MINNESOTA DURING 2011

Michael A. Larson, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Surveys for greater prairie-chickens (*Tympanuchus cupido pinnatus*) were conducted during April and May of 2011. Ditches and many roads within the prairie-chicken range were impassable during April due to a wet fall, high snow accumulation during winter, and rains during early spring. Water levels in many wetland basins were higher than ever, and flooding of homes and farm buildings was not uncommon (Doug Hedtke, MNDNR, and Brian Winter, The Nature Conservancy, personal communications).

Observers located 81 booming grounds and counted 627 male prairie-chickens, including birds of unknown sex. Counts from several survey blocks were not available for analysis at the time of this report, so I did not calculate range-wide densities of booming grounds or prairie-chickens because they would not be comparable to estimates from previous years. Within survey blocks for which counts were available, however, the total numbers of booming grounds and male prairie-chickens were less than they were during 2010.

INTRODUCTION

Index Surveys

The purpose of surveys of grouse populations in Minnesota is to monitor changes in the densities of grouse over time. Estimates of density, however, are difficult and expensive to obtain. Simple counts of animals, on the other hand, are convenient and, assuming that changes in density are the major source of variation in counts among years, they can provide a reasonable index to long-term trends in populations. Other factors, such as weather and habitat conditions, observer ability, and grouse behavior, vary over time and also affect simple counts of animals. These other factors make it difficult to make inferences about potential changes in wildlife populations over short periods of time (e.g., a few annual surveys) or from small changes in index values. Over longer periods of time or when changes in index values are large, assumptions upon which grouse surveys in Minnesota depend are more likely to be valid, thereby making inferences about grouse populations more valid. For example, index values from the ruffed grouse drumming count survey have documented what is believed to be true periodic fluctuations in ruffed grouse densities (i.e., the 10-year cycle).

Greater Prairie-Chickens

During the early 1800s greater prairie-chickens (*Tympanuchus cupido pinnatus*) were present along the southern edge of Minnesota. Their range expanded and contracted dramatically during the next 150 years. Currently, most prairie-chickens in Minnesota occur along the beach ridges of glacial Lake Agassiz in the west (Figure 1). The population of prairie-chickens was expanded southward to the upper Minnesota River valley by a series of relocations during 1998–2006. Hunters in Minnesota have harvested approximately 120 prairie-chickens annually since 2003 when a limited-entry hunting season was opened for the first time since 1942.

During spring male prairie-chickens gather at communal display areas, or leks. The display areas of prairie-chickens are called booming grounds because males make a low-frequency, booming vocalization during their displays. From 1974 to 2003 the Minnesota Prairie Chicken Society coordinated annual counts of prairie-chickens at booming grounds. During 2004 the Minnesota Department of Natural

Resources (DNR) began coordinating the annual prairie-chicken surveys, and a standardized survey design was adopted.

METHODS

During the few hours near sunrise from late-March until mid-May cooperating biologists and numerous volunteers counted prairie-chickens at booming grounds in western Minnesota. They attempted to locate and observe multiple times all booming grounds within 17 designated survey blocks (Figure 2). Each block was a square comprising 4 sections of the Public Land Survey (approximately 4,144 ha) and was selected nonrandomly based upon the spatial distribution of booming grounds and the presence of relatively abundant grassland habitat. I separated the survey blocks into 2 groups—core and periphery—based upon densities of prairie-chickens, with a threshold of approximately 1.0 male/km^2 during 2010, and geographic location relative to other survey blocks (Figure 2).

Observations of booming grounds 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 booming grounds from a distance using binoculars. If vegetation or topography obscured the view of a booming ground, the observer attempted to flush the birds to obtain an accurate count. Observed prairie-chickens were classified as male, female, or unknown sex. Male prairie-chickens were usually obvious due to their display behavior. Birds were classified as unknown sex when none of the birds at a booming ground was 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 booming grounds are males. Although most male prairie-chickens attend booming grounds most mornings, female attendance at booming grounds is much more limited and sporadic. Females are also more difficult to detect because they do not vocalize or display like males. Counts of males and unknowns, rather than females, therefore, were used to make comparisons between core and peripheral ranges and between years.

I summarized counts of booming grounds and prairie-chickens by hunting permit areas and spring survey blocks. Surveys were conducted in all traditional areas, but the counts from several permit areas and survey blocks were not available for analysis at the time of this report. Therefore, I did not calculate densities of booming grounds or prairie-chickens for comparison to estimated densities from previous years.

RESULTS & DISCUSSION

Observers from at least 4 cooperating organizations and many unaffiliated volunteers counted prairie-chickens during April and May 2011. Cooperators included the DNR Division of Fish and Wildlife, the Fergus Falls and Detroit Lakes Wetland Management Districts (U.S. Fish & Wildlife Service), The Nature Conservancy, and the Minnesota Prairie Chicken Society. Ditches and many roads within the prairie-chicken range were impassable during April due to a wet fall, high snow accumulation during winter, and rains during early spring. Water levels in many wetland basins were higher than ever, and flooding of homes and farm buildings was not uncommon (Doug Hedtke, MNDNR, and Brian Winter, The Nature Conservancy, personal communications).

Observers located 81 booming grounds and counted 627 male prairie-chickens during 2011 (Table 1). Minimum counts in Table 1 are not comparable among permit areas or years because they included surveys that were conducted outside of the survey blocks and did not follow a predetermined spatial sampling design.

Each booming ground was observed on a median of 2 (mean = 2.0) different days, and 35% of booming grounds were observed only once during 2011. Attendance of males at booming grounds varies among days and by time of day. 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 booming grounds and individual birds at booming grounds. 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 untested 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.

Table 1. Minimum abundance of prairie-chickens within and outside of hunting permit areas in western Minnesota during spring 2011. Counts of booming grounds and birds are not comparable among permit areas or years.

Permit Area	Area (km^2)	Booming grounds	Males	Unk.[a]
801A	603	0	0	0
802A	826	7	61	0
803A	668	0	0	0
804A	435	0	0	0
805A	267	8	89	0
806A	749	9	43	12
807A	440	20	216	0
808A	NA[b]	NA[b]	NA[b]	NA[b]
809A	NA[b]	NA[b]	NA[b]	NA[b]
810A	505	9	74	1
811A	704	7	25	24
PA subtotal[c]	5,197	60	508	37
Outside PAs[d]	NA[e]	21	119	45
Grand total	NA[e]	81	627	82

[a] Unk. = prairie-chickens of unknown sex. It is likely that most were males.
[b] NA = not applicable. Counts were made but not available for this report.
[c] Sum among 9 of the 11 permit areas (PA).
[d] Counts from outside the permit areas (PA).
[e] NA = not applicable. The size of the area outside permit areas was not defined.

Within survey blocks we counted 482 males, including birds of unknown sex, on 58 booming grounds during 2011 (Table 2). Booming grounds were defined as having ≥2 males, so observations of single males were excluded from summaries by survey block. Although comparable estimated densities of booming grounds and prairie-chickens during spring of 2011 are not available at this time, I provided estimates for those indexes for previous years of the survey (Figure 3).

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

			2011		Change from 2010[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	7	61	0	10
	Polk 2	42.0	8	89	-1	27
	Norman 1	42.0	4	21	1	-7
	Norman 2	42.2	6	46	-1	-11
	Norman 3	41.0	11	101	-2	-4
	Clay 1		NA[d]	NA[d]	NA[d]	NA[d]
	Clay 2		NA[d]	NA[d]	NA[d]	NA[d]
	Clay 3		NA[d]	NA[d]	NA[d]	NA[d]
	Clay 4		NA[d]	NA[d]	NA[d]	NA[d]
	Wilkin 1	40.0	5	47	0	-12
	Core subtotal	248.4[e]	4[e]	365[e]	-27[e]	-282[e]
Periphery	Mahnomen	41.7	4	31	0	-15
	Becker 1	41.4	4	36	-2	-9
	Becker 2		NA[d]	NA[d]	NA[d]	NA[d]
	Wilkin 2		NA[d]	NA[d]	NA[d]	NA[d]
	Wilkin 3	42.0	5	26	2	-19
	Otter Tail 1	41.0	1	9	-1	-7
	Otter Tail 2	40.7	3	15	2	1
	Periphery subtotal	206.8[e]	17[e]	117[e]	-4[e]	-92[e]
Grand total		455.2[e]	58[e]	482[e]	-31[e]	-374[e]

[a] The 2010 count was subtracted from the 2011 count, so a negative value indicates a decline.
[b] Survey blocks were classified as either in the core or periphery of the prairie-chicken range in Minnesota based upon bird densities and geographic location.
[c] Includes birds recorded as being of unknown sex but excludes lone males not observed at a booming ground.
[d] Surveys were conducted in these blocks, but the counts were not available for analysis at the time this report was written.
[e] These sums reflect only the blocks for which count data were available.

ACKNOWLEDGEMENTS

I sincerely appreciate the efforts of all the DNR staff and volunteer cooperators who conducted and helped coordinate the prairie-chicken survey. I thank Wes Bailey and Mark Lenarz for reviewing a draft of this report. DNR contributions to this survey were funded in part under the Federal Aid in Wildlife Restoration Act, U.S. Fish & Wildlife Service, Minnesota project W-69-S.

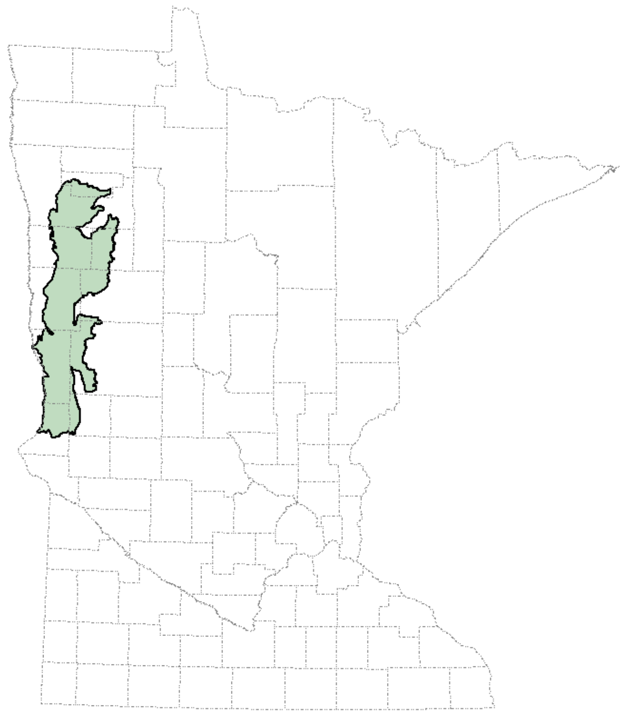

Figure 1. Primary range of greater prairie-chickens (shaded area) relative to county boundaries in Minnesota. This range boundary was based on ECS Land Type Associations and does not include all areas that are known to be occupied by prairie-chickens.

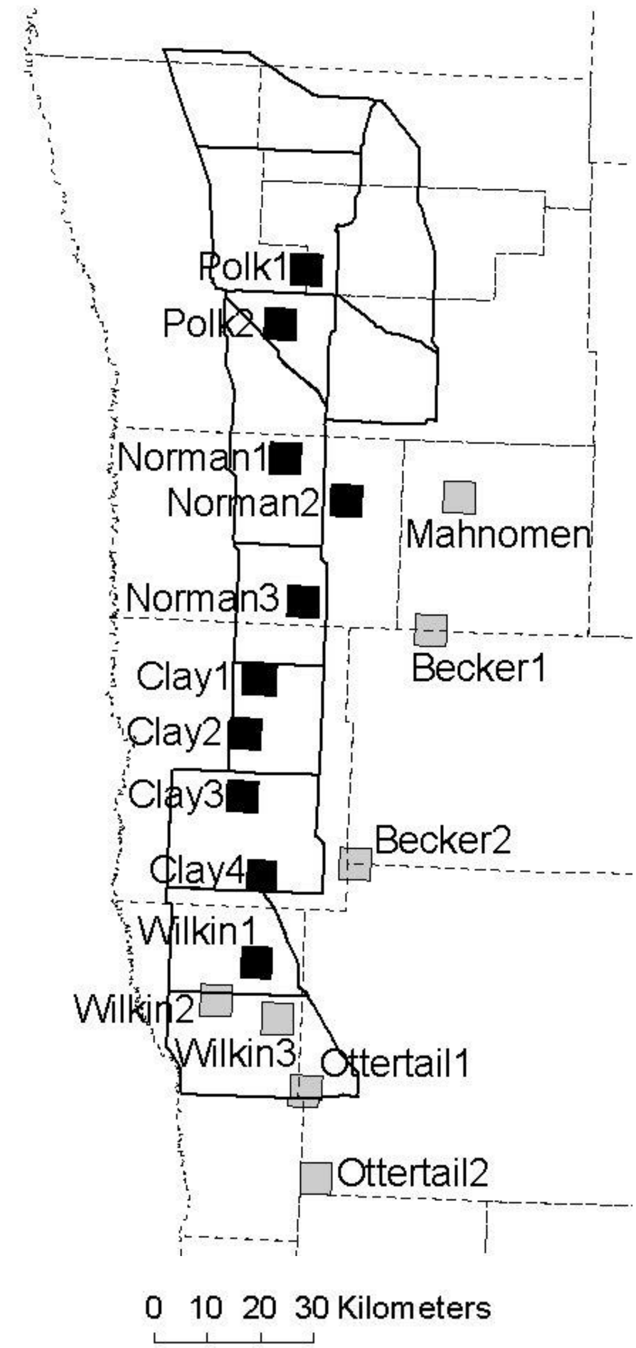

Figure 2. Survey blocks (41 km^2, labeled squares) and hunting permit area boundaries (solid lines) for prairie-chickens in western Minnesota. Survey blocks were designated as being in either the core (black) or periphery (gray) of the range. Blocks were named after the counties (dashed lines) in which they were primarily located. Permit areas were labeled sequentially from 801A in the north to 811A in the south.

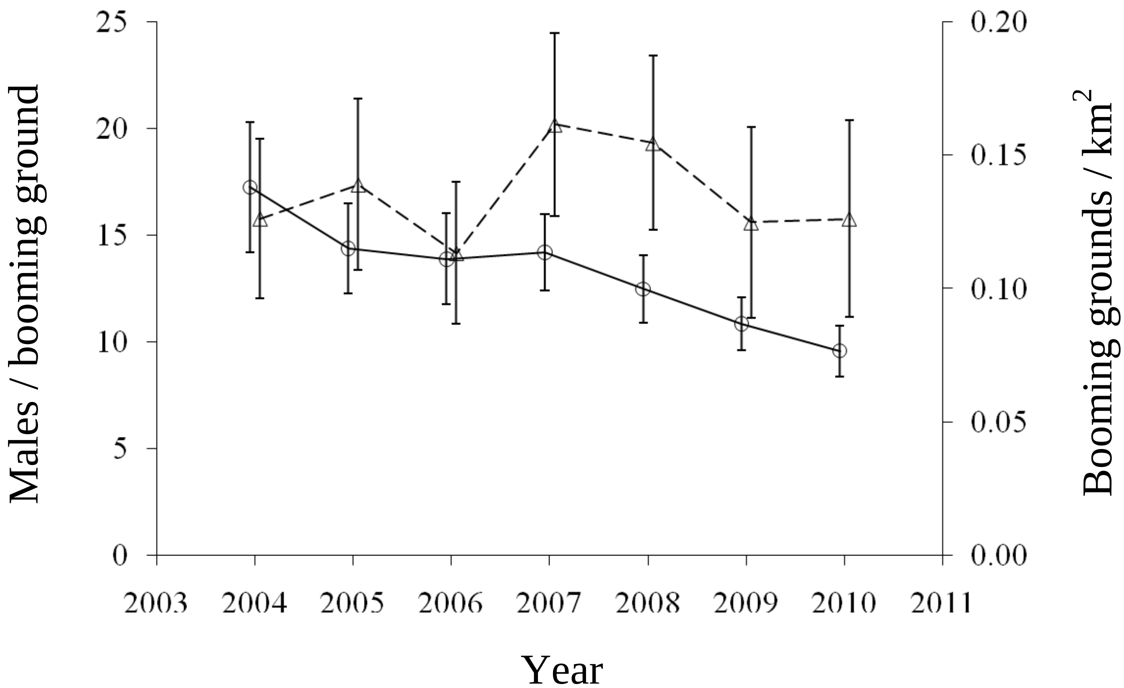

Figure 3. Number of prairie-chicken males/booming ground (circles connected by solid line) and booming grounds/km^2 (triangles connected by dashed line) observed in 17 41-km^2 survey blocks in western Minnesota. Vertical error bars represent 95% confidence intervals. The average densities during the 10 years preceding recent hunting seasons (i.e., 1993–2002) were 11.5 (10.1–12.9) males/booming ground 0.08 (0.06–0.09) booming grounds/km^2.

Drawing by Gilbert Proulx

REGISTERED FURBEARER POPULATION MODELING 2011 REPORT

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

For populations of secretive carnivores, obtaining field-based estimates of population size remains a challenging task (Hochachka et al. 2000; Wilson and Delehay 2001; Conn et al. 2004). This is particularly true when one is interested in annual estimates, multiple species, or large areas. Nevertheless, population estimates are desirable to assist in making management or harvest decisions. Population modeling is a valuable tool for synthesizing our knowledge of population demography, predicting outcomes of management decisions, and approximating population size.

In the late 1970s, Minnesota developed population models for 4 species of carnivores (fisher, marten, bobcat, and otter) to help 'estimate' population size and track population changes. All are deterministic accounting models that do not currently incorporate density-dependence. However, juvenile survival adjustments are made for bobcats and fisher during cyclic lows in hare abundance and following severe winters, particularly those where northern deer populations decline. For juvenile marten, survival is adjusted downward during apparent lows in small mammal abundance. Modeling projections are interpreted in conjunction with harvest data and results from any annual field-based track surveys.

METHODS

Primary model inputs include the estimated 1977 'starting' population size, estimates of age-specific survival and reproduction, and sex- and age-specific harvest data. Reproductive inputs are based largely on carcass data collected in the early 1980s, and for bobcats, additional data collected in 1992 and from 2003-present. Initial survival inputs were based on a review of published estimates in the literature, but are periodically adjusted as noted above. In some cases, parameter adjustments for previous years are delayed until additional data on prey abundance trends is available. Hence, population estimates reported in previous reports may not always match those reported in current reports. Obtaining updated Minnesota-specific survival and reproductive estimates is the goal of ongoing research.

Harvest data is obtained through mandatory furbearer registration. A detailed summary of 2010 harvest information is available in a separate report. Bobcat, marten, and fisher age data is obtained via x-ray examination of pulp cavity width or microscopic counts of cementum annuli from teeth of harvested animals. Although the population models only utilize data for the 3 age-classes (juvenile, yearling, adult), cementum annuli counts have periodically been collected for all non-juveniles either to examine age-specific reproductive output (bobcats) or to obtain periodic information on year-class distribution for selected species. In years where age data is not obtained for a given species, harvest age proportions are approximated using averages computed from the most recent period when data was collected.

For comparison to model projections, field-based track survey indices are presented in this report as running 3-year (t-1, t, t+1) averages of the observed track index, with the most recent year's average computed as (2/3*current index + 1/3*previous index). More detailed descriptions of scent post and winter track survey methods and results are available in separate reports.

RESULTS AND DISCUSSION

Bobcat. The 2010 registered DNR trapping and hunting harvest reached a new record level (1,012), 14% higher than the previous record in 2006 (890; Table 1). Total modeled harvest, which includes reported tribal take, was 1,042. The juvenile to adult female ratio in the harvest (1.4; Table 1) was near the long-term average (1.5) and higher than the recent 10-year average (1.1). A total of 955 bobcat carcasses were examined (Table 1), with a mean age of 2.7 for females. Approximately 9% of the harvested female bobcats were ≥ 6.5 years old (Figure 1).

Based on examination of reproductive tracts, 27% of yearling females produced a litter in 2010, identical to the 8-year average (Figure 2). Average litter size for pregnant yearlings was 2.1, similar to the recent 8-year average (2.2). Pregnancy rate for 2+ year olds was 79%, slightly above the previous 8-year mean (75%). Mean litter size for pregnant adults was 2.7 (7-year mean = 2.8). For both yearlings and adults, pregnancy rates appear to fluctuate more than average litter size, though neither has shown significant variability since data collection resumed in 2003.

Based on the recently recalibrated bobcat population model, 26% of the 2010 fall population was harvested. Due to indications that the 2010-11 winter had a negative impact on bobcats, overwinter survival of kittens was reduced by 10%. As a result of the high harvest and assumed reduction in kitten overwinter survival, population modeling projects an 11% decline in the bobcat population (Figure 3), with an estimated 2011 spring population size of ~ 2,700 (Figure 3). Harvests and both track indices remain at or near record levels (Figure 3).

Fisher. For the past 3 years, the fisher harvest season has been 1 week shorter than 'normal' (i.e., shortened from 16 days to 9 days). In addition, the fisher limit was reduced this season from 5 to 2. Fisher harvest this year under the DNR framework declined 28% to 903, the lowest harvest since 1992 (Table 2). Modeled harvest, which includes reported tribal take, was 951. Prior to 2002, the ratio of fisher to bobcat in the harvest averaged nearly 10:1, but has steadily declined since that time. For the first time since harvest seasons resumed in 1977, the 2010 bobcat harvest exceeded the fisher harvest.

Fisher carcass collections were resumed this year to collect current information on age distribution. A total of 759 carcasses were collected in 2010 (Table 2). Average age of harvested males and females was 1.3 and 1.5, respectively. Very few fishers over the age of 2.5 were harvested (Figures 4 and 5). It remains unclear whether the rapidly truncating age distribution reflects the apparently reduced harvest pressure this year, or changes to natural vital rates affecting recruitment of animals into the upper age classes. The average juvenile to adult (2+) female ratio in the harvest during the most recent 10-year period when data was collected (1985-1994) was 5.5, higher than results from the 2010 harvest (4.3). Similarly, the percentage of juveniles in the harvest from 1985-1994 (62%) was notably higher than this year (52%). Although interpretation of age ratios can be problematic (Caughley 1977, Harris et al. 2008), the differences observed are at least consistent with age structure simulations that incorporate the demographic changes observed from annual population indices and an ongoing research project (i.e., a declining population, with higher than previously assumed natural mortality of adult females with dependent kits). Specifically, holding all other parameters constant, reducing summer survival of adult females and juveniles (based on preliminary research findings) projects a 35% population decline over 8 years, a reduction in the expected percentage of juveniles in the harvest from 61% to 55%, and a reduction in the expected juvenile to adult female harvest ratio from 5.5 to 4.4, reasonably similar in all cases to the observed or estimated changes. However, comparing a previous 10-year average with a single year of current data may mask or ignore the stochastic nature of vital rates and harvest dynamics, which could also explain differences observed in harvest age proportions.

Based on projections from the recently recalibrated fisher population model, 12% of the fall fisher population was harvested during the 2010 season. After declining for ~ 7 years, the 3-year-averaged winter track index for fisher finally increased during winter 2010-11, though not significantly (Figure 6). Modeling projects a 4% increase in the population, with an estimated 2011 spring population size of ~ 6,400 fishers (Figure 6).

Marten. As with fisher, the marten harvest season the last 3 years has been 1 week shorter than 'normal' (i.e., shortened from 16 days to 9 days), though the marten limit has remained unchanged. Harvest this year under the DNR framework was 1,842, down 11% from last year (Table 3). Modeled harvest, which includes reported tribal take, was 1,977. Age-class information was obtained from a sample of 70% of the carcasses collected this year. Juveniles comprised 47% of the total harvest, identical to the recent 10-year average, though below the longer-term average of 55% (Table 3; Figure 7). The juvenile:adult female ratio (4.1) in the harvest was slightly below the recent 10-year average (5.0), and well below the longer-term average (7.8; Table 3).

Based on projections from the recently recalibrated marten population model, 16% of the fall marten population was harvested. After declining for ~ 8 years, the 3-year-averaged winter track index has now increased for 2 years, but remains well below the previous peak (Figure 8). Modeling projects a 2% population increase from last year (Figure 3), with an estimated 2011 spring population size of ~ 9,700 martens.

Otter. From 1977 - 2007, otter harvest was only allowed in the northern part of the state. From 2007-2009, otter harvest was allowed in 2 separate zones with differing limits (4 otter in the north zone, 2 in the southeast zone). Beginning in 2010, otter harvest was allowed statewide, with a consistent limit of 4 otter per trapper. Statewide harvest in 2010 under the DNR framework was 1,814 (Table 4), of which approximately 3% (50) were taken in *each* of the former southeast zone and newly opened SC/SW portion of the state. While the southeast zone no longer exists, this year's otter harvest in that area (~50) was similar to levels observed in that zone from 2007-2009 when the otter limit was 2 (range = ~45-60).

When the initial otter population model was parameterized in 1977, it was specific to northern Minnesota. Nevertheless, the model has no explicit spatial boundaries, and given that the otter population in the southern part of the state was extremely low at the time the model was developed, the model is currently assumed to reflect the statewide population (i.e., the projected increase of otter from 1980 – 2000 is assumed to explain most of the expansion of otter range into southern MN). While this assumption is partially flawed (i.e., the southern MN otter expansion was not solely a result of 'spillover' from northern Minnesota, but also undoubtedly influenced by immigration from surrounding states), it is likely a reasonable assumption in this context.

Modeled statewide otter harvest, which includes tribal take, was 1,830 (Table 4). Using the existing population model as a reflection of the statewide population, an estimated 13% of the fall population was harvested. Carcass collections ended in 1986, so no age or reproductive data are available. After declining for several years as a result of high fur prices (harvests), modeling indicates the population has now rebounded to previous levels, with an estimated 5% increase this year (Figure 7). The 2011 spring population is estimated to be ~ 12,300.

No independent statewide otter survey data are currently available for comparison, though otter surveys have periodically been conducted on the Mississippi River (Iowa border to Twin Cities) over the past 10 years. Detection-corrected comparisons of occupancy rates across years will hopefully be completed soon, but will only be possible in a couple years when repeat surveys were conducted. Simple comparison of the number of otter tracks recorded each year suggests the otter population along the

Mississippi River in SE Minnesota has been stable or increased since harvest seasons were initiated in that portion of the state.

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Table 1. Bobcat harvest data, 1981 to 2010.

Year	DNR Harvest	Modeled Harvest[1]	% Autumn Pop. Taken[2]	Carcasses Examined	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	Overall % males	Mean Pelt Price[3]
1981	260	260	13	230	37	23	40	2.1	59	63	55	58	$73
1982	274	320	15	261	35	15	50	1.3	47	49	47	48	$66
1983	208	212	10	205	37	26	37	1.5	54	53	30	45	$61
1984	280	288	15	288	37	13	50	1.4	52	66	44	51	$76
1985	119	121	6	99	33	19	48	1.2	41	41	43	42	$70
1986	160	160	8	132	26	17	57	0.9	53	32	51	51	$120
1987	214	229	12	163	33	16	51	1.4	44	52	48	48	$101
1988	140	143	7	114	40	18	42	1.7	58	62	46	54	$68
1989	129	129	6	119	39	17	44	2	49	53	56	53	$48
1990	84	87	4	62	20	34	46	0.8	58	80	44	59	$43
1991	106	110	5	93	35	33	32	3.6	59	55	70	61	$37
1992	167	167	7	151	28	22	50	1.2	55	45	53	53	$28
1993	201	210	8	161	32	20	48	1.4	51	45	52	50	$43
1994	238	270	11	187	26	16	58	0.8	64	43	45	50	$36
1995	134	152	6	96	31	15	54	2.7	57	71	79	71	$32
1996	223	250	10	164	35	20	45	1.5	51	30	49	46	$33
1997	364	401	17	270	35	16	49	1.2	60	37	43	48	$30
1998	103	107	5	77	29	26	45	1.6	59	60	60	60	$28
1999	206	228	8	163	18	24	58	0.8	55	59	62	60	$24
2000	231	250	8	183	31	26	43	1.5	54	59	50	53	$33
2001	259	278	9	213	30	21	49	1.3	52	51	53	52	$46
2002	544	621	17	475	27	25	48	1	66	49	46	52	$72
2003	483	518	15	425	25	13	62	0.9	61	46	53	54	$96
2004	631	709	17	524	28	34	38	1.6	51	40	54	49	$99
2005	590	638	15	485	25	13	62	0.8	51	48	46	48	$96
2006	890	983	22	813	26	17	57	1.1	61	50	58	57	$101
2007	702	758	19	633	34	14	52	1.2	55	60	47	52	$93
2008	853	928	21	714	26	25	49	1.1	56	52	51	52	$75
2009	884	942	22	844	23	22	55	0.9	57	46	54	53	$43
2010	1012	1042	26	955	38	16	46	1.4	62	55	43	52	$71

[1] Includes DNR and Tribal harvests

[2] Estimated from population model; includes estimated non-reported harvest of 10%.

[3] Average pelt price based on a survey of in-state fur buyers only.

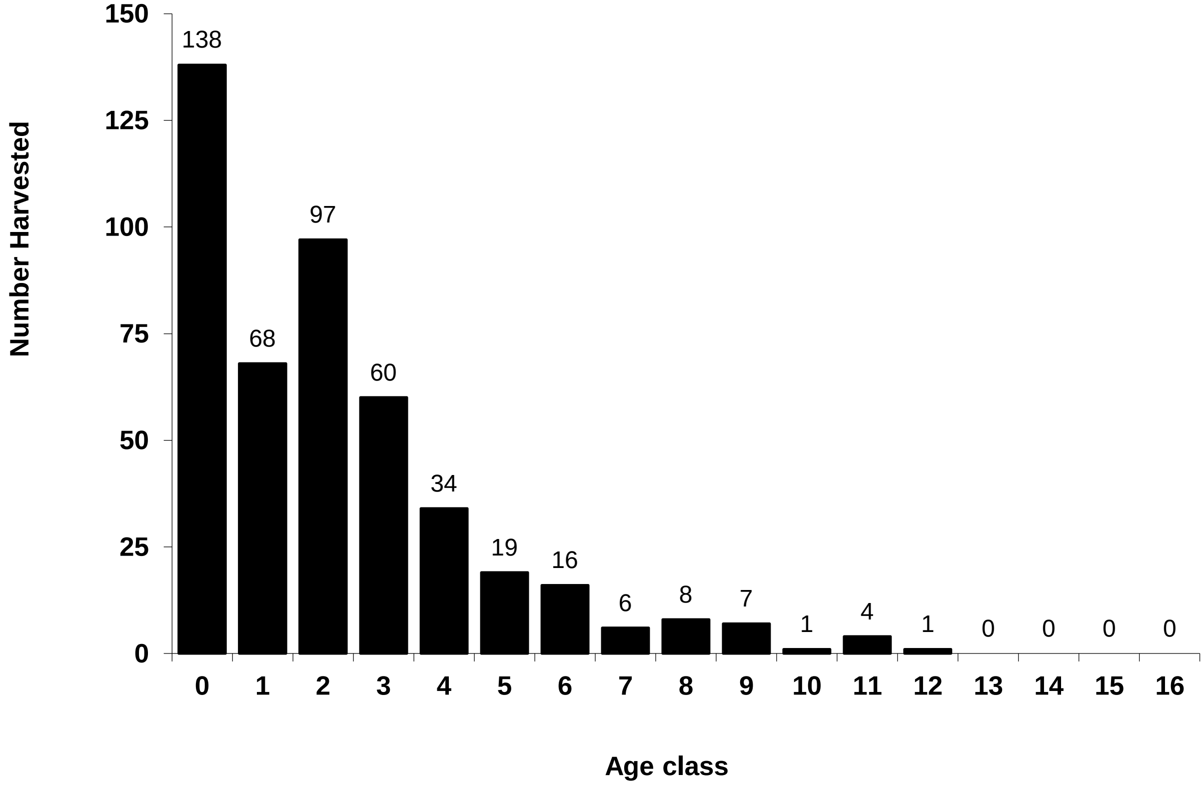

Figure 1. Age structure of female bobcats in the 2010-11 harvest.

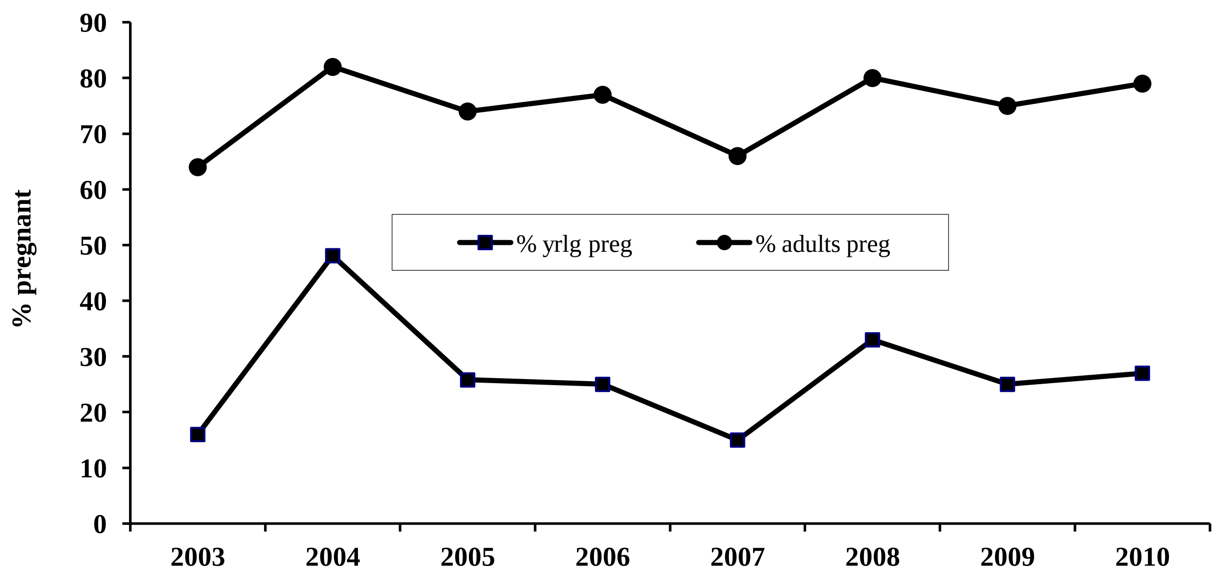

Figure 2. Pregnancy rates for yearling and adult bobcats in Minnesota, 2003-2010.

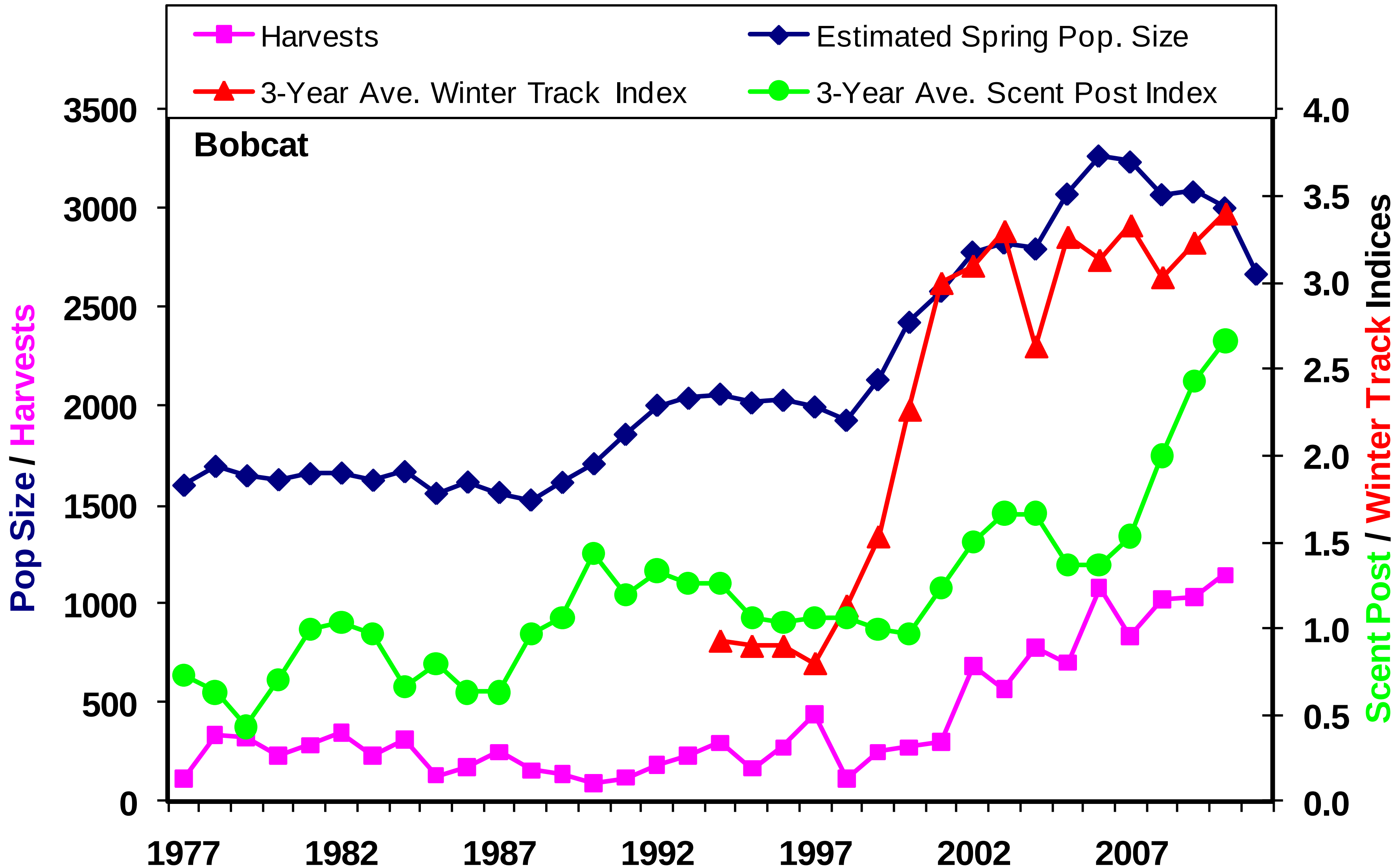

Figure 3. Bobcat populations, harvests, and survey indices, 1977-2011. Harvests include an estimate of non-reported take.

Table 2. Fisher harvest data, 1981 to 2010.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses examined	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[3]	Pelt price Females[3]
1981	862	1022	16	843	66	24	10	10.5	48	43	37	47	$94	$110
1982	912	1073	16	1073	66	19	15	9.4	46	41	52	46	$70	$99
1983	631	735	11	662	69	18	13	8.8	45	40	40	44	$71	$121
1984	1285	1332	18	1270	63	20	17	7.2	52	45	45	49	$70	$122
1985	678	735	10	712	63	20	18	5.4	46	40	34	43	$74	$130
1986	1068	1186	16	1186	59	24	18	5.3	48	50	37	46	$84	$162
1987	1642	1749	23	1534	63	15	22	4.7	46	40	37	43	$84	$170
1988	1025	1050	15	805	70	15	15	6.8	48	45	33	45	$54	$100
1989	1243	1243	17	1024	64	19	17	5.8	47	47	36	45	$26	$53
1990	746	756	10	592	65	14	21	4.5	44	55	30	43	$35	$46
1991	528	528	6	410	66	21	13	7.8	50	52	35	48	$21	$48
1992	778	782	8	629	58	21	21	4.9	42	55	45	46	$16	$29
1993	1159	1192	11	937	59	22	19	5.3	47	37	42	44	$14	$28
1994	1771	1932	16	1360	56	18	26	4	47	54	44	48	$19	$30
1995	942	1060	9	-	-	-	-	-	-	-	-	45	$16	$25
1996	1773	2000	15	-	-	-	-	-	-	-	-	45	$25	$34
1997	2761	2974	22	-	-	-	-	-	-	-	-	45	$31	$34
1998	2695	2987	23	-	-	-	-	-	-	-	-	45	$19	$22
1999	1725	1880	16	-	-	-	-	-	-	-	-	45	$19	$20
2000	1674	1900	15	-	-	-	-	-	-	-	-	45	$20	$19
2001	2145	2362	19	-	-	-	-	-	-	-	-	54	$23	$23
2002	2660	3028	24	-	-	-	-	-	-	-	-	54	$27	$25
2003	2521	2728	22	-	-	-	-	-	-	-	-	55	$27	$26
2004	2552	2753	23	-	-	-	-	-	-	-	-	52	$30	$27
2005	2388	2454	22	-	-	-	-	-	-	-	-	52	$36	$31
2006	3250	3500	33	-	-	-	-	-	-	-	-	51	$76	$68
2007	1682	1811	21	-	-	-	-	-	-	-	-	51	$63	$48
2008	1712	1828	22	-	-	-	-	-	-	-	-	52	$22	$37
2009	1259	1323	17	-	-	-	-	-	-	-	-	53	$35	$34
2010	903	951	12	759	52	25	23	4.3	54	53	49	52	$38	$37

[1] Includes DNR and Tribal harvests

[2] Estimated from population model, includes estimated non-reported harvest of 22% 1977-1992, and 10% from 1993-present.

[3] Average pelt price based on a survey of in-state fur buyers only.

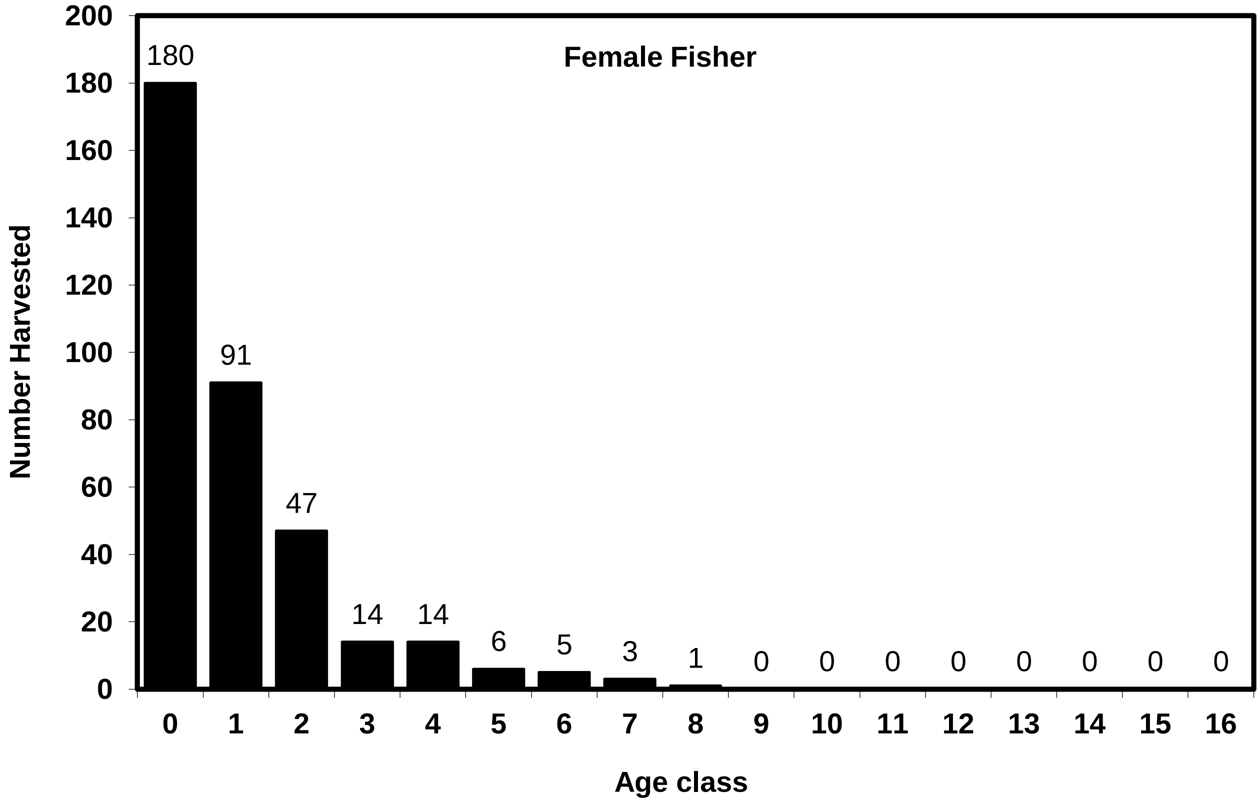

Figure 4. Age structure of female fishers in the 2010 harvest.

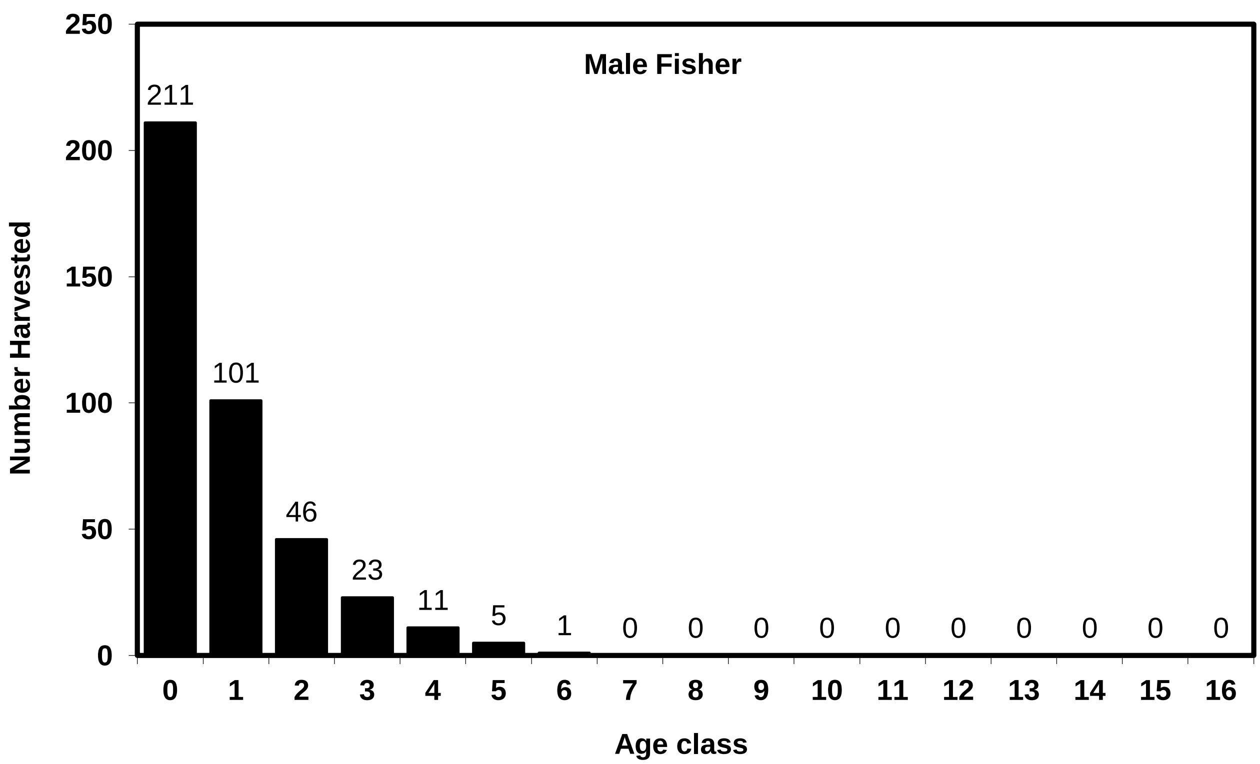

Figure 5. Age structure of male fishers in the 2010 harvest.

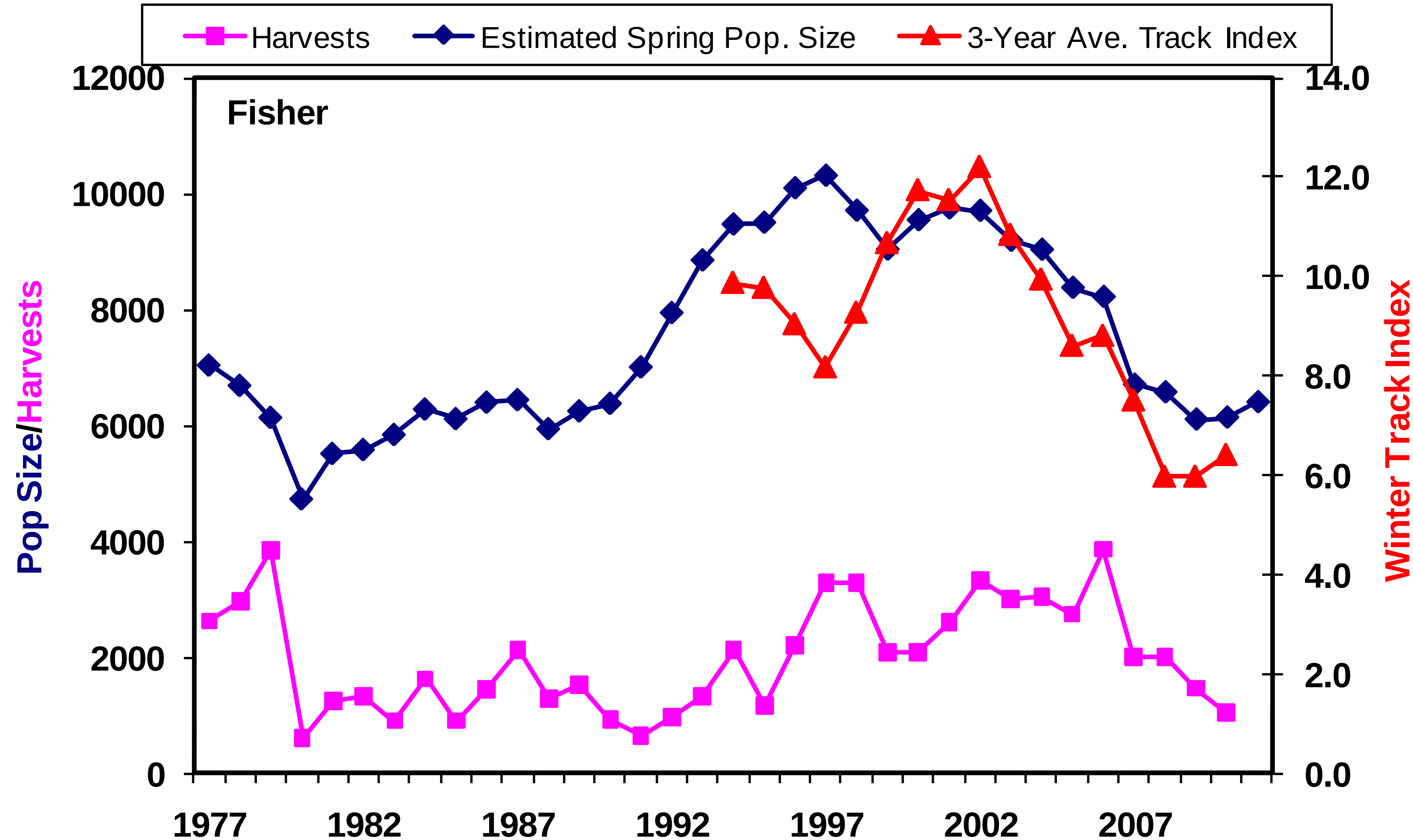

Figure 6. Fisher populations, harvests, and survey indices, 1977-2011. Harvests include an estimate of non-reported take.

Table 3. Marten harvest data, 1985 to 2010.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses Examined[3]	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[4]	Pelt price Females[4]
1985	430	430	5	507	73	18	9	17.2	69	68	82	70	$30	$28
1986	798	798	8	884	64	21	15	12.3	65	71	81	69	$36	$27
1987	1363	1363	13	1754	66	18	16	11.2	65	67	75	67	$43	$39
1988	2072	2072	16	1977	66	11	23	8.6	58	50	66	59	$50	$43
1989	2119	2119	16	1014	68	12	20	9.7	57	63	65	59	$48	$47
1990	1349	1447	12	1375	48	18	34	3.6	59	54	61	59	$44	$41
1991	686	1000	9	716	74	9	17	16.1	69	71	72	70	$40	$27
1992	1602	1802	12	1661	65	18	17	15.1	63	70	75	66	$28	$25
1993	1438	1828	12	1396	57	20	23	7.5	61	71	67	64	$36	$30
1994	1527	1846	12	1452	58	15	27	6.4	62	76	67	66	$34	$28
1995	1500	1774	11	1393	60	18	22	8.2	63	68	66	65	$28	$21
1996	1625	2000	13	1372	48	22	30	4.8	62	69	67	65	$34	$29
1997	2261	2762	16	2238	61	13	26	6.2	60	60	63	61	$28	$22
1998	2299	2795	17	1577	57	18	25	6.6	62	66	65	63	$20	$16
1999	2423	3000	16	2013	67	12	21	9.8	65	66	67	66	$25	$21
2000	1629	2050	11	1598	56	25	19	8.9	62	69	66	64	$28	$21
2001	1940	2250	11	1895	62	15	23	11	66	73	75	69	$24	$23
2002	2839	3192	16	2451	39	30	31	3.1	57	63	61	60	$28	$27
2003	3214	3548	18	2391	48	17	35	4	57	65	66	62	$30	$27
2004	3241	3592	20	2776	26	28	46	1.3	52	64	57	58	$31	$27
2005	2653	2873	18	1992	53	16	31	4.9	64	63	65	64	$37	$32
2006	3788	4120	26	1914	64	17	20	9.2	66	67	65	66	$74	$66
2007	2221	2481	18	1355	30	29	41	1.5	56	64	50	56	$59	$50
2008	1823	1953	15	1095	40	21	39	2.1	58	60	53	56	$31	$28
2009	2073	2250	16	1252	55	16	29	4.9	65	46	61	61	$27	$30
2010	1842	1977	16	1202	47	29	25	4.1	69	54	60	63	$40	$37

[1] Includes DNR and Tribal harvests

[2] Estimated from population model; includes estimated non-reported harvest of 40% in 1985-1987 and 1991, 20% in 1988-1990 and 1992-1998, and 10% from 1999-present.

[3] Starting in 2005, the number of carcasses examined represents a random sample of ~ 70% of the carcasses collected in each year.

[4] Average pelt price based on a survey of in-state fur buyers only

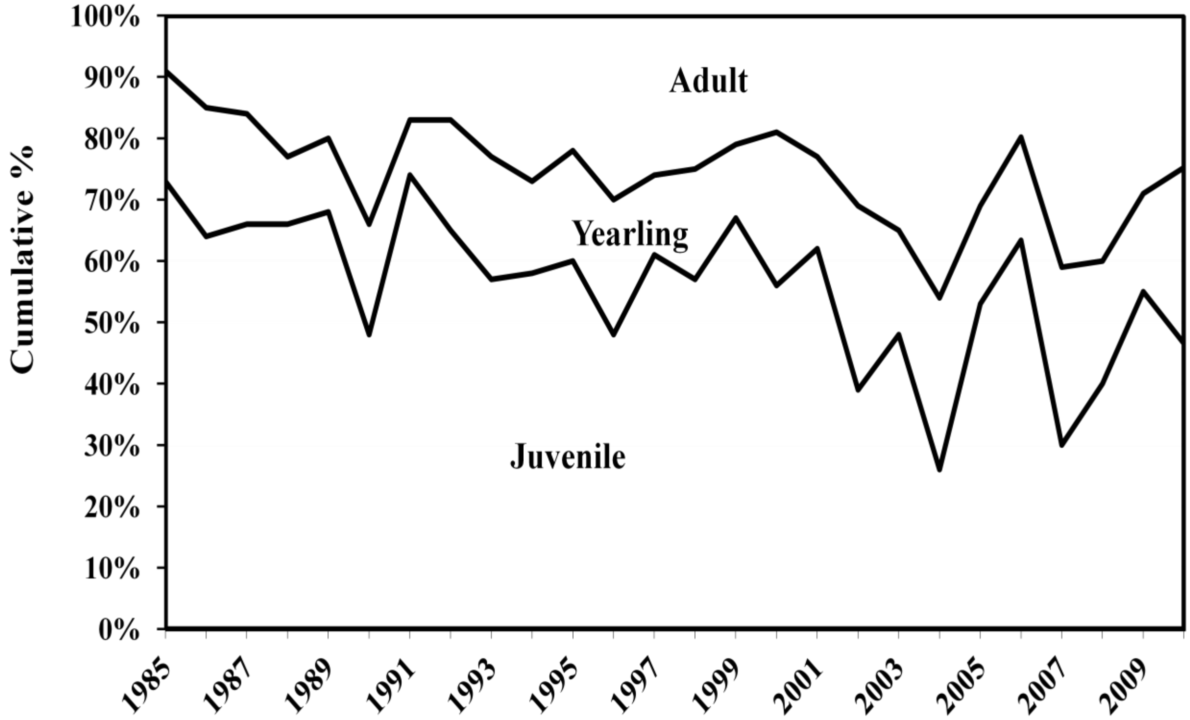

Figure 7. Marten harvest age-class proportions, 1985-2010.

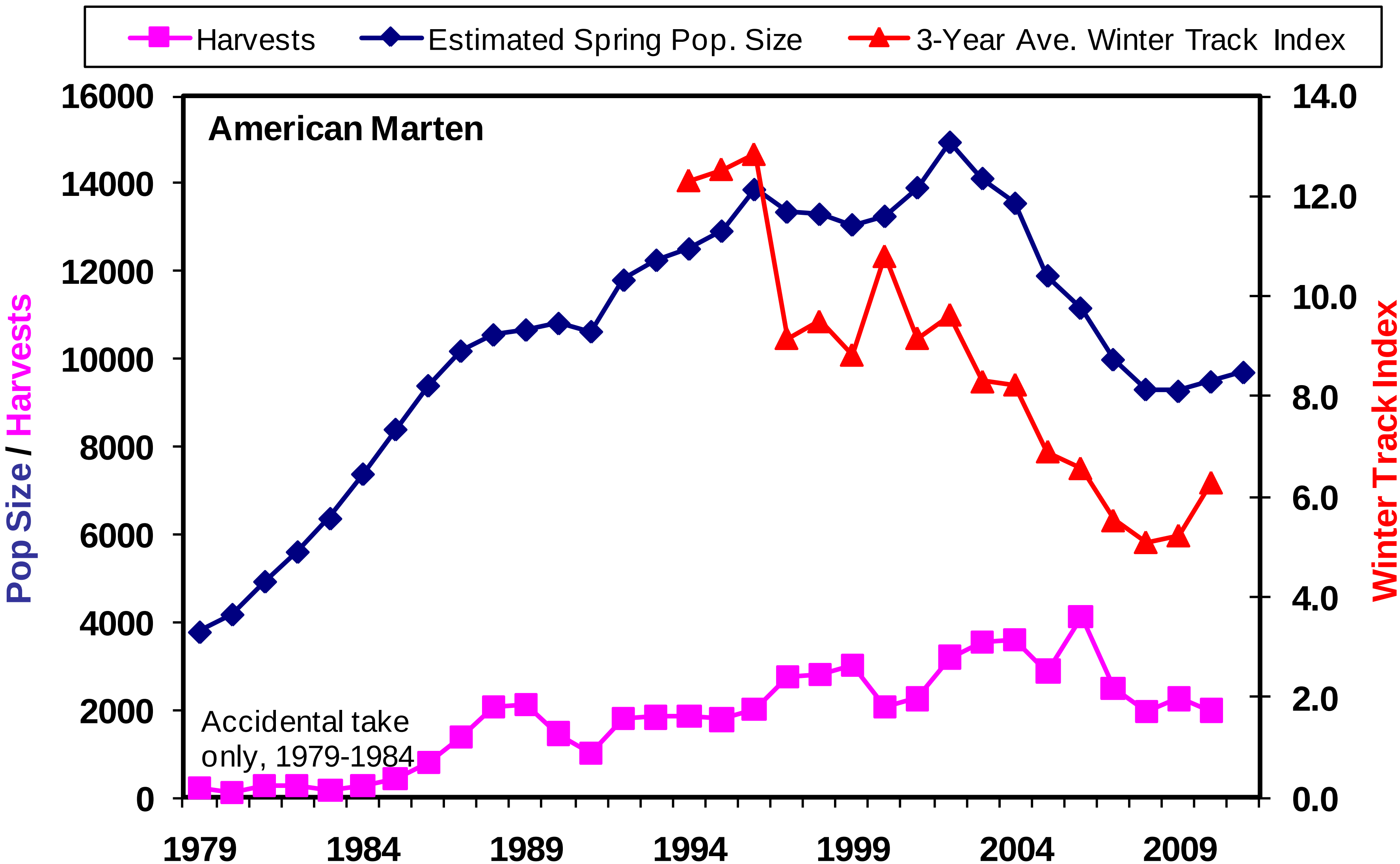

Figure 8. American marten populations, harvests, and survey indices, 1979-2011. Harvests include an estimate of non-reported take.

Table 4. Otter harvest data[1], 1981 to 2010. Carcasses were only collected from 1980-86.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses examined	% juveniles	% yearlings	% adults	Juv:ad. females	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Otter[3]	Pelt price Beaver[3]
1981	484	762	11	471	55	20	25	4.3	56	53	48	52	$30	$14
1982	385	625	9	389	51	26	23	6	57	65	65	60	$26	$11
1983	408	604	8	433	42	31	27	3.7	56	57	57	56	$25	$12
1984	529	561	7	549	48	23	29	3.2	47	50	49	49	$22	$12
1985	559	572	7	572	43	23	34	2.2	53	50	43	51	$21	$15
1986	777	777	8	745	45	23	32	2.7	45	48	46	47	$24	$20
1987	1386	1484	15	-	-	-	-	-	-	-	-	52	$23	$17
1988	922	922	9	-	-	-	-	-	-	-	-	52	$22	$14
1989	1294	1294	12	-	-	-	-	-	-	-	-	52	$22	$12
1990	888	903	8	-	-	-	-	-	-	-	-	52	$24	$9
1991	855	925	8	-	-	-	-	-	-	-	-	51	$25	$9
1992	1368	1365	10	-	-	-	-	-	-	-	-	52	$30	$7
1993	1459	1368	10	-	-	-	-	-	-	-	-	52	$43	$10
1994	2445	2708	19	-	-	-	-	-	-	-	-	52	$48	$14
1995	1435	1646	12	-	-	-	-	-	-	-	-	52	$39	$12
1996	2219	2500	18	-	-	-	-	-	-	-	-	52	$39	$19
1997	2145	2313	17	-	-	-	-	-	-	-	-	52	$40	$17
1998	1946	2139	16	-	-	-	-	-	-	-	-	52	$34	$13
1999	1635	1717	13	-	-	-	-	-	-	-	-	52	$41	$11
2000	1578	1750	13	-	-	-	-	-	-	-	-	52	$51	$14
2001	2301	2531	18	-	-	-	-	-	-	-	-	57	$46	$13
2002	2145	2390	16	-	-	-	-	-	-	-	-	59	$61	$10
2003	2766	2966	20	-	-	-	-	-	-	-	-	57	$85	$12
2004	3450	3700	25	-	-	-	-	-	-	-	-	56	$87	$14
2005	2846	3018	22	-	-	-	-	-	-	-	-	58	$89	$15
2006	2720	2873	22	-	-	-	-	-	-	-	-	56	$43	$17
2007	1861	1911	15	-	-	-	-	-	-	-	-	55	$29	$16
2008	1938	1983	15	-	-	-	-	-	-	-	-	59	$24	$12
2009	1544	1578	12	-	-	-	-	-	-	-	-	59	$36	$13
2010	1814	1830	13	-	-	-	-	-	-	-	-	57	$35	$13

[1] Includes DNR and Tribal harvests

[2] Estimated from population model. Incl. estimated non-reported harvest of 30% to 1991, 22% from 1992-2001, and 10% from 2002-present.

[3] Weighted average of spring (beaver only) and fall prices based on a survey of in-state fur buyers.

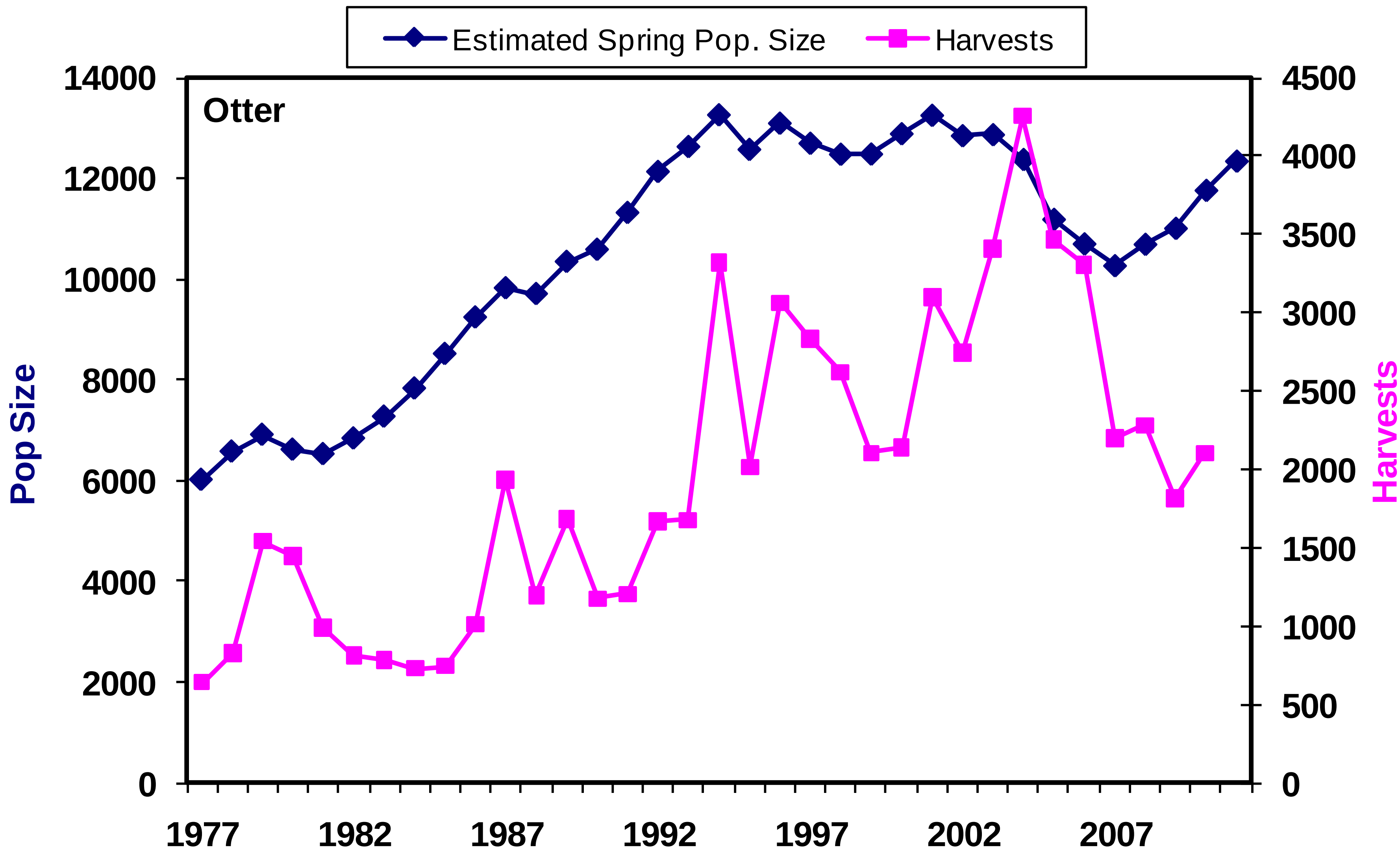

Figure 9. Otter populations and harvests, 1977-2011. Harvests include an estimate of non-reported take.

POPULATION TRENDS OF WHITE-TAILED DEER IN THE FOREST ZONE – 2011

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Deer hunters are required by regulation to register each deer they harvest within 24 hours of the close of the deer-hunting season at an official registration station. Beginning in 2010, hunters were also allowed to register their deer by phone or at the DNR website. Data collected as part of this registration process provides important information on the sex and age of deer killed, population trends, and the effectiveness of current management regulations. The following report presents a brief analysis of the 2010 harvest registration data in the forest zone (Figure 1). This is followed by a discussion of deer population trends and projections in the forest zone based on simulation modeling.

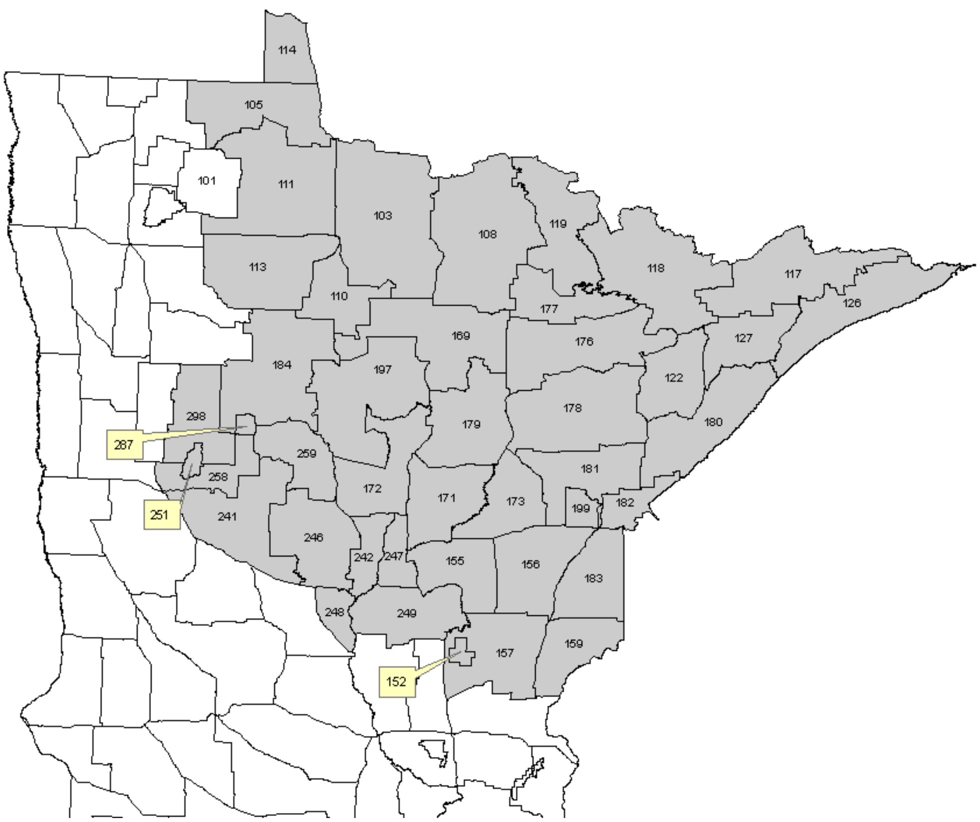

Figure 1. Permit areas in the forested zone, 2010.

HARVEST

In 2010, hunters registered 207,313 deer, up 7% from 2009. Of that number, 48% or 100,131 deer were harvested in the forested zone (Figure 1, Table 1). The 2010 forest zone harvest increased 6% from the 2009 harvest. The following discussion applies to the subset of deer harvested in the forested zone.

The boundaries of almost half (20 of 43) of the forest permit areas changed between 2009 and 2010 and comparisons between the approximate 2009 harvest for each permit area with the 2010 registered harvest may be biased (Tables 1-3). Forest-wide, the buck harvest increased 3% over the 2009 buck harvest. However, the 2010 buck harvest was almost 8% lower than the average over the previous 10 years which implies that we have been successful in reducing deer numbers over the last decade.

The forest-wide antlerless harvest also increased by 3% over 2009 despite a reduced opportunity to harvest antlerless deer (Table 3). In 2009, 37% of the permit areas were listed as “Lottery” with a limited number of antlerless permits. In 2010 this proportion increased to 49% reflecting the belief that deer populations throughout the forest were closer to goal.

The proportion of bucks in the forest zone harvest (total forest bucks/total forest harvest) increased from 49% in 2009 to 51% in 2010. This increase reflected further decreases in the opportunity for hunters to harvest antlerless deer. Forest-wide, the proportion of bucks by permit area ranged from 21% in PA 287 to 86% in PA119.

The archery harvest in the forest zone increased 15% in 2010 and was only 1% lower than the average archery harvest in the previous 10 years. Statewide, the archery harvest represented 11% of the total harvest. Statewide archery license sales were virtually identical to those in 2009.

The muzzleloader harvest increased 19% in the forest zone in 2010 and was 15% higher than the average muzzleloader harvest in the previous 10 years. Statewide, the muzzleloader harvest represented 4% of the total harvest. Statewide muzzleloader license sales declined by 12%.

The firearms, archery, and muzzleloader harvests were higher than expected in many areas. It is possible that the compliance rate (proportion of hunters who registered their deer) increased because of the options to register deer using the internet or telephone. Among stable permit areas in the forest zone (no boundary changes) the registered harvest averaged 4% higher than in 2009. This change was not significantly different from 0 (n = 20, t = 1.32, P = 0.203) and implies that there was no bias associated with the changes to registration.

Population Trends and Model Projections

Based on the winter severity index (WSI), the winter of 2010-11 was generally mild in the southern third of the forest zone (Figure 2). Northern portions of the forest, however experienced WSI values ranging from moderate to severe. The maximum WSI occurred at Poplar Lake with a reading of 193 and 14 stations measured a WSI greater than 100.

Simulation modeling was used in 37 permit areas (Figure 1 and Table 4) to approximate deer density, identify trends, and project the effect of the 2010-hunting season. To better summarize the results for this report, permit areas were pooled into one of 5 regions (Figures 3 and 4). Deer density varied according to region with the lowest densities occurring in the Northeast and Northwest. Highest densities occurred in the West Central and South. The same basic trend occurred in all 5 areas; deer density was at the lowest level in 1997 following the severe winters of the mid-1990’s and then steadily increased to peak density in 2003 in response to low (or no) antlerless permits and mild winters. Between 2003 and 2010, there was a steady decline in deer numbers in the South, Central, and West Central in response to the high antlerless harvest. In the past year, deer numbers in all regions continued to drop an average of 9%.

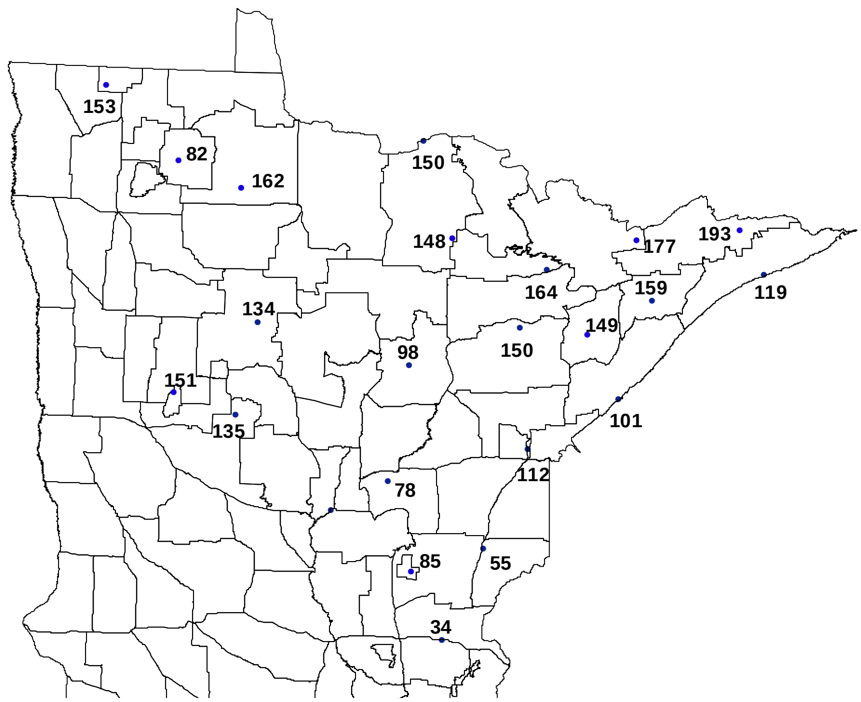

Figure 2. Final WSI values for the forested zone of Minnesota, winter of 2010-2011.

Based on density targets set during the 2005 and 2006 goal setting processes, the 2011 pre-fawn deer density was above goal over much of the forest zone (Figure 5). For purposes here, if deer density was ±10% of the goal, the permit area was listed as being at goal. Deer density in permit areas ranged from 42% below goal to almost 47% above goal.

After discussion at several levels within the Division of Fish and Wildlife, the final designations for the forest zone call for 4 permit area designated as “Lottery”, 19 as “Hunters Choice”, 11 as “Managed”, and 9 as “Intensive” (Figure 6).

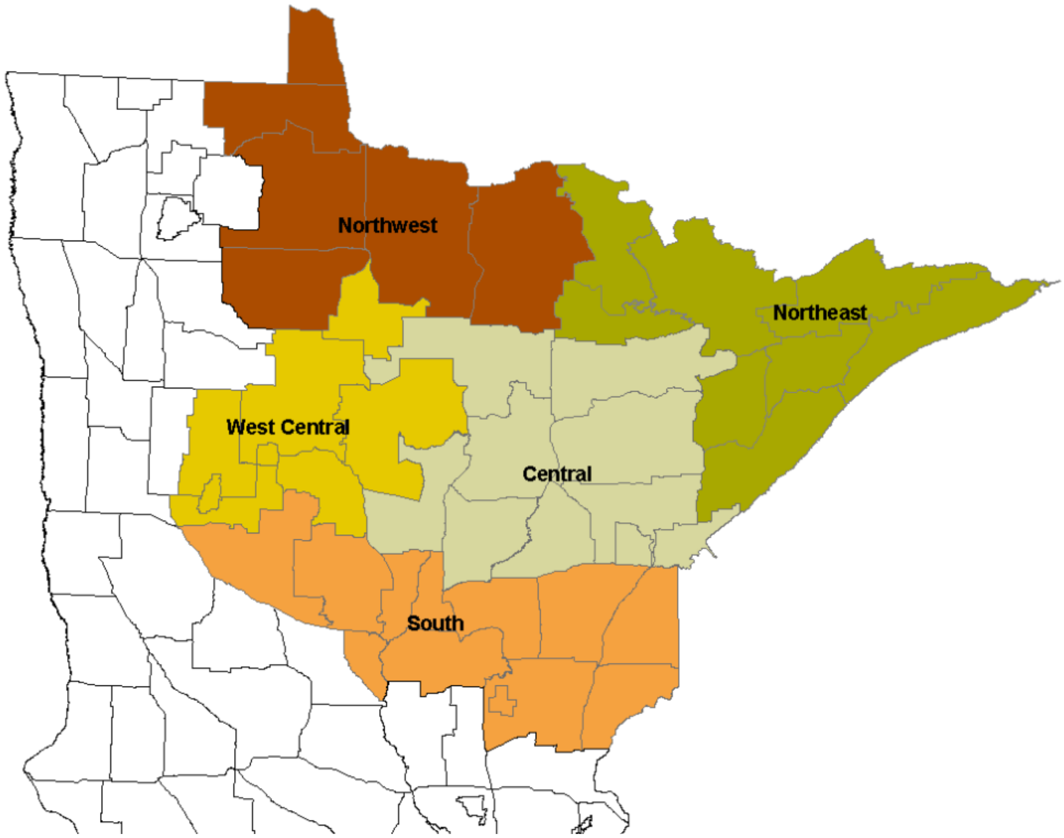

Figure 3. Permit areas grouped for summary discussion.

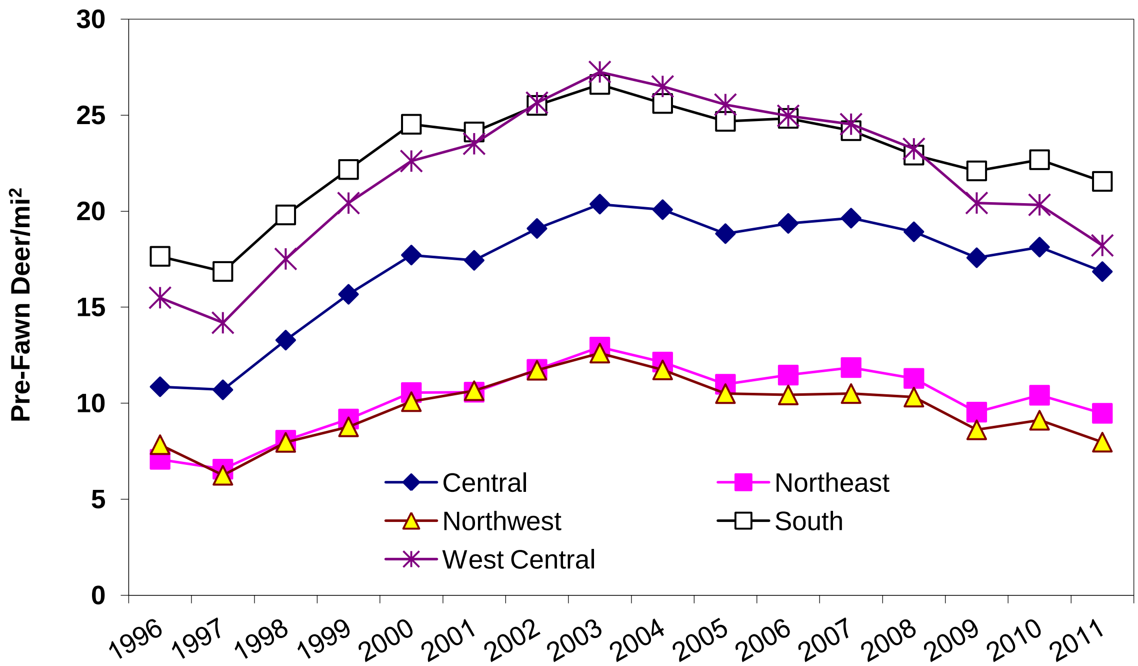

Figure 4. Population trends of deer in forest zone. Trend lines represent the groups of permit areas as illustrated in Figure 3. Density represents pre-fawn density.

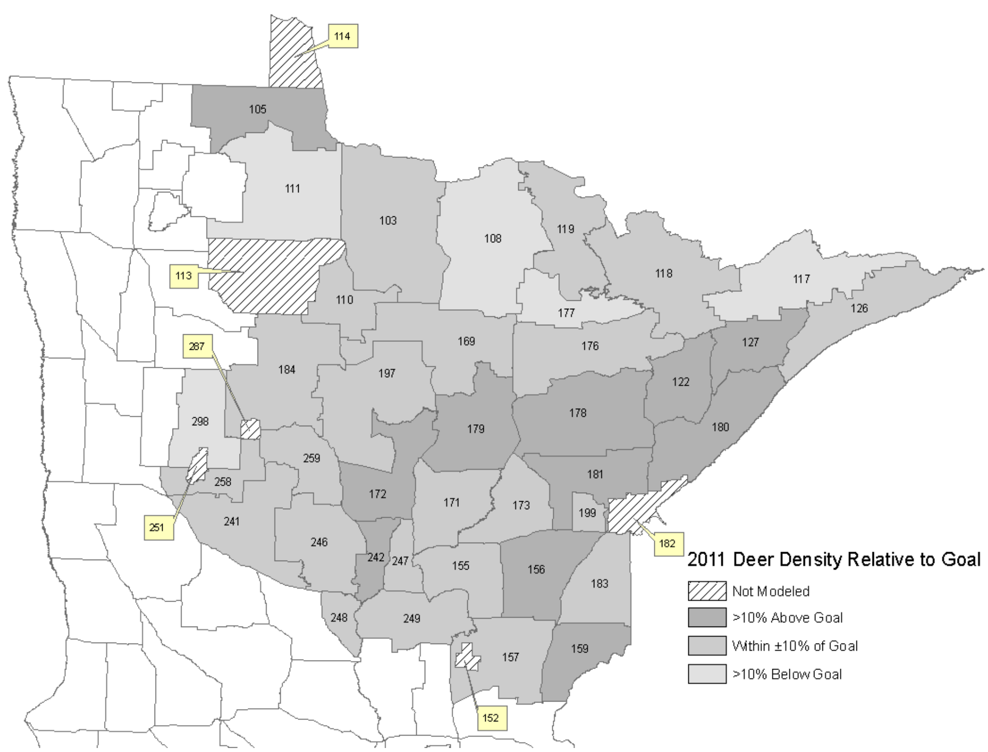

Figure 5. Deer density expressed relative to pre-fawn population goals. Note revised permit area boundaries (and numbers) effective for the 2011 hunting season.

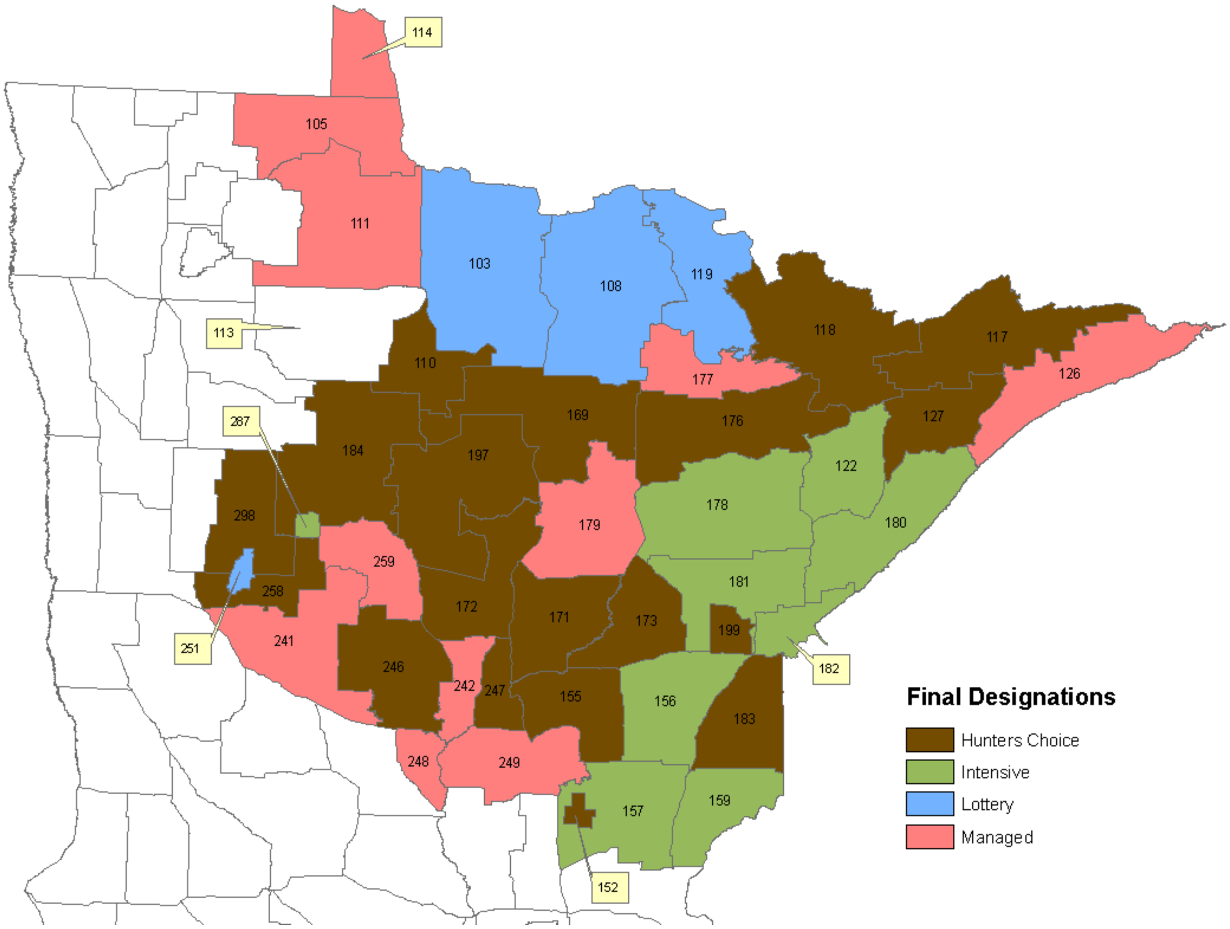

Figure 6. Final designation of permit areas in the Forest Zone for the 2011 hunting season.

Table 1. Total registered deer harvest for Deer Permit Areas in Minnesota's Forested Zone.

Permit Area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change
103	1,696	1,971	2,992	2,538	2,172	2,302	2,237	1,838	1,151	1,274 *	11%
105	1,962	2,385	3,740	3,106	3,557	3,210	3,344	2,391	2,020	1,855	-8%
108	3,075	3,033	4,513	3,491	3,412	3,316	3,358	2,734	1,500	1,371 *	-9%
110	1,918	2,233	2,729	2,615	2,368	2,448	2,520	2,391	1,807	2,425 *	34%
111	1,870	1,904	2,577	2,205	2,260	2,365	1,608	1,538	1,364	1,053	-23%
114	72	80	96	110	123	174	127	121	95	94	-1%
117	125	126	212	238	209	216	280	315	136	71 *	-48%
118	1,876	2,003	2,847	2,289	2,305	2,359	2,266	1,856	1,192	926 *	-22%
119	1,533	1,628	2,316	1,843	1,857	1,893	1,811	1,466	943	1,153 *	22%
122	576	536	650	669	614	997	1,054	949	711	990 *	39%
126	470	597	702	841	904	977	1,155	1,009	869	910	5%
127	95	99	146	177	151	188	216	187	132	157	19%
152	264	218	235	246	271	330	377	293	375	234	-38%
155	3,274	3,952	4,490	4,065	3,600	3,571	3,556	2,030	2,194	2,935 *	34%
156	3,055	3,258	4,966	4,594	4,517	4,767	5,180	4,494	4,260	4,584	8%
157	7,194	7,728	9,001	7,606	6,901	7,989	7,828	6,287	5,491	6,568	20%
159	4,180	3,944	5,043	3,788	3,830	3,810	4,090	3,146	3,278	3,512	7%
169	3,802	4,813	4,347	4,916	3,425	4,796	4,735	4,211	3,560	2,804 *	-21%
171	2,545	2,863	4,138	3,605	3,419	3,378	3,690	2,961	2,371	1,841 *	-22%
172	4,156	4,273	6,690	5,422	5,303	5,274	5,500	4,693	3,800	2,640 *	-31%
173	1,515	1,896	2,708	2,370	2,191	2,251	2,297	2,022	1,404	1,730 *	23%
176	2,874	2,784	4,367	3,664	2,674	3,926	3,821	3,726	2,090	2,206 *	6%
177	1,070	1,075	1,606	1,294	1,153	1,324	1,296	1,138	663	2,618 *	295%
178	3,343	3,659	5,509	5,284	5,359	5,473	6,563	5,912	5,056	5,718 *	13%
179	3,141	3,141	5,409	4,700	4,599	4,550	5,359	4,763	3,660	4,750 *	30%
180	1,703	1,867	3,123	2,355	2,837	3,553	3,777	3,408	2,672	3,245	21%
181	2,750	2,779	4,128	4,296	4,071	4,986	5,217	4,687	3,807	4,538	19%
182					1,256	1,460	1,599	1,640	2,339	2,125	-9%
183	2,958	2,991	4,320	3,821	3,505	4,118	3,868	3,086	2,273	2,483	9%
184	7,762	8,811	14,023	12,307	11,482	10,261	11,005	9,311	6,670	4,350	-35%
197	1,167	1,413	1,652	1,723	1,594	2,471	2,248	2,051	1858	1,699	-9%
199	166	164	140	172	188	167	206	218	239	268	12%
241	8,905	9,478	11,994	10,943	10,071	10,432	11,021	8,943	7,831	8,028 *	3%
242	2,072	2,426	2,767	2,244	2,116	2,170	2,259	2,239	1,598	1,907	19%
246	6,741	6,009	8,558	7,694	6,618	7,232	6,268	3,549	4,145	4,256 *	3%
247	2,115	2,101	2,744	2,582	2,115	2,393	2,064	1,247	1,277	1,266	-1%
248	1,231	1,339	1,917	1,864	1,693	1,812	1,878	1,486	1,405	1,568	12%
249	3,148	3,238	4,223	3,800	3,211	3,667	3,321	2,072	2,216	3,613	63%
251	254	298	470	387	325	301	253	143	199	158	-21%
258	2,709	3,249	4,171	3,751	3,449	3,466	3,975	3,079	1,503	1,601 *	7%
259	3,709	4,130	6,042	4,681	4,211	4,489	3,959	3,573	2,045	2,685 *	31%
287	460	446	529	425	280	305	306	249	301	310	3%
298	826	932	1988	1733	1664	1727	1610	1,522	1,585	1,612	2%
Forested Zone	104,357	111,870	154,818	136,454	127,860	136,894	139,102	114,974	94,085	100,131	6%

Note: Some permit area boundaries were changed in 1999 and 2010*. Harvest totals prior to 2010 are estimates that assume an evenly distributed in the old harvest permit areas and may be biased. Harvest in permit area 182 (created in 2005) were calculated in a similar manner.

Table 2. Registered buck harvest for Deer Permit Areas in Minnesota's Forested Zone.

Permit Area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change
103	1107	1165	1390	1387	1093	1028	1118	937	825	821 *	0%
105	813	1138	1488	1326	1364	1122	1206	963	807	844	5%
108	1884	1837	2187	1974	1613	1495	1665	1369	1240	1156 *	-7%
110	961	1044	1127	1088	923	880	1040	874	845	1139 *	35%
111	1173	1230	1234	1184	1107	966	830	744	607	572	-6%
114	56	63	55	55	72	95	83	69	54	49	-9%
117	125	126	190	201	184	149	209	175	106	41 *	-61%
118	1135	1254	1548	1429	1210	1191	1202	956	872	797 *	-9%
119	919	1007	1233	1132	952	940	944	750	695	806 *	16%
122	422	419	468	529	499	528	617	553	521	570 *	9%
126	417	495	585	591	595	606	689	527	497	530	7%
127	82	86	126	149	127	147	149	107	106	115	8%
152	182	130	106	152	141	158	149	126	160	134	-16%
155	1682	1703	1626	1609	1405	1317	1501	1157	1338	1620 *	21%
156	1690	1653	2001	2003	1811	1881	2073	1835	1945	2084	7%
157	3144	3048	3207	3030	2745	2916	2832	2340	2466	2960	20%
159	1947	1667	1995	1518	1528	1548	1680	1233	1428	1576	10%
169	2147	2540	2273	2443	1927	1912	2097	1737	1546	1615 *	4%
171	1418	1417	1622	1591	1416	1361	1483	1253	1242	1193 *	-4%
172	2177	2085	2454	2269	2026	1974	2085	1701	1477	1737 *	18%
173	890	965	1091	1130	968	929	991	885	884	1008 *	14%
176	1786	1821	2135	1998	1786	1887	1919	1620	1501	1675 *	12%
177	653	675	806	741	634	633	656	539	496	1064 *	115%
178	2013	2216	2649	2766	2702	2504	2972	2324	2579	2764 *	7%
179	1822	1738	2236	2134	1941	1903	2042	1752	1568	2025 *	29%
180	1358	1398	1831	1833	1692	1829	1888	1598	1566	1434	-8%
181	1717	1781	2186	2363	2077	2279	2327	1970	1923	1955	2%
182					511	520	544	492	788	643	-18%
183	1771	1695	1826	1793	1532	1687	1791	1445	1435	1388	-3%
184	3925	4310	4774	4848	4161	3554	3554	3416	2858	3013	5%
197	953	998	1,040	1,143	999	1,090	1,108	999	882	1055	20%
199	123	132	104	130	151	119	150	119	145	150	3%
241	3475	3740	4046	3913	3470	3598	3444	3153	3025	3278 *	8%
242	885	824	912	740	721	692	688	663	607	732	21%
246	2745	2686	2921	2807	2336	2454	2200	1849	1979	2327 *	18%
247	1056	948	1047	955	861	848	802	657	692	825	19%
248	622	720	714	739	656	638	634	588	584	641	10%
249	1479	1429	1479	1327	1261	1285	1251	1137	1152	1407	22%
251	152	132	176	183	128	147	91	58	63	86	37%
258	1146	1287	1421	1337	1214	1206	1164	1059	863	915 *	6%
259	1599	1783	2013	1797	1494	1636	1418	1391	1113	1556 *	40%
287	201	167	207	182	106	104	92	81	85	64	-25%
298	685	654	952	894	810	799	753	762	699	722	3%
Forested Zone	54,537	56,206	63,481	61,413	54,949	54,555	56,131	47,963	46,264	51,086	10%

Note: Some permit area boundaries were changed in 1999 and 2010*. Harvest totals prior to 2010 are estimates that assume an evenly distributed in the old harvest permit areas and may be biased. Harvest in permit area 182 (created in 2005) were calculated in a similar manner.

Table 3. Registered antlerless deer harvest for Deer Permit Areas in Minnesota's Forested Zone.

Permit Area	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change
103	589	806	1,602	1,151	1,079	1,274	1,119	901	326	453 *	39%
105	1,149	1,247	2,252	1,780	2,193	2,088	2,138	1,428	1,213	1,011	-17%
108	1,191	1,196	2,326	1,517	1,799	1,821	1,693	1,365	260	215 *	-17%
110	957	1,189	1,602	1,527	1,445	1,568	1,480	1,517	962	1,286 *	34%
111	697	674	1,343	1,021	1,153	1,399	778	794	757	481	-36%
114	16	17	41	55	51	79	44	52	41	45	10%
117	0	0	22	38	25	67	71	140	30	30 *	-1%
118	741	749	1,299	860	1,095	1,168	1,064	900	320	129 *	-60%
119	614	621	1,083	711	905	953	867	716	248	347 *	40%
122	154	117	182	140	115	469	437	396	190	420 *	121%
126	53	102	117	250	309	371	466	482	372	380	2%
127	13	13	20	28	24	41	67	80	26	42	62%
152	82	88	129	94	130	172	228	167	215	100	-53%
155	1,592	2,249	2,864	2,456	2,195	2,254	2,055	873	856	1,315 *	54%
156	1,365	1,605	2,965	2,591	2,706	2,886	3,107	2,659	2,315	2,500	8%
157	4,050	4,680	5,794	4,576	4,156	5,073	4,996	3,947	3,025	3,608	19%
159	2,233	2,277	3,048	2,270	2,302	2,262	2,410	1,913	1,850	1,936	5%
169	1,655	2,273	2,074	2,473	1,498	2,884	2,638	2,474	2,014	1,189 *	-41%
171	1,127	1,446	2,516	2,014	2,003	2,017	2,207	1,708	1,129	648 *	-43%
172	1,979	2,188	4,236	3,153	3,277	3,300	3,415	2,992	2,323	903 *	-61%
173	625	931	1,617	1,240	1,223	1,322	1,306	1,137	520	722 *	39%
176	1,088	963	2,232	1,666	888	2,039	1,902	2,106	589	531 *	-10%
177	417	400	800	553	519	691	640	599	167	1,554 *	831%
178	1,330	1,443	2,860	2,518	2,657	2,969	3,591	3,588	2,477	2,954 *	19%
179	1,319	1,403	3,173	2,566	2,658	2,647	3,317	3,011	2,092	2,725 *	30%
180	345	469	1,292	522	1,145	1,724	1,889	1,810	1,106	1,811	64%
181	1,033	998	1,942	1,933	1,994	2,707	2,890	2,717	1,884	2,583	37%
182					745	940	1,055	1,148	1,551	1,482	-4%
183	1,187	1,296	2,494	2,028	1,973	2,431	2,077	1,641	838	1,095	31%
184	3,837	4,501	9,249	7,459	7,321	6,707	7,451	5,895	3,812	1,337	-65%
197	214	415	612	580	595	1,381	1,140	1,052	976	644	-34%
199	43	32	36	42	37	48	56	99	94	118	26%
241	5,430	5,738	7,948	7,030	6,601	6,834	7,577	5,790	4,806	4,750 *	-1%
242	1,187	1,602	1,855	1,504	1,395	1,478	1,571	1,576	991	1,175	19%
246	3,996	3,323	5,637	4,887	4,282	4,778	4,068	1,700	2,166	1,929 *	-11%
247	1,059	1,153	1,697	1,627	1,254	1,545	1,262	590	585	441	-25%
248	609	619	1,203	1,125	1,037	1,174	1,244	898	821	927	13%
249	1,669	1,809	2,744	2,473	1,950	2,382	2,070	935	1,064	2,206	107%
251	102	166	294	204	197	154	162	85	136	72	-47%
258	1,563	1,962	2,750	2,414	2,235	2,260	2,811	2,020	640	686 *	7%
259	2,110	2,347	4,029	2,884	2,717	2,853	2,541	2,182	932	1,129 *	21%
287	259	279	322	243	174	201	214	168	216	246	14%
298	141	278	1,036	839	854	928	857	760	886	890	0%
Forested Zone	49,820	55,664	91,337	75,042	72,911	82,339	82,971	67,011	47,821	49,045	3%

Note: Some permit area boundaries were changed in 1999 and 2010*. Harvest totals prior to 2010 are estimates that assume an evenly distributed in the old harvest permit areas and may be biased. Harvest in permit area 182 (created in 2005) were calculated in a similar manner.

Table 4. Pre-Fawn deer density (deer/sq.mi.) as simulated from modeling in each permit area in Minnesota's forested zone.

Permit Area	Area (sq. mi.)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Change
103	1,818	7	8	9	8	7	7	7	7	6	7	6	-14%
105	766	26	29	31	30	28	27	27	27	23	23	20	-16%
108	1,643	11	13	14	12	11	11	12	11	9	10	9	-6%
110	522	32	34	35	35	33	33	33	31	28	27	24	-9%
111	1,437	6	7	7	6	6	5	5	5	4	4	4	-16%
118	1,202	8	9	9	8	7	8	8	7	6	7	6	-10%
119	799	13	14	15	14	12	13	13	13	10	11	10	-10%
122	600	5	6	6	6	7	7	7	7	7	7	7	-1%
126	941	5	5	6	6	6	6	7	6	5	5	5	-11%
127	587	2	2	2	2	2	2	3	2	2	2	2	-14%
155	597	18	18	18	17	16	16	15	14	15	17	17	4%
156	826	19	21	23	23	23	24	24	23	23	23	22	-3%
157	889	23	24	25	23	23	23	23	21	20	20	18	-8%
159	568	21	22	22	21	21	21	21	20	20	20	19	-4%
169	1,122	15	16	15	15	14	15	14	14	13	13	12	-8%
171	686	17	18	19	18	17	17	17	15	15	15	17	8%
172	695	21	23	25	23	22	21	21	19	18	18	19	6%
173	592	14	15	16	15	14	14	15	14	13	14	15	2%
176	1,099	10	11	12	11	10	10	11	11	9	11	9	-14%
177	504	38	42	45	41	36	37	39	37	30	32	28	-14%
178	1,278	19	22	24	25	24	25	26	26	23	24	21	-15%
179	867	22	24	26	25	24	25	25	24	23	23	21	-8%
180	982	13	15	16	16	15	15	15	15	14	14	14	-3%
181	856	23	26	28	29	27	28	28	27	26	26	23	-9%
183	663	25	26	28	27	25	25	24	23	22	23	23	-2%
184	1,232	25	27	29	28	27	25	25	22	19	19	18	-7%
197	965	15	16	17	17	17	18	17	17	16	15	13	-14%
241	998	35	38	39	39	38	38	38	37	32	32	27	-15%
242	215	32	33	34	32	31	31	30	28	27	27	27	-3%
246	836	26	27	28	26	25	24	23	21	22	23	24	3%
247	230	23	24	24	22	21	20	18	16	18	20	22	11%
248	212	24	26	28	27	27	27	27	25	24	23	22	-8%
249	502	17	18	19	18	17	17	16	15	16	18	16	-7%
258	328	35	38	40	39	37	36	35	32	27	28	26	-8%
259	428	34	36	38	35	34	33	32	31	27	29	26	-10%
298	619	18	19	22	21	20	20	20	20	18	18	15	-16%
Forest Zone	29,159	17	19	20	19	18	18	18	17	16	16	15	-8%

2011 AERIAL MOOSE SURVEY

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year, we conduct an aerial survey in northeastern Minnesota in an effort to monitor moose (*Alces alces*) numbers and identify fluctuations in the status of Minnesota's largest deer species. The primary objectives of this annual survey are to estimate moose numbers and determine the calf:cow and bull:cow ratios. We use these data to determine population trends and set the harvest quota for the subsequent hunting season

METHODS

We estimated moose numbers and age/sex ratios by flying transects within a stratified random sample of survey plots (Figure 1). Survey plots were last stratified in 2009. As in previous years, all survey plots were rectangular (5 x 2.67 mi.) and all transects were oriented east to west. DNR Enforcement pilots flew the Bell Jet Ranger (OH-58) helicopters used to conduct the survey. We sexed moose using the presence of antlers and or presence of a vulval patch (Mitchell 1970), and identified calves on the basis of size and behavior. We used the program DNRSurvey on Toughbook® tablet style computers to record survey data. DNRSurvey allowed us to display transect lines superimposed on a background of aerial photography, observe the aircraft's flight path over this background in real time, and record data using a tablet pen with a menu-driven data entry form.

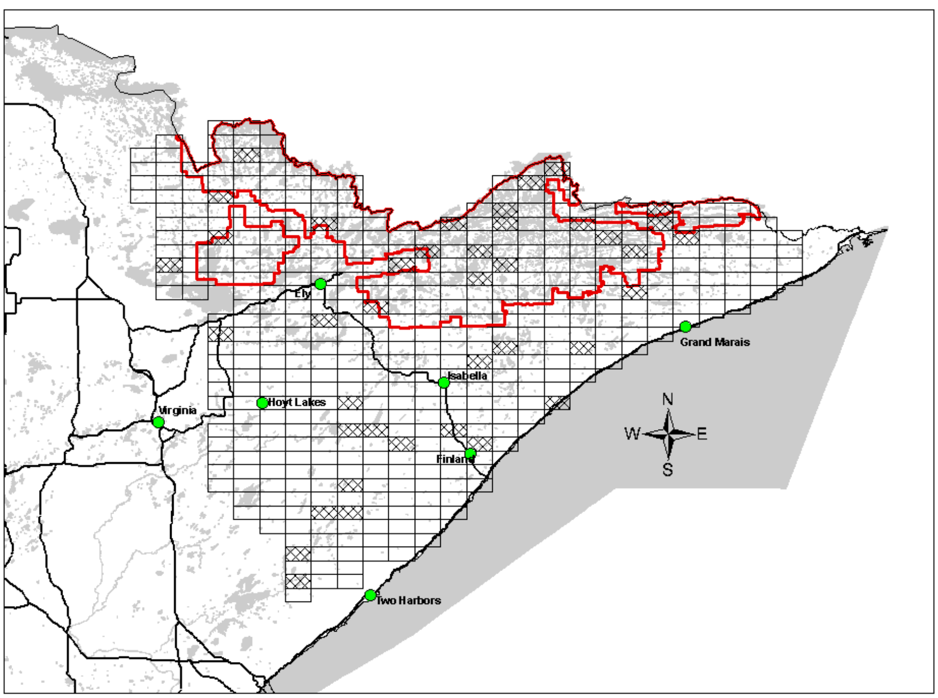

Figure 1. Northeast moose survey area and sample plots (cross hatching) flown in the 2011 aerial moose survey. The red line delineates the boundary of the Boundary Waters Canoe Area Wilderness.

We accounted for visibility bias by using a sightability model (Ackerman 1988, Anderson and Lindzey 1996, Otten et al. 1993, Quayle et al. 2001, Samuel et al. 1987). We developed this model between 2004 and 2007 using moose that were radiocollared as part of research on the population dynamics of the northeastern moose population. Logistic regression indicated that the covariate "visual obstruction" (VOC) was the most important covariate in determining whether radiocollared moose were observed. We defined VOC as the proportion of vegetation within a circle (10m radius or roughly 4 moose lengths) that would prevent you from seeing a moose when circling that spot from an oblique angle. If we observed more than one moose at a location, visual obstruction was based on the first moose sighted. We used uncorrected estimates (no visibility bias correction) of bulls, cows, and calves to calculate the bull:cow and calf:cow ratios.

We have used the sightability model approach for 8 years to account for sightability bias in our estimates of moose numbers in northeastern Minnesota. In 2004, 3 observers equated VOC to crown closure on some observations and this resulted in substantially higher estimates of VOC. As a result, the 2004 population estimate was biased very high (Table 1) and was not included in the following discussion. Population estimates prior to 2004 were based on fixed-wing aircraft surveys and are not comparable to estimates based helicopter surveys which began in 2004.

RESULTS AND DISCUSSION

We initiated the survey on 5 January and completed it on 19 January. Observers rated survey conditions as "fair" (middle rank) on 15 plots and "good" (high rank) on 25 plots. Snow conditions for the survey were between 8" and 16" on 2 plots, and >16" on 38 plots. During the survey flights, observers located 375 moose on the 40 plots (533 mi^2) including 121 bulls, 199 cows, 48 calves, and 7 unidentified moose. After adjusting for sampling and sightability, we estimated that the moose population in northeastern Minnesota contained 4,889±1,182 animals (Table 1). Estimates of the calf:cow and bull:cow ratios were 0.24 and 0.64, respectively (Table 1).

The 2011 population estimate was 12% lower than the 2010 estimate but the overlap in confidence intervals (Table 1, Figure 2) indicates no statistical difference between the two estimates. Gasaway and Dubois (1987) indicated that even with precise survey estimates, a change of 20% may be required to detect a significant change in population size. Time series analysis of estimates since 2005 indicates a significant downward trend (Figure 2, $P = 0.024$). This corroborates several data sets that suggest the northeastern Minnesota moose population is declining. Lenarz et al, (2010), for example, used simulation modeling to integrate survival and reproductive rates measured between 2002 and 2008 and found that the population was decreasing approximately 15% per year over the long term. Two measures of recruitment (calf:cow ratio and % calves) measured during the aerial survey have also declined significantly over the past 14 years (Figure 3). This decrease is explained in part by a significant decline in the proportion of cows accompanied by twins since 2002 (Table 1; $P = 0.010$). A declining population is also indicated by a significant drop in hunter success rates since 2001, for both either-sex hunting (2001-2006, $P < 0.001$) and for bulls-only hunting (2001-2010, $P = 0.006$).

Table 1. Estimated moose numbers, calves:cow, percent calves, percent cows with twins, and bulls:cow from aerial surveys in northeastern Minnesota. Surveys prior to 2004 were conducted using fixed-wing aircraft and population estimates from these surveys are not comparable to the results from helicopter surveys. Ratios and proportions estimated by fixed-wing and helicopter surveys are comparable. Survey estimate from 2004 was biased high because of an error in how visual obstruction covariate was determined. Survey estimates prior to 1998 were not included because they were biased based on starting date and length of survey (Lenarz 1998).

Survey	Estimate	**Calves:Cow**	**% Calves**	**% Cows w/ twins**	**Bulls:Cow**
1998	3,464 ±36%	0.71	25	0	0.98
1999	3,915 ±35%	0.57	18	9	1.30
2000	3,733 ±25%	0.70	20	7	1.34
2001	3,879 ±28%	0.61	19	5	1.05
2002	5,214 ±23%	0.93	25	20	1.22
2003	4,161 ±37%	0.70	14	11	2.01
2004	13,093±40%	0.42	15	4	1.24
2005	7,923±30%	0.52	19	9	1.04
2006	8,501±28%	0.34	13	5	1.09
2007	6,659±27%	0.29	13	3	0.89
2008	7,637±28%	0.36	16	2	0.77
2009	7,593±23%	0.32	14	2	0.94
2010	5,528±24%	0.28	13	3	0.83
2011	4,889±24%	0.24	13	1	0.64

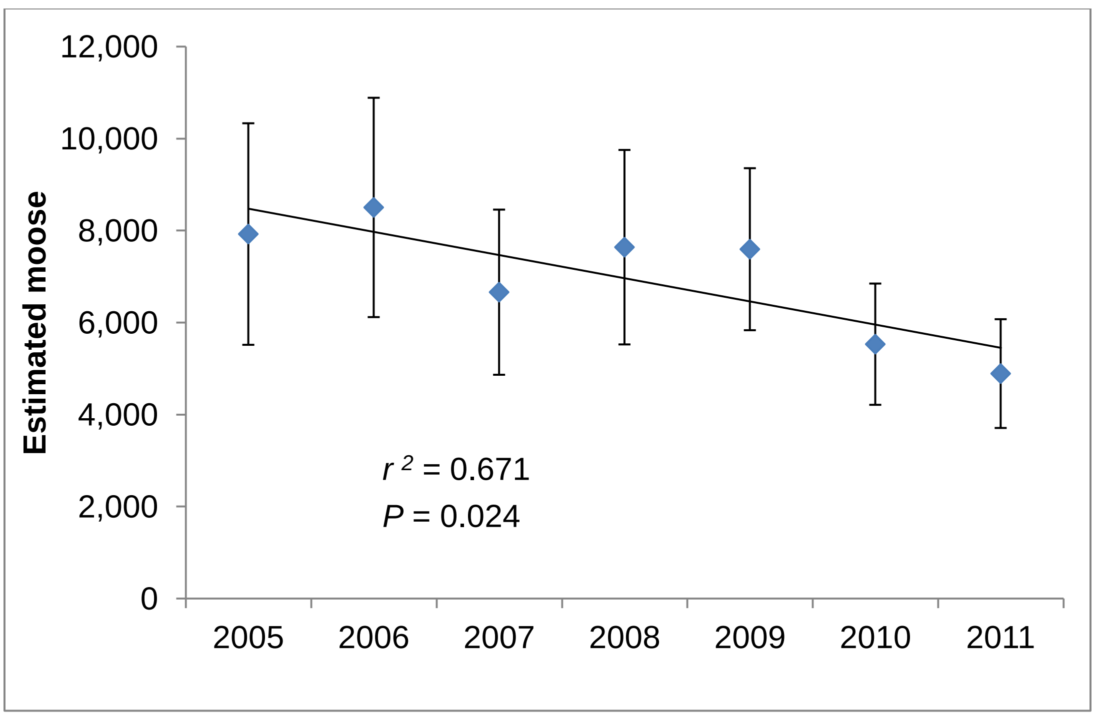

Figure 2. Point estimates, 90% confidence intervals, and trend line of estimated moose numbers in northeastern Minnesota, 2005-2011.

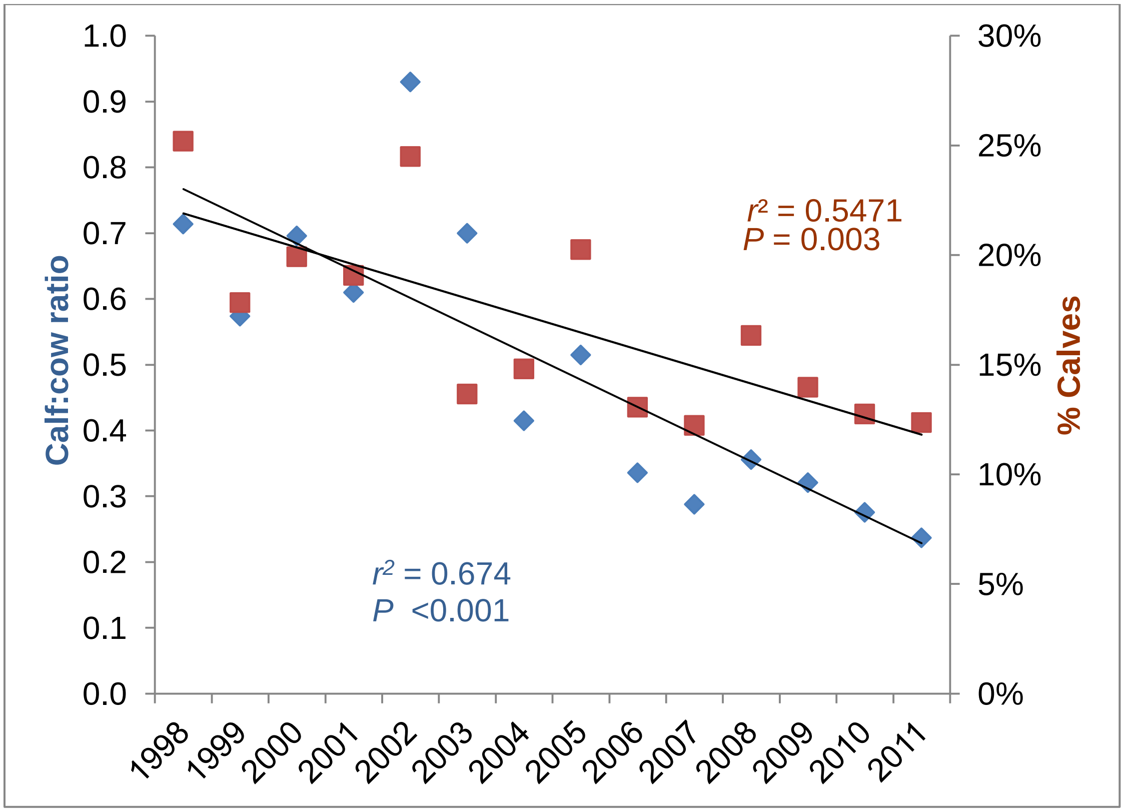

Figure 3. Estimated calf:cow ratio and % calves from aerial moose surveys in northeastern Minnesota. The % calves is less biased than the calf:cow ratio because it isn't dependent on adult cow moose being correctly classified. The calf:cow ratio is not adjusted for sightability and can be compared with estimates prior to adoption of the sightability model.

Estimated recruitment from this year's survey was at an all time low. The calf:cow ratio in January was only 0.24 and calves represented only 13% of the total moose observed (Table 1). Only 1% of the cow moose were accompanied by twins (Table 1). An aerial survey of 24 radiocollared cows in late May 2010 indicated a calf:cow ratio of 1.13 calves/cow and 21% of the cow moose were accompanied by twins (M. S. Schrage, unpublished data). By January, the calf:cow ratio among these radiocollared cows was 0.46 and 1 cow (5%) was accompanied by twins. If data from the radiocollared moose was representative of the entire northeastern population, there was substantial calf mortality between May and January. Although disturbing, it is important to note that adult survival is much more important to the population growth rate than calf survival (Lenarz et al. 2010).

The estimated bull:cow ratio (Table 1; Figure 4) continued to decline and this year's estimate (0.64) was the lowest value in the last 27 years. When the 2003 estimate (2.01) was excluded from analysis (the 2003 estimate was biologically impossible considering estimates in 2002 and 2004) there was a significant negative trend in the bull:cow ratio (Figure 4, $r^2 = 0.585$, $P = 0.002$). Analysis of non-hunting mortality from radiocollared moose between 2002 and 2008 indicated no difference in survival between sexes (Lenarz et al. 2009, 2010) which suggests that hunting may be contributing to this declining ratio. Since 2005 the combined State and tribal harvest has averaged 153 bull and 19 cow moose per year which represented an average of only 2% of the pre-harvest population. Simulation modeling indicates that even at this low harvest level, a bull biased harvest has the potential to reduce the population's bull:cow ratio especially with higher levels of non-hunting mortality and or reduced recruitment (Lenarz unpublished).

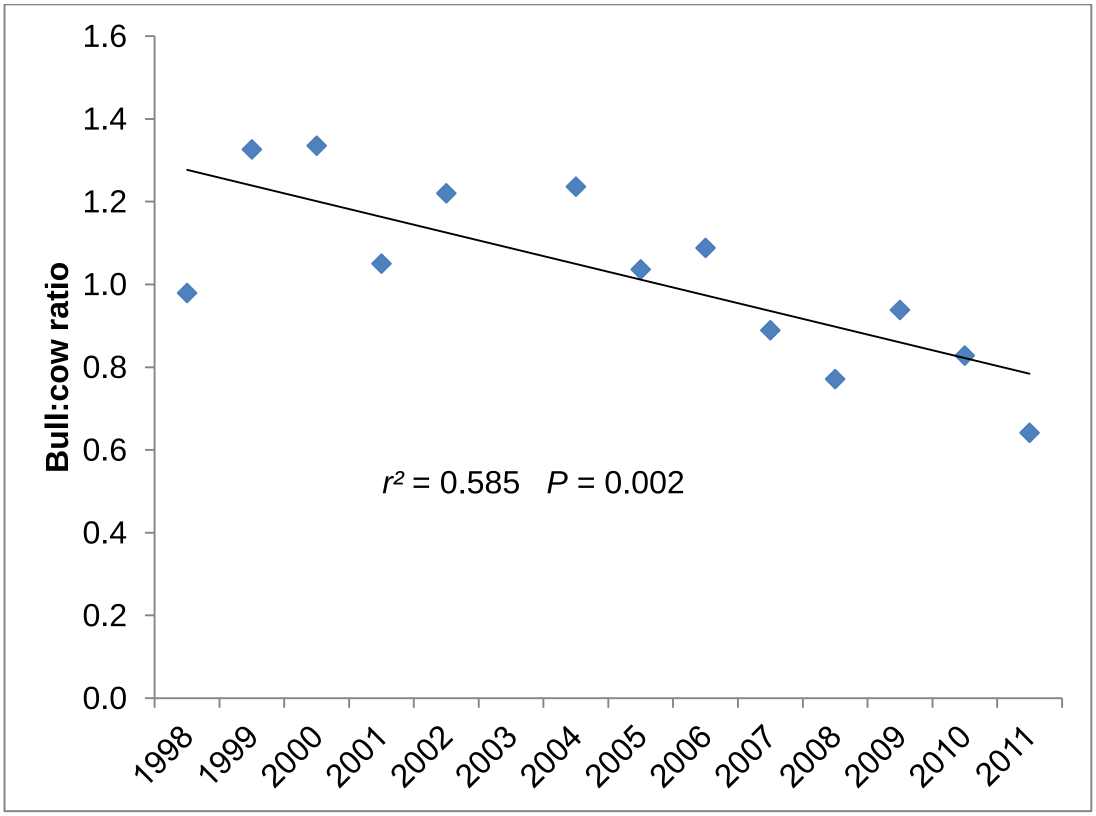

Figure 4. Estimated bull:cow ratio from aerial moose surveys in northeastern Minnesota. The 2003 estimate (2.01) was omitted from this figure because it was biologically impossible considering estimates in 2002 and 2004. The bull:cow ratio is not adjusted for sightability and can be compared with estimates prior to adoption of the sightability model.

It is generally accepted that productivity of moose decline if the proportion of bulls in the population drops below some threshold (Rausch et al. 1974, Bubenik 1987, Crete et al. 1981, Solberg et al. 2002). However, there are no empirical data to estimate this threshold for moose in Minnesota or eastern Canada. Based on simulation modeling, Crete et al. (1981) recommended maintaining a bull:cow ratio above of 0.67. If the bull:cow ratio in northeastern Minnesota continues to decline, we may witness a decline in productivity.

ACKNOWLEDGMENTS

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WETLAND WILDLIFE POPULATIONS

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2011 WATERFOWL BREEDING POPULATION SURVEY MINNESOTA

Steve Cordts, Minnesota DNR, Waterfowl Staff Specialist, 21 June 2011

ABSTRACT: The number of breeding waterfowl in a portion of Minnesota has been estimated each year since 1968 as a part of the overall inventory of North American breeding waterfowl. The survey consists of aerial observations in addition to more intensive ground counts on selected routes to determine the proportion of birds counted by the aerial crew. Procedures used are similar to those used elsewhere across the waterfowl breeding grounds. The 2011 aerial survey portion was flown from 3-16 May. Spring ice-out dates were near normal this year but 2-3 weeks later than 2010. Spring temperatures were below normal in April and May and precipitation was above normal. Overall, spring wetland habitat conditions were excellent across the survey area. Wetland numbers (Types II-V) increased 33% compared to 2010 and were well above both the 10-year (+37%) and long-term (+44%) averages and were the highest count on record. The estimated numbers of temporary (Type 1) wetlands was 36% above the long-term average. The estimated mallard breeding population was 283,000, which was 17% higher than 2010 but statistically unchanged from last year's estimate of 242,000 mallards (P = 0.49). Mallard numbers were similar (+3%) to the 10-year average and 26% above the long-term average of 225,000 breeding mallards. The estimated blue-winged teal breeding population was 214,000, which was 61% higher than 2010 but statistically unchanged from last year's estimate of 132,000 blue-winged teal (P=0.38). Blue-winged teal numbers were similar to both their 10-year (+6%) and long-term (-2%) averages. The combined population index of other ducks, excluding scaup, was 191,000, which was 22% higher than last year's estimate of 157,000, 16% below the 10-year average and 7% above the long-term average of 178,000 other ducks. Population estimates of wood duck (57,000), ring-necked duck (54,000), redhead (16,000) and gadwall (12,000) accounted for most (75%) of the total population of other ducks. The estimate of total duck abundance (687,000), which excludes scaup, was 30% higher than last year's estimate (531,000) and was 3% below the 10-year average and 11% above the long-term average of 622,000 ducks. The estimated number of Canada geese (corrected for visibility) was 156,000 and 6% higher than 2010. Based on the social status of mallards observed (number of pairs, lone males, and flocked birds), the survey timing was good and consistent with recent years. Survey timing for other ducks (e.g. blue-winged teal, ring-necked ducks) suggests that some migrants were still present in the state due to the late spring weather conditions.

METHODS: The aerial survey is based on a sampling design that includes three survey strata (Table 1, Figure 1). The strata cover 39% of the state area and are defined by density of lake basins (>10 acres) exclusive of the infertile northeastern lake region. The strata include the following:

Stratum I: high density, 21 or more lake basins per township.

Stratum II: moderate density, 11 to 20 lake basins per township.

Stratum III: low density, 2 to 10 lake basins per township.

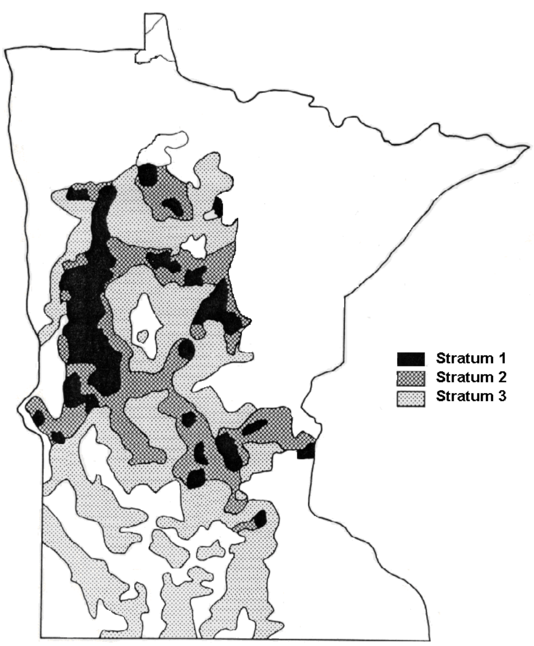

Figure. 1. Location of waterfowl breeding population survey strata in Minnesota.

Areas with less than two basins per township are not surveyed. Strata boundaries were based upon "An Inventory of Minnesota Lakes" (Minnesota Conserv. Dept. 1968:12). Standard procedures for the survey follow those outlined in "Standard Operating Procedures for Aerial Waterfowl Breeding Ground Populations and Habitat Surveys in North America" (USFWS/CWS 1987). Changes in survey methodology were described in the 1989 Minnesota Waterfowl Breeding Population Survey report. Pond and waterfowl data for 1968-74 were calculated from Jessen (1969-72) and Maxson and Pace (1989).

All aerial transects in Strata I-III (Table 1) were flown using a Cessna 185 (N605NR). Wetlands were counted on the observer's side of the plane (0.125 mile wide transect) only; a correction factor obtained in 1989 was used to adjust previous data (1968-88) that was obtained when the observer counted wetlands on both sides of the plane (0.25 mile wide transect). Data were recorded on digital voice recorders for both the pilot and observer and transcribed from the digital WAV files.

Visibility correction factors (VCFs) were derived from intensive ground surveys on 14 selected routes flown by the aerial crew. Many of these routes use a county road as the mid-point of the transect boundary which aids in navigation and helps ensure the aerial and ground crews survey the same area. Ground routes each originally included about 100 wetland areas; however, drainage has reduced the number of wetlands on most of the routes. All observations from both ground crews and aerial crews were used to calculate the VCFs.

The SAS computer program was modified in 1992 to obtain standard errors for mallard and blue-winged teal breeding population estimates. These calculations were based upon SAS computer code written by Graham Smith, USFWS-Office of Migratory Bird Management. Estimates for 2010 and 2011 were compared using two-tailed Z-tests.

SURVEY CHRONOLOGY: The 2011 aerial survey began on 3 May in southern Minnesota and concluded in northern Minnesota on 16 May. The survey was completed in 9 days of flight time. Transects were flown May 3-4, 6-7, 10-12, and 15-16; flights began no earlier than 7 AM and were completed by 12:00 PM each day.

WEATHER AND HABITAT CONDITIONS: Ice out on most lakes across the state was near average but 2-3 weeks later than last year. Temperatures in April averaged 0.9°F below normal statewide. April precipitation was 0.8 inches above normal statewide and ranged from 0.5 inches below normal in west central Minnesota to 1.9 inches above normal in north central Minnesota. May temperatures averaged 2.2°F below normal statewide. May precipitation was 1.1 inches above normal statewide and ranged from 0.5 inches below normal in north central and northeast Minnesota to 2.4 inches above normal in central Minnesota (http://climate.umn.edu). Additional temperature and precipitation data are provided in Appendix A.

In early May 2011, statewide topsoil moisture indices were rated as 56 % adequate and 44% surplus moisture. By late May, statewide indices were rated as 1% short, 65% adequate and 35% surplus moisture. For comparison, in early May 2010 statewide topsoil moisture indices were rated as 24% short or very short, 70% adequate, and 6% surplus moisture.

Planting dates for row crops were extremely late in 2011. By 1 May, only 1% of the corn acres had been planted statewide compared to 84% in 2010 and 46% for the previous 5-year average. By 29 May, only 2% of alfalfa hay had been cut compared to 44% in 2010 and a 5-year average of 21% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, (http://www.nass.usda.gov/mn/).

Wetland numbers (Type II-V) increased 33% from 2010 and were 37% above the 10-year average, 44% above the long-term average (Table 2; Figure. 2), and the highest number recorded since the survey was initiated. The number of temporary (Type 1) wetlands was 36% above the long-term average.

Leaf-out dates were 2-3 weeks later than last year, which greatly increased visibility from the air. The emergence of wetland vegetation was also much later than last year, which also improved visibility.

WATERFOWL POPULATIONS: The number of ducks, Canada geese, and coots, by stratum, are shown in Tables 3-5; total numbers are presented in Table 6. These estimates are expanded for area but not corrected for visibility bias.

The 2011 breeding population estimate of mallards was 283,329 (SE = 49,845), which was unchanged from 2010 (Z = 0.69, P = 0.49) (Table 7, Figure 3). Mallard numbers were 3% above the 10-year average and 26% above the long-term average of 225,000. In 2010, 3% of the total mallards were in flocks compared to 5% in 2010. Pairs comprised 15% of the mallards observed, compared to 12% in 2010. This suggests that the survey timing for mallards was similar to recent years based on the social status observed.

The estimated blue-winged teal population was 213,584 (SE = 88,720), which was unchanged from 2010 (Z = 0.88, P = 0.38). Blue-winged teal numbers were 6% above the 10-year average and 2% below the long-term average (Table 7, Figure 4). Pairs comprised 44% of the blue-winged teal observed. Lone males comprised 9% of the blue-winged teal and flocks comprised 47% of the blue-winged teal observed. In 2010, 21% of the blue-winged teal observed were in flocks. The social structure of blue-winged teal (e.g. more birds observed in flocks) this year was influenced by a few large flocks of blue-winged teal counted during the first 2 days of the survey.

Other duck numbers (excluding scaup) were 191,000, which was 22% higher than last year's estimate of 157,000 and 16% below the 10-year average and 7% above the long-term average (Table 7, Figure 5). Population estimates of wood duck (57,000), ring-necked duck (54,000), redhead (16,000) and gadwall (12,000) accounted for most (75%) of the total population of other ducks. Scaup numbers were higher than last year but 40% below the 10-year average, indicating most scaup had already migrated through the state before the survey began.

The total duck population index, excluding scaup, was 687,000, which was 30% higher than last year's index of 531,000 ducks but similar (-3%) to the 10-year average and 11% above the long-term average (Table 7, Figure 6).

Visibility Correction Factors (VCFs) for mallards, blue-winged teal, and other ducks were similar to 2010 (Table 7). The mallard VCF (2.77) was 4% above the 10-year average. The blue-winged teal VCF (3.46) was 17% below the 10-year average. The VCF for other ducks (2.39) was 34% lower than the 10-year average.

Canada goose numbers (uncorrected for visibility) decreased 8% compared to 2010 but remained 36% above the long-term average (Table 7). The VCF for Canada geese was 2.57 and similar to the long-term average of 2.37. The population estimate of Canada geese (adjusted for visibility) was 156,000, which was 4% below the long-term average of 162,000 geese (Table 7, Figure 7). A total of 10 Canada goose broods were observed, which was the fewest number observed in the past 5 years.

The estimated coot population, uncorrected for visibility, was 4,000 in 2011 compared to 700 in 2010.

The number of swans (likely all trumpeters) counted was a record high this year as breeding swan populations continue to increase and expand across the survey area.

SUMMARY: Overall wetland conditions were excellent. Mallard abundance in 2011 (283,000) was similar to 2010 (242,000). Mallard numbers were 26% above the long-term average (225,000) and similar to the 10-year average. Blue-winged teal abundance (214,000) was 61% higher than 2010 (132,000) but near the 10-year average and the long-term average (219,000). The combined population index of other ducks (191,000) was 22% higher than 2010 and 7% above the long-term average. Total duck abundance (687,000), excluding scaup, was 30% higher than 2010 (531,000) and was 3% below the 10-year average and 11% above the long-term average. Canada goose numbers, adjusted for visibility bias, increased 6% from 2010.

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Ground Crew Leaders: Sean Kelly, Asst. Chief, Migratory Bird & Refuges, USFWS, Region III, Twin Cities; Wayne Brininger, USFWS, Tamarac National Wildlife Refuge, Dan Hertel, USFWS, HAPET, Fergus Falls, Tom Cooper, Jim Kelley, Bob Russell, and Paul Richert; USFWS, Region III, Twin Cities; Kim Bousquet, USFWS, Big Stone National Wildlife Refuge; Lizzy Berkley and Paul Soler, USFWS, Sherburne National Wildlife Refuge
Ground Crew Assistants: Jihadda Govan, USFWS, Big Stone National Wildlife Refuge; Lowell Deede and Gina Kemper, USFWS, Tamarac National Wildlife Refuge; Ron Beam and Greg Dehmer, USFWS, Sherburne National Wildlife Refuge, Ryan Drum and Seth Fisher, USFWS, HAPET, Fergus Falls

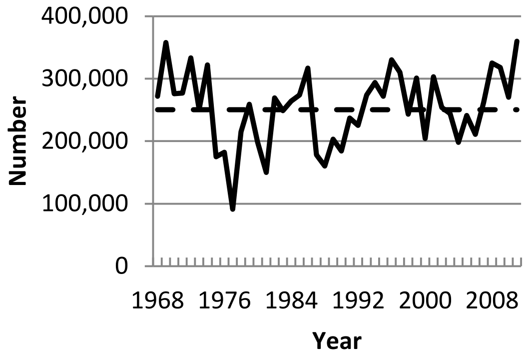

Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2011.

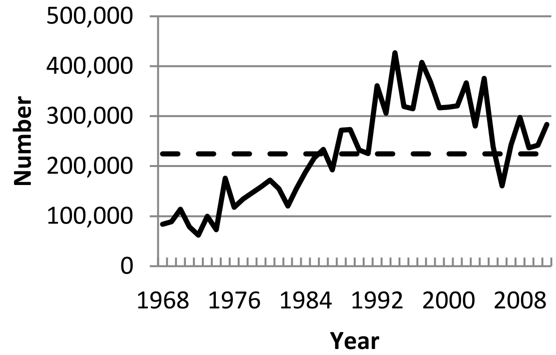

Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011.

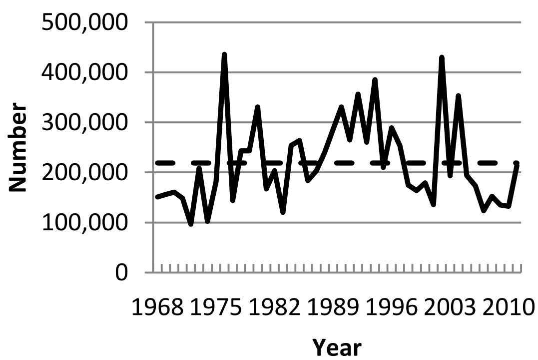

Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011.

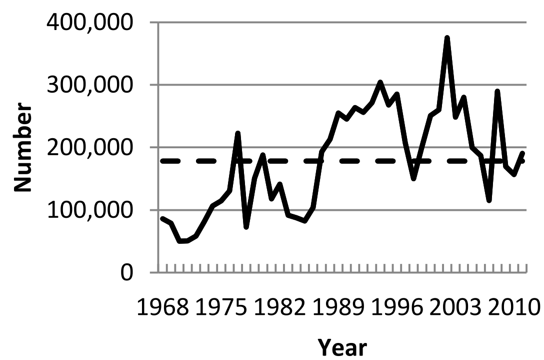

Figure. 5. Other duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011

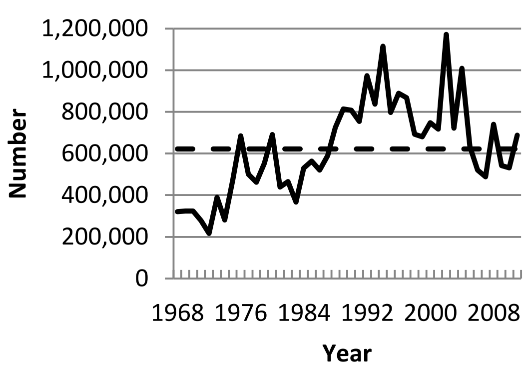

Figure. 6. Total duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011

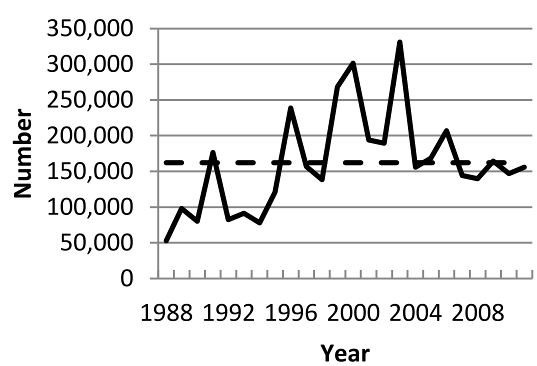

Figure. 7. Canada goose population (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1988-2011.

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Table 1. Survey design for Minnesota, May 2011.[1]

	Stratum			
	1	2	3	Total
Survey design				
Square miles in stratum	5,075	7,970	17,671	30,716
Square miles in sample - waterfowl	182.75	136.375	203.125	522.25
Square miles in sample - ponds	91.375	68.1875	101.5625	261.125
Linear miles in sample	731.0	545.5	812.5	2,089.0
Number of transects in sample	39	36	40	115
Minimum transect length (miles)	5	6	7	5
Maximum transect length (miles)	36	35	39	39
Expansion Factor - waterfowl	27.770	58.442	86.996	
Expansion Factor - ponds	55.540	116.884	173.991	
Current year coverage				
Square miles in sample - waterfowl	182.75	136.375	203.125	522.25
Square miles in sample - ponds	91.375	68.1875	101.5625	261.125
Linear miles in sample	731.0	545.5	812.5	2,089.0
Number of transects in sample	39	36	40	115
Minimum transect length (miles)	5	6	7	5
Maximum transect length (miles)	36	35	39	39
Expansion Factor - waterfowl	27.770	58.442	86.996	
Expansion Factor - ponds	55.540	116.884	173.991	

[1] Also, 8 additional air-ground transects (total linear miles = 202.5, range - 10-60 miles) were flown to use in calculating the VCF.

Table 2. Estimated May ponds (Type 1 and Types II-V), 1968-2011.

	Year	Type I	Number of ponds[1]
	1968		272,000
	1969		358,000
	1970		276,000
	1971		277,000
	1972		333,000
	1973		251,000
	1974		322,000
	1975		175,000
	1976		182,000
	1977		91,000
	1978		215,000
	1979		259,000
	1980		198,000
	1981		150,000
	1982		269,000
	1983		249,000
	1984		264,000
	1985		274,000
	1986		317,000
	1987		178,000
	1988		160,000
	1989		203,000
	1990		184,000
	1991	82,862	237,000
	1992	10,019	225,000
	1993	199,870	274,000
	1994	123,958	294,000
	1995	140,432	272,000
	1996	147,859	330,000
	1997	30,751	310,000
	1998	20,560	243,000
	1999	152,747	301,000
	2000	5,090	204,000
	2001	66,444	303,000
	2002	30,602	254,000
	2003	34,005	244,000
	2004	9,494	198,000
	2005	30,764	241,000
	2006	56,798	211,000
	2007	32,415	262,000
	2008	69,734	325,000
	2009	39,078	318,000
	2010	26,880	270,000
	2011	89,218	360,000
Averages:	10-year	39,621	263,000
	Long-term	65,518	251,000
% change from:	2010	232%	33%
	10-year	125%	37%
	Long-term	36%	44%

[1] Type II-V, correction factor from 1989 (123,000/203,000=0.606) used to adjust 1968-88 pond numbers.

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1993-2011.

	Year																		
Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dabblers:																			
Mallard	23,327	22,160	20,494	25,104	26,992	33,157	26,576	26,604	28,742	29,297	25,937	29,381	19,050	16,829	16,357	25,104	19,467	18,439	19,856
Black Duck	0	56	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0
Gadwall	778	444	1,055	1,083	611	1,111	1,777	833	1,333	944	1,250	2,111	1,166	1,444	889	1,166	1,055	1,000	167
American Wigeon	0	0	194	0	0	56	56	56	111	0	56	555	167	0	56	111	56	56	111
Green-winged Teal	111	278	0	278	56	333	0	278	56	278	222	444	56	56	167	278	167	56	56
Blue-winged Teal	10,358	9,164	7,609	6,720	6,387	8,220	6,998	11,247	7,387	14,218	9,664	23,771	9,303	5,665	5,332	9,942	5,998	7,304	4,665
Northern Shoveler	111	278	111	1,277	1,500	500	555	1,055	305	1,277	278	1,166	333	167	56	1,000	666	1,027	111
Northern Pintail	611	167	167	167	111	111	167	167	389	56	111	56	0	56	0	56	56	0	111
Wood Duck	11,636	7,359	6,831	6,498	9,497	12,302	5,582	10,219	6,720	2,888	4,499	8,081	5,498	3,555	2,666	6,665	4,277	3,999	3,416
Dabbler Subtotal	46,932	39,906	36,461	41,127	45,154	55,790	41,711	50,459	45,043	48,958	42,017	65,565	35,629	27,772	25,523	44,322	31,742	31,881	28,493
Divers:																			
Redhead	1,416	1,972	639	722	778	944	500	583	1,444	750	333	805	666	666	916	1,389	472	944	805
Canvasback	2,777	3,166	3,860	1,166	1,333	1,777	2,971	1,222	2,027	1,833	1,333	666	972	833	1,000	2,277	1,333	1,222	833
Scaup	6,748	19,661	7,192	13,829	3,416	9,247	1,750	7,415	5,832	2,444	2,055	5,971	4,110	111	555	6,276	8,553	2,777	2,222
Ring-necked Duck	2,222	3,582	1,583	3,166	2,694	2,749	2,360	4,776	2,444	2,777	1,361	5,165	1,722	2,055	1,555	21,494	6,859	3,138	4,804
Goldeneye	111	222	111	167	0	111	56	56	333	111	0	222	222	56	222	278	278	222	56
Bufflehead	0	444	56	278	0	56	111	56	111	222	111	389	167	222	56	1,611	833	389	278
Ruddy Duck	1,250	639	167	139	528	11,052	972	0	83	1,305	417	305	1,222	305	0	1,027	861	28	56
Hooded Merganser	222	111	278	611	555	389	722	500	722	555	333	278	333	555	111	666	944	555	500
Large Merganser	0	56	0	0	56	0	0	0	111	0	972	0	111	0	278	333	333	333	111
Diver Subtotal	14,746	29,853	13,886	20,078	9,360	26,325	9,442	14,608	13,107	9,997	6,915	13,801	9,525	4,803	4,693	35,351	20,466	9,608	9,665
Total Ducks	61,678	69,759	50,347	61,205	54,514	82,115	51,153	65,067	58,150	58,955	48,932	79,366	45,154	32,575	30,216	79,673	52,208	41,489	38,158
Other:																			
Coot	1,166	528	611	3,055	5,054	555	83	3,999	1,722	2,888	2,666	21,411	2,444	639	139	16,829	2,166	139	2,194
Canada Goose	13,135	12,802	14,413	12,774	10,330	16,967	19,495	22,160	24,882	24,104	22,160	23,160	22,938	21,633	29,797	18,717	16,523	16,440	13,691

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1993-2011.

	Year																		
Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dabblers:																			
Mallard	37,111	42,896	42,896	48,507	54,643	53,942	52,247	49,559	44,650	43,773	34,715	44,474	26,883	25,130	24,779	27,935	23,494	21,507	30,974
Black Duck	0	0	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0
Gadwall	1,286	1,403	1,052	935	468	584	1,519	3,039	1,636	701	584	3,565	584	1,052	234	3,039	1,169	1,286	935
American Wigeon	0	117	0	468	351	818	0	468	0	0	0	2,513	117	0	0	351	0	351	0
Green-winged Teal	351	117	0	935	234	351	117	117	117	468	234	234	0	117	0	0	234	117	0
Blue-winged Teal	18,818	19,227	10,636	13,851	13,792	13,208	10,578	19,637	9,701	21,390	15,955	30,624	11,513	9,000	8,416	12,740	11,104	8,474	12,390
Northern Shoveler	1,286	935	818	1,636	2,571	701	2,104	4,675	1,052	2,221	1,403	1,753	234	584	351	468	701	2,513	1,052
Northern Pintail	351	468	234	117	234	468	117	117	117	0	117	0	0	0	234	0	0	0	234
Wood Duck	9,468	9,409	6,662	8,708	11,338	10,520	19,753	13,792	7,831	5,143	4,558	8,766	3,273	1,753	2,221	6,546	5,260	6,312	6,955
Dabbler subtotal	68,671	74,572	62,298	75,157	83,631	80,592	86,435	91,404	65,221	73,696	57,566	91,929	42,604	37,636	36,235	51,079	41,962	40,560	52,540
Divers:																			
Redhead	2,279	3,799	1,403	1,110	1,987	935	1,636	2,805	2,455	234	584	1,110	292	175	935	935	584	760	1,578
Canvasback	584	1,052	0	234	701	117	117	935	0	468	1,052	234	0	0	1,169	468	234	117	584
Scaup	877	14,085	7,831	21,916	18,935	4,032	3,331	6,779	3,039	5,961	2,279	7,188	2,981	468	643	3,097	2,104	0	1,929
Ring-necked Duck	3,156	3,331	1,403	7,714	3,565	2,279	2,221	5,610	3,799	6,370	2,455	5,377	1,929	3,331	1,578	13,149	9,117	2,396	11,455
Goldeneye	584	701	701	1,753	818	234	935	584	468	234	234	351	117	117	0	351	584	468	468
Bufflehead	117	234	0	117	117	0	0	0	0	1,169	117	468	351	117	117	1,403	818	643	1,403
Ruddy Duck	3,390	409	117	58	117	0	468	0	0	1,870	2,688	0	351	58	0	0	175	409	58
Hooded Merganser	584	468	117	234	468	117	701	935	1,403	701	701	234	234	351	234	584	701	117	2,221
Large Merganser	0	0	0	0	0	0	0	117	117	0	0	234	351	0	0	351	0	0	234
Diver subtotal	11,571	24,079	11,572	33,136	26,708	7,714	9,409	17,765	11,281	17,007	10,110	15,196	6,606	4,617	4,676	20,338	14,317	4,910	19,930
Total Ducks	80,242	98,651	73,870	108,293	110,339	88,306	95,844	109,169	76,502	90,703	67,676	107,125	49,210	42,253	40,911	71,417	56,279	45,470	72,470
Other:																			
Coot	5,201	1,461	526	7,013	5,026	643	234	1,110	468	4,909	1,519	8,007	584	292	409	23,961	0	117	292
Canada Goose	9,409	12,565	12,682	13,559	16,364	19,812	18,585	25,831	24,604	20,688	22,091	28,461	20,688	26,825	25,890	19,753	22,675	18,935	14,201

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1993-2011.

	Year																		
Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dabblers:																			
Mallard	63,333	73,425	79,166	79,862	78,993	101,873	90,390	81,690	72,642	72,121	55,156	84,561	36,539	30,884	35,843	50,371	35,408	40,976	51,415
Black Duck	0	0	0	0	0	0	0	0	0	0	0	174	0	0	174	174	0	0	0
Gadwall	1,218	2,610	3,306	3,306	2,436	3,045	2,436	2,610	10,701	3,306	1,566	6,960	2,001	5,568	4,176	870	1,392	1,392	4,089
American Wigeon	348	1,218	0	1,044	348	696	0	522	174	1,218	174	1,566	1,044	174	348	348	174	348	1,044
Green-winged Teal	348	174	0	957	348	174	0	1,218	1,392	522	174	0	174	522	0	0	0	0	174
Blue-winged Teal	35,494	41,932	29,492	36,625	25,316	26,360	18,530	29,405	20,618	56,374	21,140	39,758	27,578	23,663	15,659	18,095	20,183	16,964	44,716
Northern Shoveler	1,914	2,784	5,307	12,701	11,049	4,176	4,002	20,444	10,701	6,264	870	3,828	348	522	870	4,002	2,088	6,873	2,088
Northern Pintail	1,218	696	174	870	522	870	870	696	522	0	174	348	174	174	348	174	0	174	0
Wood Duck	25,229	23,228	16,355	27,926	14,268	23,837	20,531	25,055	17,225	13,572	12,702	20,705	7,482	7,308	5,394	14,442	10,266	12,354	13,659
Dabbler subtotal	129,102	146,067	133,800	163,291	133,280	161,031	136,759	161,640	133,975	153,377	91,956	157,900	75,340	68,815	62,812	88,476	69,511	79,081	117,185
Divers:																			
Redhead	1,827	2,958	7,134	1,044	1,044	2,001	3,480	2,523	3,654	1,305	174	1,740	1,479	0	522	783	870	174	4,350
Canvasback	348	696	174	1,392	0	3,306	174	3,915	522	696	1,131	2,784	0	0	348	1,566	1,218	348	1,044
Scaup	4,176	23,924	13,397	29,840	8,787	15,137	8,961	18,182	6,873	4,611	783	17,747	5,307	1,392	696	5,481	1,914	522	5,133
Ring-necked Duck	2,871	5,568	1,044	12,875	3,654	2,958	1,479	8,178	8,526	7,395	1,479	5,133	10,179	6,699	1,392	8,526	6,525	3,045	6,264
Goldeneye	696	783	1,479	1,914	522	696	696	1,044	1,566	3,132	1,305	696	1,044	1,044	870	348	522	174	870
Bufflehead	348	696	0	1,044	174	348	0	0	0	1,218	783	2,088	0	174	696	1,218	870	174	2,871
Ruddy Duck	1,218	2,175	2,349	1,740	348	0	174	0	696	18,878	87	2,262	870	696	261	87	348	0	3,828
Hooded Merganser	348	696	1,044	1,566	696	696	1,218	957	174	2,175	174	1,740	1,218	870	174	696	348	1,218	1,044
Large Merganser	0	174	174	0	0	0	0	0	0	522	0	0	261	957	348	348	348	348	174
Diver subtotal	11,832	37,670	26,795	51,415	15,225	25,142	16,182	34,799	22,011	39,932	5,916	34,190	20,358	11,832	5,307	19,053	12,963	6,003	25,578
Total Ducks	140,934	183,737	160,595	214,706	148,505	186,173	152,941	196,439	155,986	193,309	97,872	192,090	95,698	80,647	68,119	107,529	82,474	85,084	142,763
Other:																			
Coot	12,179	12,788	3,828	182,953	24,620	5,133	14,702	67,684	3,132	14,007	7,134	77,427	8,613	14,702	5,742	15,137	7,047	435	1,479
Canada Goose	21,314	23,228	30,971	34,537	33,755	42,368	41,933	57,940	39,932	33,407	43,412	46,717	39,758	27,230	42,629	31,841	28,274	30,710	32,711

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1993-2011.

	Year																		
Species	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dabblers:																			
Mallard	123,771	138,481	142,556	153,473	160,628	188,972	169,213	157,853	146,034	145,191	115,974	158,416	82,472	72,843	76,979	103,411	78,368	80,922	102,245
Black Duck	0	56	0	0	0	0	0	0	117	0	0	174	56	0	174	174	0	0	0
Gadwall	3,282	4,457	5,413	5,324	3,515	4,740	5,733	6,482	13,670	4,951	3,400	12,635	3,752	8,064	5,298	5,075	3,616	3,677	5,191
American Wigeon	348	1,335	194	1,512	699	1,570	56	1,045	285	1,218	230	4,634	1,327	174	404	810	230	754	1,155
Green-winged Teal	810	569	0	2,170	638	858	117	1,613	1,564	1,267	630	678	230	694	167	278	400	172	230
Blue-winged Teal	64,670	70,323	47,737	57,196	45,495	47,788	36,106	60,288	37,706	91,982	46,759	94,152	48,394	38,328	29,407	40,777	37,286	32,742	61,772
Northern Shoveler	3,311	3,997	6,236	15,614	15,120	5,377	6,661	26,175	12,058	9,762	2,550	6,747	915	1,273	1,276	5,469	3,456	10,413	3,251
Northern Pintail	2,180	1,331	575	1,154	867	1,449	1,153	979	1,028	56	402	404	174	230	582	230	56	174	345
Wood Duck	46,333	39,996	29,848	43,132	35,103	46,659	45,866	49,067	31,777	21,603	21,759	37,553	16,253	12,616	10,281	27,652	19,802	22,664	24,029
Dabbler subtotal	244,705	260,545	232,559	279,575	262,065	297,413	264,905	303,502	244,239	276,030	191,704	315,393	153,573	134,222	124,568	183,876	143,214	151,518	198,218
Divers:																			
Redhead	5,522	8,729	9,176	2,876	3,809	3,880	5,616	5,911	7,552	2,289	1,092	3,656	2,438	842	2,373	3,107	1,926	1,878	6,733
Canvasback	3,709	4,914	4,034	2,792	2,034	5,200	3,262	6,072	2,549	2,996	3,516	3,684	972	833	2,517	4,311	2,785	1,687	2,461
Scaup	11,801	57,670	28,420	65,585	31,138	28,416	14,041	32,376	15,743	13,016	5,117	30,906	12,397	1,971	1,894	14,854	12,571	3,299	9,283
Ring-necked Duck	8,249	12,481	4,030	23,755	9,913	7,986	6,060	18,565	14,768	16,542	5,294	15,675	13,829	12,085	4,525	43,169	22,501	8,579	22,523
Goldeneye	1,391	1,706	2,291	3,834	1,340	1,041	1,687	1,684	2,367	3,477	1,539	1,269	1,383	1,216	1,092	976	1,384	864	1,393
Bufflehead	465	1,374	56	1,439	291	404	111	56	111	2,609	1,011	2,944	517	513	868	4,231	2,521	1,206	4,551
Ruddy Duck	5,858	3,223	2,633	1,937	993	11,052	1,613	0	779	22,054	3,192	2,567	2,443	1,060	261	1,114	1,384	437	3,942
Hooded Merganser	1,154	1,275	1,439	2,411	1,719	1,202	2,641	2,392	2,299	3,432	1,209	2,251	1,785	1,776	519	1,947	1,993	1,890	3,765
Large Merganser	0	230	174	0	56	0	0	117	228	522	972	234	723	957	626	1,032	681	681	519
Diver subtotal	38,149	91,602	52,253	104,629	51,293	59,181	35,031	67,173	46,396	66,937	22,942	63,186	36,487	21,253	14,675	74,741	47,746	20,521	55,170
Total Ducks	282,854	352,147	284,812	384,204	313,358	356,594	299,936	370,675	290,635	342,967	214,646	378,579	190,060	155,475	139,243	258,617	190,960	172,039	253,388
Other:																			
Coot	18,546	14,777	4,965	193,021	34,700	6,331	15,020	72,793	5,321	21,804	11,319	106,845	11,641	15,633	6,290	55,927	9,213	691	3,965
Canada Goose	43,858	48,595	58,066	60,870	60,449	79,147	80,012	105,932	89,418	78,200	87,663	98,339	83,384	75,688	98,316	70,311	67,473	66,085	60,603

Table 7. Estimated waterfowl populations in Minnesota from May breeding waterfowl survey, 1968-2011.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
1968	41,030	2.04	83,701		61,943	2.44	151,141		41,419	2.08	86,152
1969	53,167	1.67	88,789		45,180	3.45	155,871		34,605	2.27	78,553
1970	67,463	1.69	113,945		31,682	5.06	160,343		30,822	1.62	49,932
1971	47,702	1.65	78,470		42,445	3.49	148,218		29,520	1.71	50,450
1972	49,137	1.27	62,158		49,386	1.96	96,895		34,405	1.69	58,127
1973	56,607	1.76	99,832		53,095	3.92	208,292		33,155	2.45	81,362
1974	44,866	1.62	72,826		39,402	2.59	102,169		38,266	2.79	106,609
1975	55,093	3.19	175,774		45,948	3.95	181,375		34,585	3.31	114,459
1976	69,844	1.69	117,806		89,370	4.87	435,607		39,022	3.35	130,669
1977	60,617	2.21	134,164		37,391	3.86	144,187		18,633	11.95	222,748
1978	56,152	2.61	146,781		28,491	8.53	242,923		22,034	3.30	72,798
1979	61,743	2.57	158,704	28,668	46,708	5.21	243,167	62,226	39,749	3.79	150,545
1980	83,775	2.05	171,957	22,312	50,966	6.49	330,616	40,571	47,322	3.97	188,020
1981	79,562	1.95	154,844	16,402	64,546	2.59	167,258	23,835	30,947	3.80	117,667
1982	51,655	2.33	120,527	17,078	42,772	4.75	203,167	34,503	32,726	4.32	141,501
1983	73,424	2.12	155,762	15,419	42,728	2.81	119,980	20,809	32,240	2.84	91,400
1984	94,514	1.99	188,149	24,065	89,896	2.82	253,821	33,286	40,326	2.18	87,709
1985	96,045	2.26	216,908	32,935	90,453	2.91	263,607	33,369	35,018	2.35	82,383
1986	108,328	2.16	233,598	30,384	68,235	2.69	183,338	28,204	38,900	2.67	103,851
1987	165,881	1.16	192,289	23,500	102,480	1.99	203,718	32,289	76,746	2.51	192,947
1988	155,543	1.75	271,718	38,675	101,183	2.38	240,532	39,512	81,514	2.61	212,988
1989	124,362	2.19	272,968	26,508	90,300	3.16	285,760	39,834	88,109	2.89	254,887
1990	140,879	1.65	232,059	26,316	107,177	3.09	330,659	44,455	124,531	1.97	245,152
1991	128,315	1.75	224,953	28,832	91,496	2.90	265,138	42,057	93,784	2.81	263,619
1992	144,126	2.50	360,870	43,621	93,107	3.83	356,679	53,619	109,779	2.33	255,774
1993	123,771	2.47	305,838	31,103	64,670	4.02	260,070	36,307	82,612	3.28	271,263
1994	138,482	3.08	426,455	66,240	70,324	5.48	385,256	82,580	85,671	3.55	303,847
1995	142,557	2.24	319,433	48,124	47,737	4.40	210,043	40,531	66,096	4.05	267,668
1996	153,473	2.05	314,816	53,461	57,196	5.05	288,913	64,064	107,950	2.64	285,328
1997	160,629	2.54	407,413	65,771	45,496	5.57	253,408	67,526	76,095	2.72	207,316
1998	188,972	1.95	368,450	61,513	47,788	3.66	174,848	33,855	91,478	1.64	149,786
1999	169,213	1.87	316,394	51,651	36,106	4.53	163,499	36,124	80,459	2.49	200,570
2000	157,853	2.02	318,134	36,857	60,288	2.97	179,055	32,189	120,158	2.09	250,590
2001	146,034	2.20	320,560	39,541	37,706	3.60	135,742	19,631	91,152	2.85	260,051
2002	145,191	2.53	366,625	46,264	91,982	4.67	429,934	87,312	92,778	4.04	374,978
2003	115,974	2.42	280,517	34,556	46,759	4.13	193,269	36,176	46,796	5.30	248,019
2004	158,416	2.37	375,313	57,591	94,152	3.75	353,209	56,539	95,105	2.94	279,802
2005	82,472	2.89	238,500	28,595	48,394	4.01	194,125	37,358	46,797	4.26	199,355
2006	72,843	2.21	160,715	24,230	38,328	4.53	173,674	60,353	42,333	4.41	186,719
2007	76,979	3.15	242,481	30,020	29,407	4.20	123,588	20,055	30,963	3.73	115,390
2008	103,411	2.88	297,565	27,787	40,777	3.74	152,359	24,157	99,575	2.91	289,629
2009	78,368	3.02	236,436	36,539	37,286	3.63	135,262	32,155	62,725	2.70	169,568
2010	80,922	2.99	241,884	33,940	32,742	4.04	132,261	27,430	55,076	2.84	156,599
2011	102,245	2.77	283,329	49,845	61,772	3.46	213,584	88,720	79,743	2.39	190,586
Averages: 10-year (01-10)	106,061	2.67	276,060	35,906	49,753	4.03	202,342	40,117	66,330	3.60	228,011
Long-term (1968-10)	102,451	2.20	224,816	35,891	58,919	3.90	218,906	41,341	60,511	3.16	178,065
% change from: 2010	26%	-7%	17%	47%	89%	-14%	61%	223%	45%	-16%	22%
10-year average	-4%	4%	3%	39%	24%	-14%	6%	121%	20%	-34%	-16%
Long-term average	0%	26%	26%	39%	5%	-11%	-2%	115%	32%	-24%	7%

[1] Unad. PI - unadjusted population index, VCF - Visibility Correction Factor, PI - adjusted population index, SE - standard error.

Table 7. Cont.

Year	Scaup			Total ducks (ex. scaup)		Total Ducks		Canada geese		
	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
1968	22,834	2.08	47,495	144,392	320,994	167,226	368,488			
1969	9,719	2.27	22,062	132,952	323,213	142,671	345,275			
1970	12,105	1.62	19,610	129,967	324,219	142,072	343,829			
1971	5,713	1.71	9,764	119,667	277,137	125,380	286,901			
1972	12,062	1.69	20,379	132,928	217,181	144,990	237,560	366		
1973	10,633	2.45	26,093	142,857	389,486	153,490	415,580	1,965		
1974	18,378	2.79	51,201	122,534	281,605	140,912	332,806	8,835		
1975	9,563	3.31	31,649	135,626	471,608	145,189	503,257	5,997		
1976	22,494	3.35	75,323	198,236	684,082	220,730	759,405	5,409		
1977	2,971	11.95	35,517	116,641	501,099	119,612	536,616	7,279		
1978	14,774	3.35	48,812	106,677	462,502	121,451	511,314	7,865		
1979	92,134	3.79	348,948	148,200	552,416	240,334	901,364	4,843		
1980	12,602	3.97	50,070	182,063	690,593	194,665	740,663	6,307		
1981	19,844	3.88	75,451	175,055	439,769	194,899	515,220	10,156		
1982	21,556	4.32	93,204	127,153	465,195	148,709	558,399	6,600		
1983	9,551	2.84	27,077	148,392	367,142	157,943	394,219	11,081		
1984	15,683	2.18	34,111	224,736	529,679	240,419	563,790	14,051		
1985	7,409	2.35	17,430	221,516	562,898	228,925	580,328	16,658		
1986	6,247	2.67	16,678	215,463	520,787	221,710	537,465	19,599		
1987	10,306	2.51	25,910	345,107	588,954	355,413	614,864	29,960		
1988	10,545	2.61	27,553	338,240	725,238	348,785	752,791	39,057	1.36	53,004
1989	71,898	2.89	207,991	302,771	813,615	374,669	1,021,606	51,946	1.88	97,898
1990	40,075	1.97	78,892	372,587	807,870	412,662	886,761	58,425	1.37	80,147
1991	40,727	2.81	114,480	313,595	753,710	354,322	868,191	42,231	4.18	176,465
1992	66,071	2.33	153,939	347,012	973,323	413,083	1,127,262	33,965	2.43	82,486
1993	11,801	3.28	38,750	271,053	837,172	282,854	875,921	43,858	2.08	91,369
1994	57,670	3.55	204,536	294,477	1,115,558	352,147	1,320,095	48,595	1.68	77,878
1995	28,421	4.05	115,096	256,390	797,144	284,811	912,241	58,065	2.08	120,775
1996	65,585	2.64	173,351	318,619	889,057	384,204	1,062,408	60,870	3.92	238,708
1997	31,138	2.72	84,834	282,220	868,137	313,358	952,971	60,449	2.59	156,817
1998	28,416	1.64	46,528	328,238	693,084	356,654	739,612	79,147	1.75	138,507
1999	14,041	2.49	35,002	285,778	680,463	299,819	715,465	80,012	3.35	268,168
2000	32,376	2.10	67,520	338,299	747,779	370,675	815,299	105,932	2.84	301,298
2001	15,743	2.85	44,914	274,892	716,353	290,653	761,267	89,418	2.17	193,887
2002	13,016	4.04	52,606	327,951	1,171,537	340,967	1,224,143	78,200	2.42	189,353
2003	5,117	5.30	27,120	209,529	721,805	214,646	748,925	87,663	3.78	331,094
2004	30,906	2.94	90,926	347,673	1,008,324	378,579	1,099,250	98,339	1.58	155,859
2005	12,397	4.26	52,811	177,663	631,980	190,060	684,791	83,384	2.02	168,469
2006	1,971	4.41	8,692	153,504	521,109	155,475	529,801	75,688	2.73	206,757
2007	1,894	3.73	7,058	137,349	488,517	139,243	495,575	98,316	1.47	144,289
2008	14,854	2.91	43,205	243,763	739,553	258,617	782,758	70,311	1.99	139,708
2009	12,571	2.70	33,979	178,379	541,266	190,950	575,245	67,473	2.44	164,405
2010	3,299	2.84	9,380	168,740	530,744	172,039	540,124	66,085	2.22	146,960
2011	9,283	2.39	22,186	244,105	687,499	253,043	709,685	60,603	2.57	155,750
Averages: 10-year (00-10)	11,177	3.60	37,069	221,944	707,119	233,123	744,188	81,488	2.28	184,078
Long-term (1968-10)	22,076	3.17	65,022	221,835	621,951	243,861	686,973	44,472	2.36	161,926
% change from: 2010	181%	-16%	137%	45%	30%	47%	31%	-8%	16%	6%
10-year average	-17%	-34%	-40%	10%	-3%	9%	-5%	-26%	13%	-15%
Long-term average	-58%	-25%	-66%	10%	11%	4%	3%	36%	9%	-4%

[1] Unad. PI - unadjusted population index, VCF - Visibility Correction Factor, PI - adjusted population index, SE - standard error

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 12 April - 17 May 2011 (Source: Minnesota Climatological Working Group, http://climate.umn.edu/cawap/nwssum/nwssum.asp).

		Temperature (F) for week ending:										Total weekly precipitation (inches)					Precipitation departure from normal
		17-April		24-April		1-May		8-May		15-May							
Region	City	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	17-April	24-April	1-May	8-May	15-May	1 Apri1-May 15
NW	Crookston	36.8	-4.2	38.4	-6.4	49.8	1.3	48.2	-3.8	51.8	-3.3	0.55	0.41	0.23	0.22	0.21	0.16
NC	Grand Rapids	38.2	-2.2	37.8	-6.0	44.8	-2.2	48.0	-2.2	52.9	-0.1	0.49	0.53	1.43	0.72	0.16	1.09
	Itasca	36.9	-0.2	35.0	-5.7	45.8	1.4	43.4	-4.5	50.6	-0.5	2.12	0.55	0.53	0.08	0.83	2.66
WC	Alexandria	40.0	-1.9	39.4	-6.0	46.5	-2.4	50.4	-1.7	55.0	-0.1	0.07	0.52	0.40	0.73	0.63	-0.07
	Fergus Falls																
	Montevideo	42.6	-1.1	39.6	-7.5	47.6	-2.9	49.3	-4.5	56.0	-0.8	0.16	0.59	0.56	0.85	0.85	0.12
	Morris	40.5	-2.9	38.1	-8.9	46.6	-3.8	47.5	-6.1	53.2	-3.4	0.10	0.71	0.39	0.51	1.72	0.92
C	Becker	45.0	1.1	39.4	-7.8	45.4	-4.9	47.4	-5.8	56.8	1.0	0.04	0.55	1.54	1.01	1.07	2.98
	Hutchinson	44.6	0.5	39.4	-8.1	46.7	-4.1	48.4	-5.6	57.0	0.0	0.23	0.62	1.68	0.64	1.30	3.28
	St. Cloud	43.2	0.2	40.2	-6.2	44.7	-4.9	50.0	-2.6	56.7	1.3	0.02	0.45	1.04	0.92	0.58	2.03
	Staples	Missing															
	Willmar	42.0	-0.5	38.4	-7.5	45.4	-3.9	46.2	-6.5	55.6	-0.2	0.16	0.74	1.02	0.77	1.08	1.68
EC	Aitkin	40.0	-0.4	36.6	-7.0	43.9	-2.8	44.0	-5.7	49.2	-3.2	0.44	0.67	1.49	0.97	0.54	3.11
	Cambridge																
	Msp Airport	45.8	-0.2	42.4	-6.8	46.4	-5.9	52.4	-2.8	59.2	1.2	0.13	0.49	1.99	0.33	0.59	1.85
SW	Pipestone	41.0	-3.0	36.7	-10.5	44.4	-6.0	50.0	-3.5	55.4	-0.9	0.73	0.57	0.57	0.50	1.70	2.70
	Redwood Falls	43.5	-2.7	41.9	-7.7	46.4	-6.4	52.5	-3.5	57.8	-1.1	0.30	0.66	0.93	0.78	1.54	3.30
	Worthington	43.9	1.1	36.0	-10.1	46.0	-3.4	49.9	-2.8	56.0	0.3	0.77	0.80	0.69	0.04	1.44	1.38
SC	Faribault	45.7	2.2	39.0	-7.8	45.1	-4.8	46.3	-6.7	59.1	3.2	0.28	0.55	1.84	0.14	1.48	1.48
	Waseca	45.2	1.0	39.0	-8.6	45.3	-5.5	48.0	-6.0	59.2	2.2	0.67	0.50	1.35	0.02	1.16	1.08
	Winnebago	45.8	0.4	39.2	-9.4	47.0	-4.6	51.6	-3.0	59.2	1.9	1.00	0.89	1.14	0.01	0.98	1.40
Statewide		41.6	-0.7	38.6	-7.1	45.6	-3.3	47.8	-4.2	54.9	0.0	0.46	0.56	1.13	0.35	0.89	

[1] Average temperature (°F) for the week ending on the date shown.
[2] Departure from normal temperature.

Waterfowl information is taken from the U.S. Fish and Wildlife Service report Waterfowl Population Status, 2011 by Kathy Fleming, Pamela Garrettson, Walt Rhodes, and Nathan Zimpfer. The entire report is available on the Division of Migratory Bird Management home page (http://www.fws.gov/migratorybirds/reports/reports.html .

Table 1. Canada goose population indices (in thousands) of the eastern prairie flock, 1971-2011 (from: U.S. Fish and Wildlife Service. 2011. Waterfowl population status, 2011. U.S. Department of the Interior, Washington, D.C. U.S.A.).

Year	Population[a]
1971-72	95.0
1972-73	116.6
1973-74	96.7
1974-75	121.5
1975-76	168.4
1976-77	110.8
1977-78	111.2
1978-79	72.8
1979-80	n.a.
1980-81	78.9
1981-82	96.4
1982-83	92.8
1983-84	112.0
1984-85	105.6
1985-86	126.4
1986-87	145.9
1987-88	137.0
1988-89	132.1
1989-90	163.4
1990-91	167.4
1991-92	158.4
1992-93	136.2
1993-94	136.2
1994-95	139.0
1995-96	141.0
1996-97	130.5
1997-98	99.3
1998-99	139.5
1999-00	130.0
2000-01	122.2
2001-02	152.0
2002-03	122.4
2003-04	145.5
2004-05	161.6
2005-06	134.8
2006-07	153.4

Year	Population[a,b]
2007-08	161.1
2008-09	169.2
2009-10	172.6
2010-11	133.1

[a] Surveys conducted in Spring.

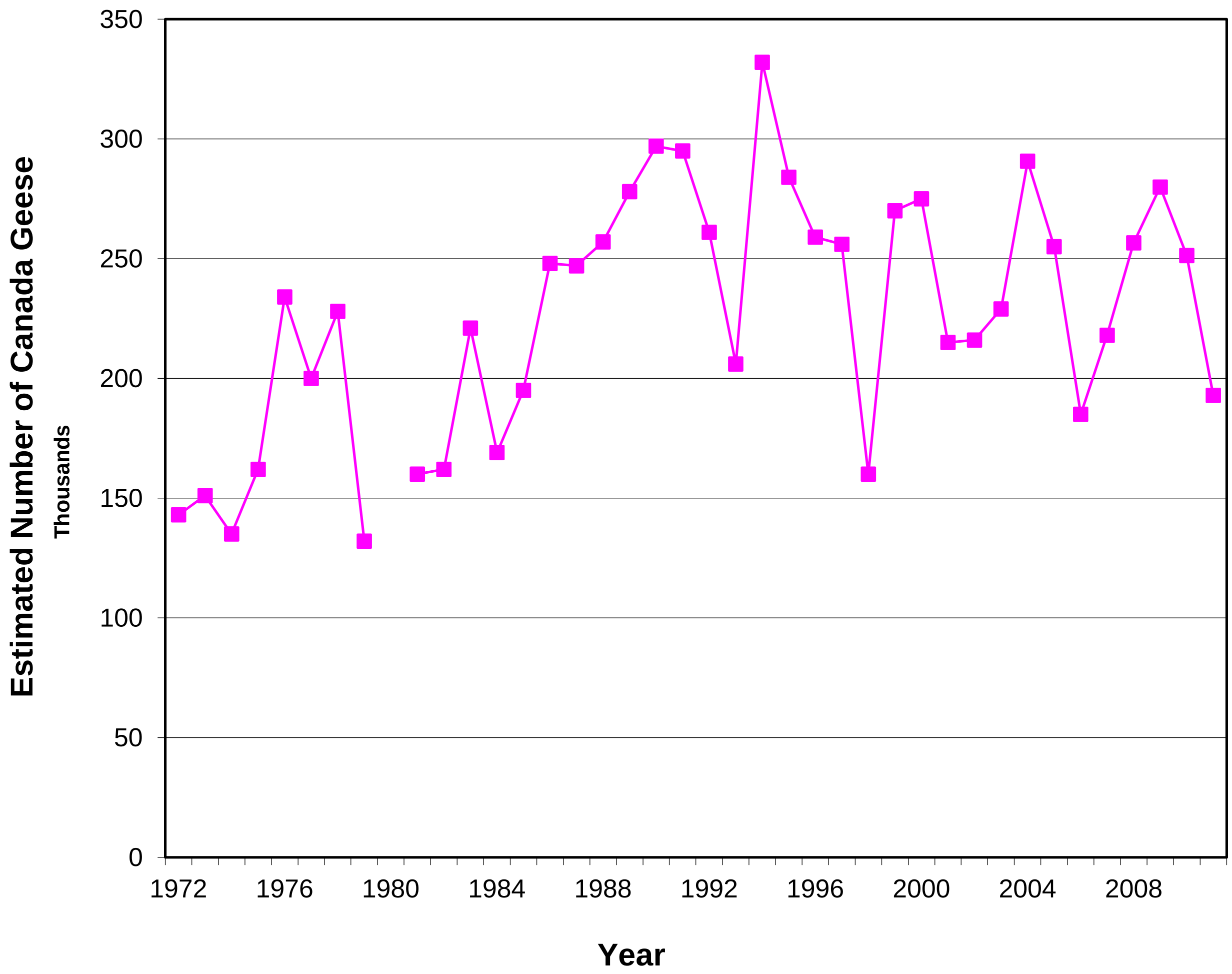

Figure 1. Breeding ground survey estimates of the Eastern Prairie Population of Canada geese, 1972-2011. (from: U.S. Fish and Wildlife Service. 2011. Waterfowl population status, 2011. U.S. Department of the Interior, Washington, D.C. U.S.A.). Surveys conducted in spring. Indirect or preliminary estimates. Data not available for 1980.

Table 2. Estimated number of May ponds (adjusted for visibility) in Prairie Canada (portions of Alberta, Saskatchewan and Manitoba) 1967-2011 and north-central U.S. (North Dakota, South Dakota and Montana) 1974-2011. (from: U.S. Fish and Wildlife Service. 2011. Waterfowl population status, 2011. U.S. Department of the Interior, Washington, D.C. U.S.A.)

	Ponds (thousands)	
Year	Prairie Canada	North Central U.S.[a]
1967	4,691	--
1968	1,986	--
1969	3,548	--
1970	4,875	--
1971	4,053	--
1972	4,009	--
1973	2,950	--
1974	6,390	1,841
1975	5,320	1,911
1976	4,599	1,392
1977	2,278	771
1978	3,622	1,590
1979	4,859	1,522
1980	2,141	761
1981	1,443	683
1982	3,185	1,458
1983	3,906	1,259
1984	2,473	1,766
1985	4,283	1,327
1986	4,025	1,735
1987	2,524	1,348
1988	2,110	791
1989	1,693	1,290
1990	2,817	691
1991	2,494	706
1992	2,784	825
1993	2,261	1,351
1994	3,769	2,216
1995	3,893	2,443
1996	5,003	2,480
1997	5,061	2,397
1998	2,522	2,065
1999	3,862	2,842
2000	2,422	1,524
2001	2,747	1,893
2002	1,439	1,281
2003	3,522	1,668
2004	2,513	1,407
2005	3,921	1,461
2006	4,450	1,644
2007	5,040	1,963
2008	3,055	1,377
2009	3,568	2,866
2010	3,729	2,936
2011	4,893	3,239
Average	3,439	1,608
% Change in 2011 from:		
2010	+ 31	+ 10
Long term Average	+ 43	+ 102

[a] No comparable survey data available for the north-central U.S. during 1967-73.

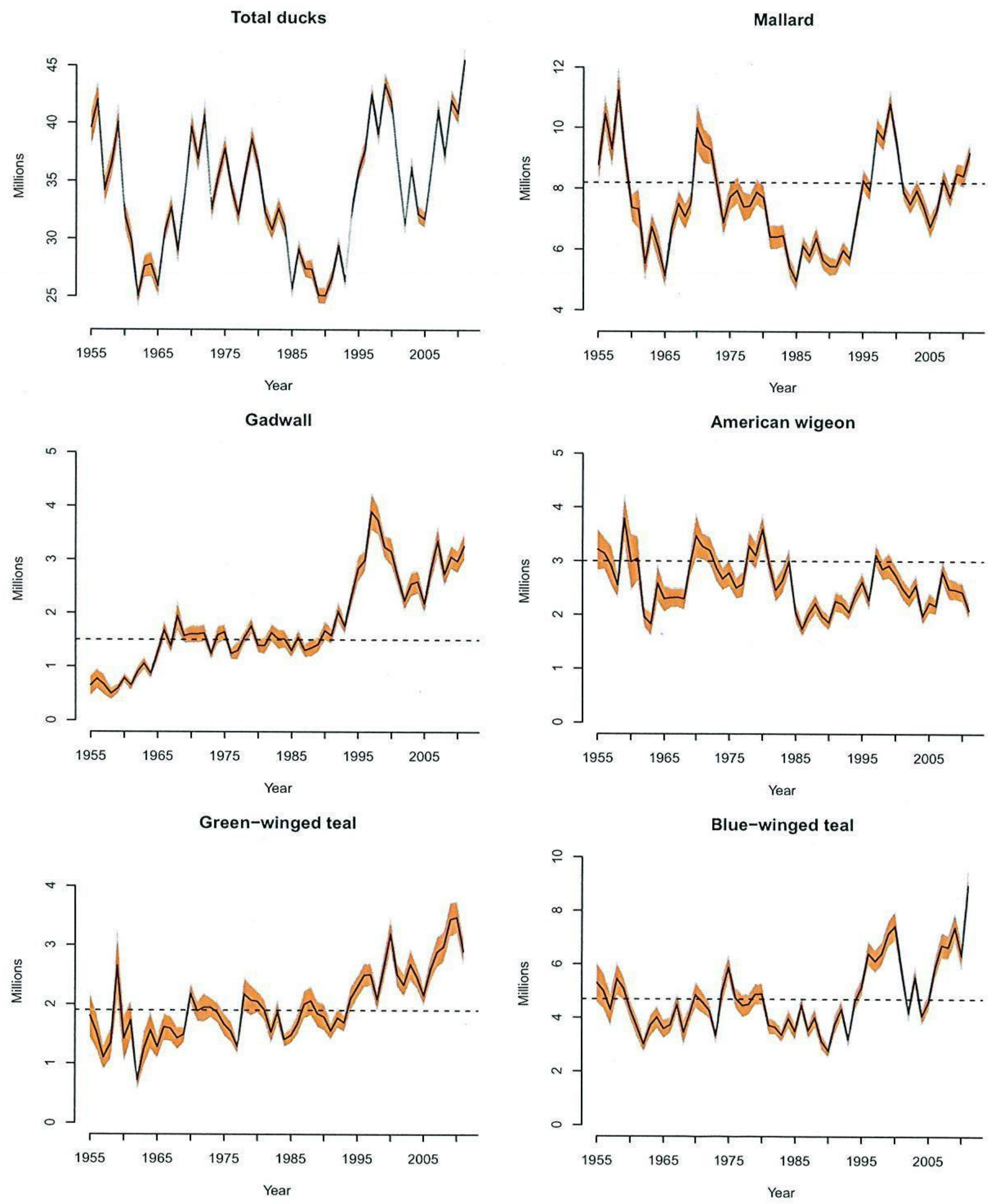

Figure 2. Estimates of North American breeding populations, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S. (from: U.S. Fish and Wildlife Service. 2011. Waterfowl population status, 2011. U.S. Department of the Interior, Washington, D.C. U.S.A.)

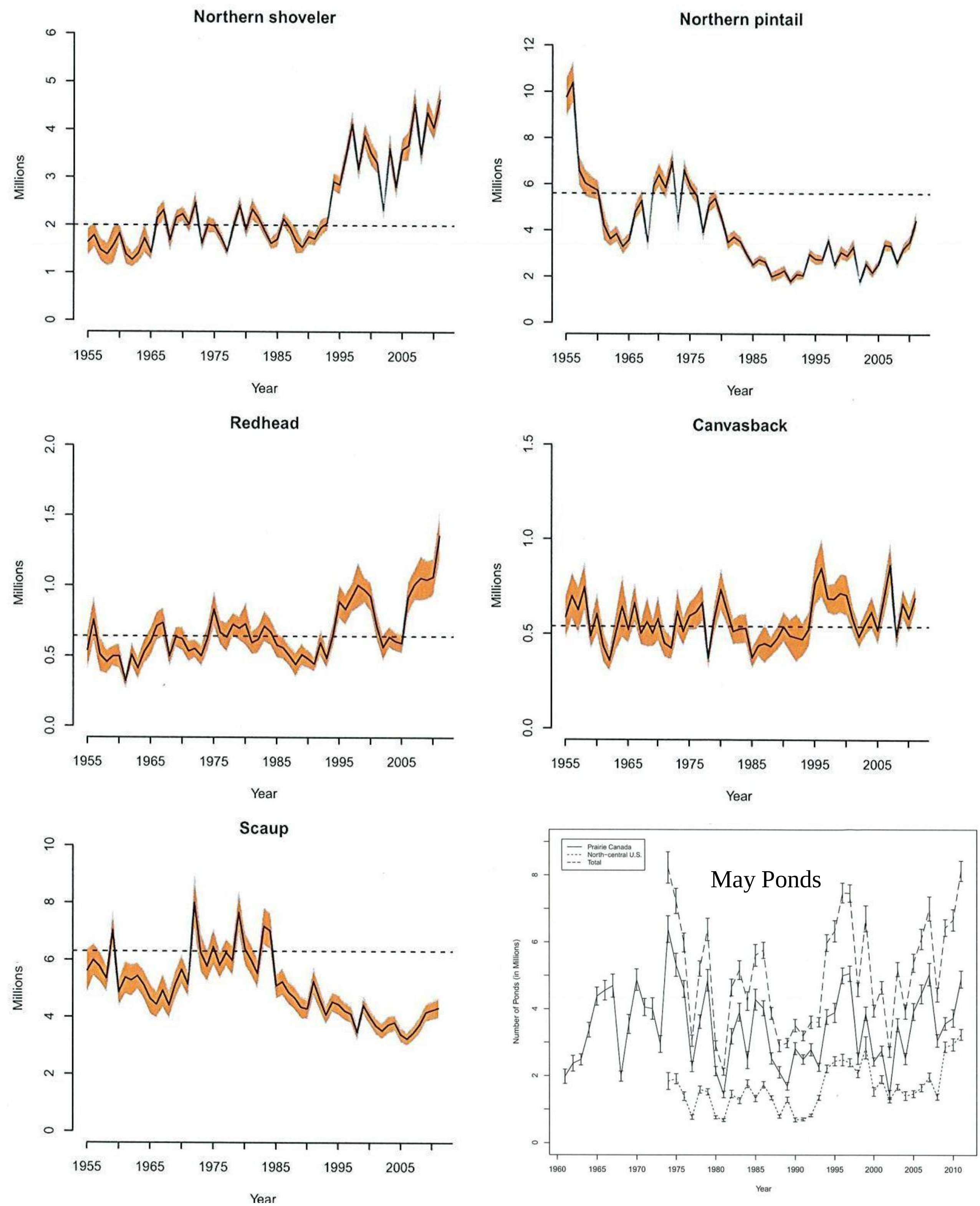

Figure 2. (continued).

2011 MINNESOTA SPRING CANADA GOOSE SURVEY

David Rave, Wetland Wildlife Populations and Research Group

INTRODUCTION

This report presents results from the eleventh year of a spring helicopter survey of resident Canada geese in Minnesota. The survey was developed to comply with a Mississippi Flyway Council request to produce a statewide population estimate of resident giant Canada geese having 95% confidence intervals (C.I.'s) that are within ± 25% of the estimate.

METHODS

The original survey was initiated in 2001 using a double sampling design where an annual stratified sample was randomly selected from 900 plots in each ecoregion (Maxson 2002). I eliminated the double sampling design in 2008 by stratifying all potential plots in each ecoregion, and randomly sampling from the entire sampling frame (i.e., it is now a simple stratified sampling design with new sample plots drawn each year).

The state was divided into three ecoregions (Prairie Parkland, Eastern Broadleaf Forest/Tallgrass Aspen Parklands, Laurentian Mixed Forest) hereafter referred to as Prairie, Transition, and Forest. The 7-county Metro area was excluded from the Transition ecoregion. Similarly, Lake and Cook Counties plus the Boundary Waters Canoe Area and the Northwest Angle were excluded from the Forest ecoregion. Four Statewide ArcView shapefiles were then unioned together: National Wetlands Inventory circular 39, DNR 1:24k lakes, Public Land Survey Quarter section Boundaries, and ECS provinces, to assign each quarter section plot to the appropriate strata.

Four new fields were then computed: total acres of Type 3, 4, and 5 wetlands per quarter section (Circ39_acr) , total acres of 1:24k lakes per quarter section (Lakes_acr), total acres of type 3 wetlands per quarter section (Sum_type3_acr) and total acres of river per quarter section (Sum_Riv_acr). A summary table was created with text fields for each of the 8 strata (habitat-quality class x ecoregion). Using the query builder in ArcMap, quarter sections in each ecoregion were assigned to habitat-quality classes for resident geese: 1) not nesting habitat – expect no geese, 2) limited nesting habitat – habitat capable of supporting 1 or 2 pairs of geese, 3) prime nesting habitat – habitat capable of supporting 3 or more pairs.

Habitat-classification criteria for each ecoregion was:

	Prairie
No geese =	Type 3-4-5 <0.5 acres and rivers <10 acres or plot is all water. (n = 61,597 plots).
1-2 pairs =	Type 3-4-5 ≥ 0.5 acres but Type 3 <15 acres or Type 3-4-5 <0.5 acres and rivers >10 acres. (n = 30,874 plots).
3+ pairs =	Type 3 >15 acres, but plot is not all water. (n = 9,537 plots).

Transition	
No geese =	Type 3-4-5 <1 acre and rivers <8 acres or plot is all water. (n = 39,484 plots).
1-2 pairs =	Type 3-4-5 = 1-25 acres or Type 3-4-5 >25 acres, but Type 3 <15 acres or Type 3-4-5 <1 acre and rivers >8 acres. (n = 31,091 plots).
3+ pairs =	Type 3-4-5 >25 acres, but Type 3 >15 acres and plot is not all water. (n = 7,988 plots).

Forest

No geese =	Type 3-4-5 <2 acres and rivers <2 acres or plot all water. (n = 75,835 plots).
1-2 pairs =	Type 3-4-5 ≥2 acres, but not all water or Type 3-4-5 <2 acres and rivers >2 acres. (n = 51,155 plots).
3+ pairs =	None.

Plots in the "no geese class" are not flown and there are no plots in the "3+ pairs" class in the Forest ecoregion. Prior to 2011, 30 plots were randomly selected in each of the 5 remaining strata using ArcView's AlaskaPak extension, and these 150 plots were surveyed at low level using a helicopter. The stratification was modified slightly in 2011 to include a binary stratification variable (zone), which permitted a domain analysis of total geese in a proposed new hunting zone (Figure 1). Thus, the 9 strata for 2011 were Forest–12, Transition–12new, Transition–12other, Transition–3new, Transition– 3other, Prairie–12new, Prairie–12other, Prairie–3new, and Prairie–3other. Thirty plots (quartersections) were randomly selected from strata in the new zone (using proportional allocation) and 130 plots were selected from strata not in the new zone for a total of 160 sample plots (Figure 1). Ideally, the survey should be conducted during mid-incubation.

Pilots John Heineman (7 days) and Mike Trenholm (1 day), and I flew the survey on eight days between 20 and 29 April, 2011. Canada geese seen within plot boundaries were recorded as singles, pairs, and groups. We also recorded whether singles and pairs were observed with a nest. The number of singles and pairs was doubled when the total number of geese per plot was calculated.

RESULTS AND DISCUSSION

The total Canada goose population estimate in the surveyed area for 2011 was 352,175 (±119,814). Adding 17,500 for the Twin Cities metro area (Cooper 2004) yields a statewide estimate of 369,675 (Table 1). Relative error (95% CI half-width) was 34.0% of the estimate. The survey tallied 50.3% singles, 47.2% pairs, and 2.6% groups (Table 2). Typically, many of the pairs seen on this survey are not associated with nests and are likely nonbreeders. An index to nesting effort (i.e., Productive Geese) was obtained by combining singles and pairs associated with nests. In 2011, 55.7% of the geese seen were classified as Productive Geese (Table 2).

The 2011 Canada goose breeding population estimate for the surveyed area was similar to the 2010 estimate, although goose numbers appeared to be slightly lower in the Transition region and slightly higher in the Forest and Prairie regions (Table 1). A time-series plot suggested the goose population in the survey area has been reasonably stable over the last 11 years (Figure 2). The estimated breeding population in the proposed new hunting zone was 151,669 (±105,319), or approximately 41% of the state population.

Weather conditions in 2011 were characterized by normal spring temperatures statewide, and cool weather throughout most of the incubation period and during the survey period. The normal spring and the number of productive geese observed this year indicates that 2011 will likely be a very good year for Canada goose production. Weather conditions throughout May and June will influence goose productivity. Regardless, the 2011 Canada goose population estimate remained above the state Canada goose population goal of 250,000 geese.

Wetland and habitat quality were variable in the state this year. Wetland conditions were wetter than average throughout the state. Due to the large percentage of productive geese in the population, and good wetland conditions in much of the state, I expect above average Canada goose production throughout the state again in 2011.

ACKNOWLEDGEMENTS

Frank Martin (Univ. of MN) and Steve Maxson were instrumental in the original design of this survey. Steve also was the principal observer during the first 6 years of the survey. Tim Loesch, Christopher Pouliot, and Shelly Sentyrz set up the original 2,700 ¼-section plots using ArcView and were very helpful in getting the survey up and running in 2001. Shelly Sentyrz was also instrumental in helping to restratify plots statewide for the 2008 survey. Chris Scharenbroich provided GPS coordinates of plots to the pilot, and printed out maps of the 150 plots flown this year. John Heineman and Michael Trenholm piloted the helicopter and served as the second observer. John Giudice provided statistical assistance.

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Table 1. Spring Canada goose population estimates in Minnesota, 2001-2011.

Year	Prairie	Transition	Forest	Subtotal	95% CI	Metro	**TOTAL**
2001	77,360	95,470	92,390	265,220	±69,500	20,000	**285,220**
2002	135,850	144,900	33,940	314,690	±134,286	20,000	**334,690**
2003	106,520	121,290	56,420	284,230	±78,428	20,000	**304,230**
2004	128,501	130,609	95,636	354,747	±107,303	20,000	**374,747**
2005	113,939	149,286	57,529	320,754	±90,541	17,500	**338,254**
2006	126,042	164,085	67,994	358,071	±108,436	17,500	**375,571**
2007	137,151	99,274	25,509	261,933	±80,167	17,500	**279,433**
2008*	113,483	127,490	30,400	271,372	±69,055	17,500	**288,872**
2009	129,115	114,737	23,644	267,496	±70,607	17,500	**284,996**
2010	83,911	151,902	57,421	293,234	±70,760	17,500	**310,734**
2011	143,266	117,711	91,199	352,175	±119,814	17,500	**369,674**

*Prior to 2008, double-sampling for stratification was used to estimate stratum weights. The entire frame was re-stratified in 2008 (double-sampling was eliminated) and Lake of the Woods and the NW Angle were removed from the frame. The sampling frame was adjusted slightly in 2009 because of some processing errors in 2008. The population estimates for 2008-2011 are based on the updated sampling frame.

Table 2. Percent of Canada Geese seen as singles, pairs, groups, and productive geese on the Minnesota Spring Canada Goose Survey, 2001-2011.

Year	Singles[1]	Pairs[1]	Groups	Productive Geese[2]	Dates of Survey
2001	27.0	63.9	9.1	36.4	4/14 to 5/02/2001
2002	30.7	52.0	17.2	41.5	4/26 to 5/11/2002
2003	27.9	58.2	13.9	29.3	4/22 to 5/01/2003
2004	26.5	57.5	16.0	35.5	4/22 to 5/04/2004
2005	33.0	50.2	16.8	40.7	4/20 to 5/03/2005
2006	43.5	45.9	10.6	50.3	4/24 to 5/05/2006
2007	31.0	51.5	17.5	36.2	4/23 to 4/28/2007
2008	38.4	55.4	6.2	42.6	4/23 to 5/05/2008
2009	41.8	50.7	7.5	45.2	4/21 to 5/01/2009
2010	42.5	48.2	9.3	46.6	4/15 to 4/20/2010
2011	50.3	47.2	2.6	55.7	4/21 to 4/29/2011

[1]Singles and pairs were doubled before calculating proportions.
[2]Productive geese equals Singles + Pairs with nests.

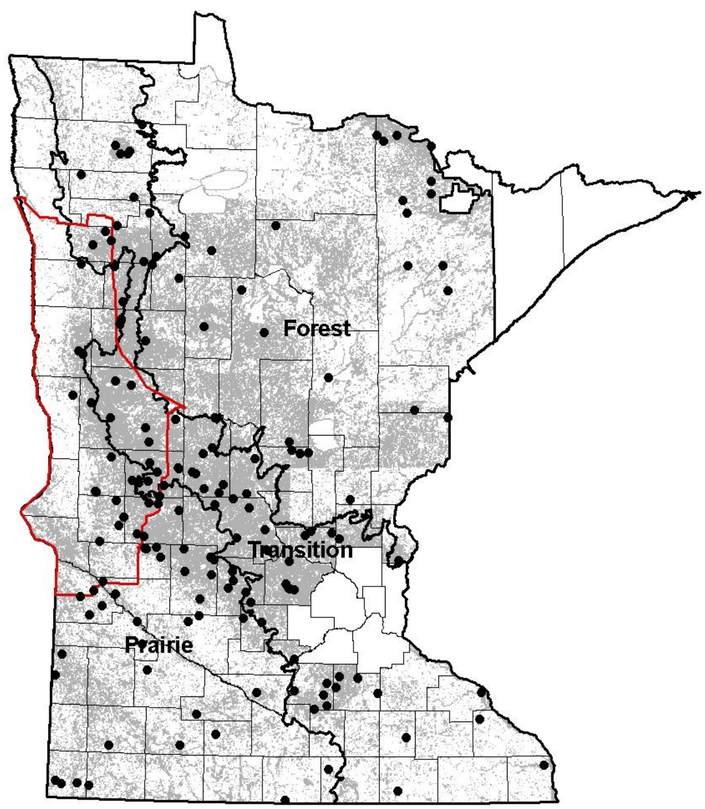

Figure 1. Location of 160 ¼ mi^2 plots surveyed for the 2011 Canada goose breeding pair survey within 3 ecoregions of Minnesota; forest, transition, and prairie. Red outlined polygon is the location of a possible "new" Early Season Canada goose hunting zone.

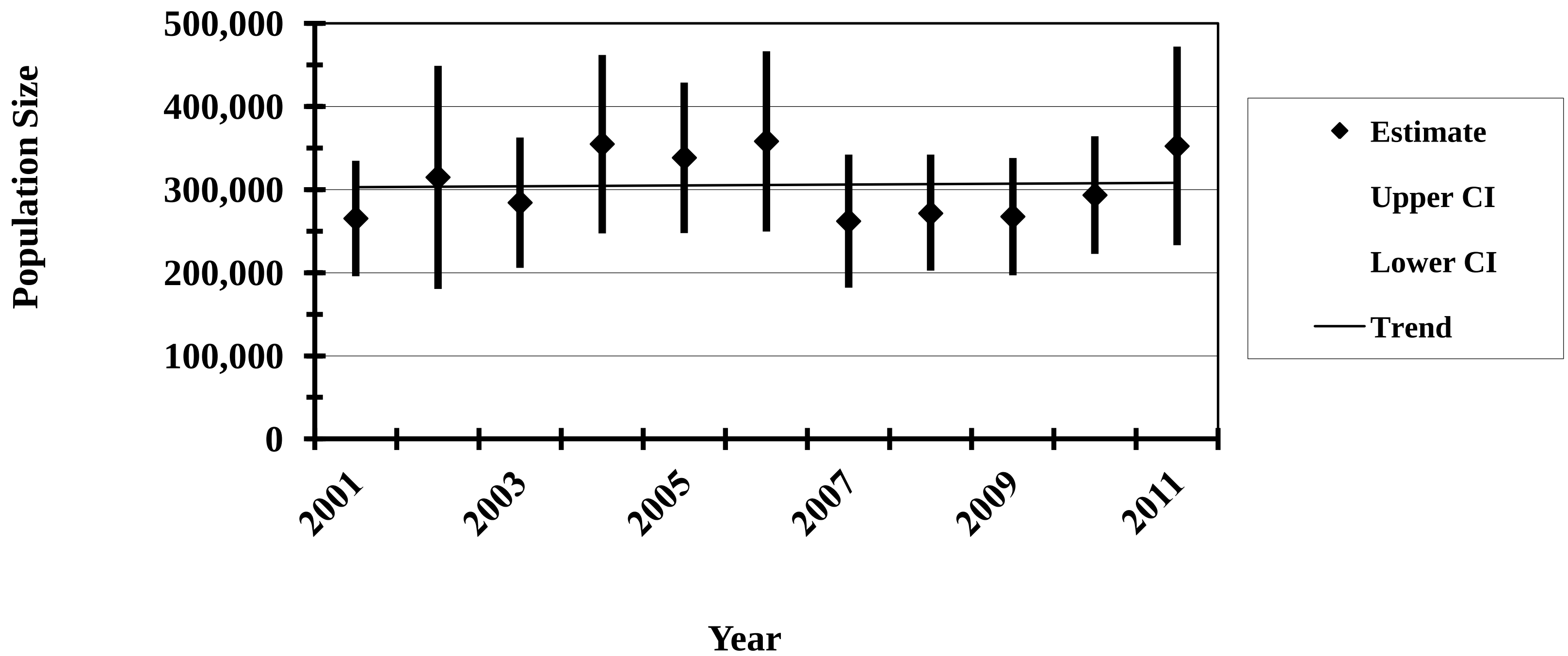

Figure 2. Spring Canada goose population estimates (+95% CI) in Minnesota, 2001-2011. (Does not include Metro area.)

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp. The entire report is available on the Division of Migratory Bird Management web site (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

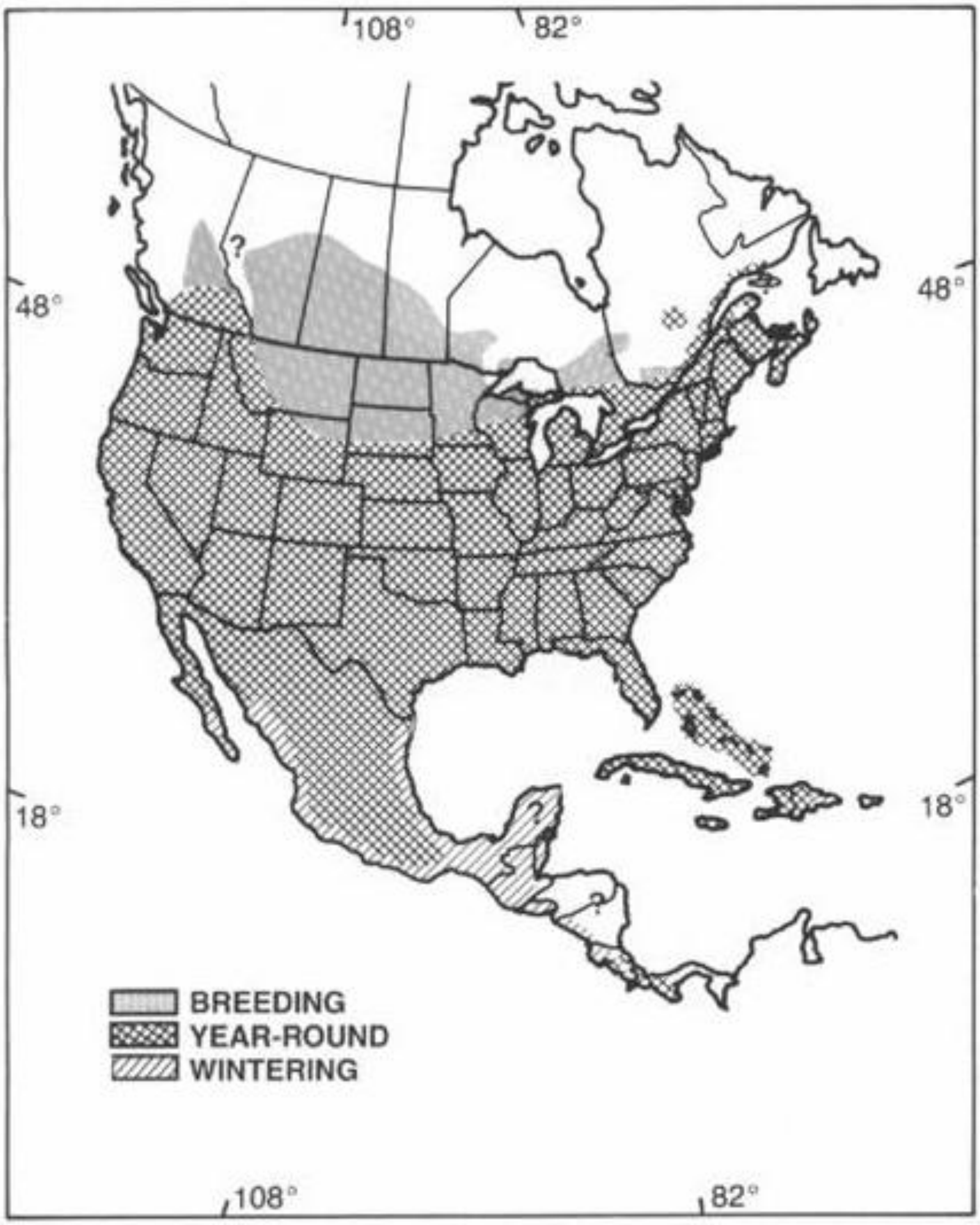

Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

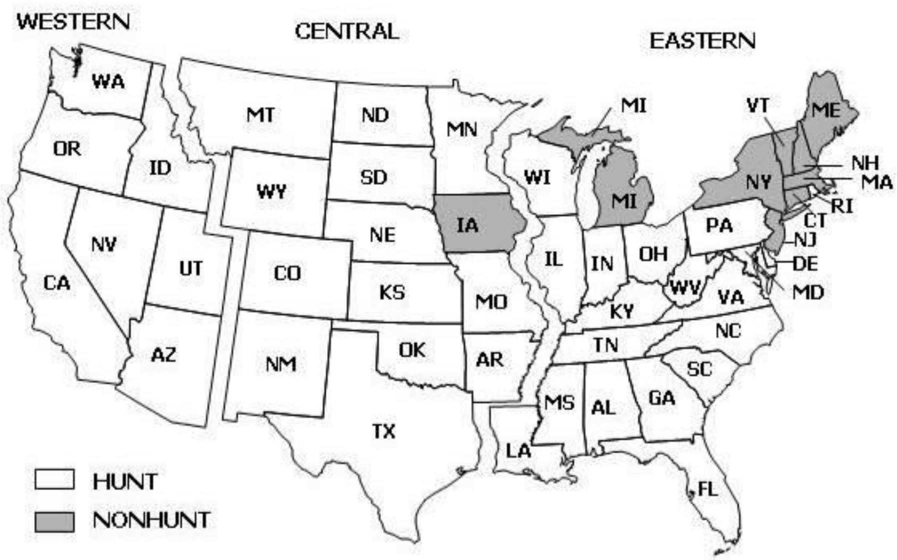

Figure 2. Mourning dove management units with 2010 hunting and non-hunting states. (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

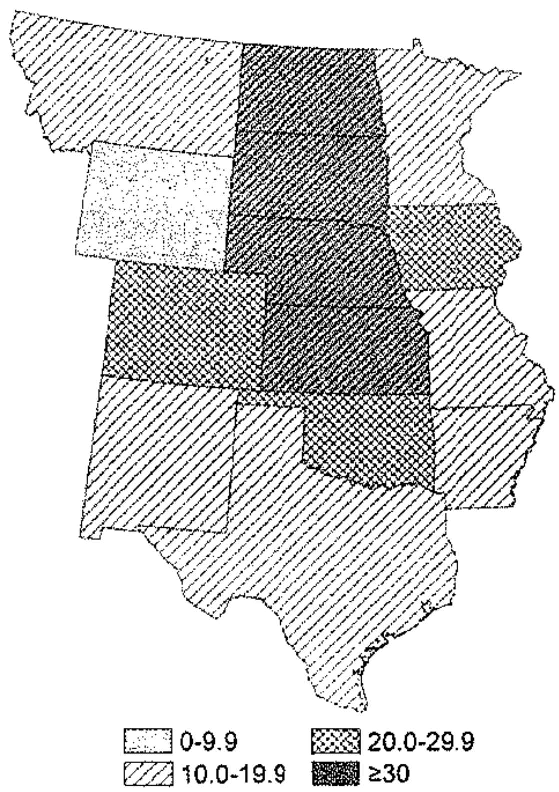

Figure 3. Mourning dove abundance in the Central Management Unit, based on the mean of the 2 CCS-heard index values from the last 2 years (2010-11). (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

Table 1. Preliminary estimates and 95% confidence intervals (CI, expressed as the interval half width in percent) of mourning dove harvest and hunter activity for the Central management unit during the 2008, 2009 and 2010 seasons [a]. (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

Management unit / State	Hunters			Hunter Days Afield			Total Harvest		
	2008[1]	2009	2010	2008	2009	2010	2008	2009	2010
CENTRAL	443,900	393,400 †[3]	406,100 †[3]	1,496,900 ± 9	1,312,700	1,362,300	7,520,000 ± 10	7,474,600 ± 12	7,194,900 ± 10
AR	23,300 ± 18	22,400 ±19	23,900 ±20	76,600 ± 33	53,800 ± 26	63,300 ± 28	422,000 ± 23	353,500 ± 21	446,400 ± 28
CO	23,200 ± 12	20,300 ± 13	15,900 ± 14	60,400 ± 18	45400 ± 18	38,400 ± 19	288,400 ± 19	242,400 ± 17	172,000 ± 18
KS	26,800 ± 11	29,400 ± 10	28,200 ± 10	78,500 ± 15	97,000 ± 14	93,900 ± 13	443,700 ± 15	572,600 ± 16	511,200 ± 15
MN	11,300 ± 28	6,800 ± 36	10,000 ± 42	34,900 ± 42	24,100 ± 64	55,300 ± 115	83,500 ± 48	61,500 ± 67	98,900 ± 58
MO	34,300 ± 9	21,500 ± 16	29,300 ± 10	93,400 ± 14	58,700 ± 21	75,200 ± 14	467,800 ± 16	294,700 ± 26	426,000 ± 20
MT	2,100 ± 45	2,500 ± 32	1,600 ± 35	3,700 ± 44	6,400 ± 46	4,700 ± 44	18,400 ± 51	12,700 ± 32	17,400 ± 36
NE	13,600 ± 33	16,000 ± 12	15,800 ± 14	48,800 ± 52	51,800 ± 15	49,700 ± 21	238,600 ± 49	277,600 ± 17	276,400 ± 19
NM	6,300 ± 18	7,800 ±16	5,900 ±20	26,200 ± 29	35,700 ± 26	21,000 ± 20	138,100 ± 30	170,200 ± 26	128,000 ± 29
ND	2,700 ± 30	2,800 ± 28	3,800 ± 28	9,200 ± 44	10,800 ± 50	11,800 ± 37	26,400 ± 31	40,000 ± 31	54,200 ± 38
OK	19,300 ± 17	18,600 ± 12	19,500 ± 14	57,800 ± 17	55,500 ± 15	51,300 ± 22	361,200 ± 18	378,400 ± 17	268,700 ± 28
SD	7,300 ± 18	6,500 ± 19	5,000 ± 21	27,500 ±34	21,700 ± 23	14,200 ± 26	152,100 ± 30	105,400 ± 24	64,300 ± 23
TX	271,300 ± 10	236,600 ± 10	244,600 ± 10	974,100 ± 13	846,200 ± 12	876,500 ± 10	4,849,600 ± 14	4,945,100 ± 18	4,699,300 ± 14
WY	2,500 ± 25	2,300 ± 27	2,700 ± 26	5,900 ± 33	5,800 ± 31	7,100 ± 32	30,100 ± 36	20,600 ± 31	32,100 ± 36

[1] This represents the 95% confidence interval expressed as a percent of the point estimate.

[2] Hunter number estimates at the Management Unit and national levels may be biased high, because the HIP sample frames are state specific; therefore hunters are counted more than once if they hunt in >1 state. Variance is inestimable.

[3] No estimate available.

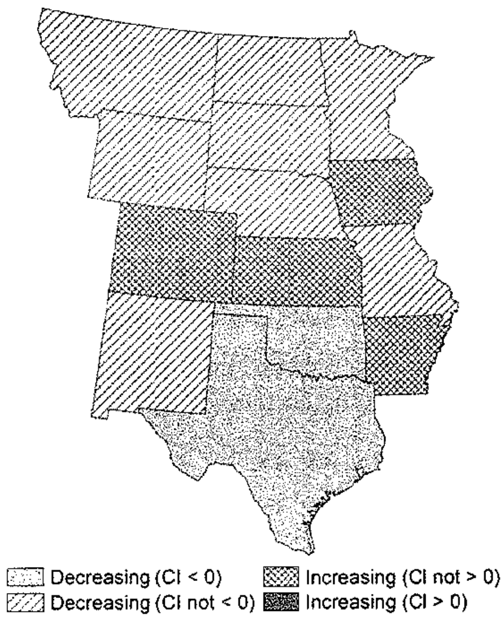

Figure 4. Trend in mourning dove abundance by state in the Central Management Unit over the last 10 years (2002-2011) based on CCS-heard data. Credible intervals (CI, 95%) that exclude zero provide evidence for an increasing or decreasing trend (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

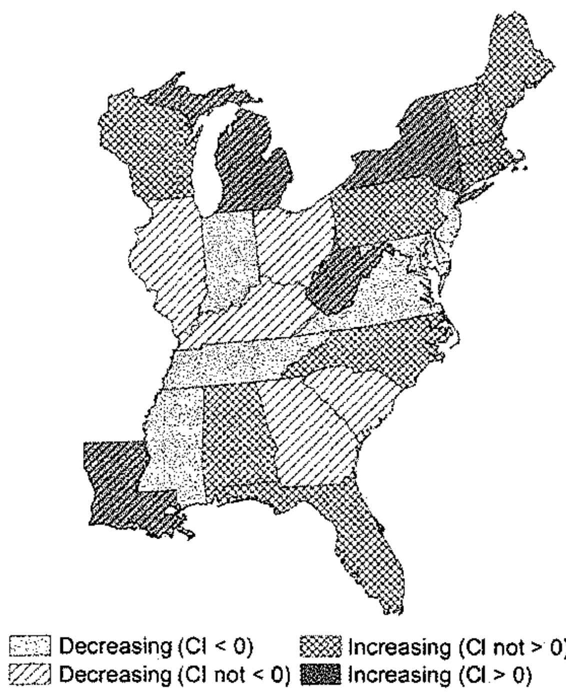

Figure 5. Trend in mourning dove abundance by state in the Central Management Unit over the last 46 years (1966-2011) based on CCS-heard data. Credible intervals (CI, 95%) that exclude zero provide evidence for an increasing or decreasing trend. (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

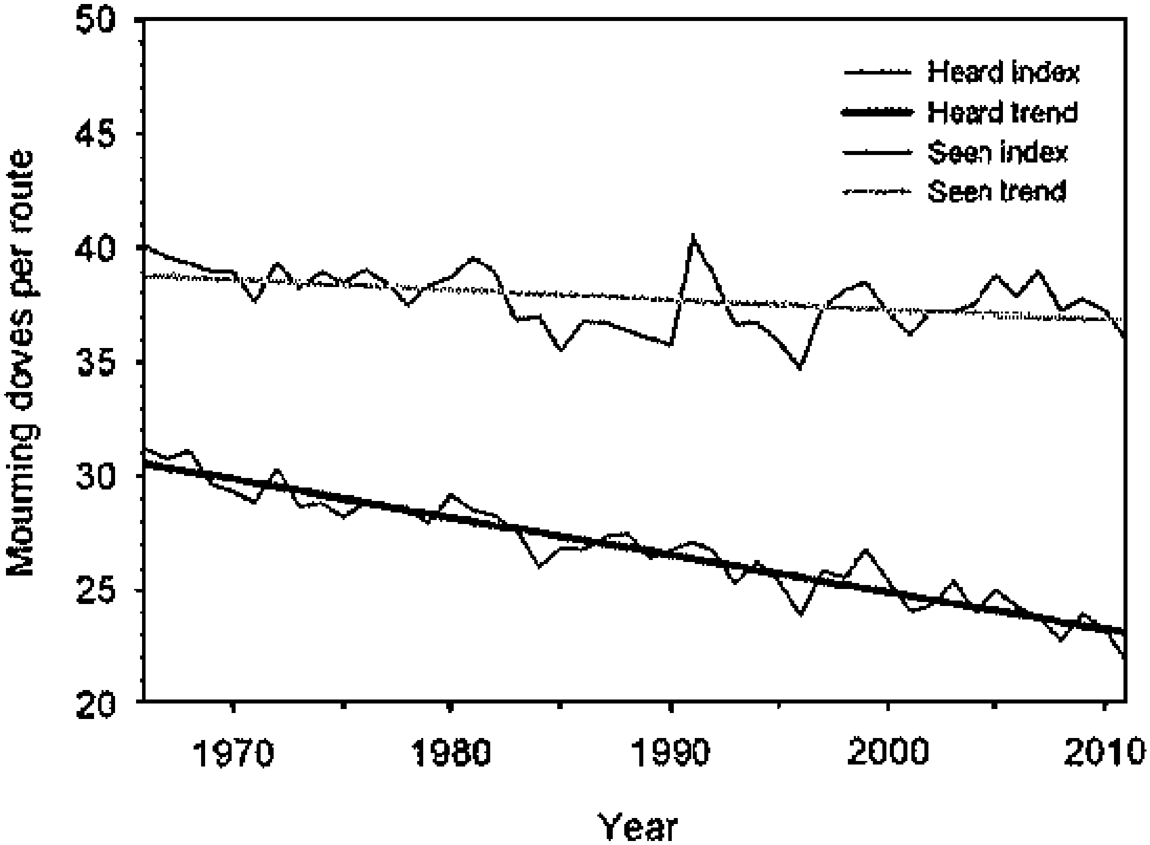

Figure 6. Mourning dove abundance indices and predicted trends in the Central Management Unit based on CCS data, 1966-2011. Trend lines are exponentiated predicted values from fitting a regression line through the log transformed annual indices. (From: Seamans, M.E., K. Parker, and T.A. Sanders. 2011. Mourning dove population status, 2011. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 28 pp.)

American Woodcock information is taken from the U.S. Fish and Wildlife Service report American Woodcock Population Status, 2011. Cooper, T.R. and K. Parker. Us. Fish and Wildlife Service, Laurel, MD. 17 pp. The entire report is available on the Division of Migratory Bird Management home page (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

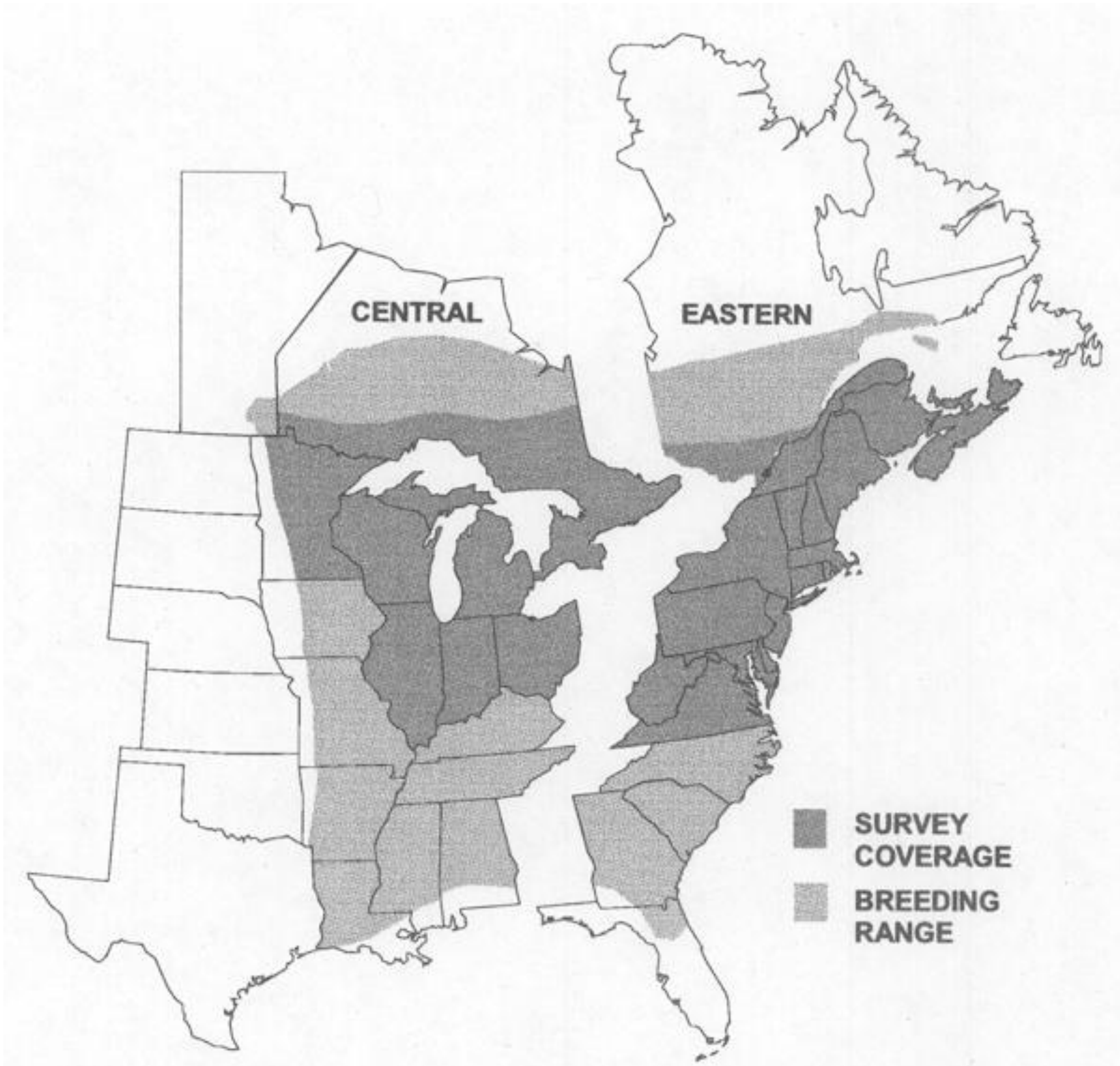

Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.)

Table 24. Short term (2010 – 11), 10 –year (2001-2011), and long-term (1968-2011) trends (% change per year [a]) in the number of American woodcock heard during the Singing-ground Survey as determined by using the hierarchical log-linear modeling technique (Sauer et al. 2008) (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

Management Unit/State	Number of Routes[b]	n[c]	(2010-11) % Change	(2001-11) % Change	(1968-11) % Change
CENTRAL	415	712	4.87	-0.14	- 0.76
IL	32	45	- 15.27	- 1.62	1.27
IN	13	60	- 16.21	- 5.26	- 4.40
MB[d]	11	28	17.82	1.23	- 0.18
MI	103	149	12.10	0.39	- 0.77
MN	73	120	- 1.99	0.82	0.35
OH	29	72	- 1.11	- 0.83	- 1.57
ON	87	149	6.55	- 1.19	- 1.08
WI	67	117	8.52	0.67	- 0.38

[a] Median of route trends estimated used hierarchical modeling. To estimate the total percent change over several years, use: 100(% change/100+1)y)-100 where y is the number of years. Note: extrapolating the estimated trend statistic (% change per year) over time (e.g., 30 years) may exaggerate the total change over the period.

[b] Total number of routes surveyed in 2011 for which data were received by 8 June, 2011.

[c] Number of routes with >2 years of data and at least 1 observed woodcock between 1968 and 2011.

[d] Manitoba began participating in the Singing-ground survey in 1990.

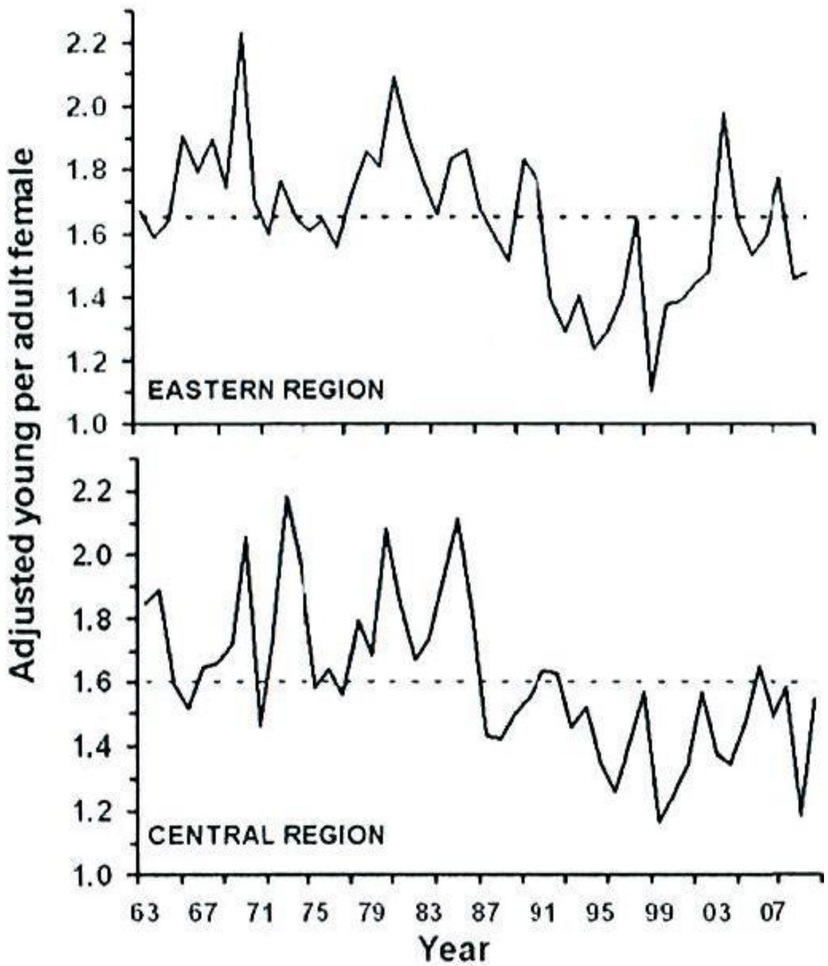

Figure 2. Weighted annual indices of American woodcock recruitment, 1963-2010. Dashed line is the 1963-2009 average. (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

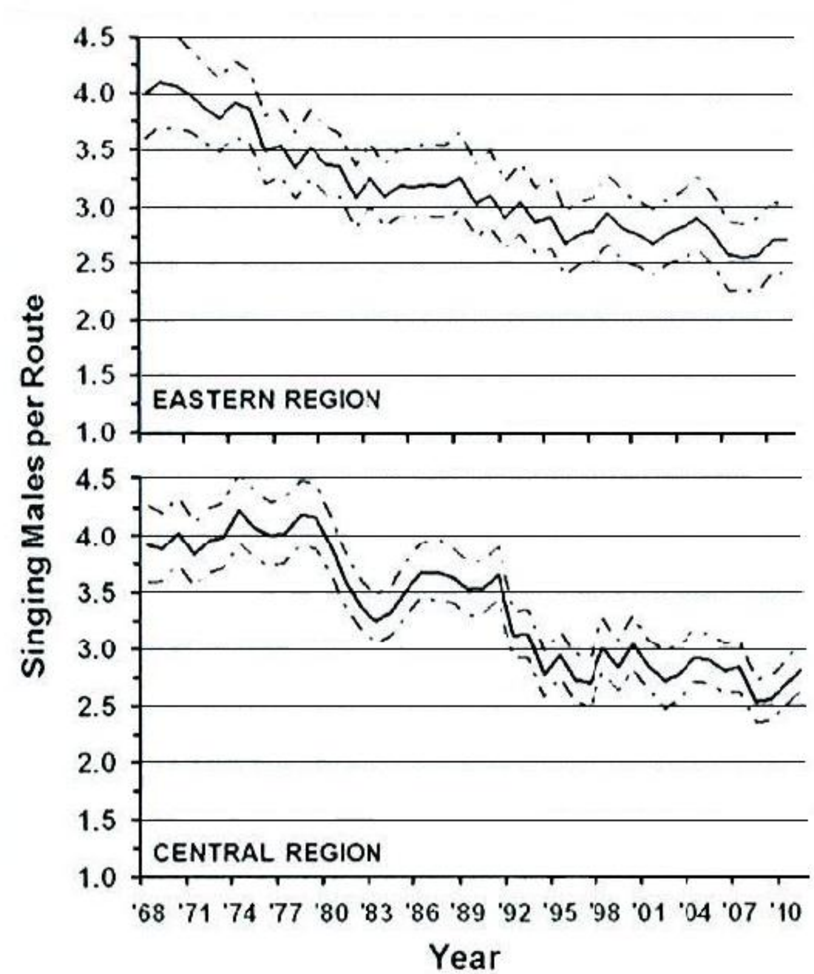

Figure 3. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2011. The dashed lines represent the 95th percentile credible interval. (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

Table 25. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2007-08, 2008-09, 2009-10 and 2010-11 Harvest Information Program surveys. Note: beginning 2008-09 all estimates rounded to the nearest 100 for harvest, hunters, and days afield. (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

Management Unit / State	Active woodcock hunters ([a])				Days afield ([a, c])				Harvest ([a, c])			
	2007-08	2008-09	2009-10	2010-11	2007-08	2008-09	2009-10	2010-11	2007-08	2008-09	2009-10	2010-11
Central Region	n.a.[b]	n.a. [b]	n.a. [b]		358,480 ± 14%	369,800 ± 16%	322,300 ± 14	392,400 ± 20	214,162 ± 16%	174,300 ± 16%	175,100 ± 17	233,100 ± 20
IL	3,111 ± 73%	2,100 ± 90%	1,800 ± 98	800 ± 171	7,644 ± 72%	6,100 ± 103%	6,200 ± 91	1,200 ± 123	3,819 ± 149%	4,300 ± 100%	5,300 ± 142	900 ± 106
IN	1,788 ± 71	900 ± 69%	1,100 ± 63	1,000 ± 66	3,342 ± 58%	2,400 ± 63%	4,000 ± 80	3,900 ± 89	1,203 ± 53%	800 ± 31%	1,700 ±79	3,000 ± 134
MI	28,412 ± 13%	34,600 ± 13%	26,400 ± 15	31,100 ± 14	138,881 ±15%	156,000 ± 17%	146,200 ± 21	159,200 ± 19	86,825 ± 17%	78,900 ± 17%	80,900 ± 22	93,200 ± 21
MN	15,295 ± 29%	8,700 ± 37%	9,700 ± 37	13,900 ± 32	62,810 ± 36%	37,900 ± 43%	38,300 ± 44	55,400 ± 33	34,400 ± 38%	19,900 ± 67%	16,00 ± 48	34,800 ± 39
OH	2,611 ± 73%	2,900 ± 69%	1,600 ± 82	1,800 ± 98	9,259 ± 72%	10,300 ± 70%	7,200 ± 94	4,300 ± 70	2,598 ± 68%	2,300 ± 68%	1,200 ± 63	1,700 ± 93
WI	17,258 ± 23%	14,200 ± 24%	19,400 ± 22	14,600 ± 25	79,139 ± 31%	65,400 ± 35%	77,100 ±24	65,700 ± 40	48,027 ± 31%	36,000 ± 27%	29,200 ± 24	42,300 ± 22

[a] All 95% Confidence Intervals are expressed as a % of the point estimate.

[b]. Regional estimates of hunter numbers cannot be obtained due to the occurrence of individual hunters being registered in the Harvest Information Program in more than one state.

[c]. Days afield and Harvest estimates are for the entire 18 state Central Region.

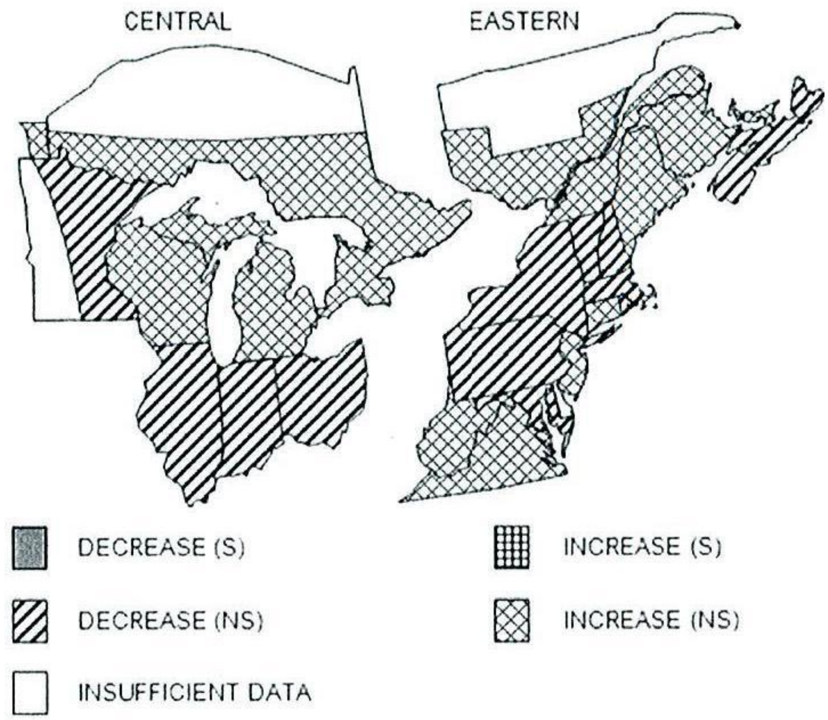

Figure 4. Short-term trends in number of American woodcock heard on the Singing-ground Survey; 2010-11, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

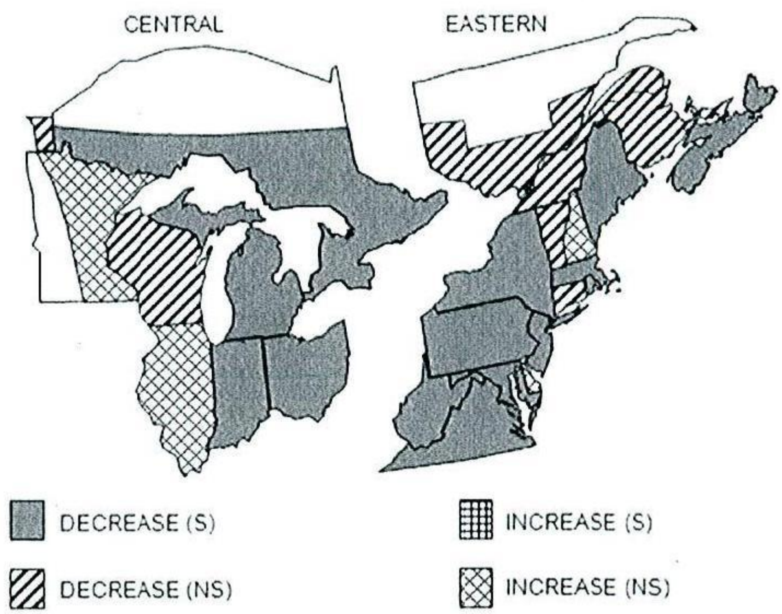

Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-2011, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and K. Parker. 2011. American woodcock population status, 2011. U.S. Fish and Wildlife Service, Laurel, MD. 17pp.).

2011 RING-NECKED DUCK BREEDING PAIR SURVEY

Christine Herwig Wetland Wildlife Populations and Research Group and
John Giudice, Wildlife Biometrics Unit

SUMMARY OF FINDINGS

Ring-necked duck breeding populations have been surveyed with helicopters in portions of Minnesota since 2004. We used a stratified sampling design in all years, but in 2011 we switched to a generalized random tessellation stratified (GRTS) design to obtain a spatially balanced sample and to explore the feasibility of using a local variance estimator to account for spatial correlation in counts. We surveyed 225 plots in 2011, which consisted of 176 'new' (random) plots and 49 resample plots (also surveyed in 2009 and 2010). We treated resample plots as a separate stratum for population estimation, although their primary purpose was to help us evaluate the feasibility of using sampling with partial replacement to obtain more reliable estimates of population trends.

Helicopter-based counts in 2011 entailed 8 survey-crew days from 6–11 June totaling ~43 hrs of flight time. The estimated breeding population was 10,395 (SE = 1,325) indicated breeding pairs (IBP) and 22,727 (SE = 2,759) total birds, which was similar to estimates from 2006–2009 (range: 8,705–10,947 IBP, 18,533–22,987 birds) but greater than 2010 estimates (5,338 IBP, 11,843 birds). Accounting for spatial correlation in counts reduced sampling variance by ~30% (compared to using a standard variance estimator), which translated into in a small improvement in the relative precision of population estimates (i.e., coefficient of variation [CV] was reduced from 15.3% to 12.7% for the IBP estimate). Correlation among annual counts within resample plots was moderately strong (intra-class correlation = 0.476), and estimates of among- and within-plot variance was similar, which suggests that sampling with partial replacement may be beneficial in future ring-necked duck surveys. We plan to explore this further with simulation studies and, possibly, a Bayesian analysis approach.

INTRODUCTION

Growing concern among biologists about the status of ring-necked ducks (*Aythya collaris*) in Minnesota prompted the initiation of a pilot study (2004–2005) to develop a breeding pair survey (Zicus et al. 2008). At the time, little was known about the breeding distribution and abundance of ring-necked ducks in Minnesota (Zicus et al. 2008). Concerns were raised, in part, due to counts from 10 wetlands in the Bemidji area, which showed a ~70% decline in ring-necked duck breeding pairs using these historically-important lakes since 1969 (Zicus et al. 2004). Counts from this geographically limited survey suggested that the Minnesota population may be declining despite continental increases (U.S. Fish and Wildlife Service 2008). Additionally, the species was identified as a forest indicator because of its unique habitat associations (Minnesota Department of Natural Resources 2006). The importance of this species to Minnesota is also reflected in the number of ring-necked ducks harvested annually, often the 3rd most common duck taken by hunters (U.S. Fish and Wildlife Service, unpublished reports).

A pilot study was conducted in 2004–2005 to develop an aerial survey for Minnesota's ring-necked duck breeding population (Zicus et al. 2008). We used survey protocols and methodologies developed in the pilot study to estimate abundance and trends of breeding ring-necked ducks in Minnesota during 2006–2011. Due to budget constraints, we reduced the spatial extent and focus of the survey beginning in 2008. More specifically, we reduced the sampling frame to the core area of the breeding range (based on pilot-study data) in Minnesota, and we excluded plots with no or relatively little predicted nesting cover (see Herwig 2010). Here, we present results from the portion of the state that has been consistently surveyed for the past 6 years. The primary objectives of this survey were to estimate breeding pair numbers and monitor population trends of ring-necked ducks in northern Minnesota.

METHODS

Public Land Survey (PLS) sections (~2.6-km^2 plots, range = 1.2 – 3.0 km^2) were used as primary sampling units (Zicus et al. 2008). We used a stratified sampling design to both distribute plots and to focus the survey in areas where ring-necked ducks were most likely to be found (Zicus et al. 2008). Stratification variables included estimated nesting-cover availability, which was based on habitat modeling using Minnesota Gap Analysis Program (MNGAP) data (Table 1), and Ecological Classification System (ECS) sections. Breeding habitat was comprised of two land-cover components: 1) nesting cover and 2) near-shore water. Habitat specifications for the model were tested and refined during the pilot study. Nesting cover served as a surrogate for predicted breeding ring-necked duck density (Zicus et al. 2008). Four habitat classes were surveyed from 2006–2007, and 2 habitat classes (1 and 2, Table 1) were surveyed from 2008–2011 (Zicus et al. 2008). From 2006–2007, 6 ECS sections were surveyed in the primary breeding range, but in 2008, the survey was reduced to the core area, which included 3 ECS sections (Sousa et al. 2008). The use of ECS sections as a stratification variable contributed little to variance reduction, but it helped to ensure a spatially representative sample. In 2011, we used a generalized random tessellation stratified (GRTS) design to obtain a spatially balanced sample (Stevens and Olsen 2004). The GRTS design is a probability-based model that allows for design-based estimators and variances (Stevens and Olsen 2004).

For 2011, our sample of 225 plots included 49 resample plots. In 2010, these resample plots were randomly selected from plots sampled in 2009 to reflect a range of ring-necked duck counts and habitat (see Herwig 2010). Resample plots were sampled in 2010 and 2011. For population estimates, we treated the 49 resample plots as a third stratum (with sampling rate = 1).

Plots were surveyed from a helicopter (Bell OH-58 [Jet Ranger] or Enstrom 480B) flying at ~30–45 meters above ground level (agl) and ~75–130 km/h with a 2-person survey crew (pilot + 1 observer). We recorded all ring-necked duck observations by sex and social status (Zicus et al. 2008). We considered pairs, lone males, and males in flocks of 2–5 birds to indicate breeding pairs (IBP; Zicus et al. 2008). The breeding population in the survey area was considered to be twice the IBP plus the number of lone females, flocked females, mixed sex groups, and single-sex groups >5 birds. We used the R libraries survey (Lumley 2009, R Development Core Team 2009) and spsurvey (Kincaid and Olsen 2011) to estimate IBP and the total breeding population. Population estimates from 2006 and 2007 were re-calculated to reflect the reduced sampling frame.

RESULTS

Sample plots were well distributed throughout the study area (Figure 1B). Plots chosen with a stratified random sampling design tended to be spatially clustered; whereas the GRTS design resulted in less clustering. The GRTS design allowed us to use a local variance estimator, which improved the precision of the 2011 population estimates by reducing sample variance by ~30% (when compared to a stratified random sampling variance estimator). Most plots (143) were located in the Northern Minnesota Drift and Lake Plains section (Table 2). The fewest plots (15) were located in the Lake Agassiz, Aspen Parklands section, but the sampling rate was higher than the other 2 ECS sections (Table 2).

The survey was conducted 6–11 June and entailed 8 survey-crew days totaling ~43 hrs of flight time. A total of 338 ring-necked ducks were observed in 73 (32%) of 225 plots (Table 3, Figure 2). By habitat type, birds were detected on 48 (41%) of habitat class 1 plots and 25 (23%) of habitat class 2 plots (Figure 3). Overall, counts on occupied plots ranged from 1 to 18 birds (median = 3, mean = 4.6 birds/plot). Numbers of IBP on occupied plots ranged from 0 to 15 (median = 2, mean = 3.0 IBP/plot). Total breeding birds on occupied plots ranged from 1 to 30 ducks (median = 4.0, mean = 6.5 breeding birds/plot). Of the birds observed, 50% were classified as pairs, 25% flocked males, 15% lone males, 6% mixed groups, and 4% lone females; no flocked females were observed. Of IBP, 38% were classified as pairs, 39% flocked males, and 23% lone males. The IBP ratio (percentage of pairs to lone males plus flocked males) provides information on the timing of nesting. For example, when the proportion of pairs is less than ~50%, the survey is considered late, as more of the birds observed are only males and their females are assumed to already be nesting. These IBP ratios suggest that survey timing may have been later phenologically in 2011 than in some of the previous years (Figure 4).

Estimated IBP in the survey area was 10,395 pairs (SE = 1,325; Figure 5A) and the estimated total breeding population was 22,727 ring-necked ducks (SE = 2,759; Figure 5B). Population estimates from 2011 were similar to estimates from 2006–2009 (annual range: 8,705–10,947 IBP, 18,533–22,987 breeding birds), but higher than in 2010 (5,338 IBP, 11,843 breeding birds). The sharp decrease in ring-necked ducks counted in 2010 was not observed within the resample strata (49 resampled plots; Table 5, Figure 6), which may reflect the relative importance of sampling uncertainty in our population estimates. To explore this question, we fit a log-linear mixed-effects model (ignoring sampling design) to IBP counts from 2009–2011 to estimate a temporal trend (fixed effect) and two random variance parameters (among-plot and residual [within-plot] variance). The estimated finite rate of change (0.997; 95% CI: 0.944–1.054) suggested a stable IBP index during 2009–2011, and the estimated among-plot variance (= 0.455, 95% CI: 0.392–0.527) was similar to within-plot variance (= 0.434, 95% CI: 0.381–0.493). In other words, temporal variation in counts within plots (~process variation) was similar to spatial variation in counts among plots (sampling uncertainty). However, intra-class correlation was moderately strong (0.476), which suggests that sampling with partial replacement may be beneficial in future surveys. We plan to explore this further via a simulation study and, possibly, a Bayesian approach that can more easily account for the sampling design as well as random effects. A Bayesian approach may also allow us to more easily deal with the problem of zero counts on many plots. For example, ring-necked ducks were observed in only 14 (29%) of the 49 resampled plots each year; and there were 21 plots (43%) where ducks were not detected in any year, 18 plots (37%) had ducks detected in one year, 6 plots (12%) had ducks detected in 2 years, and 4 plots (8%) had ducks detected all years.

DISCUSSION

The Minnesota breeding population of ring-necked ducks remained stable from 2006–2009 at 18,000–23,000 breeding birds. In 2010, there was a notable drop in the estimates of IBP and breeding birds, declining 49% and 52%, respectively, from 2009 levels. The lack of a large decline in total counts on resample plots suggests that the observed decline in estimated IBP and breeding population may have partly reflected sampling uncertainty and may not have been as great as depicted by the point estimates. Monitoring the same plots through time will give us a better understanding on how to interpret the results of the random plots. Future work will include exploring model-based approaches that use information from both the random plots and resampled plots to provide more efficient estimators of population sizes and trends (e.g., Fong 1990, Bokalo et al. 1996). Resampled plots provided useful information for examining annual variation within plots; we will continue to monitor these 49 resampled plots. In 2011, the population estimate rebounded within the range of estimates from 2006–2009. Although the population appears to have returned to pre-2010 levels, additional survey years will be needed to detect long-term, biologically-significant population trends.

Switching to a GRTS sampling design and local variance estimator improved precision of the 2011 population estimates. This survey was designed to provide information about abundance and to monitor population trends. Increased precision will allow us to better detect changes in the population.

Ring-necked ducks are an important, perhaps sentinel, Minnesota forest waterfowl species. There is some interest in conducting this survey every other year, but annual monitoring may provide a better understanding of sampling variation and allow enhanced detection of ring-necked duck population trends. Additionally, predictions that the spruce-fir forest will shift north of Minnesota as a result of global climate change (Iverson and Prasad 2001) may further limit available forest habitat for these birds. Given the importance of the ring-necked ducks to hunters and increasing development and recreational use in

Minnesota's forested habitats (Minnesota Department of Natural Resources 2006), it is important to continue to monitor these ducks annually in Minnesota.

ACKNOWLEDGMENTS

Michael Zicus and David Rave helped develop survey methodology and David continues to provide helpful advice to improve the survey and reviewed a draft of this document. I also thank pilots John Heineman and Mike Trenholm for help with survey planning and for flying the survey. Frank Swendsen and Jeff Lawrence (2011) have served as observers for a portion of the plots. Bob Wright conducted with the nesting habitat analysis. Shelly Sentyrz and Chris Scharenbroich created the navigation maps used during the survey. We also acknowledge the Red Lake band of the Ojibwe, National Guard personnel at Camp Ripley, and managers at Agassiz, Tamarac, and Sherburne National Wildlife Refuges for allowing plots under their purview to be surveyed. Brian Hargrave and Nancy Dietz provided the initial Minnesota Gap Analysis Program (MNGAP) data, and Dan Hertel supplied Habitat and Population Evaluation Team (HAPET) data used to define the primary breeding range.

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Table 1. Habitat classes assigned to Public Land Survey section plots in the Minnesota ring-necked duck breeding pair survey area (sampling frame), June 2006–2011.

Habitat class	Definition[a]	Percent of survey area[b] 2006–2007	2008–2011
1	Plots with $\geq$ the median amount of MNGAP class 10, 14, and/or 15 cover within 250 m of and adjacent to MNGAP class 12 and/or 13 cover (i.e., high pair potential).	21.5	51.4
2	Plots with < the median amount of MNGAP class 10, 14, and/or 15 cover within 250 m of and adjacent to class 12 and/or 13 cover (i.e., moderate pair potential).	21.5	48.6
3	Plots with no MNGAP class 10, 14, and/or 15 cover that include class 12 and/or 13 cover that is within 100 m of a shoreline (i.e., low pair potential).	13.5	0.0
4	Plots with no MNGAP class 10, 14, and/or 15 cover and no class 12 and/or 13 cover within 100 m of a shoreline (i.e., no pair potential).	43.5	0.0

[a]Plots are Public Land Survey sections. MNGAP = Minnesota GAP level 4 land cover data. Class 10 = lowlands with <10% tree crown cover and >33% cover of low-growing deciduous woody plants such as alders and willows. Class 12 = lakes, streams, and open-water wetlands. Class 13 = water bodies whose surface is covered by floating vegetation. Class 14 = wetlands with <10% tree crown cover that is dominated by emergent herbaceous vegetation such as fine-leaf sedges. Class 15 = wetlands with <10% tree crown cover that is dominated by emergent herbaceous vegetation such as broad-leaf sedges and/or cattails. MNGAP class 10, 14, and 15 cover associated with lakes having a General or Recreational Development classification under the Minnesota Shoreland Zoning ordinance was not considered nesting cover in 2006–2011.
[b]In 2006–2007, the survey area included 6 Ecological Classification System sections; in 2008 – 2011, the survey area included 3 Ecological Classification System sections. Individual plots retained their habitat class.

Table 2. Sampling rates for Minnesota's ring-necked duck breeding-pair survey by Ecological Classification System (ECS) section and by habitat class (1 and 2), June 2006–2011.

	No. of plots[a]		No. of plots surveyed (Sampling rate [%])[b]									
			2006–2007		2008		2009		2010		2011	
ECS section	1	2	1	2	1	2	1	2	1	2	1	2
N Minnesota Drift & Lake Plains	3,828	3,317	41 (1.1)	36 (1.1)	83 (2.2)	25 (0.8)	56 (1.5)	47 (1.4)	67 (1.8)	59 (1.8)	76 (2.0)	64 (1.9)
Minnesota & NE Iowa Morainal	1,638	1,923	15 (0.9)	17 (0.9)	31 (1.9)	22 (1.1)	24 (1.5)	27 (1.4)	32 (2.0)	34 (1.8)	32 (2.0)	38 (2.0)
Lake Agassiz, Aspen Parklands	216	124	5 (2.3)	3 (2.4)	9 (4.2)	4 (3.2)	10 (4.6)	10 (8.1)	15 (6.2)	15 (12.1)	8 (3.7)	7 (5.6)

[a]Number of Public Land Survey sections in the ECS section(s).
[b]Number of plots within each ECS sections by habitat class (1 and 2); percentage of the number of available plots that were surveyed is provided.

Table 3. Survey results for 3 Ecological Classification System sections and habitat class 1 and 2, combined, in the Minnesota ring-necked duck breeding pair survey area, June 2006–2011.

Year	No. of plots surveyed	No. plots with birds (%)	Birds[a] Total	Birds[a] Per plot	Birds[a] Per occupied plot	IBP[b] Total	IBP[b] Per plot	IBP[b] Per occupied plot	Breeding birds[c] Total	Breeding birds[c] Per plot	Breeding birds[c] Per occupied plot
2006	117	27 (23)	201	1.72	7.44	120	1.03	4.44	263	2.25	9.74
2007	117	33 (28)	174	1.49	5.27	101	0.86	3.06	209	1.79	6.33
2008	174	58 (33)	296	1.70	5.10	173	0.99	2.98	364	2.09	6.28
2009	174	57 (33)	273	1.57	4.79	173	0.99	3.04	362	2.08	6.35
2010	222	56 (25)	230	1.04	4.11	147	0.66	2.63	321	1.45	5.73
2011	225	73 (32)	338	1.50	4.63	220	0.98	3.01	474	2.11	6.49

[a]Total number of ring-necked ducks counted during the survey.
[b]The number of indicated breeding pairs (IBP) is the sum of the pairs, lone males, and males in flocks of 2–5 birds.
[c]The total breeding population in the survey area was considered to be twice the IBP plus the number of lone females, flocked females, mixed sex groups, and single-sex groups >5 birds.

Table 4. Total number of ring-necked ducks, indicated breeding pairs (IBP), and breeding birds for 49 resample plots surveyed in 2009, 2010, and 2011. The range and median per occupied plot (14 occupied in 2009, 14 in 2010, and 14 in 2011) are also provided.

	2009			2010			2011		
	Total	Range/plot	Median/plot	Total	Range/plot	Median/plot	Total	Range/plot	Median/plot
No. birds	68	1 - 19	3.0	65	1 - 17	4.0	82	1 - 17	5.0
IBP	42	1 - 7	2.5	42	1 - 12	2.0	54	1 - 15	3.0
Breeding birds	96	1 - 23	5.0	85	2 - 24	4.5	111	1 - 30	6.0

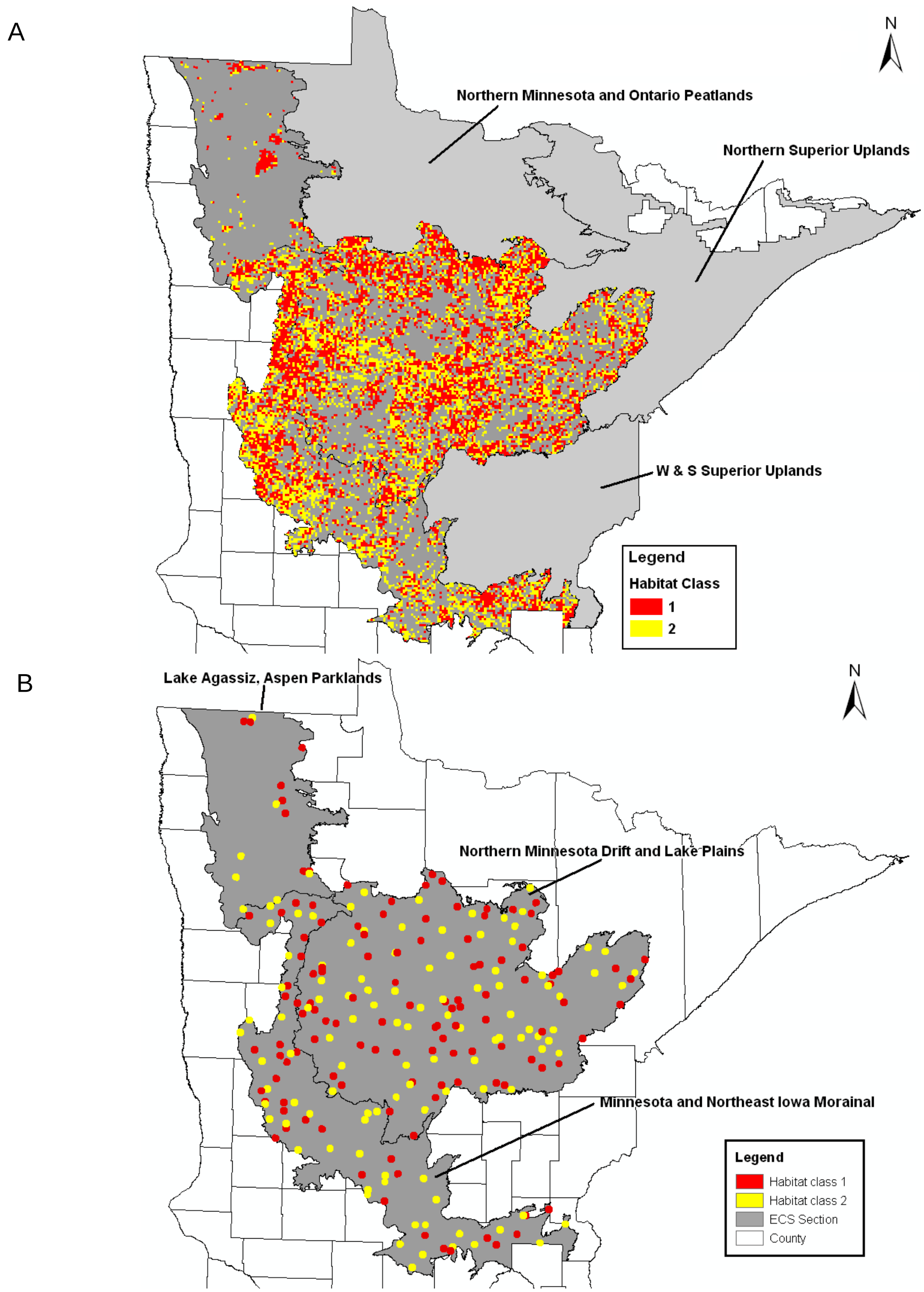

Figure 1. In the 3 Ecological Classification System (ECS) sections sampling frame (A) all Public Land Survey (PLS) plots, (B) 2011 survey plots (enlarged for visibility), and (C) plots from 2009 re-sampled in 2010 and 2011 indicated by habitat class for Minnesota's ring-necked duck breeding pair survey.

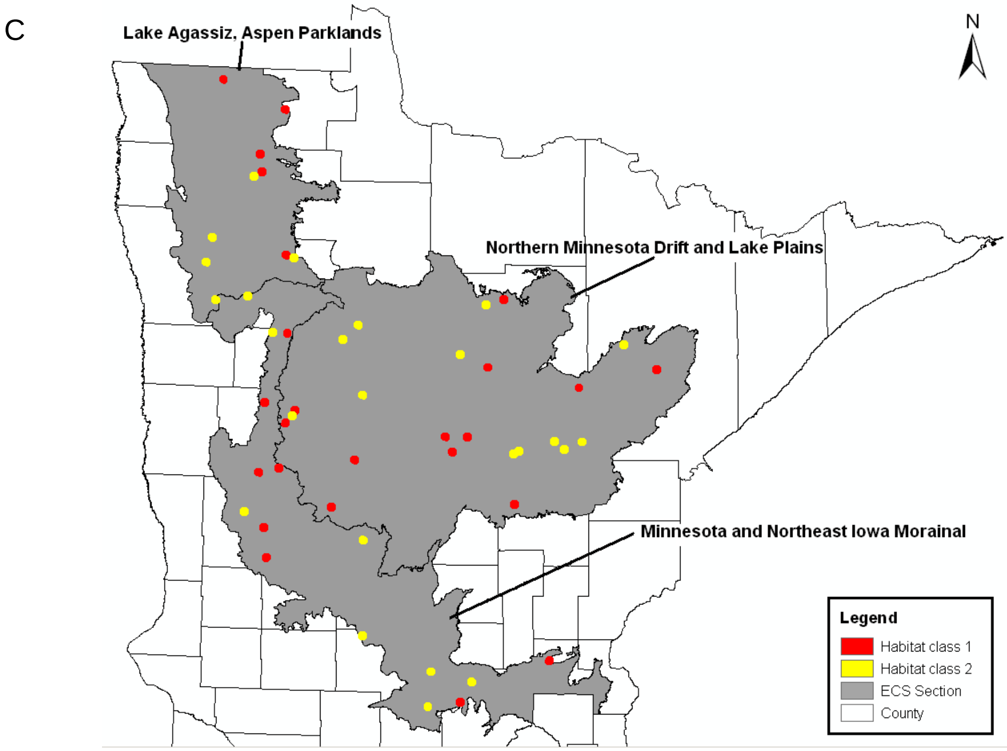

Figure 1. (Continued)

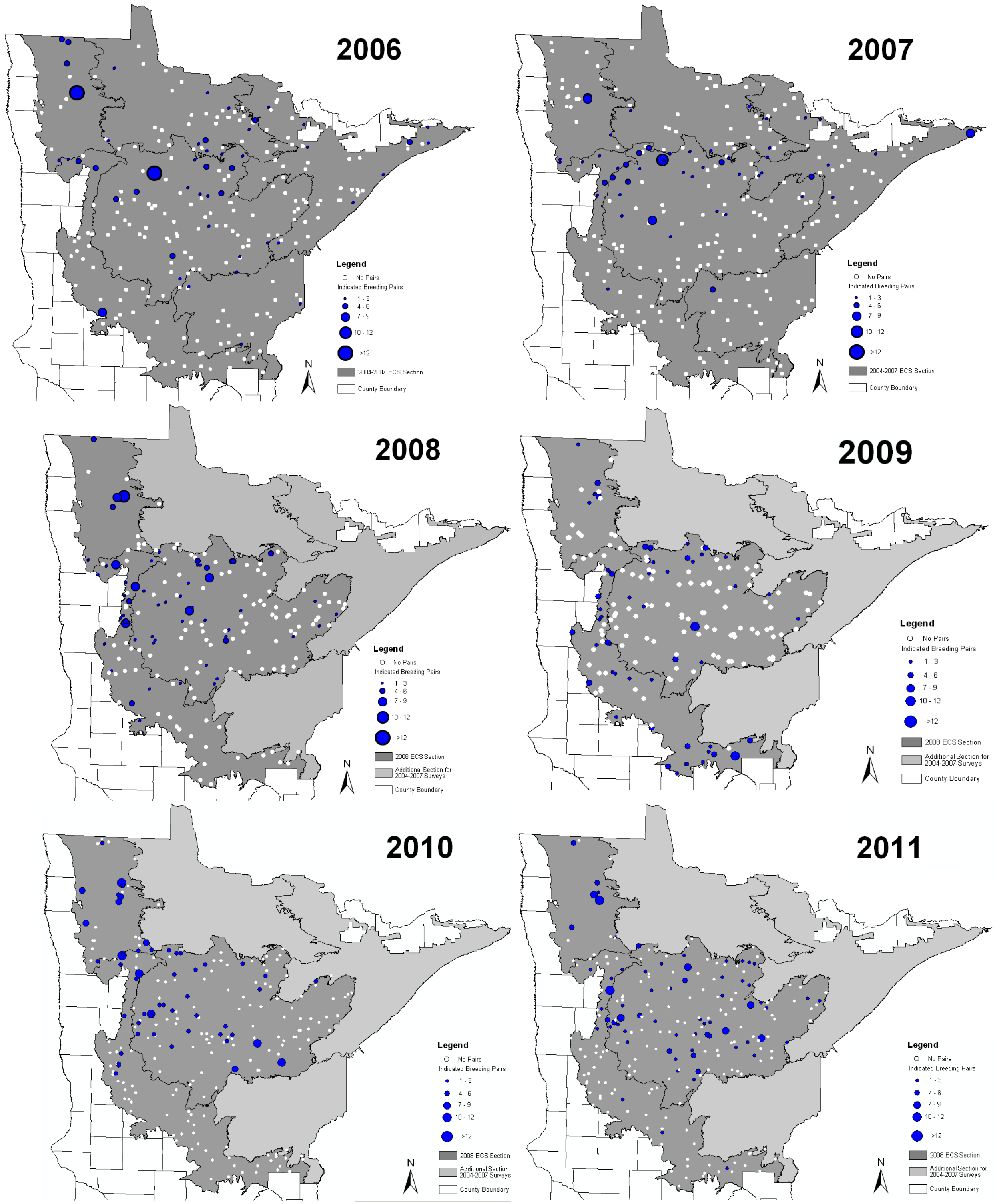

Figure 2. Plot locations and numbers of indicated breeding pairs (IBP) observed on survey plots in the Minnesota ring-necked duck breeding pair survey area in June 2006-2011. White circles indicate plots where no indicated pairs were seen. Maximum number of indicated breeding pairs per plot was 16 pairs in 2011 (16 in 2006; 11 in 2007; 10 in 2008; 8 in 2009, 12 in 2010, and 15 in 2011). The Ecological Classification System (ECS) sections are also shown.

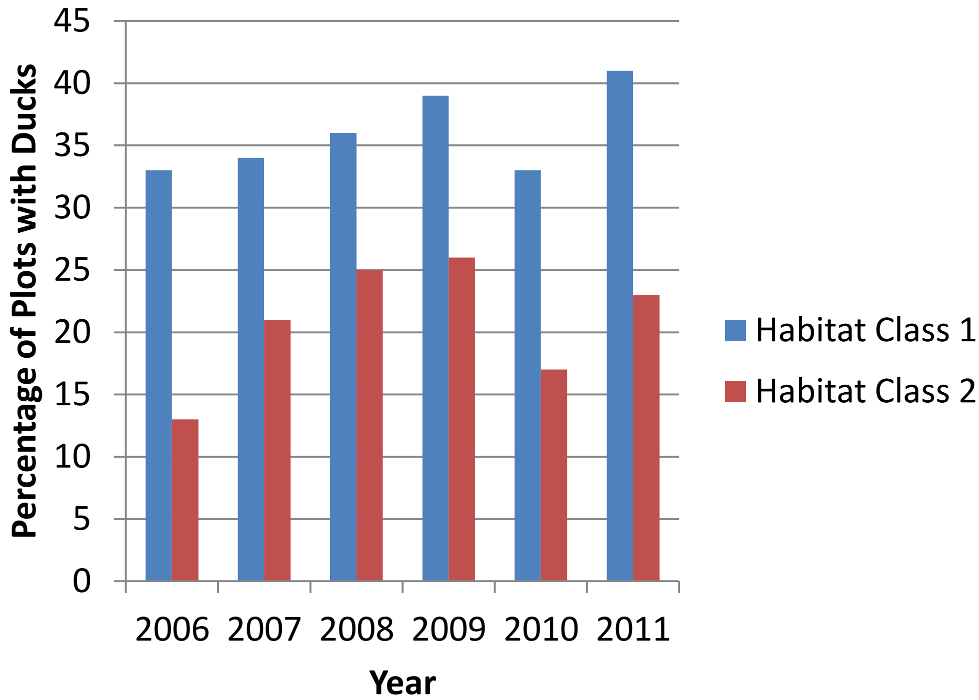

Figure 3. Percentage of plots occupied by ring-necked ducks by habitat class, June 2006–2011.

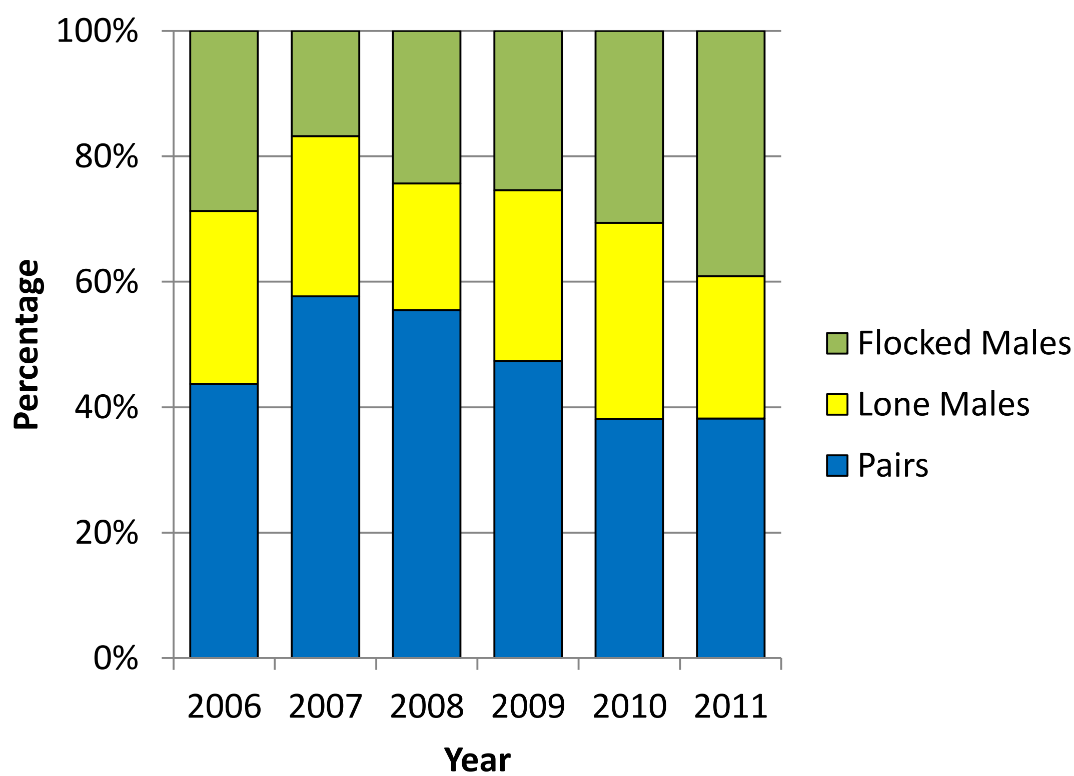

Figure 4. Social status of the indicated breeding pairs observed in the Minnesota ring-necked duck breeding pair survey area, June 2006–2011. Surveys were conducted 6–16 June 2006, 5–13 June 2007, 9–17 June 2008, 5–12 June 2009, 7–16 June 2010, and 6–11 June 2011.

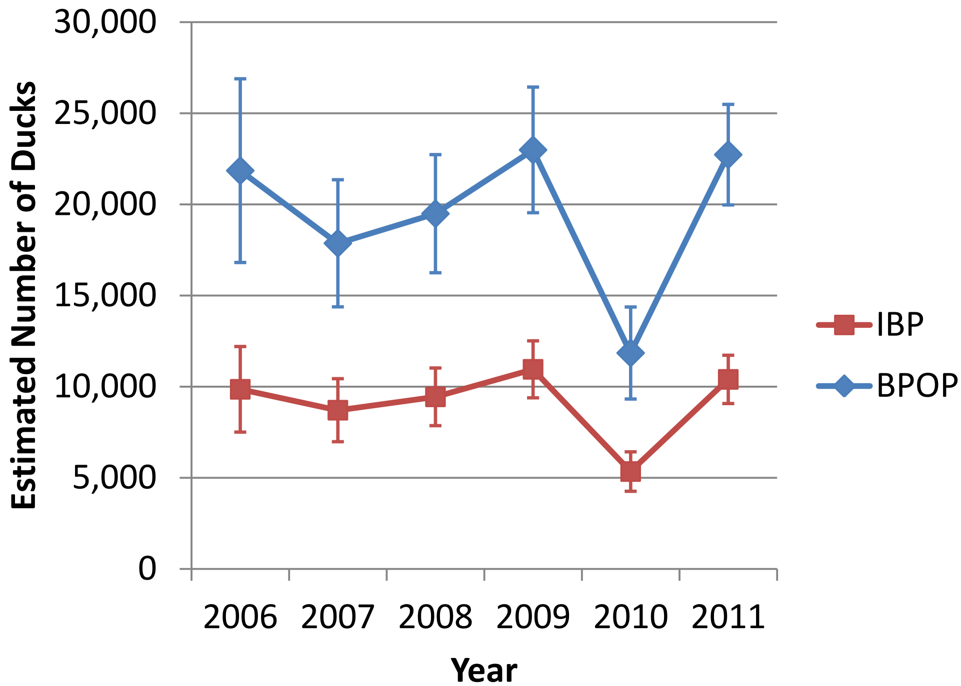

Figure 5. Estimated indicated breeding pairs (IBP) with SE bars and estimated breeding birds (BPOP) with SE bars for the habitat class 1 and 2 strata in the Minnesota ring-necked duck breeding pair survey area, June 2006–2011. Estimates from 2006 and 2007 were recalculated using the same sampling frame as 2008–2011 (3 Ecological Classification System sections instead of 6) for comparison.

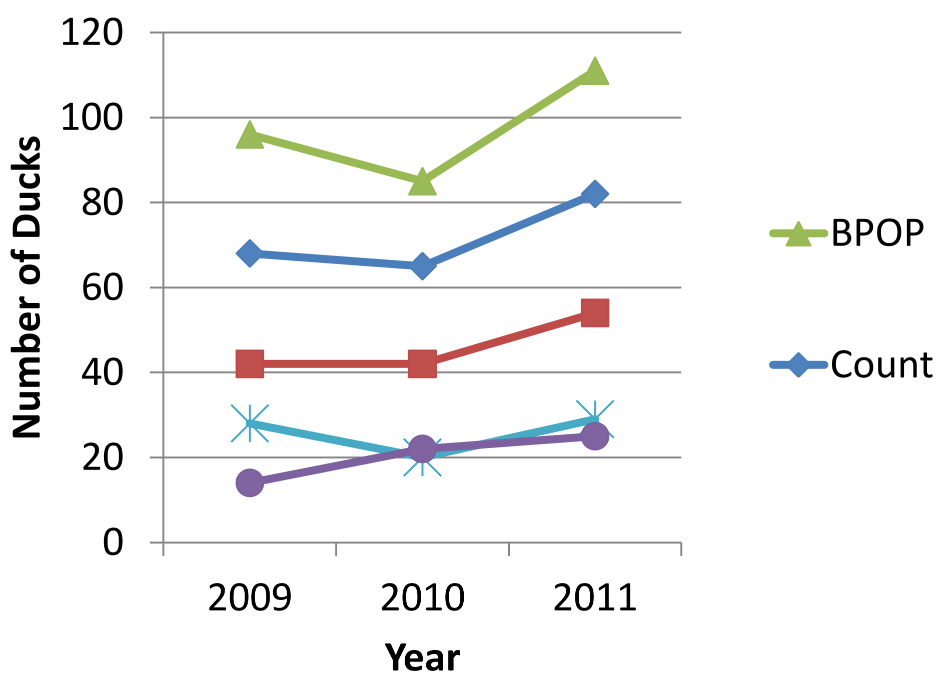

Figure 6. A comparison of the summary data collected for 49 plots re-sampled in 2009, 2010, and 2011. Breeding population (BPOP), total counts, indicated breeding pairs (IBP), number of lone males (LM) and flocked males (FM) combined, and the number of pairs for the 49 plots are shown.

RING-NECKED DUCK BREEDING PAIR COUNTS ON 14 LAKES IN NORTH-CENTRAL MINNESOTA, 1975-2011

Jeffrey S. Lawrence, Wetland Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Ring-necked ducks (*Aythya collaris*) are an important breeding waterfowl species in Minnesota. Fourteen lakes/wetlands in north-central Minnesota have been surveyed annually for ring-necked duck indicated breeding pairs (IBP) since 1975. In 2011, 91 IBP were counted, an increase of 17% from the previous year, but 14% below the long-term average. The counts started at a high level in 1975, and have undergone 2 declining and 1 increasing periods. Concerns with variation in annual survey timing are discussed.

INTRODUCTION

Ring-necked ducks (*Aythya collaris*) breed throughout much of central and northern portions of Minnesota (Hohman and Eberhardt 1998) and have been surveyed or studied by Minnesota Department of Natural Resources (MN DNR) Wildlife staff since the 1950's. A survey was initiated in 1969 to monitor ring-necked duck breeding pair numbers on several lakes and wetlands (hereafter lakes) in north-central Minnesota. I present results on 14 lakes that have been surveyed consistently since 1975.

STUDY AREA

The 14 lakes are located in 4 counties in north-central Minnesota (Figure 1). They range in size from 8.8 ha (Four-legged Pond, from Landview 4.3.8 [MN DNR, St. Paul, Minnesota]) to 144.5 ha (Little Moose Lake, MN DNR 1968). All contained some adjacent bog habitat favored by nesting ring-necked duck hens and historically had been considered good ring-necked duck breeding lakes.

METHODS

Waterfowl were counted on 14 lakes in north-central Minnesota (Figure 1). Most counts were obtained while slowly motoring a canoe around the perimeter of a lake. Generally, counts were conducted with one observer counting, with binoculars when necessary, while another individual operating the canoe. In some cases one individual did both. Efforts were made to observe flight paths of flushed birds to avoid double counting. On a few lakes, birds were counted from shore using a spotting scope or binoculars.

Ring-necked duck lone males, pairs, and flocked males in groups ≤ 5 were considered as indicated breeding pairs (IBP). Lone female ring-necked ducks are counted and considered IBP by ground crews during the May Waterfowl Breeding Ground Population and Habitat Survey (U.S. Fish and Wildlife Service/Canadian Wildlife Service 1987), but these were excluded from this survey by Zicus et al. (2004). The survey was generally timed to occur when about ½ of the indicated breeding pairs were lone/flocked males; however, in most recent years the survey was conducted in early to mid-June without verifying the pair status (D. Rave, pers. comm.).

RESULTS

Ring-necked ducks increased 17% to 91 IBP, but were 14% below the long-term average (1975-2010 average = 106.1 IBP, Figure 2). Data for individual lakes show various trends over the 37 years (Table 1). In 2011, social status of the indicated breeding pairs was 24% lone males, 31% flocked males ($\leq$5), and 45% pairs. In 2010, 32% were lone males, 24% were flocked males, and 44% were pairs. Survey start and end dates were available for most years since 1984 (Figure 3).

DISCUSSION

Ring-necked ducks on the 14 lakes have generally declined since 1975. However, counts declined 50% during the first 11 years of the survey and then rebounded to near the previous high in the next 5 years. Many of the years from 1985-1990 when the counts increased were characterized by drought conditions throughout Minnesota. After 1990, the count began a decline to a record low (60 IBP) in 2001, but has remained relatively stable averaging 84 IBP the last 10 years.

The weather conditions in 2011 were characterized by heavy precipitation prior to the survey and high water levels on many of the 14 lakes. Water levels vary on individual lakes due to precipitation amounts, beaver activity, and other factors. For example, Ten Lake had water in the vegetation surrounding the lake this year and we were able to launch the canoe near the trail on the SE portion of the lake. The previous 3 years we had walked through these vegetated areas around the lake and counted without putting in the canoe. Water levels on Popple Lake were 95, 98, 82, and 86 cm below the top of the road culvert (a fixed measure) in 2008-2011, respectively. At School Lake, water levels were 27, 36, and 41 cm below the top of the culvert in 2008-2010, respectively (no measurement in 2011). In 2010, a new water level gauge was established on Big Rice Pond. The reading was 5.60 ft in 2010 and 5.06 ft in 2011.

Survey timing has changed since 1984. Originally, the survey was conducted in late May or early June, with the survey beginning as early as mid-May in a few years (Figure 3). When lead observers changed in 2001, pre-survey observations were conducted to determine when the population was approximately 50% lone and flocked males before initiation of the survey. These observations resulted in the survey shifting to early to mid-June. Beginning in 2004, the survey was conducted during the 2nd or 3rd week of June without the pre-survey observations (D. Rave, pers. comm.). In 2011, we began the survey earlier in June. The survey was completed in 4 days, a shorter time frame than most recent years, due to good survey conditions and work schedules.

In 2010 and 2011, approximately ½ the population was comprised of lone and flocked males, even though the survey was conducted earlier in 2011. We observed a higher proportion of flocked males in 2011. Burns Lake had the largest count on record, 30 IBP, with 57% of the indicated pairs represented by flocked males. Muskrat Lake also had a group of 9 males with 1 female. It is difficult to distinguish migrant from resident birds, but groups and flocks of males

>5 are assumed to be nonbreeders. There may have been migrant ring-necked ducks in the area when the survey was conducted in 2011.

Christine Herwig, Wildlife Research Biologist with the Wetland Group, has been entering historical survey data from the field notes. We plan to examine these relationships and survey timing prior to next year's survey.

ACKNOWLEDGEMENTS

A variety of individuals have conducted this survey over the years. Lead observers included Leon Johnson, Todd Eberhardt, Jeff DiMatteo, Mike Zicus, and Jeff Lawrence. In 2011, Blane Klemek assisted with the survey of 9 of the lakes. Al Killian has also assisted with the survey in recent years. Rice Lake, east of Grand Rapids, was surveyed by Perry Loegering, Mark Spoden and Mike Broschart. Dave Rave and Christine Herwig reviewed a draft report.

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Table 1. Number of ring-necked duck indicated breeding pairs observed on 14 lakes in north-central Minnesota, 1969-2011[a].

Year	Big Rice Pond	Burns Lake	Dutchman Lake	Four-legged Lake	Four-legged Pond	Grass Lake	Little Moose Lake	Muskrat Lake	Popple Lake	Refuge Pond	Rice Lake	School Lake	Ten Lake	Tax Forfeit Lake	14 Lake Sum
1969	15		14	10	7	30	18		16	9	18	3	6		
1970	17	7	9	13	10	30	24		5	13	15	2			
1971	14	6	9	6	7	21	18		7	13	9	7	7	1	
1972	8	8	10	9	15	33	5		10	12	22	10	14	8	
1973	11	12	12	11	8	32	5		14	14	19	14	4	8	
1974	12	6	9	8	10	20	9		14	23	18	11		3	
1975	13	3	14	5	15	19	16	9	5	14	24	7	9	8	**161**
1976	14	2	7	9	5	15	1	16	6	16	20	6	5	1	**123**
1977	10	2	16	5	0	16	22	5	12	15	19	11	5	5	**143**
1978	7	0	15	12	3	17	18	12	7	10	29	3	13	4	**150**
1979	4	9	4	7	10	11	11	4	10	6	9	8	15	2	**110**
1980	1	0	3	6	7	12	16	7	14	12	14	3	9	6	**110**
1981	13	1	7	9	0	20	19	6	9	13	15	0	7	5	**124**
1982	6	3	4	13	0	18	20	2	14	11	20	4	8	2	**125**
1983	7	1	12	9	1	13	16	14	4	9	32	3	8	0	**129**
1984	7	3	6	9	2	6	8	15	0	8	19	2	10	0	**95**
1985	4	1	5	12	0	10	4	4	0	8	23	2	7	0	**80**
1986	3	2	7	12	4	10	8	7	0	7	28	2	7	0	**97**
1987	5	2	14	12	3	17	12	10	0	7	17	1	11	1	**112**
1988	12	8	16	20	4	21	13	6	2	9	12	1	14	4	**142**
1989	12	3	15	27	4	21	9	10	1	11	15	3	12	1	**144**
1990	11	7	10	29	1	25	5	14	3	12	8	4	19	2	**150**
1991	6	8	16	14	0	20	4	3	0	9	15	3	10	4	**112**
1992	3	7	14	19	2	19	8	21	5	13	10	2	9	5	**137**
1993	11	6	9	14	2	8	1	15	2	12	11	3	3	10	**107**
1994	6	3	12	14	2	17	11	16	4	9	15	3	7	3	**122**
1995	6	11	8	7	3	17	5	11	2	6	19	0	6	5	**106**
1996	7	6	2	5	3	12	3	8	0	2	16	2	7	0	**73**
1997	7	4	5	2	4	11	27	14	0	6	12	0	10	0	**102**

Table 1. continued.

Year	Big Rice Pond	Burns Lake	Dutchman Lake	Four-legged Lake	Four-legged Pond	Grass Lake	Little Moose Lake	Muskrat Lake	Popple Lake	Refuge Pond	Rice Lake	School Lake	Ten Lake	Tax Forfeit Lake	14 Lake Sum
1998	9	10	13	3	3	6	14	11	0	2	23	0	19	0	**113**
1999	11	14	3	3	3	8	8	5	0	2	7	0	17	0	**81**
2000	5	9	3	1	0	10	2	4	0	1	21	0	7	1	**64**
2001	10	6	6	1	0	4	7	5	0	1	5	3	12	0	**60**
2002	16	11	7	5	4	4	8	8	0	2	3	0	4	0	**72**
2003	9	13	14	9	7	8	7	2	0	1	8	0	9	1	**88**
2004	4	17	13	4	3	2	0	15	3	5	13	7	4	0	**90**
2005	15	5	13	3	2	5	11	21	0	5	9	10	3	0	**102**
2006	12	12	11	7	3	2	3	9	0	5	15	3	0	1	**83**
2007	4	0	16	8	0	1	8	16	2	0	6	9	2	5	**77**
2008	10	13	4	5	3	0	3	24	2	6	6	5	0	3	**84**
2009	4	16	8	6	4	0	5	15	2	5	3	1	0	3	**72**
2010	9	12	7	7	6	0	6	6	4	7	10	4	0	0	**78**
2011	6	30	9	8	6	3	7	14	2	3	1	1	0	1	**91**

[a] – blank cells indicate no survey.

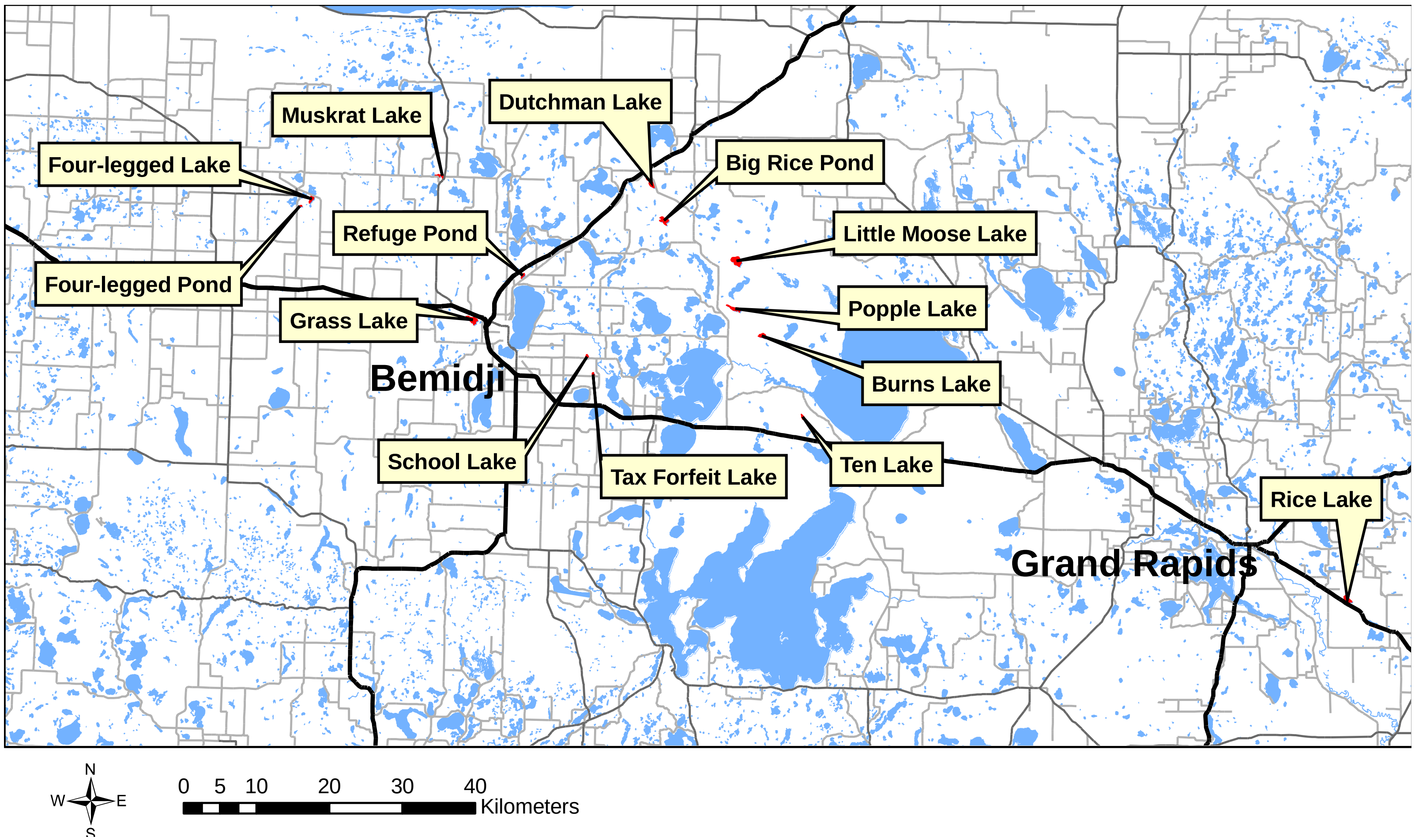

Figure 1. Location of 14 lakes surveyed for ring-necked ducks in north-central Minnesota.

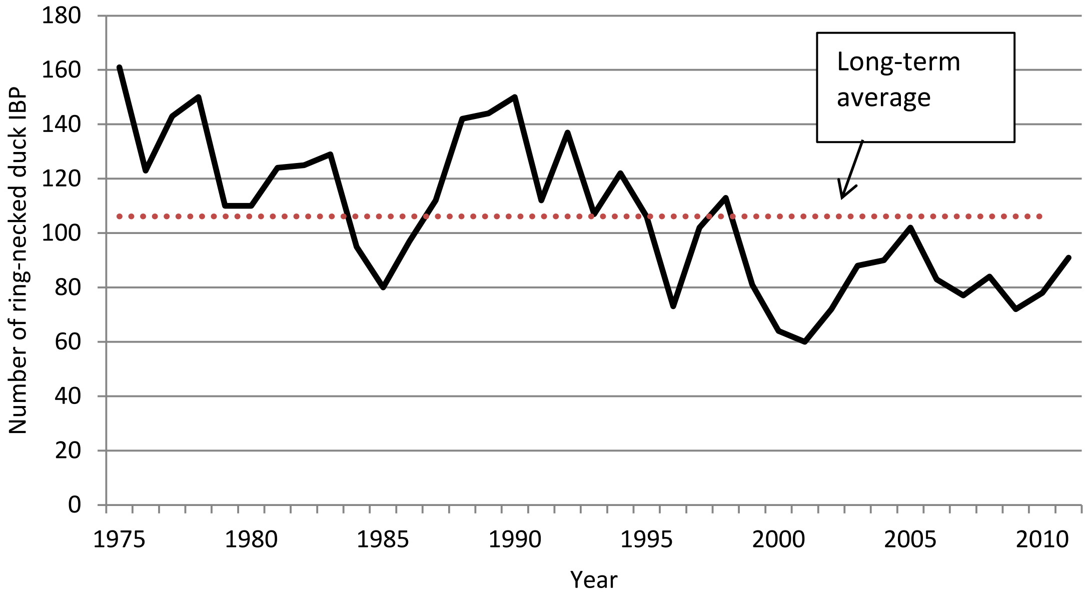

Figure 2. Number of ring-necked duck indicated breeding pairs (IBP) on 14 lakes in north-central Minnesota, 1975-2011.

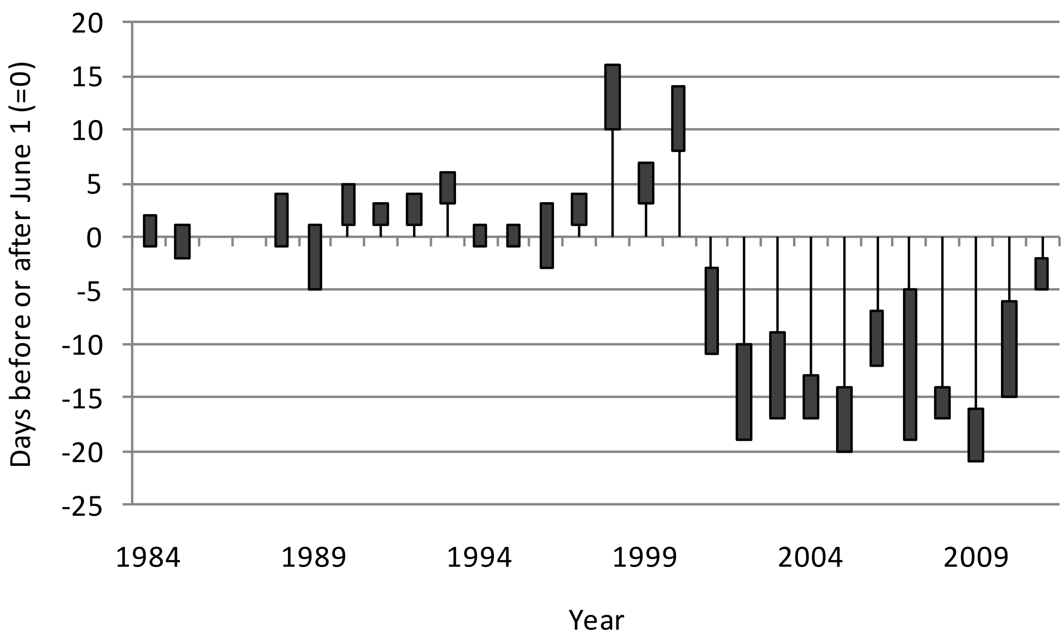

Figure 3. Survey periods (start date through end date) relative to June 1 (=0) for the ring-necked duck 14-lakes survey, 1984-2011.

HUNTING HARVEST STATISTICS

Division of Fish and Wildlife
500 Lafayette Road, Box 20
Saint Paul, MN 55155 - 4020
(651) 259-5207

2010 SMALL GAME HUNTER MAIL SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources, Division of Fish and Wildlife, Wildlife Research unit annually conducts a survey of small game hunters. Annual harvest estimates from survey data provide guidance for future hunting regulations and season structure.

METHODS

The Wildlife Research unit requested a random sample be drawn from the Electronic License System database in late February, 2010 to ensure that each license holder had an equal chance of being in the survey sample. The sample consisted of 6,000 (approximately 2%) Small Game License holders, drawn proportionately from each of the nine Small Game license types available: Resident Senior Citizen, Resident Youth Small Game, Resident (Adult) Small Game, Resident Individual sports, Resident Combination Sports, Resident Lifetime Small Game, Resident Lifetime sports, Nonresident Youth, and Nonresident (Adult) Small Game.

Hunters that returned the survey questionnaire within three weeks were marked returned and eliminated from follow-up mailings. Follow-up mailings were sent to non-respondents at three week intervals. There were three follow-up mailings to non-respondents.

Completed and returned questionnaires were checked for completeness, consistency, and biological practicability. Cards were marked with numeric county codes corresponding to the hunter's written information. Data from each usable card was converted to an electronic database. Data were checked for errors, duplicate responses, and /or missing data. The following is a list of assumptions made in data coding:

1) If an individual checked the box indicating (s)he did not hunt, but harvest information was provided, it was assumed that the individual did hunt.
2) If a range was given for "number of days hunted" or "number of animals harvested", the median of the range, rounded to the nearest even integer was recorded.
3) If a hunter indicated spending time hunting for a species, but left "number bagged" blank, the # bagged was entered as missing data.
4) If a small game hunter indicated bagging a species, but left "number of days hunted" blank, then "number of days hunted" was recorded as missing data.
5) If more than one county was indicated for "county hunted in most", the first county listed was recorded. However, if the several counties listed were indicated to apply to all species hunted, then counties were recorded in sequential order in relation to species hunted.
6) If "county hunted in most" was left unanswered or not legible, the county was recorded as missing data.

Data from all usable cards were tabulated and statistically analyzed by the St. Paul staff, using SAS statistical analysis software programs.

RESULTS

Estimated number of hunters continued to decrease for ducks, geese, and pheasants (Table 3). However the estimated take per hunter was up slightly for ducks and geese and held steady for pheasants (Table 4). Total estimated harvests (Table 6) increased for ducks, Canada geese, coots, ruffed grouse, sharp-tailed grouse, gray squirrel, fox squirrel, jack rabbits and raccoons. Estimated harvests declined for rails and gallinules, woodcock, mourning dove, spruce grouse, cottontail and red fox. Estimated harvest for pheasant, gray partridge and coyote stayed the same as for the previous year. Note that all estimates were based on a survey of approximately 2% of all small game license holders. Data in this report may change as a result of future verification and more comprehensive analysis.

Attached are survey results. All estimates were statewide unless otherwise indicated.
Tables 1-7 are historic tables of small game harvest for the previous 10.

Table 1. Small game hunter response to mail surveys, 1979 - 80 through 2010 - 11.

Year	Number mailed	Number not delivered	Delivered questionnaires completed and returned Number	Percent
1979 - 80	5,696	443	4,504	85.7
1980 - 81	6,434	385	4,963	82.0
1981 - 82	6,656	399	5,419	86.6
1982 - 83	5,963	266	4,792	84.1
1983 - 84	4,551	269	3,325	77.7
1984 - 85	4,096	127	3,280	82.6
1985 - 86	3,370	157	2,574	80.1
1986 - 87	4,668	208	3,623	81.2
1987 - 88	5,513	248	4,191	79.6
1988 - 89	15,388	857	11,431	78.7
1989 - 90[a]	10,893	735	7,790	76.7
1990 - 91[a]	5,000	394	3,467	75.3
1991 - 92[a]	5,050	387	3,541	75.9
1992 - 93[a]	5,000	288	3,625	76.9
1993 - 94[a]	5,011	282	3,320	70.2
1994 - 95[a]	5,000	387	3,353	72.7
1995 - 96[a]	5,000	321	3,293	70.4
1996 - 97[a]	5,000	170	3,334	69.0
1997 - 98[a]	5,000	198	3,234	67.3
1998 - 99[a]	5,000	200	3,153	65.7
1999 - 00[a]	5,001	180	3,349	69.5
2000 - 01[a]	5,000	184	3,001	62.3
2001 - 02 [a]	6,000	225	3,667	64.0
2002 - 03 [a]	6,000	363	3,862	68.5
2003 - 04[a]	6,400	381	3,972	66.0
2004 - 05[a]	6,000	356	3,823	68.0
2005 – 06[a]	6,280	142	3,946	64.3
2006 – 07[a]	6,000	151	3,810	65.1
2007 – 08[a]	6,000	113	3,736	65.5
2008 – 09[a]	5,996	183	3,551	61.1
2009 - 10[a]	5,999	88	3,828	63.8
2010 - 11[a]	6,000	100	3,777	63.0

[a] Includes resident and non-resident licenses, and excludes duplicate licenses.

Table 2. Use of small game hunter licenses, 2001-02 through 2010-2011.

		Returns from mail survey	Projections from license sales
2001-02	Hunted	2,849 (77.7%)	231,589
	Did not hunt	610 (21.3%)	66,466
		3,665 (100.0%)	298,055
2002-03	Hunted	2,962 (76.7%)	221,455
	Did not hunt	900 (23.3%)	67,274
		3,862 (100.0%)	288,729
2003-04	Hunted	3,085 (78.2%)	232,206
	Did not hunt	862 (21.8%)	64,733
		3,947 (100.0%)	296,939
2004-05	Hunted	2,934 (77.6%)	223,275
	Did not hunt	847 (22.4%)	64,450
		3,781 (100.0%)	287,725
2005-06	Hunted	3,035 (77.1%)	216,000
	Did not hunt	900 (22.9%)	64,156
		3,935 (100.0%)	280,156
2006-07	Hunted	2,994 (79.0%)	233,759
	Did not hunt	795 (21.0%)	62,139
		3,789 (100.0%)	295,898
2007-08	Hunted	2,894 (77.9%)	232,505
	Did not hunt	822 (22.1%)	65,961
		3,716 (100.0%)	298,467
2008-09	Hunted	2,678 (75.4%)	218,753
	Did not hunt	873 (24.6%)	71,311
		3,551 (100.0%)	290,064
2009-10	Hunted	2,850 (75.0%)	212,126
	Did not hunt	952 (25.0%)	70,857
		3,802 (100.0%)	282,983
2010-11	Hunted	2,824 (74.8%)	210,129
	Did not hunt	953 (25.2%)	70,911
		3,777 (100.0%)	281,040

Includes resident and non-resident information. Excludes duplicates and free licenses (youth under 16, active-duty military and disabled veterans).

2010 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2010 - Feb 2011)? ☐No ☐Yes (Please check box)
2. Indicate the **total number of days** spent hunting small game of all species listed below, in Minnesota. ________
3. For the species you hunted indicate your harvest, number of days hunted, and county in which you hunted most for each species, even if **None** were bagged. Report only game **you personally** bagged and retrieved in Minnesota. **Do not** include birds taken on shooting preserves or game farms.

		Number You bagged	Days Hunted	County
Ducks (all species)	01			
Coots (mud hens)	50			
Canada geese	40			
Other geese	41			
Snipe (jacksnipe)	51			
Rails and gallinules	52			
Crows	53			
Woodcock	60			
Mourning Dove	65			
Pheasants	70			
Ruffed grouse (Forest partridge)	71			
Spruce grouse	72			
Sharp-tailed grouse	73			
Hungarian (Gray) partridge	74			
Fox squirrel	89			
Gray squirrel	90			
Cottontail rabbit	91			
Jackrabbit	92			
Snowshoe hare	93			
Badger	35			
Coyote (brush wolf)	97			
Gray fox	96			
Raccoon	94			
Red fox	95			

Dear Small Game Hunter:

You have been selected at random from among Minnesota's small game hunting license buyers to assist us in evaluating the 2010-2011 small game hunting season **(March 2010-February 2011)**. We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2010 hunting experience.

YOUR RESPONSE IS NEEDED
EVEN IF YOU DID NOT HUNT OR HARVEST SMALL GAME

Please fill out the attached questionnaire and mail as soon as possible.
A reminder will be sent to individuals not returning the questionnaire within three weeks. No envelope or stamp is necessary; just tear along the perforation and drop into a mailbox.

THANK YOU FOR YOUR COOPERATION

Ed Boggess, Director
Division of Fish and Wildlife
Department of Natural Resources

Figure 1. Sample of Small Game Hunter survey card

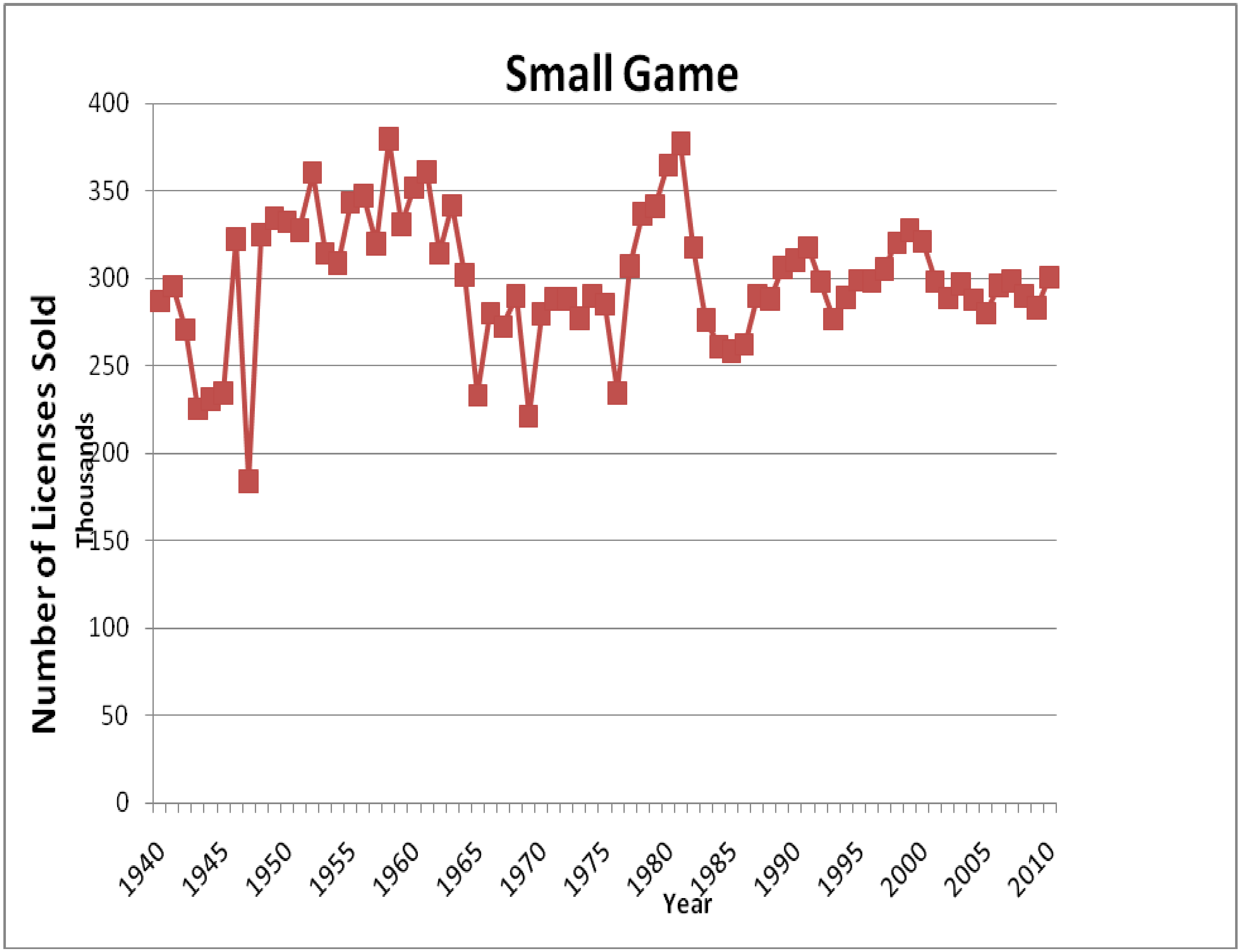

Figure 2. Number of Minnesota small game licenses sold, 1940–2010.

Table 3. Estimated number of hunters for various species, 1999-00 through 2010-11.

	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Ducks	121,718	109,008	109,241	111,619	101,487	104,634	92,634	87,075	87,468	81,358	77,705	72,772
Canada goose	80,458	76,518	76,322	78,574	74,855	74,728	69,416	66,224	62,649	59,222	55,599	53,426
Other geese	5,403	6,834	6,502	5,981	7,373	5,327	4,628	4,529	3,695	4,411	3,275	3,647
American coot	6,189	3,809	3,901	4,411	3,912	5,099	4,129	4,529	3,454	4,166	4,094	4,614
Common snipe	1,768	2,241	1,382	2,243	1,429	1,902	1,210	2,187	1,928	1,797	1,340	1,340
Rails / gallinules	491	336	406	673	150	228	0	547	482	408	372	224
Crow [*]	13,557	14,004	11,542	12,859	12,263	12,404	11,890	10,777	8,514	10,047	10,643	9,376
American woodcock	19,353	15,909	11,542	11,962	12,789	12,023	11,035	13,510	10,843	12,171	11,834	10,790
Mourning dove [γ]						15,524	11,107	12,886	13,172	11,599	10,495	10,641
Ring-necked pheasant	92,836	100,045	84,694	91,284	105,023	104,406	110,852	118,703	118,311	106,763	99,811	89,142
Ruffed grouse	138,812	120,547	101,194	90,686	93,513	79,141	76,037	91,682	90,600	86,505	87,530	92,490
Spruce grouse	10,806	9,411	8,778	7,327	8,727	7,305	7,048	9,840	10,602	8,332	9,825	8,855
Sharp-tailed grouse	8,350	9,747	8,372	6,355	6,921	6,164	4,913	6,560	6,827	6,616	5,582	7,144
Gray partridge	9,922	7,842	6,828	6,579	7,975	5,327	6,265	6,013	6,667	4,411	4,243	3,721
Gray squirrel	30,749	26,664	26,010	25,494	29,190	23,438	24,563	25,459	25,863	22,382	22,255	23,737
Fox squirrel	20,139	16,693	15,281	14,878	19,936	15,372	15,094	15,619	14,779	13,233	13,174	15,626
Eastern cottontail	18,174	19,830	17,150	15,700	21,441	18,644	20,148	20,070	19,598	17,644	16,300	15,031
White-tailed jackrabbit	3,242	2,465	3,251	2,467	3,009	3,044	2,065	2,577	2,891	2,451	1,786	2,233
Snowshoe hare	6,680	5,154	6,502	5,682	5,567	4,338	3,346	5,545	4,257	4,574	3,498	3,795
Raccoon (Sept - Feb)	5,993	6,498	6,340	5,981	5,868	6,316	4,841	8,747	9,558	7,433	7,294	8,260
Raccoon[‡] (March -Aug)	2,554	4,593	4,145	3,589	4,589	3,348	2,705					
Red fox (Sept -Feb)	7,761	10,083	5,608	7,476	7,222	5,783	5,980	6,248	5,783	5,800	7,815	7,218
Red fox[‡] (March -Aug)	1,867	1,905	2,682	2,243	2,182	1,370	1,282					
Gray fox	1,965	1,344	1,544	1,271	1,505	1,674	997	2,030	1,928	1,879	1,786	1,637
Coyote	10,806	15,797	10,648	12,261	15,122	16,133	18,653	17,024	16,064	19,278	19,426	19,421
Badger	786	672	406	748	451	533	783	859	482	490	372	596

[*]Crow season added in 1989. [‡] Raccoon and red fox season continuous May 1994 thru March 15, 2006. [γ] Mourning dove season added 2004.

Table 4. Estimated take per hunter, for respondents reporting that they hunted a particular species, 1999-00 through 2010-11.

	Estimated take per hunter											
	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Ducks	8.4	8.9	9.1	9.2	9.0	6.9	7.3	8.4	8.1	8.1	7.4	8.5
Canada geese	3.5	3.9	4.0	3.3	3.9	3.8	4.1	4.9	3.9	4.9	4.1	4.8
Other geese	1.2	2.2	1.2	1.9	1.7	1.5	1.9	1.5	2.1	3.2	1.9	1.1
American coot	4.0	2.7	4.5	4.6	2.8	4.0	3.9	5.6	4.6	5.7	3.6	5.7
Common snipe	1.6	1.3	1.3	1.5	1.8	1.1	4.4	1.9	2.0	1.2	1.1	1.4
Rails/gallinules	0.2	3.7	0.6	2.6	0.5	0.3	0	2.4	5.3	0.4	0.8	0.3
Crow *	4.4	6.9	7.7	5.6	6.7	5.8	7.8	6.4	6.4	5.2	5.3	6.1
American woodcock	2.8	2.8	2.3	2.4	2.4	3.5	2.5	3.2	2.6	2.4	3.0	2.8
Mourning dove $^{\gamma}$						6.2	7	6.7	7.7	11.4	10.5	9.4
Ring-necked pheasant	3.7	3.7	3.2	3.9	4.9	4.0	5.3	4.9	5.5	4.9	4.0	4.0
Ruffed grouse	4.9	5.1	3.3	2.8	3.8	2.5	2.9	4.5	3.2	3.7	4.1	5.0
Spruce grouse	1.8	2.5	1.1	1.6	2.1	1.3	1.4	2.7	1.7	2.0	1.9	1.7
Sharp-tailed grouse	1.6	1.6	1.2	1.3	1.7	1.7	1.3	1.8	2.0	2.1	1.7	2.4
Gray partridge	1.9	2.1	1.5	1.7	2.8	2.4	2.6	1.9	1.6	2.2	1.9	2.5
Gray squirrel	4.3	5.3	5.6	5.2	6.0	5.7	5.0	5.5	5.2	5.4	4.9	5.9
Fox squirrel	3.5	3.9	4.1	4.5	4.2	4.1	4.1	4.2	3.2	3.9	4.1	3.9
Eastern cottontail	3.2	3.9	3.6	3.3	4.3	4.6	4.5	3.9	4.0	4.5	3.5	3.6
White-tailed jackrabbit	1.9	2.8	2.6	1.6	2.4	2.3	2.7	1.6	3.3	2.6	1.5	3.2
Snowshoe hare	3.1	5.2	3.3	1.9	2.2	1.8	3.1	3.0	1.4	2.5	1.5	1.8
Raccoon (Sept - Feb)	10.9	7.6	9.4	10.0	8.5	9.0	6.0	7.2	4.9	9.7	9.1	9.4
Raccoon[‡] (March -Aug)	6.4	7.8	4.4	5.4	4.7	6.1	2.7					
Red fox (Sept -Feb)	1.2	1.9	1.2	1.5	1.8	1.1	1.7	1.3	1.1	0.8	1.3	1.2
Red fox[‡] (March -Aug)	0.6	0.9	1.5	1.7	0.6	0.6	0.9					
Gray fox	0.9	0.7	0.4	0.4	0.4	1.1	0.9	1.8	0.3	1.3	1.0	1.5
Coyote	1.3	1.8	1.1	1.2	1.3	1.1	2.1	1.2	2.1	2.4	2.4	2.3
Badger	1.1	0.8	0.6	1.7	0.7	1.0	1.2	1.3	0.3	1.0	2.0	1.0

[*]Crow season added in 1989. [‡] Raccoon and red fox season continuous May 1994 thru March 15, 2006. $^{\gamma}$ Mourning dove season added 2004.

Table 5. Mean harvest for successful hunters and hunter success rates (%), 2001-02 through 2010-11.

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Ducks	10.6 (85.6)	10.6 (86.7)	10.4 (86.7)	8.6 (81.1)	8.9 (82.5)	9.9 (84.4)	9.5 (85.4)	9.8 (82.8)	9.2(80.5)	10.3 (82.7)
Canada geese	5.3 (76.3)	4.6 (72.0)	5.1 (76.0)	5.2 (72.8)	5.5 (73.7)	6.3 (78.4)	5.5 (71.4)	6.4 (76.6)	5.6 (72.8)	6.1 (79.5)
Other geese	2.8 (43.8)	4.4 (42.5)	2.7 (65.3)	3.3 (45.7)	4.5 (43.1)	2.7 (55.2)	4.2 (50.0)	6.3 (50.0)	3.5 (54.5)	2.7 (40.8)
American coot	7.5 (60.4)	6.4 (71.2)	3.7 (76.9)	5.5 (73.1)	5.1 (75.9)	7.2 (77.6)	6.3 (74.4)	6.9 (82.4)	5.5 (65.5)	7.2 (79.0)
Common snipe	2.4 (52.9)	2.6 (60.0)	2.3 (78.9)	1.6 (68.0)	4.7 (94.1)	2.6 (75.0)	2.9 (70.8)	1.7 (72.7)	1.8 (61.1)	2.2 (66.7)
Rails / gallinules	1.5 (40.0)	3.8 (66.7)	1.0 (50.0)	1.0 (33.3)	0.0 (0.0) *	4.3 (57.1)	6.4 (83.3)	1.0 (40.0)	1.3 (60.0)	1.0 (33.3)
Crow	8.6 (89.4)	6.3 (89.0)	7.9 (85.3)	6.4 (90.8)	9.1 (85.6)	7.2 (89.1)	7.3 (87.7)	5.9 (87.8)	5.9 (89.5)	6.7 (91.3)
American woodcock	3.4 (68.3)	3.6 (65.6)	3.3 (71.8)	5.3 (64.6)	3.6 (70.3)	3.9 (82.7)	3.7 (68.9)	3.3 (73.8)	4.1 (72.3)	3.6 (75.9)
Mourning dove $^{\gamma}$				7.9 (78.9)	8.7 (80.1)	8.2 (81.2)	9.8 (78.7)	13.2 (86.6)	11.4 (92.2)	11.1 (84.6)
Ring-necked pheasant	4.7 (66.4)	5.5 (71.7)	6.3 (77.2)	5.7 (70.0)	7.0 (75.9)	6.6 (75.3)	7.1 (78.1)	6.4 (76.7)	5.8 (68.7)	5.6 (71.5)
Ruffed grouse	4.8 (68.5)	4.3 (63.8)	5.1 (73.5)	3.9 (63.3)	4.4 (67.5)	5.9 (77.4)	4.7 (69.4)	5.0 (73.7)	5.5 (74.5)	6.6 (76.3)
Spruce grouse	2.3 (47.2)	3.4 (48.0)	3.3 (62.9)	2.3 (54.2)	2.4 (60.6)	3.8 (70.6)	3.1 (53.8)	3.0 (67.6)	3.1 (63.6)	2.4 (70.6)
Sharp-tailed grouse	2.4 (49.5)	3.5 (38.8)	3.3 (52.2)	3.1 (54.3)	2.4 (55.1)	3.3 (56.0)	4.4 (45.9)	3.2 (64.2)	3.0 (57.3)	3.5 (67.7)
Gray partridge	2.5 (58.3)	2.8 (59.1)	4.1 (68.9)	3.6 (65.7)	5.0 (52.3)	2.8 (68.8)	3.0 (55.4)	3.4 (64.8)	3.3 (57.9)	4.2 (58.0)
Gray squirrel	6.6 (84.4)	6.1 (86.2)	7.0 (85.3)	6.9 (82.5)	5.8 (86.1)	6.4 (87.1)	5.9 (87.6)	6.2 (87.6)	5.8 (85.6)	7.0 (84.0)
Fox squirrel	5.3 (77.7)	5.9 (76.4)	5.1 (82.6)	4.8 (85.1)	5.0 (82.5)	5.0 (84.5)	3.9 (82.6)	4.6 (83.3)	4.8 (84.7)	4.6 (85.7)
Eastern cottontail	4.7 (77.7)	4.7 (70.5)	5.2 (84.2)	5.8 (79.6)	5.4 (83.4)	4.6 (84.8)	4.8 (84.0)	5.3 (85.2)	4.3 (82.6)	4.4 (81.2)
White-tailed jackrabbit	5.2 (50.0)	2.7 (60.6)	3.3 (72.5)	3.0 (75.0)	3.2 (82.8)	2.5 (63.6)	4.5 (72.2)	3.8 (70.0)	2.1 (70.8)	4.6 (70.0)
Snowshoe hare	4.4 (75.0)	2.9 (67.1)	3.5 (60.8)	3.0 (61.4)	4.6 (68.1)	3.8 (80.3)	2.2 (62.3)	3.5 (71.4)	2.6 (59.6)	2.6 (68.6)
Raccoon (Sept -Feb)	10.0 (93.6)	11.6 (86.3)	9.6 (88.5)	9.9 (91.6)	6.5 (92.6)	7.7 (93.8)	5.4 (89.9)	10.6 (91.2)	9.6 (94.9)	10.0 (93.7)
Raccoon‡ (March -Aug)	4.9 (90.2)	5.9 (91.7)	5.6 (85.2)	6.7 (90.9)	3.1 (86.8)					
Red fox (Sept -Feb)	2.7 (44.9)	3.1 (49.0)	3.5 (51.0)	2.8 (38.2)	3.7 (46.4)	2.1 (60.0)	2.3 (45.8)	1.5 (49.3)	2.4 (54.3)	2.3 (53.6)
Red fox‡ (March -Aug)	2.8 (54.5)	3.6 (46.7)	1.1 (51.7)	1.4 (44.4)	1.6 (55.6)					
Gray fox	1.4 (26.3)	1.8 (23.5)	1.3 (30.0)	2.6 (40.9)	1.9 (50.0)	2.7 (65.4)	1.0 (29.2)	3.3 (39.1)	2.5 (41.7)	4.0 (36.4)
Coyote	2.4 (47.3)	3.2 (36.6)	2.7 (48.8)	2.5 (45.3)	4.11 (50.4)	2.4 (50.5)	4.4 (49.0)	4.4 (53.8)	4.6 (51.7)	4.0 (57.1)
Badger	1.0 (60.0)	2.8 (60.0)	1.0 (66.7)	1.2 (85.7)	1.2 (100.0)	1.6 (81.8)	1.0 (33.3)	1.2 (83.3)	2.5 (80.0)	1.0 (100.0)

‡ Raccoon and red fox season continuous May 1994 thru March 15, 2006. $^{\gamma}$ Mourning dove season added 2004. * No hunters surveyed reported Rails/Gallinules in bag.

Table 6. Statewide (resident and non-resident) small game hunting license sales and estimated hunter harvest, 1999-00 through 2010-11.

	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Small game license sales[a]	327,431	320,862	298,055	288,729	296,939	287,725	280,156	295,898	298,467	290,064	282,983	300,624
State duck stamp sales	128,245	121,709	118,590	119,677	118,757	114,003	102,143	101,792	100,134	95,675	89,942	88,069
Pheasant stamp sales	106,945	114,440	97,665	102,097	121,456	114,653	117,301	129,546	129,315	123,270	110,456	104,286
Estimated harvest[b]												
Ducks	1,021,214	969,081	989,723	1,024,662	914,398	727,206	676,741	730,559	708,491	658,186	576,571	619,604
Canada geese	284,821	301,481	308,341	256,937	289,689	284,714	281,829	324,498	243,705	288,411	229,068	257,532
Other geese	5,781	14,761	7,867	11,125	12,755	8,150	9,025	6,658	7,723	13,895	6,255	3,945
American coot	24,880	10,437	17,554	20,114	10,993	20,345	15,938	24,909	16,061	23,871	14,820	26,345
Common snipe	2,758	2,801	1,783	3,432	2,558	2,130	5,336	4,221	3,933	2,210	1,487	1,936
Rails / gallinules	98	1,233	244	1,723	75	75	0	1,329	2,569	163	298	75
Crow	60,057	96,347	84,412	71,753	82,285	71,943	92,742	69,188	54,319	51,742	56,301	57,298
American woodcock	54,382	45,341	26,662	28,230	30,438	41,479	27,919	39,907	27,866	29,210	35,384	29,766
Mourning dove[d]						96,559	77,749	85,950	101,161	132,577	109,988	100,234
Ring-necked pheasant	339,780	375,169	266,786	357,833	511,462	419,712	585,299	587,580	655,443	522,071	400,242	359,396
Ruffed grouse	685,731	619,612	331,916	249,386	350,674	194,687	224,309	417,153	293,544	318,338	357,998	465,576
Spruce grouse	19,343	23,151	9,480	11,943	18,327	9,204	10,079	26,568	17,705	16,997	19,159	14,957
Sharp-tailed grouse	13,694	15,888	9,795	8,516	11,835	10,417	6,387	11,939	13,790	13,695	9,545	16,819
Gray partridge	19,050	16,782	10,174	10,921	22,250	12,572	16,289	11,545	11,000	9,660	8,019	9,154
Gray squirrel	132,221	140,253	145,916	133,589	174,848	132,659	122,078	140,788	133,194	121,534	109,717	138,925
Fox squirrel	71,091	65,103	62,958	67,100	84,529	62,410	62,187	66,068	47,736	51,079	54,013	61,686
Eastern cottontail	58,702	78,328	62,426	51,967	93,054	86,508	90,062	77,872	78,588	79,927	57,702	53,874
White-tailed jack rabbit	6,192	6,803	8,453	4,046	7,161	6,940	5,493	4,149	9,482	6,446	2,608	7,221
Snowshoe hare	20,842	26,904	21,717	10,909	11,969	7,895	10,406	16,801	5,789	11,343	5,352	6,772
Raccoon (Sept -Feb)	65,024	3,785	59,279	60,049	49,878	56,970	29,191	62,891	46,739	72,026	66,667	77,689
Raccoon [c] (Mar –Aug)	16,294	35,733	18,362	19,524	21,752	20,456	7,331					
Red fox (Sept –Feb)	9,546	19,460	6,842	11,438	13,000	6,072	10,166	7,872	6,188	4,408	10,238	8,781
Red fox [c] (Mar –Aug)	1,176	1,676	4,077	3,746	1,287	836	1,141					
Gray fox	1,768	900	571	521	602	1,758	927	3,593	559	2,443	1,857	2,382
Coyote	13,507	28,908	12,032	14,223	19,961	18,230	38,612	20,769	34,377	45,689	46,234	44,051
Badger	888	558	244	1,272	302	533	924	1,091	159	490	744	596

Harvest estimates in this table, and the number of hunters and mean take per hunter in Table 5, are calculated from different questions on the survey form. The sample used in calculations differs from one estimator to the next. This is because some respondents give specific answers to one question but not to a related one. A formula is used to calculate the total estimated take for each species that appear in this table. In most years the formula produces results rather close to those obtained by multiplying the average take per hunter times the number of hunters. However, in other years (e.g., 1985) results of the two methods are quite divergent, perhaps as a result of an unusual sample. This is being investigated further, and as a result, numbers may change somewhat in future reports. The most current report of survey findings will have the best data available at that time.

[a] Includes all types of Small game licenses. Duplicate licenses not included.
[b] Estimates based upon response of hunters to questionnaires.
[c] Raccoon and red fox seasons were year round from May, 1994 through March 16, 2006.
[d.] Mourning dove season added 2004.

Table 7. Mail survey results of nonresident small game hunters, 1999-00 through 2010-11.

	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Nonresident licenses issued[a]	7,572	7001	5,843	5,852	6,291	6,385	5,897	7,356	7,858	7,114	6,934	6,695
Questionnaires:												
Number mailed	199	98	124	130	123	182	210	185	185	226	196	163
Number not delivered	16	6	9	9	17	13	10	11	11	15	10	6
Number (percent) returned	136 (74)	56 (61)	77 (67)	75 (66)	68 (64)	114 (67)	134 (67)	115 (62)	101 (58)	89 (42)	105 (54)	107 (66)
Estimated nonresidents and (percent) of all nonresidents hunting:												
Ducks	2,505 (33)	2,375 (34)	2,727 (47)	2,263 (39)	2,498 (40)	2,394 (37)	2,040 (35)	2,344 (32)	2,256 (29)	2,293 (32)	1,849 (27)	2,003 (29.9)
Canada goose	1,225 (16)	1,500 (21)	1,169 (20)	1,092 (19)	1,388 (24)	1,368 (21)	1,818 (31)	2,083 (28)	934 (12)	1,587(22)	726 (10)	1,314 (19.6)
Ruffed grouse	3,508 (46)	3,000 (43)	1,169 (20)	2,029 (35)	2,313 (40)	1,824 (29)	1,774 (30)	1,953 (26)	1,867 (24)	1,940 (27)	1,915 (28)	2,503 (37.4)
Ring-necked pheasant	947 (13)	625 (9)	935 (16)	1,404 (24)	2,128 (36)	2,679 (42)	2,572 (44)	3,776 (51)	2,645 (34)	3,116 (44)	1,519 (22)	2,003 (29.9)
Raccoon	56 (1)	250 (4)	0 (0)	0 (0)	0 (0)	0 (0)	44 (0.7)	0 (0)	78 (1.0)	0 (0)	0 (0)	63 (0.9)
Estimated nonresident take:												
Ducks	26,391	18,253	42,225	17,556	17,855	19,269	12,149	12,173	22,718	15,463	11,755	17,055
Canada goose	6,960	5,001	13,400	5,852	5,736	6,214	3,946	3,580	3,501	5,762	3,698	6,334
Ruffed grouse	23,384	24,003	6,622	9,207	9,437	7,924	6,429	11,522	7,236	6,938	8,651	12,600
Ring-necked pheasant	4,844	4,001	3,740	7,647	9,344	11,174	13,656	16,079	17,661	10,642	6,274	8,076
Raccoon [b]	724	3,375	0	0	0	0	887	0	3,268	0	0	593

[a] Excludes duplicate licenses and nonresident shooting preserve licenses.
[b] In 2001, 2002, 2003, 2004, 2006, 2008, and 2009 no non-residents reported hunting/harvesting raccoons.

Raccoon take per hunter			
Year	Resident	Non-resident	Number of Non-resident raccoon licenses
2001 [b]	10	0	48
2002 [b]	11	0	46
2003 [b]	10	0	44
2004 [b]	8	0	46
2005	6	20	44
2006 [b]	8	0	53
2007	5	42	45
2008 [b]	10	0	40
2009 [b]	10	0	33
2010	9.4	9.4	42

The following information has been excerpted from: U.S. Fish and Wildlife Service. Migratory bird hunting activity and harvest during the 2009 and 2010 hunting seasons: preliminary estimates. U.S. Department of the Interior, Washington, D.C. U.S.A. The entire report is available on-line at http://www.fws.gov/migratorybirds/reports/reports.html

Table 1. Species composition of the Minnesota waterfowl harvest, 2009 and 2010. (from: Raftovich, R.V., K.A. Wilkins, S.S. Williams, H.L. Spriggs, and K.D. Richkus,. 2011. Migratory Bird Hunting activity and harvest during the 2009 and 2010 hunting seasons: Preliminary estimates. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2011. 63 pp). **Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

	Minnesota Harvest					Mississippi Flyway Harvest		
Species	2009	% of Harvest	2010	% of Harvest	Percent change in Harvest 09-10	2009	2010	Percent change Harvest 09-10
Mallard	101,280	25.82	138,167	26.37	+ 27	2,076,235	2,228,872	+ 7
Domestic mallard	0	0.00	0	0	0	1,990	1,482	- 34
American black duck	0	0.00	1,421	0.27	+100	30,373	27,073	- 12
Black x mallard	641	0.16	284	0.05	- 126	6,104	4,522	- 35
Gadwall	23,931	6.10	25,871	4.94	+ 7	713,277	1,098,694	+ 35
American wigeon	10,470	2.67	9,382	1.79	- 12	96,709	129,962	+ 26
Green-winged teal	49,999	12.74	36,674	7.00	- 36	755,233	1,052,784	+ 28
Blue-winged /cinnamon teal	34,828	8.87	36,958	7.05	+ 6	732,594	633,448	- 16
Northern shoveler	16,666	4.25	19,332	3.69	+ 14	283,039	475,080	+ 40
Northern pintail	3,632	0.93	11,087	2.12	+ 67	106,727	196,185	+ 46
Wood duck	53,204	13.56	77,897	14.87	+ 32	647,412	919,239	+ 30
Redhead	8,974	2.29	18,479	3.53	+ 51	59,860	109,003	+ 45
Canvasback	3,846	0.98	13,362	2.55	+ 71	27,831	72,703	+ 62
Greater scaup	1,496	0.38	1,421	0.27	- 5	24,567	23,692	- 4
Lesser scaup	10,043	2.56	14,783	2.82	+ 32	111,522	157,275	+ 29
Ring-necked duck	45,726	13.65	88,984	16.98	+ 49	186,243	268,411	+ 31
Goldeneye	7,051	1.79	7,051	0.92	- 46	30,017	33,578	+ 11
Bufflehead	12,607	3.21	12,607	3.26	+ 26	91,175	79,652	- 14
Ruddy duck	214	0.05	1,421	0.27	+ 85	12,243	8,196	- 49
Scoters	0	0.00	284	0.05	+100	3,599	3,136	- 15
Hooded merganser	7,478	1.91	6,254	1.19	- 20	41,645	45,988	+ 9
Other mergansers	214	0.05	0	0.00	0	7,534	5,256	- 43
Total Duck Harvest (retrieved kill)	392,300 ±14%		524,000 ±13%		+ 25	6,121,500 ± 6%	7,647,000 ±6%	+ 20

[a] Sum of all species does not equal total because of rounding error.

Table 2. Top 10 states in number of **adult duck hunters**, 2010, and number of hunter-days and retrieved duck kill, in each (from: Raftovich, R.V., K.A. Wilkins, S.S. Williams, H.L. Spriggs, and K.D. Richkus,. 2011. Migratory Bird Hunting activity and harvest during the 2009 and 2010 hunting seasons: Preliminary estimates. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2011. 63 pp). **Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

State	**Number of active duck hunters**	**Duck hunter days afield**	**Total duck harvest**	**Seasonal duck harvest per hunter**
Louisiana	89,300 ± 6%	821,700 ± 9%	2,736,300 ± 11%	30.6 ±12%
Minnesota	69,600 ± 9%	396,600 ± 14%	524,000 ± 13%	7.5 ± 16%
Texas	67,000 ± 20%	355,100 ± 16%	986,000± 20%	14.7 ± 28%
Wisconsin	58,700 ± 11%	383,400 ± 14%	448,500 ± 14%	7.6 ± 18%
California	55,500 ± 10%	596,800 ± 18%	1,734,100 ± 22%	31.3 ± 24%
Arkansas	52,700 ± 9%	460,200 ± 15%	1,410,800 ± 18%	26.8 ± 20%
Michigan	37,100 ± 10%	203,000 ± 11%	288,000 ±13%	7.8 ± 16%
Illinois	32,700 ± 11%	227,600 ± 15%	372,700 ± 18%	11.4 ± 21%
Missouri	30,200 ± 11%	225,400 ± 18%	520,200 ± 19%	17.2 ± 22%
Pennsylvania	25,200 ± 15%	118,200 ± 15%	125,900 ± 18%	5.0 ± 23%
Mississippi Flyway		3,404,200 ± 5%	7,647,000 ± 6%	
United States		6,590,800 ± 3%	14,867,000 ± 4%	

Table 3. Top 10 states in number of **adult goose hunters**, 2010, and number of hunter-days and retrieved goose kill, in each (from: Raftovich, R.V., K.A. Wilkins, S.S. Williams, H.L. Spriggs, and K.D. Richkus,. 2011. Migratory Bird Hunting activity and harvest during the 2009 and 2010 hunting seasons: Preliminary estimates. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2011. 63 pp). **Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

State	Number of active goose hunters	Goose hunter days afield	Total goose harvest	Seasonal goose harvest per hunter
Minnesota	51,600 ± 11%	298,200 ± 19%	190,400 ± 21%	3.7 ± 24%
Texas	46,000 ± 20%	152,400 ± 30%	252,100 ± 32%	5.5 ± 38%
Wisconsin	44,100 ± 11%	269,600 ± 17%	92,300 ± 22%	2.1 ± 24%
California	38,600 ± 11%	279,100 ± 17%	206,800 ± 20%	5.4 ± 23%
Michigan	30,700 ± 11%	164,300 ± 13%	125,100 ± 16%	4.1 ± 20%
Pennsylvania	28,100 ± 13%	127,100 ± 16%	155,700 ± 22%	5.5 ± 25%
Illinois	27,900 ± 13%	209,000 ± 20%	138,200 ± 22%	5.0 ± 26%
Maryland	26,600 ± 8%	152,300 ± 11%	206,100 ± 13%	7.7 ± 16%
North Dakota	21,600 ± 8%	90,400 ± 10%	130,200 ± 15%	6.0 ± 17%
Virginia	16,400 ± 14%	77,100 ± 22%	74,300 ± 18%	4.4 ± 23%
Mississippi Flyway		1,579,900 ± 7%	1,131,400 ± 8%	
United States [b]		3,453,400 ± 4%	3,190,700 ± 5%	

[b]. Goose hunter statistics do not include brant hunter statistics for coastal states with brant seasons: Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Virginia, California, Oregon, Washington, and Alaska.

HUNTER ACTIVITY AND GOOSE HARVEST DURING THE SEPTEMBER 2010 CANADA GOOSE HUNT IN MINNESOTA

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The September Canada goose season in Minnesota was 4 - 22 September 2010 (19 days). Beginning in 2007 and continuing through 2009, a 7-day (16 - 22 Sep) experimental season addition was added in the Northwest Goose Zone (Figure 1). The U.S. Fish and Wildlife Service had approved the 7-day season extension in other goose zones in Minnesota after a 3-year experimental season from 1999-2001 (Maxson et al. 2003). In 2010, this season extension became operational statewide.

During the September season the daily bag limit was 5 Canada geese per day statewide. Shooting hours were 1/2 hour before sunrise to sunset. Taking of Canada geese was prohibited on or within 100 yards of all surface waters in the Northwest Goose Zone, in the Carlos Avery Wildlife Management Area and in the Swan Lake Area. Within the Twin Cities Metro Zone, and goose refuges open to goose hunting, hunting was not permitted from public road right-of-ways. Goose hunters were required to obtain a $4.00 permit to participate in the September season. This report documents results of the 2010 September goose hunter mail questionnaire survey (Appendix A).

METHODS

Permittees were randomly selected to receive a post-season hunter survey. Questionnaires were sent to 3,101 permit holders following the season. Questionnaires were individually numbered, and up to 3 questionnaires were mailed to individuals who had not responded. Completed questionnaires were double key-punched to reduce errors.

The questionnaire asked hunters the number of days they hunted, and, for the season as a whole, number of geese shot and retrieved, number of geese knocked down and not retrieved, and the county they hunted in the most. Hunters were asked to indicate the number of days during the September season that they hunted over water, and not over water, and the number of geese they shot under each scenario. Finally, the questionnaire asked hunters their support/opposition to 3 potential regulations for early Canada goose hunting: allow goose hunting in August; increase daily bag limit from 5 to 8; and allow goose hunting until ½ hour after sunset.

We used the R programming language (ver. 2.9.2; R Development Core Team [RDCT] 2009) to summarize responses to the questionnaire survey.

RESULTS AND DISCUSSION

The DNR License Bureau reported that 35,817 Special Canada Goose Season permits were sold prior to 23 September, 2010. Response rate to the survey was 59.3%. Among those respondents, 75.0% indicated that they hunted during the September season. Active hunters were afield an average of 4.1 days and retrieved 4.0 geese. Overall, the success rate for active hunters was 71.1% (Table 1).

The survey estimates that 26,848 active hunters shot and retrieved 107,580 Canada geese during the 2010 September season (Table 2). Prior to the implementation of the Harvest Information Program, the U.S. Fish and Wildlife Service adjusted their mail survey statistics by a memory and prestige response bias factor of 0.848 for geese bagged in the Mississippi Flyway (Voelzer et al. 1982:56). Multiplying

September Canada goose harvest by the adjustment factor would indicate a 2010 retrieved harvest of 91,228.

We asked hunters how many days they hunted overwater and how many days they hunted away from water. A total of 40 % of hunters statewide hunted over water, and 31 % of all days spent hunting during the September season were overwater. The survey indicates that 7.2 % (CI 4.6 – 10.0%) of the geese harvested in the early season (7,769 total geese) were harvested by hunters overwater. Hunters harvested 0.2 geese per day while hunting overwater as opposed to 1.13 geese per day when hunting away from water.

We asked hunters how much they supported or opposed liberalizing September Canada goose regulations by 1) Hunting in August, 2) Increasing the daily bag limit from 5 to 8 Canada geese, and 3) Hunting ½ hour past sunset (regulations now allow hunting until sunset). Most (≥97%) respondents answered this question, and indicated they had sufficient knowledge or experience to provide an opinion (i.e., they did not answer "don't know"). The majority (≥59%) of respondents that had an opinion supported liberalized regulations. Mean scores (where 1 = strongly oppose and 5 = strongly support) for Hunting in August, Increasing daily bag limits, and Hunting until ½ hour after sunset, were 3.6, 3.7, and 4.2, respectively. There were positive correlations (0.40 ≤ Spearman's rho ≤ 0.49) among scores for the 3 questions, indicating that respondents who supported hunting in August also tended to support increased bag limits and hunting past sunset (Figure 2).

Landowners and managers in the west central portion of Minnesota are still reporting numerous goose depredation issues. If these issues continue, there may be justification for a new September goose zone (Figure 3) to attempt to address these issues. To determine how many September goose hunters hunt in the area where the new zone would be located, we asked hunters which county they hunted in the most during the September Canada goose season (Appendix B). Sixteen percent of September goose hunters (4,317) hunted most within counties at least partially within the new zone, and those hunters harvested 15.4% (16,603) of the geese harvested during the 2010 September Canada goose season, although it is unknown how many of those geese were actually harvested within the new zone.

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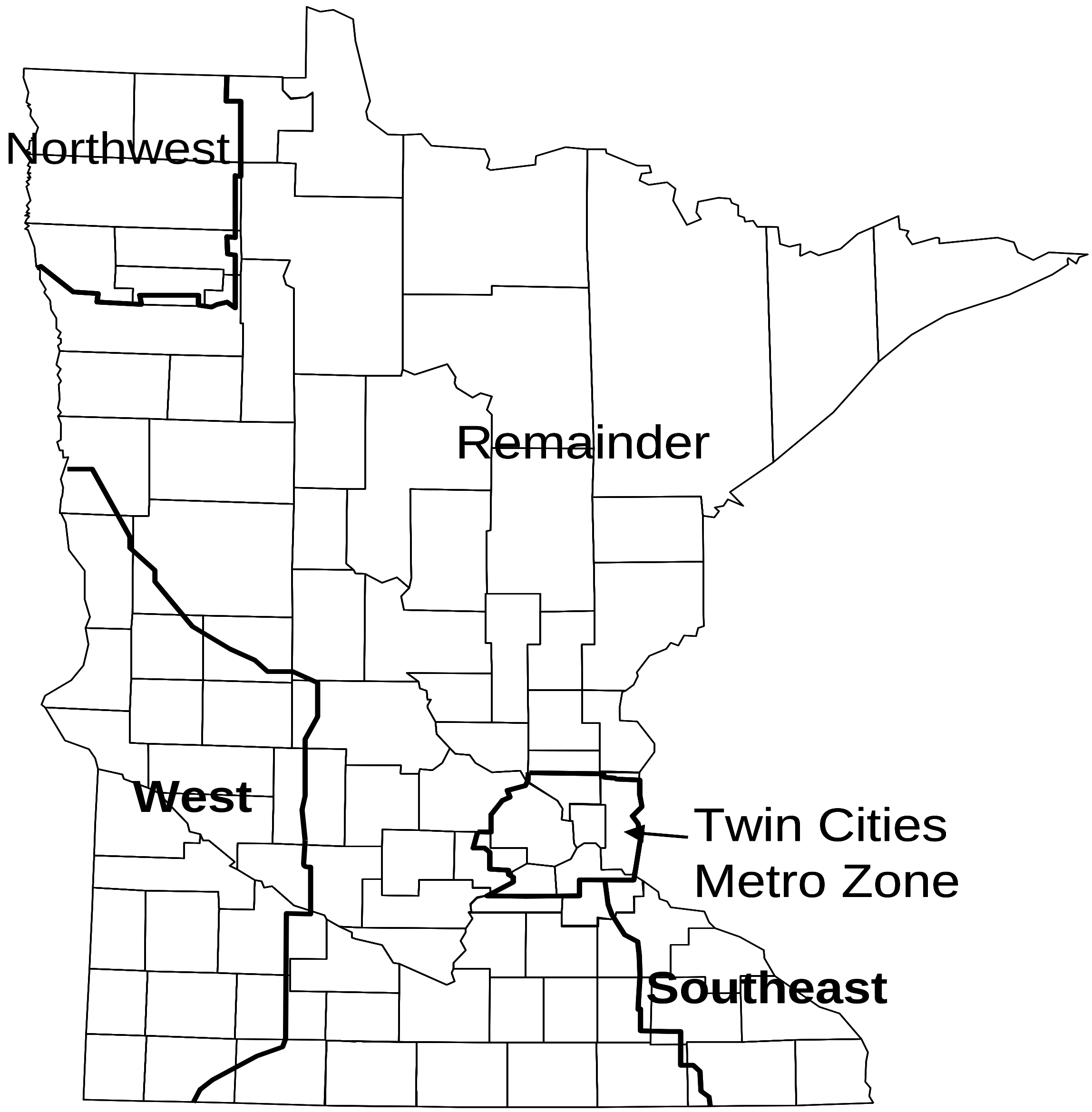

Figure 1. Traditional September season Goose Zones in Minnesota. The West, Twin Cities Metro and Southeast zones are now included in the Remainder zone during the September season.

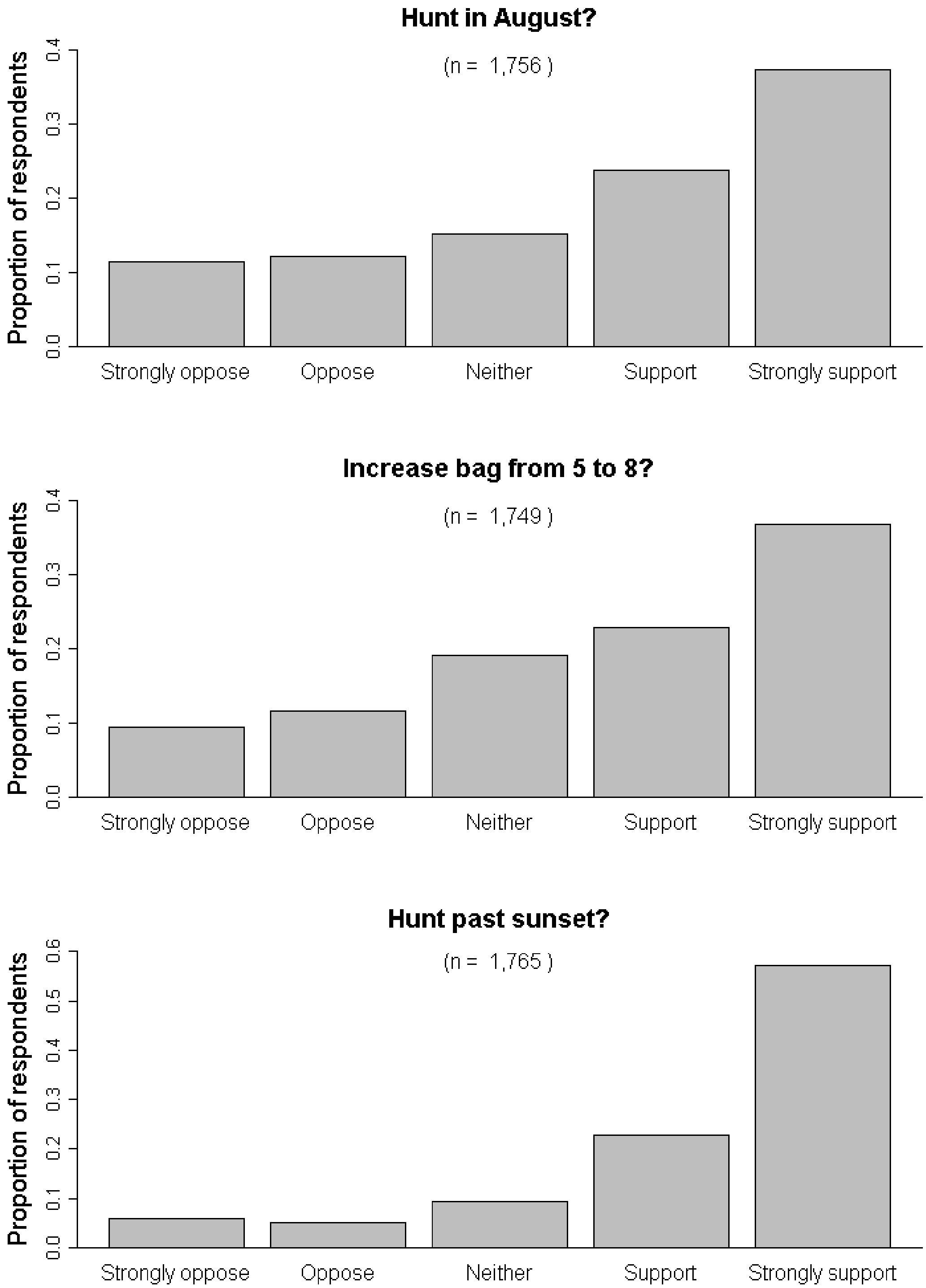

Figure 2. Proportion of respondents that supported or opposed (where 1 = strongly oppose and 5 = strongly support) 3 regulations changes during the September Canada goose hunt in Minnesota; Allow hunting in August, Increase the daily bag limit from 5 to 8 geese, and Allow hunting until ½ hour past sunset.

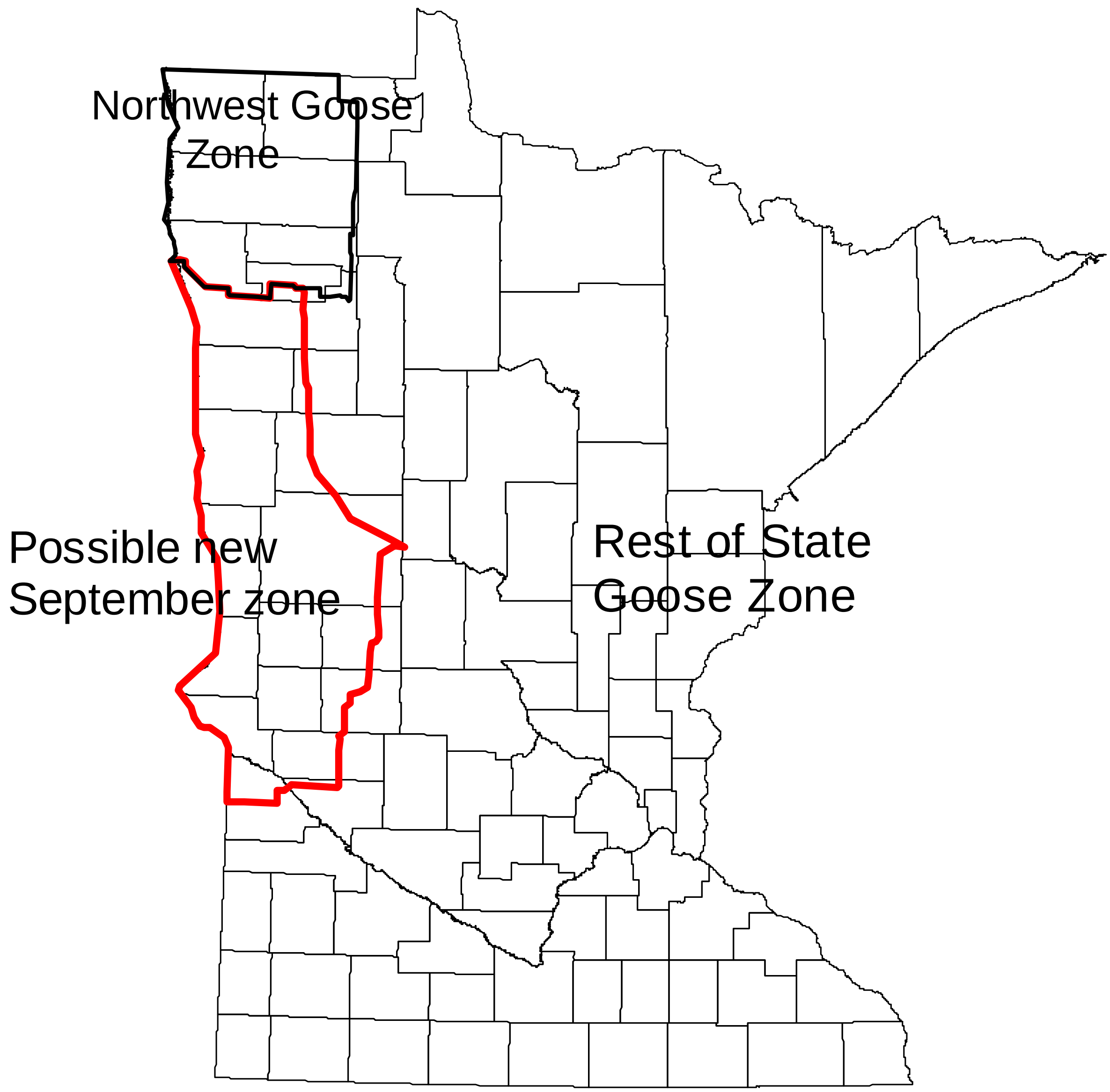

Figure 3. Location of a possible new September Canada goose zone in comparison to the current Northwest goose zone, and the Rest of State Goose zone.

Table 1. Permit sales, hunter activity, and harvest [a] during the September Canada Goose season (4 – 22 September) in Minnesota, 2010.

Parameter	Total
Total permits sold	35,817
Questionnaires delivered	3,101
Useable questionnaires returned	1,809
% responding	59.3
Active hunters	1,356
% active hunters	75.0
% hunters that were successful	71.1
Days hunted per active hunter	4.1
Geese shot and retrieved per active hunter	4.0
Unretrieved harvest per active hunter	0.37
% unretrieved harvest	0.083
EXPANDED:	
Active hunters	26,848
Hunter days	110,580
Retrieved harvest	**107,907**
Est. unretrieved harvest	9,954
Total harvest	119,637

[a]Harvest estimates not adjusted for memory/exaggeration bias.

Table 2. Retrieved harvest estimates by zone during the September Canada Goose season in Minnesota, 2000 – 2009. Total retrieved harvest estimates during the September Canada Goose season in Minnesota, 2010.

Year	Northwest	West	Southeast	Twin Cities Metro	Remainder	Total Geese Harvested	Number of Hunters	Geese/ Day/ Hunter	Total Geese/ Hunter
2000	2,750	18,909	1,183	15,594	51,685	**90,121**	33,202	0.63	2.71
2001	2,047	27,663	538	8,164	62,608	**101,021**	28,265	0.82	3.57
2002	1,568	22,075	848	8,504	50,769	**83,764**	26,089	0.68	3.20
2003	2,805	17,779	2,357	9,890	48,157	**80,988**	30,415	0.74	2.66
2004	4,326	16,843	1,197	11,090	56,480	**89,936**	29,657	0.80	3.03
2005	4,888	15,304	1,717	11,139	61,218	**94,266**	27,865	0.89	3.38
2006	6,826	17,987	1,461	11,844	53,321	**91,439**	28,405	0.86	3.22
2007	7,948	14,952	1,469	11,702	58,243	**94,314**	25,379	0.91	3.72
2008	5,530	16,168	2,580	13,656	62,827	**100,748**	27,392	0.98	3.73
2009	4,442	10,294	2,023	12,794	48,609	**78,151**	25,189	0.85	3.10
2010						**107,907**	26,848	0.98	4.00

Appendix A. Questions asked on the 2010 September Special Canada Goose Season Hunter Survey.

1. Did you hunt during the September 4-22, 2010 Special Canada Goose season?
   __ Yes __ No (Please check one.)

   If NO, proceed to Question 4. .

2. Please indicate the number of days you hunted, the total number of geese you **personally** shot and retrieved (do not include information from other members in your party), total geese personally knocked down but not retrieved and the County you hunted most.
   _________________ Number of days hunted
   _________________ Total geese personally shot and retrieved
   _________________ Total geese personally knocked down but not retrieved
   _________________ County hunted most

3. Please indicate the number of days hunted and number of geese you personally shot and retrieved when you hunted geese in September 2010:

   a) Overwater, (e.g. with decoys floating in or along the shore of a wetland or pass shooting next to a wetland) ____________Days hunted
   ____________ Total geese personally shot and retrieved

   b) Not overwater (e.g. field shooting) ____________Days hunted
   ____________ Total geese personally shot and retrieved

4. In the future, Minnesota may need to liberalize regulations in order to control resident Canada goose populations (geese that nest in Minnesota). How much do you support/oppose the following methods for controlling resident Canada geese in Minnesota during the early (currently September) Canada goose season only: (*Please circle one for each*.)

	Strongly oppose	**Oppose**	**Neither support nor oppose**	**Support**	**Strongly support**	**Don't know**
Allow goose hunting in August (season currently begins in early September)	**1**	**2**	**3**	**4**	**5**	**9**
Increase daily bag limit from 5 to 8	**1**	**2**	**3**	**4**	**5**	**9**
Allow goose hunting until ½ hour after sunset (currently closes at sunset)	**1**	**2**	**3**	**4**	**5**	**9**

Appendix B. Number and percent of September Canada Goose hunters in each county in Minnesota, 2010. Counties in bold are at least partially within a proposed new early season Canada goose zone.

County	Hunters N	Hunters %	County	Hunters N	Hunters %	County	Hunters N	Hunters %
AITKIN	396	1.5	LAKE OF THE WOODS	257	1.0	WABASHA	257	1.0
ANOKA	772	2.9	LE SUEUR	416	1.6	WADENA	119	0.5
BECKER	614	2.3	LINCOLN	139	0.5	WASECA	238	0.9
BELTRAMI	416	1.6	LYON	198	0.8	WASHINGTON	535	2.0
BENTON	257	1.0	MAHNOMEN	139	0.5	WATONWAN	139	0.5
BIG STONE	396	1.5	MARSHALL	178	0.7	**WILKIN**	59	0.2
BLUE EARTH	416	1.6	MARTIN	218	0.8	WINONA	119	0.5
BROWN	277	1.1	McLEOD	356	1.4	WRIGHT	1069	4.1
CARLTON	139	0.5	MEEKER	475	1.8	YELLOW MEDICINE	79	0.3
CARVER	574	2.2	MILLE LACS	317	1.2			
CASS	436	1.7	MORRISON	277	1.1			
CHIPPEWA	79	0.3	MOWER	119	0.5			
CHISAGO	297	1.1	MURRAY	158	0.6			
CLAY	376	1.4	NICOLLET	277	1.1			
CLEARWATER	158	0.6	NOBLES	139	0.5			
COOK	20	0.1	OLMSTEAD	178	0.7			
COTTONWOOD	238	0.9	**OTTERTAIL**	1445	5.5			
CROW WING	317	1.2	PENNINGTON	178	0.7			
DAKOTA	515	2.0	PINE	416	1.6			
DODGE	40	0.2	POLK	455	1.7			
DOUGLAS	594	2.3	**POPE**	396	1.5			
FARIBAULT	158	0.6	RAMSEY	59	0.2			
FILLMORE	198	0.8	RED LAKE	20	0.1			
FREEBORN	238	0.9	REDWOOD	40	0.2			
GOODHUE	79	0.3	RENVILLE	119	0.5			
GRANT	218	0.8	RICE	535	2.0			
HENNEPIN	614	2.3	ROCK	99	0.4			
HOUSTON	20	0.1	ROSEAU	455	1.7			
HUBBARD	257	1.0	SCOTT	535	2.0			
ISANTI	317	1.2	SHERBURNE	554	2.1			
ITASCA	594	2.3	SIBLEY	218	0.8			
JACKSON	257	1.0	ST. LOUIS	574	2.2			
KANABEC	158	0.6	STEARNS	990	3.8			
KANDIYOHI	475	1.8	STEELE	317	1.2			
KITTSON	178	0.7	**STEVENS**	198	0.8			
KOOCHICHING	59	0.2	**SWIFT**	198	0.8			
LAC QUI PARLE	238	0.9	TODD	574	2.2			
LAKE	20	0.1	**TRAVERSE**	119	0.5			

2011 LIGHT GOOSE CONSERVATION ORDER HARVEST IN MINNESOTA

David Rave, Wetland Wildlife and Populations Research Group
Margaret Dexter, Wildlife Populations and Research Unit

INTRODUCTION

This report documents results of the 2011 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 1 March - 30 April 2011. Participants were required to obtain a $3.50 permit. No other license, stamp or permit was required. Shooting hours were 1/2 hour before sunrise to 1/2 hour after sunset. There were no daily or possession limits. Use of electronic calls and unplugged shotguns was allowed.

All permit holders were sent a questionnaire after the season. Survey questions are listed in Figure 1. Second and third mailings were sent to non-respondents after one month had elapsed.

RESULTS AND DISCUSSION

A total of 994 permits was issued and 659 responses (67 %) to the questionnaire were obtained (Table 1). In calculating harvest estimates, we assumed that the 335 non-respondents participated in the conservation action and took light geese in the same manner as respondents (i.e., tallies were expanded by 1.51). Light geese were present in Minnesota for more days during spring 2011 than spring 2010, which resulted in more geese harvested in 2011 than 2010. Harvest was again concentrated in the southwest portion of the state with some also being taken in west-central Minnesota. Four-hundred fifty five people attempted to take light geese during the 61-day conservation order period. Active participants pursued light geese for 1,830 days and 1,554 light geese were shot and retrieved. This was an average retrieved take of 3.4 geese per active participant. Another 145 light geese were reported wounded and not retrieved.

Unplugged shotguns were used by 201 (44.2%) individuals to take 742 (47.7%) geese, of which 311 (20.0%) were taken with the 4^{th}, 5^{th}, or 6^{th} shell. Electronic calls were used by 97 (21.3%) participants to take 531 (34.2%) light geese. During the 1/2 hour after sunset period, 238 (15.3%) geese were harvested by 180 (39.5%) active hunters.

ACKNOWLEDGMENTS

J. Giudice, MNDNR Biometrics Unit analyzed all data for this report.

MINNESOTA 2011 LIGHT GOOSE HARVEST SURVEY

For the Period of March 1 - April 30, 2011 ONLY

You are being asked to provide information to help us evaluate the harvest of light geese (snow, blue, and Ross' geese) in Minnesota during March 1 - April 30, 2011. Your cooperation is important. Please return this survey card even if you did not hunt light geese. Please answer the following questions to the best of your ability. **Answer only for your Minnesota 2011 hunting experience.**
THANK YOU! Ed Boggess, Director, Division of Fish and Wildlife, MN DNR.

1. Did you hunt light geese in Minnesota during March 1 - April 30, 2011? Yes / No

If NO, please disregard all remaining questions and return this survey card.

2. How many days did you hunt light geese in Minnesota during March 1 - April 30, 2011? ________
3. In what county did you hunt light geese most often during March 1 - April 30, 2011? ________
4. How many light geese did you personally shoot and retrieve in Minnesota? ________
5. How many light geese did you personally shoot, but were UNABLE to retrieve? ________
6. Did you hunt light geese in Minnesota with a gun(s) that was holding more than 3 shells? Yes / No
7. If yes, how many light geese did you shoot with a gun holding more than 3 shells? ________
8. How many light geese did you shoot and retrieve with the 4th, 5th, or 6th shell? ________
9. Did you hunt light geese in Minnesota with the aid of an electronic caller? Yes / No
10. If yes, how many light geese did you shoot and retrieve with the aid of an electronic caller? ________
11. Did you hunt light geese in Minnesota during the ½ hour after sunset period? Yes / No
12. If yes, how many light geese did you shoot and retrieve during the ½ hour after sunset period? ____
13. What method of hunting did you use most often? Check one
    ☐ hunt over decoys ☐ pass shoot ☐ Sneak
14. What type of shotgun shells did you use most often?
    ☐ Steel shot ☐ Other (Hevi-shot, bismuth, tungsten-matrix, etc.)
15. What size shot did you use most often? ☐ BBs or larger ☐ 1s or 2s ☐ Smaller than 2s

Figure 1. Light Goose Conservation Order hunter questionnaire, 2011.

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2001 - 2011

	Year									
Statistic	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total permits sold	1,997	1,438	1,424	1,383	1,363	1,292	1,406	1,670	952	994
Useable returns	1,375	1,071	1,095	998	955	921	910	1,057	671	659
Response rate (%)	69.0	74.0	77.0	72.0	70.0	71.0	65.0	63.0	72.3	67.1
Active hunters (%)	60.5	38.5	48.5	44.7	37.3	39.8	54.9	66.0	40.8	45.7
Estimated total hunters	1,209	553	690	618	516	514	773	1,103	389	455
Estimated hunter days	5,517	2,600	3,372	2,643	2,665	2,302	3,404	4,647	1,475	1,830
Mean days/hunter	4.6	4.7	4.9	4.3	5.2	4.5	4.4	4.2	3.8	4.0
Estimated harvest (shot & retrieved)	3,516	2,005	2,735	1,395	1,360	1,786	2,409	4,366	559	1,554
Mean harvest/hunter	2.9	3.6	4.0	2.3	2.6	3.5	3.1	4.0	1.4	3.4
Estimated crippling losses	637	253	315	150	163	172	302	640	70	145
Percent using unplugged guns	46.4	50.6	48.2	44.0	42.3	43.6	46.7	46.8	44.9	44.2
Est. number hunters using uplugged guns	560	280	333	272	215	224	361	516	175	201
Est. number geese **shot** with unplugged guns	2,137	996	1,385	777	689	1,032	1,275	2,413	348	742
Est. harvest with shell 4-5-6	615	401	491	269	287	277	339	822	131	311
Percent using electronic calls	11.8	15.7	19.3	17.8	14.4	17.1	19.1	23.5	25.9	21.3
Est. number hunters using e-calls	142	87	133	110	73	88	148	260	101	97
Est. harvest while using e-calls	512	474	326	268	280	329	566	1,171	192	531
Percent hunting 1/2-hr after sunset	45.5	41.2	38.4	42.7	43.9	38.3	42.3	43.1	39.7	39.7
Est. number hunting after 1/2-hr sunset	550	228	265	264	223	197	326	475	154	180
Est. harvest 1/2-hr after sunset	841	267	311	242	246	209	511	713	87	238

2010 FALL WILD TURKEY HARVEST REPORT

Eric Dunton, Farmland Wildlife Populations and Research Group

Minnesota's fall turkey hunting season is managed with a quota system similar to the spring turkey hunting season. Permits are allocated across 67 permit areas (PAs; Figure 1). In 2010, the fall season was expanded from 2, 5-day time periods to 1, 30-day time period in all PAs.

Three types of permits were available to hunters: (1) general lottery permits in which applicants or parties of up to 4 hunters applied for a specific PA, (2) landowner permits in which up to 20% of permits for each PA were reserved for landowners or tenants who lived on 40 acres or more of land within the PA, and (3) surplus permits which were offered in under-subscribed PAs. General lottery and landowner permits were made available based on a system of preference, which was determined by the number of years applicants submitted a valid, but unsuccessful application since last receiving a permit. Surplus permits could be purchased on a first-come, first-served basis. Permit holders were allowed to harvest 1 turkey of either sex during the fall season.

Fall turkey hunting opportunity has increased significantly since 2007 with the addition of 5,940 available permits (132% increase), 35 new permit areas, and the extension of the season from 2, 5-day time periods to 1, 30-day time period (October 2-31). In 2010, over 6,500 permits were issued, and hunters registered 1,353 turkeys, a 16% increase from the 2009 season (Table 1; Figure 2). Hunter success averaged 20%, below the 5-year average (23%), and success varied among PAs from 0% in PAs 183, 446, 451, and 458 to 63% in PA 431 (Table 2). The majority of permits issued were general lottery (69%), followed by surplus permits (28%), and landowner (3%; Table 3). Compared to 2009, the number of general lottery permits issued declined by 25% while the number of surplus permits issued increased by an equivalent amount, indicating that some hunters may be opting to purchase a surplus permit rather than apply for a permit through the general lottery system.

Overall weather conditions for the 2010 fall wild turkey season were favorable across much of the turkey range. After a record-setting wet September, much of October received little or no precipitation during the first 3 weeks (Minnesota Climatology Working Group 2010). Regional mean temperatures for October were generally 3 to 5° F above average (Minnesota Climatology Working Group 2010). Although favorable weather conditions contribute to increased harvest and participation, the continued increase in harvest can be partially attributed to the greater number of permits available (132% increase since 2007), 35 new PAs open to fall hunting since 2007, and the extension of the season from 2, 5-day time periods to 1, 30-day season. Favorable weather, more permits, and a longer season all combined to provide more opportunities for hunters to harvest turkeys.

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Table 1. Permits available and issued, applicants, registered harvest, and hunter success rates for fall wild turkey seasons 1990 – 2010, Minnesota.

Year	Permits available	Applicants	Permits issued	Registered harvest	Hunter success (%)[a]
1990	1,000	4,522	951	326	34
1991	2,200	2,990	2,020	552	27
1992	2,200	2,782	2,028	588	29
1993	2,400	3,186	2,094	605	29
1994	2,500	3,124	2,106	601	29
1995	2,500	3,685	2,125	648	30
1996	2,500	4,453	2,289	685	30
1997	2,580	4,574	2,378	698	29
1998	2,710	4,526	2,483	828	33
1999	2,890	5,354	2,644	865	33
2000	3,090	5,263	2,484	735	30
2001	2,870	4,501	2,262	629	28
2002	3,790	5,180	2,945	594	20
2003	3,870	5,264	2,977	889	30
2004	4,380	5,878	3,277	758	23
2005	4,410	4,542	2,978	681	23
2006	4,290	4,167	2,802	618	22
2007	4,490	4,464	2,837	695	24
2008	7,560	5,834	4,981	1,187	24
2009	9,330	7,738	5,019	1,163	23
2010	10,430	6,869	6,607	1,353	20

[a] Success rates not adjusted for non-participation.

Table 2. Permits available and issued, registered harvest, and current and historic success by permit area for the 2010 fall wild turkey season, Minnesota.

	Permits		2010		Historic mean[b]	
Permit area	Available	Issued	Registered harvest	Success (%)[a]	Success (%)	*n*
156	20	18	4	22	13	2
157	100	78	20	26	23	3
159	20	17	1	6	7	2
183	10	5	0	0	0	2
213	200	161	19	12	16	3
214	200	168	30	18	26	3
215	300	246	50	20	24	3
218	200	159	45	28	27	2
219	100	82	21	26	18	2
221	200	147	34	23	22	3
222	200	120	16	13	21	3
223	200	139	16	12	16	3
225	200	150	22	15	15	2
227	300	236	52	22	24	4
229	50	41	7	17	19	3
235	20	15	2	13	8	2
236	300	244	45	18	24	8
239	300	239	63	26	26	3
240	200	157	42	27	28	3
241	20	14	3	21	31	2
243	20	15	4	27	29	2
244	40	35	12	34	40	2
248	100	78	20	26	25	3
249	100	76	22	29	24	3
262	40	21	4	19	31	3
338	200	164	45	27	25	8
339	200	169	27	16	19	8
341	500	400	97	24	25	8
342	350	190	50	26	23	8
343	300	252	64	25	27	8
344	200	144	21	15	20	8
345	200	98	11	11	17	8
346	300	145	18	12	22	8
347	200	149	24	16	24	8

Table 2. Continued.

	Permits		2010		Historic mean[b]	
Permit area	Available	Issued	Registered harvest	Success (%)[a]	Success (%)	*n*
348	250	177	29	16	24	8
349	450	144	27	19	22	8
412	40	30	7	23	31	3
416	20	12	1	8	19	2
417	30	25	10	40	31	2
420	40	17	3	18	31	5
422	50	40	13	33	40	5
425	40	28	7	25	24	5
427	20	15	4	27	24	2
428	30	26	9	35	28	3
431	20	16	10	63	35	5
433	20	16	1	6	19	5
440	20	19	6	32	36	3
442	250	198	42	21	26	8
443	100	89	18	20	17	8
446	20	18	0	0	22	5
447	20	15	4	27	16	5
448	30	25	5	20	22	8
449	30	21	5	24	28	7
450	20	14	3	21	14	5
451	20	4	0	0	11	2
454	20	14	3	21	33	2
457	20	15	1	7	5	2
458	20	3	0	0	0	2
459	20	19	1	5	4	3
461	250	192	51	27	29	8
462	240	196	37	19	24	8
463	30	24	1	4	21	3
464	80	40	8	20	24	8
465	80	39	5	13	23	8
466	160	129	29	22	27	8
467	100	84	26	31	21	8
601	2,000	531	76	14	20	8
Total	10,430	6,607	1,353	20	-	-

[a] Success rates not adjusted for non-participation.
[b] Mean success rates (%) over all fall turkey seasons (*n*) between 2003 – 2010 or since a permit area opened for fall turkey hunting.

Table 3. Permits available and issued by type, registered harvest, and success by permit area for the 2010 fall wild turkey season, Minnesota.

Permit area	Permits available	Permits issued by type: General	Landowner	Surplus	Total	Registered harvest	Success (%)[a]
156	20	14	4	0	18	4	22
157	100	75	3	0	78	20	26
159	20	16	1	0	17	1	6
183	10	4	1	0	5	0	0
213	200	117	5	39	161	19	12
214	200	87	5	76	168	30	18
215	300	161	2	83	246	50	20
218	200	138	5	16	159	45	28
219	100	78	4	0	82	21	26
221	200	82	3	62	147	34	23
222	200	61	1	58	120	16	13
223	200	135	2	2	139	16	12
225	200	76	2	72	150	22	15
227	300	120	5	111	236	52	22
229	50	41	0	0	41	7	17
235	20	15	0	0	15	2	13
236	300	162	2	80	244	45	18
239	300	159	5	75	239	63	26
240	200	123	3	31	157	42	27
241	20	13	1	0	14	3	21
243	20	15	0	0	15	4	27
244	40	32	3	0	35	12	34
248	100	32	4	42	78	20	26
249	100	47	2	27	76	22	29
262	40	11	0	10	21	4	19
338	200	121	6	37	164	45	27
339	200	112	3	54	169	27	16
341	500	267	5	128	400	97	24
342	350	117	6	67	190	50	26
343	300	222	9	21	252	64	25
344	200	116	1	27	144	21	15
345	200	60	3	35	98	11	11
346	300	95	5	45	145	18	12
347	200	88	2	59	149	24	16

Table 3. Continued.

Permit area	Permits available	Permits issued by type: General	Landowner	Surplus	Total	Registered harvest	Success (%)[a]
348	250	124	3	50	177	29	16
349	450	105	0	39	144	27	19
412	40	27	3	0	30	7	23
416	20	12	0	0	12	1	8
417	30	24	1	0	25	10	40
420	40	3	3	11	17	3	18
422	50	27	0	13	40	13	33
425	40	26	2	0	28	7	25
427	20	14	1	0	15	4	27
428	30	23	3	0	26	9	35
431	20	15	1	0	16	10	63
433	20	16	0	0	16	1	6
440	20	15	4	0	19	6	32
442	250	188	10	0	198	42	21
443	100	65	1	23	89	18	20
446	20	7	0	11	18	0	0
447	20	11	1	3	15	4	27
448	30	17	5	3	25	5	20
449	30	17	1	3	21	5	24
450	20	5	0	9	14	3	21
451	20	3	0	1	4	0	0
454	20	14	0	0	14	3	21
457	20	10	1	4	15	1	7
458	20	2	0	1	3	0	0
459	20	12	1	6	19	1	5
461	250	183	9	0	192	51	27
462	240	146	6	44	196	37	19
463	30	22	2	0	24	1	4
464	80	26	0	14	40	8	20
465	80	24	0	15	39	5	13
466	160	82	1	46	129	29	22
467	100	62	7	15	84	26	31
601	2,000	251	0	280	531	76	14
Total	10,430	4,590	169	1,848	6,607	1,353	20

[a] Success rates not adjusted for non-participation

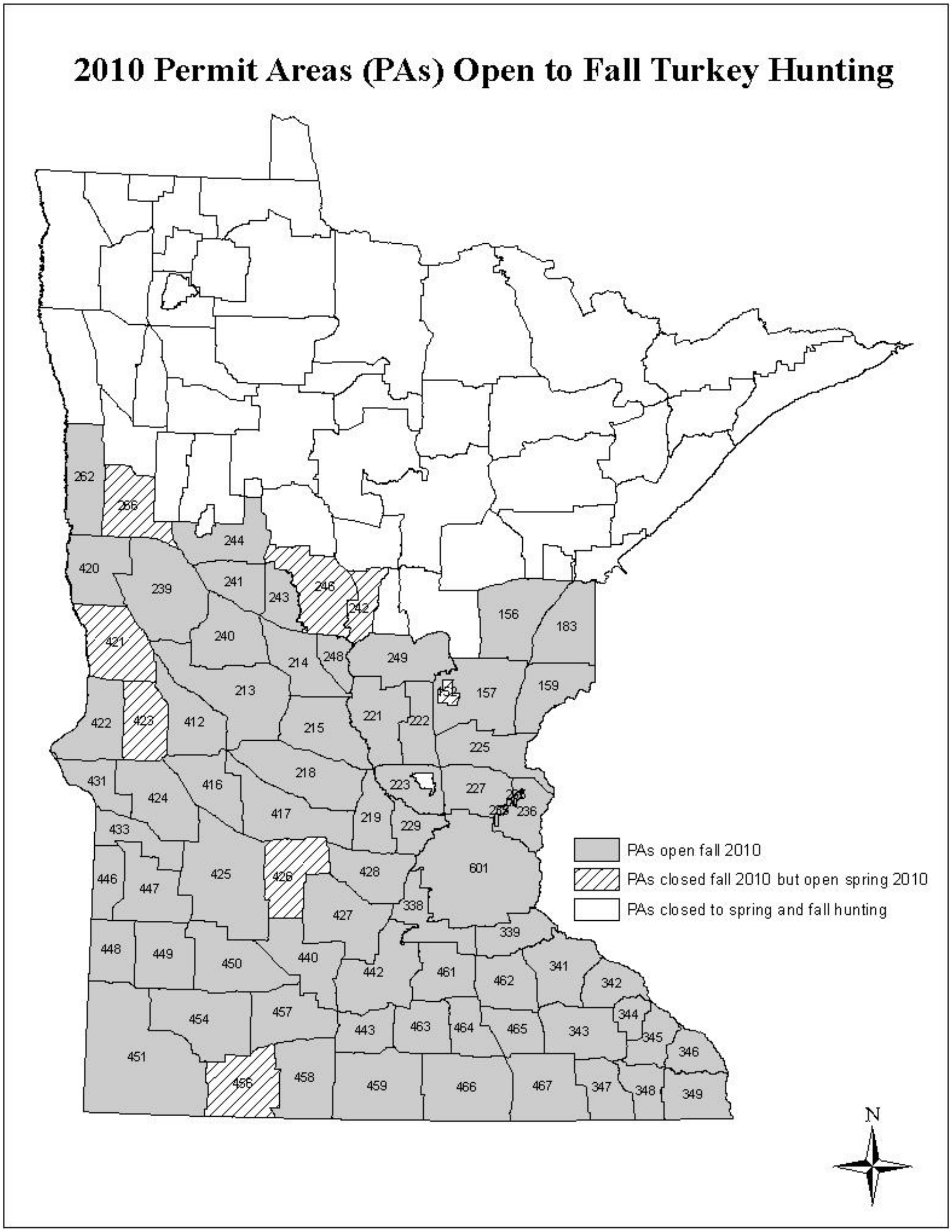


Figure 1. Permit areas (PAs) open for the 2010 fall wild turkey hunting season, Minnesota.

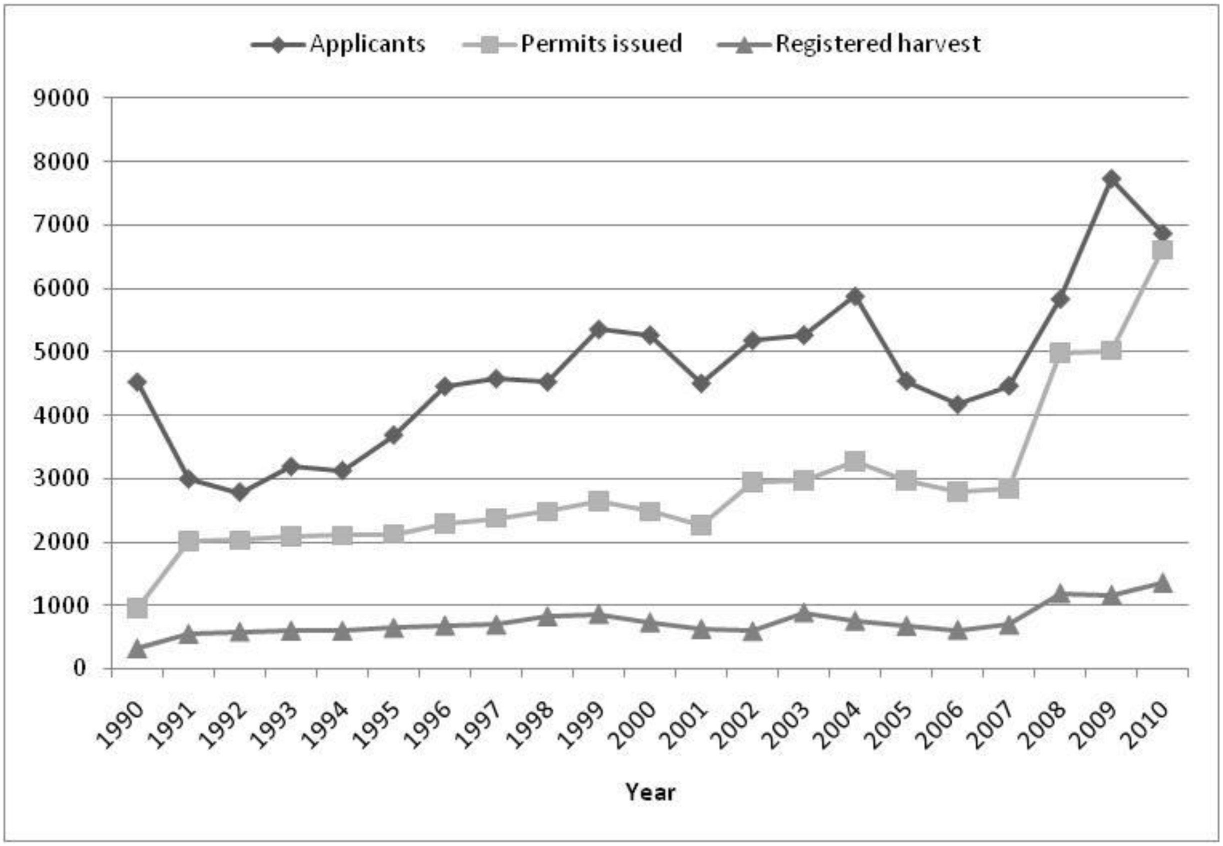


Figure 2. Applicants, permits issued, and registered harvest for fall wild turkey seasons 1990 – 2010, Minnesota.

SPRING 2011 WILD TURKEY HARVEST REPORT

Kurt Haroldson, Farmland Wildlife Populations and Research Group

In Minnesota, the spring wild turkey hunting season is designed to regulate harvest and distribute hunting pressure by allocating permits across 81 permit areas (PAs, Figure 1) and 8 time periods using a quota system. Although youth hunters (age 17 or less on opening day of the turkey hunting season) could purchase a permit over the counter, adult hunters interested in pursuing wild turkeys were required to apply for a permit through a drawing based on a system of preference. Preference is determined by the number of years a valid but unsuccessful application has been submitted since last receiving a permit. Hunters may apply individually or in a group of up to 4 hunters. Successful applicants are notified through mail, and unsuccessful applicants are awarded a preference point. The goal of this system is to provide quality turkey hunting opportunities by minimizing hunter interference rates while allowing hunters to take the harvestable surplus of turkeys.

There was one notable regulation change for the 2011 spring hunting season: the number of permits available for the last 2 time periods (G and H) was unlimited. Permits for time periods G and H and all surplus licenses remaining after the drawing were offered over the counter in mid-March on a first-come, first-served basis.

Eight types of hunting licenses were available to resident turkey hunters: (1) general lottery permit in which an applicant or a group of up to 4 hunters applied for a specific PA and time period; (2) landowner permit in which up to 20% of permits for each PA and time period were reserved for landowners or tenants who lived on 40 acres or more of land within the PA; (3) youth permit; (4) archery permit which could be purchased for the last 2 time periods of any PA with 50 or more permits per period; (5) youth archery; (6) surplus permits; (7) youth surplus; and (8) military permit.

During 2011, 54,042 applicants were issued 43,521 permits (Table 1, Figure 2), including 21,754 general lottery permits, 1,629 landowner permits, 8,693 youth permits, and 11,324 surplus permits. An additional 2,462 permits were issued to archers, and 121 permits were issued for the Camp Ripley disabled veterans hunt. Hunters registered 10,055 turkeys, a decrease of 25% from 2010 (Table 1, Figure 2). Hunter success averaged 23% (Table 1), which is below the 5-year average of 32%. Hunter success by PA ranged from 15% (PA 459) to 58% (PA 256; Table 2). Hunter success varied by license type from 9% (archery) to 19% (youth), 25% (general lottery and landowner), and 20% (surplus). Similar to the 10-year average, hunter success rates were highest during the first 2 time periods (Table 3). The majority of general lottery (82%), landowner (94%), and youth (78%) permits were issued during time periods A – D, while the majority of surplus permits (97%) were issued during time periods E – H (Table 4). The 8,693 permits issued to resident and non-resident youth hunters (general lottery, surplus, archery, and mentored) in 2011 was a 73% increase over the 5,024 youth permits issued in 2009, when youth were required to compete for permits in the lottery. Approximately 18% (1,792) of harvested turkeys were registered using the phone registration system, 30% (3,008) through the internet, and 52% (5,255) at a registration station.

Annual changes in turkey harvest are influenced by turkey population size, hunter effort, and weather. As of 2010, Minnesota's wild turkey population appeared to be stable or growing modestly throughout most of the range, with more rapid growth in the northern PAs (Giudice et al. 2011). The effect of the severe winter of 2010-11 on turkey abundance is unknown, but survival rates may have been lower than average, leaving fewer birds in the spring 2011 population. Although hunting opportunity increased in 2011 with 4 new PAs open to hunting and unlimited permit availability for time periods G and H, hunter effort was reduced, with over 3,000 fewer permits issued in 2011 compared to the previous year despite an increase in permit applications. Reduced hunter effort was likely a function of poor weather during the 2011 spring turkey hunting season. Weather conditions in April and May were relatively cool, wet, and windy across much of Minnesota, with below average temperatures and above average precipitation (Minnesota Climatology Working Group 2011). Thus, the reduced harvest in 2011 was likely the result of poor weather (as it affects hunter effort and turkey vulnerability to hunting), and possibly reduced turkey abundance. Spring turkey harvest in Wisconsin, Iowa, Illinois, and South Dakota also declined from 2010. The combination of severe winter weather and cool, wet spring weather has affected turkey numbers or behavior as well as hunter effort across the upper Midwest.

LITERATURE CITED

GIUDICE, J., M. TRANEL, and K. HAROLDSON. 2011. Fall Wild Turkey Population Survey, 2010. Minnesota Department of Natural Resources, St. Paul, MN, Agency Report.

MINNESOTA CLIMATOLOGY WORKING GROUP. 2011. Climate journal. http://climate.umn.edu/ Accessed 22 June 2011.

Table 1. Spring applicants, permits available and issued, and registered harvest from 1978 – 2011 for all spring wild turkey hunting seasons, Minnesota.

		Permits				
Year	Applicants	Available	Issued	Issued (%)	Registered harvest	Success (%)[a]
1978	10,740	420	411	97.9	94	22.9
1979	11,116	840	827	98.5	116	14.0
1980	9,613	1,200	1,191	99.3	98	8.2
1981	8,398	1,500	1,437	95.8	113	7.9
1982	7,223	2,000	1,992	99.6	106	5.3
1983	8,153	2,100	2,079	99.0	116	5.6
1984	7,123	3,000	2,837	94.6	178	6.3
1985	5,662	2,750	2,449	89.1	323	13.2
1986	5,715	2,500	2,251	90.0	333	14.8
1987	6,361	2,700	2,520	93.3	520	20.6
1988	8,402	3,000	2,994	99.8	674	22.5
1989	13,007	4,000	3,821	95.5	930	24.3
1990	14,326	6,600	6,126	92.8	1,709	27.9
1991	15,918	9,170	8,607	93.9	1,724	20.0
1992	16,401	9,310	9,051	97.2	1,691	18.7
1993	17,800	9,625	9,265	96.3	2,082	22.5
1994	19,853	9,940	9,479	95.4	1,975	20.8
1995	21,345	9,975	9,550	95.7	2,339	24.5
1996	23,757	12,131	10,983	90.5	2,841	25.9
1997	25,958	12,530	11,610	92.7	3,302	28.4
1998	29,727	14,035	13,229	94.3	4,361	33.0
1999	39,957	18,360	16,387	89.3	5,132	31.3
2000	42,022	20,160	18,661	92.6	6,154	33.0
2001	41,048	22,936	21,404	93.3	6,383	29.8
2002	42,415	24,136	22,607	93.7	6,516	28.8
2003	44,415	25,016	22,770	91.0	7,666	33.7
2004	48,059	27,600	25,261	91.5	8,434	33.4
2005	49,181	31,748	27,638	87.1	7,800	28.2
2006	45,704	32,624	27,876	85.4	8,241	29.6
2007[b]	52,566	33,976	28,320	83.4	9,412	33.2
2008[b]	51,000	37,992	31,942	84.1	10,994	34.4
2009[b]	57,692	42,328	36,193	85.5	12,210	33.7
2010[b]	51,312	55,982	46,548[c]	83.0	13,467	29.0
2011[b]	54,042	unlimited	43,521[c]		10,055	23.1

[a] Success rates not adjusted for non-participation
[b] Youth hunt data included
[c] 2,462 permits were issued to archery hunters and are not included in this figure.

Table 2. Permits issued, registered harvest, and hunter success during the 2011 spring wild turkey season and historic success rates by permit area for Minnesota.

	2011			Historic mean[d]	
Permit Area	Permits Issued[a]	Harvest[b]	Success (%)[c]	Success (%)	n
152	40	7	18	33	3
154[e]	85	19	22		0
156	225	71	32	38	3
157	714	176	25	40	7
159	196	41	21	31	7
183	97	22	23	22	3
213	938	215	23	39	4
214	727	183	25	36	7
215	1,079	288	27	40	12
218	1,223	306	25	44	4
219	634	168	26	31	12
221	626	168	27	44	6
222	472	123	26	37	6
223	974	247	25	35	12
225	1,178	243	21	27	12
227	1,162	298	26	33	12
229	392	86	22	25	11
235	178	31	17	32	12
236	1,256	296	24	38	12
239	1,153	278	24	39	9
240	821	223	27	38	6
241	362	84	23	35	3
242	63	17	27	34	2
243	262	70	27	35	3
244	490	120	24	33	9
245[e]	104	43	41		0
246	362	124	34	36	2
247	56	20	36	34	1
248	367	87	24	39	7
249	512	121	24	31	8
256[e]	43	25	58		0
262	40	9	23	38	3
265[e]	24	13	54		0
266	66	14	21	35	2
338	924	219	24	33	10
339	841	203	24	34	10
341	1,978	461	23	34	10
342	1,356	276	20	27	10

Table 2. Continued

	2011			Historic mean[d]	
Permit Area	Permits Issued[a]	Harvest[b]	Success (%)[c]	Success (%)	n
343	1,673	390	23	40	10
344	922	145	16	27	12
345	828	130	16	22	10
346	1,487	266	18	25	12
347	1,012	199	20	27	10
348	1,068	195	18	25	10
349	2,076	381	18	24	12
412	403	86	21	36	4
416	216	55	25	37	11
417	663	189	29	38	4
420	70	20	29	34	7
421	34	10	29	31	3
422	173	44	25	44	12
423	17	4	24	20	3
424	67	18	27	30	6
425	611	135	22	37	7
426	35	6	17	25	10
427	147	33	22	34	10
428	368	102	28	40	10
431	120	36	30	39	12
433	171	49	29	39	7
440	584	151	26	32	12
442	1,415	337	24	35	12
443	548	129	24	31	12
446	88	27	31	36	6
447	71	18	25	26	6
448	116	30	26	45	7
449	164	27	16	43	7
450	75	17	23	29	12
451	99	22	22	41	8
454	77	17	22	34	6
456	29	9	31	12	6
457	105	32	30	34	12
458	51	11	22	31	6
459	207	31	15	23	12
461	1,083	206	19	34	12
462	972	220	23	37	10
463	264	47	18	29	12
464	321	68	21	29	10

Table 2. Continued

Permit Area	2011 Permits Issued[a]	2011 Harvest[b]	2011 Success (%)[c]	Historic mean[d] Success (%)	Historic mean[d] n
465	266	56	21	28	10
466	526	132	25	31	9
467	545	98	18	33	9
601	1,613	442	27	38	11

[a] 2,462 permits were issued to archery hunters and 121 permits were issued for the Camp Ripley disabled veterans hunt and are not included in these figures
[b] 40 turkeys were registered from the Camp Ripley disabled veterans hunt and are not included in these figures
[c] Success rates not adjusted for non-participation
[d] Mean success rate (%) over all spring turkey seasons (*n*) between 1999 – 2010 or since a permit area boundary change occurred.
[e] New permits area for the 2011 spring season

Table 3. Permits available and issued, registered harvest, and success (2011 and mean) by time period for the 2011 spring wild turkey season, Minnesota.

Time period[a]	Permits Available	Permits Issued	2011 Registered harvest	2011 Success (%)[b]	2001 – 2010 Mean success (%)
A	5,705	7,177	2,128	30	43
B	5,705	5,402	1,500	28	39
C	5,705	7,217	1,514	21	31
D	5,705	6,485	1,254	19	28
E	5,705	5,159	1,070	21	32
F	5,705	4,255	865	20	28
G	unlimited	4,960	1,069	22	25
H	unlimited	2,489	522	21	23
Youth hunt[c]	273	256	93	36	
Camp Ripley[d]					
802A		21	3	14	
801B		39	14	36	
802B		3	1	33	
801C		41	17	41	
801D		17	5	29	

[a] A = April 13 – 17, B = April 18 – 22, C = April 23 – 27, D = April 28 – May 2, E = May 3 – 7, F = May 8 – 12, G = May 13 – 19, and H = May 20 – 26
[b] Success rates not adjusted for non-participation
[c] In 2011 all mentored youth hunts were in time period A except one, which was in time period C.
[d] Disabled veterans hunt

Table 4. Permits available and issued by license type (resident and non-resident) and time period for the spring 2011 wild turkey season, Minnesota.

		Permits issued			
Time period	Permits available	General lottery	Landowner	Surplus	Youth[b]
A	5,705	4,367	659	41	2,357
B	5,705	4,407	348	145	502
C	5,705	4,480	351	63	2,332
D	5,705	4,623	172	98	1,592
E	5,705	2,471	56	2,205	427
F	5,705	1,400	43	2,506	306
G	unlimited	3	0	4,231	726
H	unlimited	3	0	2,035	451
Total[a]	unlimited	21,754	1,629	11,324	8,693

[a] Total excludes 121 permits issued for the Camp Ripley disabled veterans hunt
[b] Total includes 247 permits issued for mentored youth hunts in Time Period A and 9 in Time Period C.

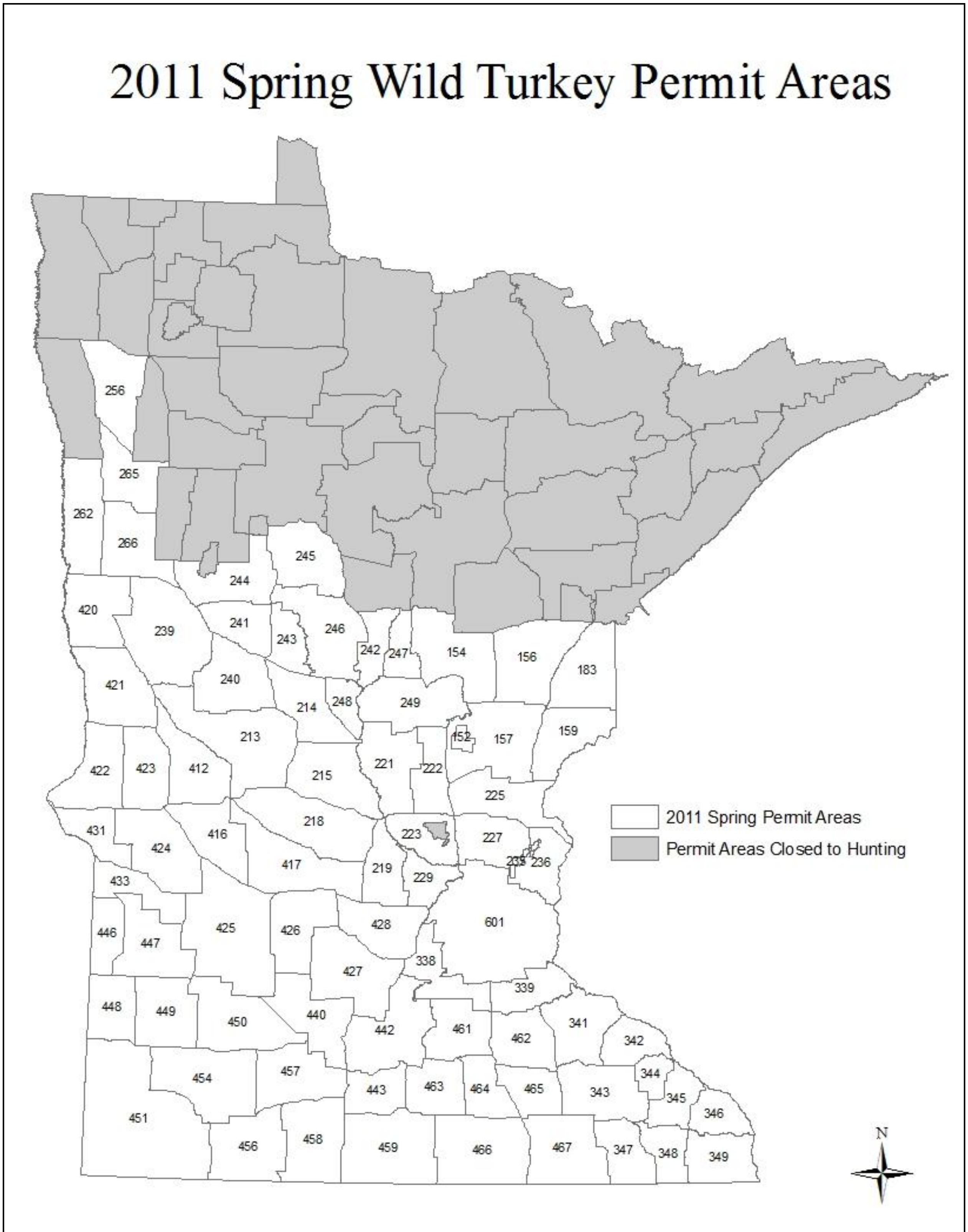


Figure 1. Permit areas open for hunting during the 2011 spring turkey hunting season, Minnesota.

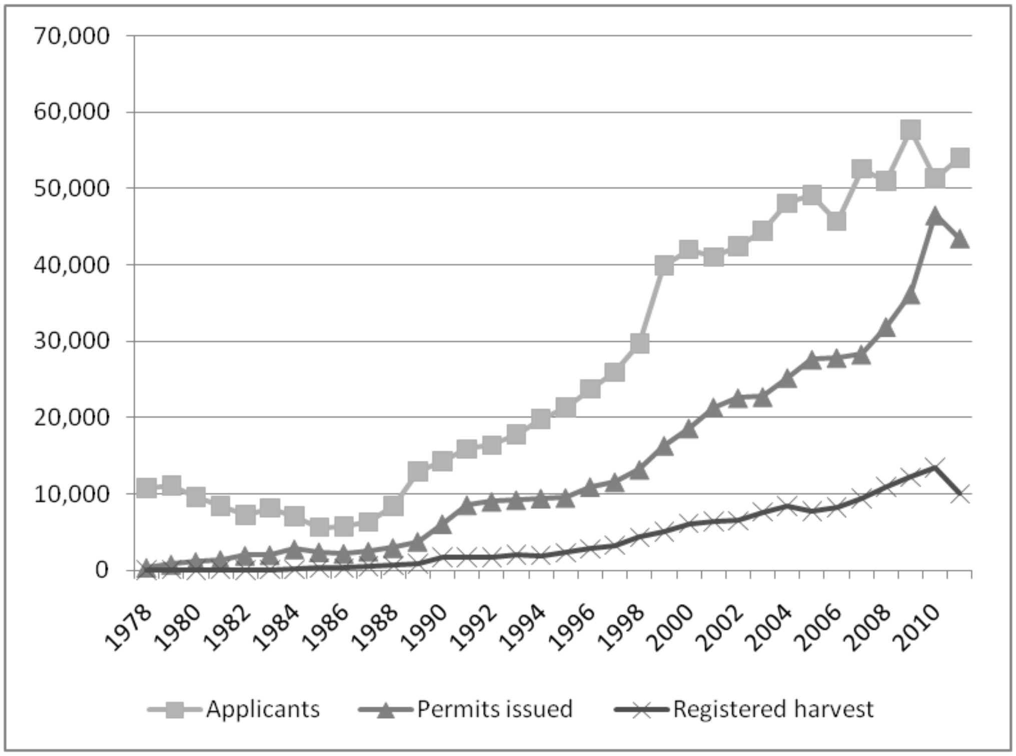


Figure 2. Applicants, permits issued, and registered harvest for the spring wild turkey seasons 1978-2011, Minnesota.

PRAIRIE-CHICKEN HARVEST IN MINNESOTA DURING 2010

Michael A. Larson, Forest Wildlife Populations and Research Group

INTRODUCTION

Hunting seasons for prairie-chickens (*Tympanuchus cupido pinnatus*) in Minnesota were closed from 1943 through 2002. During October 2003 a limited-entry, 5-day hunting season for prairie-chickens was held within 7 contiguous permit areas in western Minnesota. Opportunities to purchase a hunting permit were awarded through a lottery system, and each licensed hunter could harvest a maximum of 2 prairie-chickens. The same format for prairie-chicken hunting seasons has been implemented annually since 2003. The only changes that have occurred were adding 4 new permit areas in 2006 (Figure 1) and increasing the quota of hunters in some permit areas.

Only residents of Minnesota are eligible for the prairie-chicken lottery. They may apply to the lottery as an owner or tenant of ≥40 acres of grassland within a permit area (i.e., landowner). Twenty percent of the available permits in a permit area are awarded in a lottery consisting of only landowner applicants. Any permits not awarded in the landowner lottery are then included with the other 80% of permits to be awarded in a subsequent lottery for regular applicants. Any landowners who are unsuccessful in the landowner lottery are also included in the subsequent lottery. The permits within each permit area are awarded first to people who have applied the greatest number of years since last winning a permit.

Lottery winners must purchase a prairie-chicken hunting permit (i.e., license) before they hunt prairie-chickens. Permit areas 804A–811A (i.e., those south of U.S. Highway 2) are in an area that is closed to the hunting of sharp-tailed grouse (*Tympanuchus phasianellus*). Licensed prairie-chicken hunters in those permit areas, however, are allowed to take a regular bag limit of sharp-tailed grouse while hunting prairie-chickens.

The objective of the hunter survey described below is to document results of prairie-chicken hunting seasons.

METHODS

The Electronic Licensing System (ELS) automatically recorded all lottery applications, lottery results, and purchases of permits. Prairie-chicken hunters are not required to register their harvested birds in the ELS, so during the week before the hunting season I sent a postcard survey by mail to all people who were successful in the lottery. Approximately 3 weeks later I sent the postcard survey a second time to people who had not responded to the first mailing. The survey consisted of the following 5 questions: did you hunt, how many days did you hunt, how many prairie-chickens did you bag, how many sharp-tailed grouse did you bag while hunting for prairie-chickens, and how satisfied were you with the hunt?

To summarize hunting results for this report I used only responses from lottery winners who purchased a hunting permit. I checked to ensure that responses from people who replied to the first mailing were similar to responses from people who replied to the second mailing. Then, to estimate the numbers of hunters and birds harvested, I assumed that nonrespondents would have had the same average response as all those who responded to either mailing of the survey.

RESULTS AND DISCUSSION

One hundred eighty-six prairie-chicken hunting permits were available during 2010. There were 186 lottery winners (Table 1), and 14 of them were landowners. There were fewer applicants than there were permits available in permit area 801A. One hundred forty-seven lottery winners purchased a permit. Four lottery winners reported hunting but did not purchase a permit, so for the purposes of this summary I considered there to be 151 permit purchasers in 2010. The postcards of 3 purchasers were returned as undeliverable, so survey response rates were based on a sample size of 148. Ninety-nine permit purchasers (67%) responded to the first mailing of the survey, and 25 (17%) responded to the second mailing, so the response rate of purchasers was 84% (i.e., 124 of 148).

Fourteen purchasers who responded to the survey reported that they did not hunt (11%), and 110 respondents reported hunting, so there were an estimated 133 hunters (i.e., purchasers who went afield; Table 2). Hunters hunted an average of 2.0 days during the 5-day season (23–27 October 2010). Hunters reported harvesting 63 prairie-chickens, and the estimated total harvest was 87 prairie-chickens (Table 2). These totals for harvest included results from a hunter who reported harvesting 10 prairie-chickens, which may be questionable. Only 2 of the 730 responses to our survey since 2003 were from hunters who reported harvesting as many as 4 prairie-chickens during a single season. I estimated that 49 hunters bagged at least 1 prairie-chicken (37%, Table 2). The average rating for hunter satisfaction on a 1–5 scale was 3.0 (median = 3), and 68% of the 116 respondents to this question reported a satisfaction level of 3 or greater. Hunter satisfaction is highly correlated with hunter success (Spearman's $r = 0.81$, $n = 7$ years, Table 3).

The prairie-chicken harvest and hunter success rate during 2010 were lower than during most years since 2003 (Table 3). This may have been due to poor weather conditions during the hunting season, relatively low densities of birds during the fall, or a combination of both. Thirty-four (27%) of the 124 purchasers who responded to the survey mentioned experiencing poor weather, including high winds and rain. This percentage was not higher among the subset of purchasers who reported not hunting (4 of 14 = 29%) or lottery winners who did not purchase a permit (2 of 26 = 8%). During 2004 when the hunter success rate was equally low, 33% of hunters reported poor weather conditions.

Although the number of male prairie-chickens counted at booming grounds during spring surveys has declined from 17.2 (14.1–20.3) in 2004 to 9.6 (8.4–10.8) in 2010, the density of booming grounds has remained relatively constant at approximately 0.13/km^2 (0.08–0.19/km^2). There is a moderate degree of correlation between the total number of males observed in survey blocks during spring and total harvest during the fall since 2006 (i.e., when >180 permits have been available; Kendall's $\tau = 0.6$, $n = 5$ years, Table 3). The correlation coefficient (τ) is on a 0–1 scale and is not closer to 1 because (1) survey counts are not a perfect reflection of spring bird densities, (2) reproductive success (i.e., the number of juvenile birds in the fall population per adult in the spring population) varies from year to year, and (3) factors other than bird density contribute to annual variation in hunter success (e.g., weather conditions during the hunting season).

Prairie-chicken hunters reported bagging 15 sharp-tailed grouse while hunting prairie-chickens, and the estimated harvest was 19 sharp-tailed grouse. These sharp-tailed grouse were harvested from permit areas 802A–805A and 809A–810A, and the greatest sharp-tailed grouse harvest was from permit area 805A (Figure 1).

ACKNOWLEDGEMENTS

I appreciate the help of Laura Gilbert in preparing and mailing the survey and in data entry, and comments from Mark Lenarz and Wes Bailey helped me improve the clarity of the report.

Table 1. Results of the lottery for prairie-chicken hunting permits in Minnesota during 2010.

Permit area	Permits available	No. of applicants	Lottery winners		Permit purchasers	
			Number[a]	Proportion	Number	Proportion[b]
801A	10	9	9	1.00	4	0.44
802A	10	18	10	0.56	6	0.60
803A	10	10	10	1.00	10	1.00
804A	17	39	18	0.46	16	0.89
805A	20	62	20	0.32	19	0.95
806A	17	39	17	0.44	16	0.94
807A	25	61	25	0.41	21	0.84
808A	20	28	20	0.71	16	0.80
809A	20	44	20	0.45	16	0.80
810A	27	82	27	0.33	16	0.59
811A	10	29	10	0.34	7	0.70
All	186	421	186	0.44	147	0.79

[a] Extra permits may be awarded in a permit area when the last applicant selected in the lottery applied as a member of a hunting party.
[b] Proportion of lottery winners who purchased a permit.

Table 2. Hunter harvest of prairie-chickens in Minnesota during 2010.

Permit area	No. of hunters[a]		Birds harvested		Birds per harvester[b]	Success rate[c]
	Self-reported	Estimated	Self-reported	Estimated		
801A	2	4	0	0		0.00
802A	6	7	2	2	1.0	0.29
803A	7	9	3	4	1.0	0.44
804A	14	14	10	11	1.6	0.50
805A	15	17	2	2	1.0	0.12
806A	12	15	6	8	1.1	0.47
807A	14	18	9	13	1.4	0.50
808A	10	15	11	18	2.3	0.53
809A	11	13	7	11	1.8	0.46
810A	13	15	13[d]	18[d]	4.5[d]	0.27
811A	6	6	0	0		0.00
All	110	133	63[d]	87[d]	1.8	0.37

[a] Number of permit purchasers who actually went hunting.
[b] Estimated number of prairie-chickens harvested per successful hunter.
[c] Proportion of estimated hunters who harvested ≥1 prairie-chicken.
[d] One hunter reported harvesting 10 prairie-chickens, which may be questionable.

Table 3. Annual summary of prairie-chicken hunting results in Minnesota during 2003–2010.

Year	Permits available	Applicants	Hunters[a]	Birds harvested	Success rate[b]	Hunter satisfaction[c]
2003	100	853	92	115	0.68	4.4
2004	101	759	87	51	0.37	3.6
2005	110	500	86	90	0.58	4.0
2006	182	512	149	92	0.40	3.6
2007[d]	187	519		122	0.53	
2008	186	535	137	141	0.62	3.9
2009	186	512	141	120	0.54	3.4
2010	186	421	133	87[e]	0.37	3.0

[a] Estimated number of people who went hunting, not the number of permit purchasers.
[b] Proportion of hunters who harvested ≥1 prairie-chicken.
[c] Average on a 1–5 scale.
[d] No hunter survey was conducted for the 2007 season; results are from the Electronic Licensing System only.
[e] One hunter reported harvesting 10 prairie-chickens, which may be questionable.

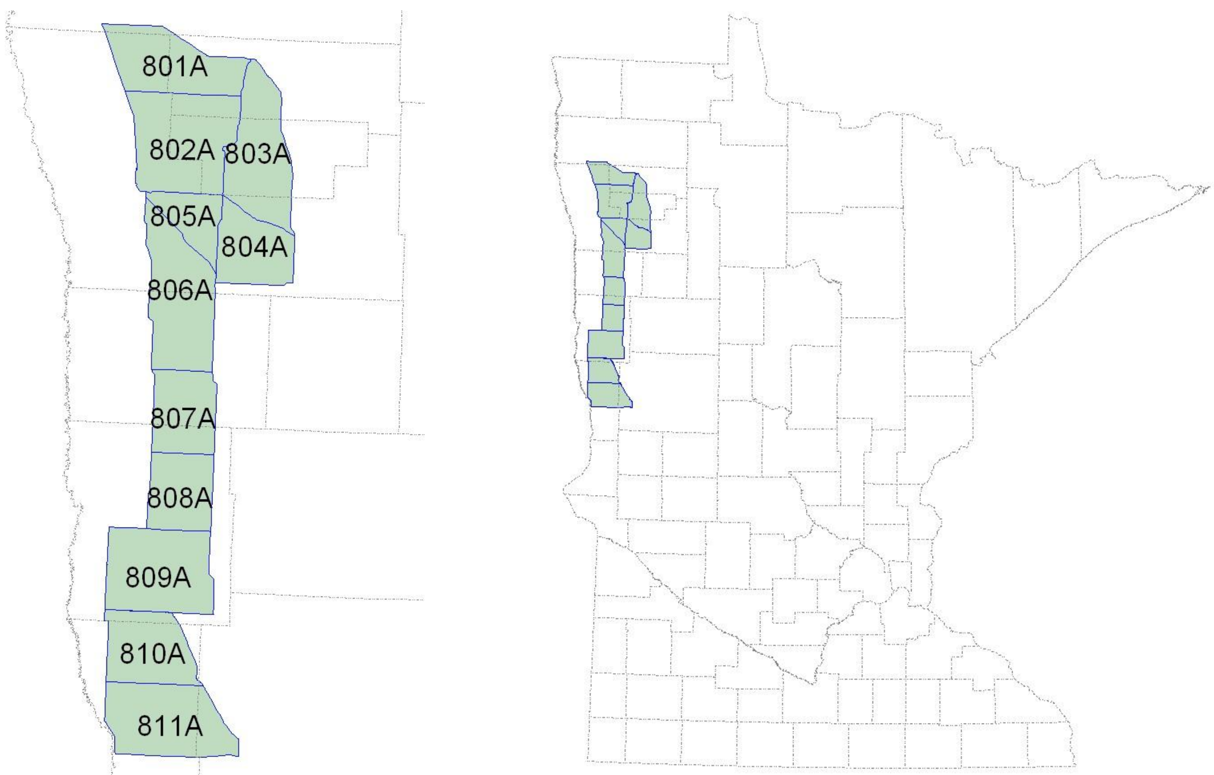


Figure 1. Map of permit areas for prairie-chicken hunting in Minnesota (top) and their location relative to counties within the state (bottom).

2010 MINNESOTA BEAR HARVEST REPORT

David Garshelis, Karen Noyce, Forest Wildlife and Populations Research Group

INTRODUCTION

The Minnesota bear range is divided into 11 bear management units (BMUs; Figure 1). Each has a separate quota on hunting licenses. Outside the primary bear range, where bear depredation to crops is a primary concern, license sales are unlimited (no-quota area). Hunters in this area can harvest two bears, and beginning in 2005 hunters could purchase both a quota and no-quota license. In all areas the season runs from September 1 through mid-October. About 80% of hunters use bait. This report summarizes status and trends in harvests and population size and structure.

METHODS

Successful hunters must register their bears at designated registration stations. Stations are not staffed by DNR personnel. Harvest data are a simple tally of these registrations, which for the most part are done electronically. Hunters also are required to submit a tooth from harvested bears (compliance ≈ 70%), which is used to estimate age. Some years, including this year, they were also requested to submit a section of rib bone. Hunters receive a postage-paid tooth envelope when they register their bear, and extract and submit the tooth and rib samples themselves. Teeth samples are used to estimate harvest age structure. Rib samples are used to check for tetracycline, the biomarker that is used to obtain statewide mark–recapture population estimates. The most recent tetracycline-marking was done in the summer of 2008, and samples were collected that year to derive a preliminary population estimate. Tetracycline persists in bones for several years, so the collection in 2009 and 2010 helps to refine the 2008 estimate.

RESULTS

Permit applications in 2010 increased to the highest level in 8 years (Table 1). This may have been in response to the diminished number of permits available, which was the lowest since 1994. The estimated number of hunters in the field (9,200) was equivalent to that of 1994. Total harvest (2,699) remained high, however, because success rate (29%) was high. The high success rate appears largely attributable to the reduced number of hunters. Success rates (and hunter effort to kill a bear) are inversely related both to abundance of natural foods and to hunter numbers (Figure 2).

Permits were reduced in 2010 in 5 of 11 BMUs in the Quota Zone (Figure 1), to reduce harvest pressure and increase hunting success (i.e., hunter satisfaction)(Table 2). Due to this reduction, no BMU was undersubscribed and thus no surplus licenses were offered (Table 3).

As permit allocations were significantly reduced in all BMUs over the past 5 years, the percentage of applicants drawn in the lottery diminished. In 2010, >50% of first-year applicants were selected in only 4 BMUs (13, 22, 25, 51); all second-year applicants were drawn, except in BMU 44 (Table 4).

Because of reduced permits and hunter numbers, 2010 harvests were equal to or below the 5-year mean in all quota-area BMUs (Table 5). However, BMU 45, which had shown a precipitous decline in 2009, increased in 2010. No-quota harvest equaled the 5-year mean. BMU 11 continued a pattern of high harvests in odd-numbered years, followed by a low harvest in even-numbered years. BMU 11b (no-quota zone between BMU 11 and 52; Figure 1) has few bears and few hunters, but harvests seem to be increasing.

Hunting success was above the 5-year mean for all BMUs except 12 and 41, and was especially high in BMUs 13 and 45 (Table 6). Permits had been cut most severely in BMU 45 (1/3 of the 2007 permit allocation) because of a perceived decline in bear numbers. Increased hunting success there in 2010 may indicate a population rebound and/or less competition among hunters (fall foods were average).

Chronology of the harvest in 2010 was typical, with 69% of bears harvested in the 1st week and 84% by the end of the 2nd week (Table 7).

A combination of two key factors, fall food abundance and number of hunters, accounts for 86% of the yearly variation in the harvest since 1984 (Figure 3). The regression based on these two variables predicted a higher harvest than actually occurred during 2002–2009, but the prediction was accurate for 2010, probably because of reduced hunter numbers. Above some threshold, increased hunter numbers (competition among hunters) disproportionately reduces hunting success. A tighter fit for this regression is exhibited by the subset of data since 2000, where variation in hunter numbers has been less extreme.

Statewide, ages of harvested females have steadily declined for about 2 decades (decline in median age and increase in proportion of 1-2 year olds; Figs. 4-5), reflecting increasingly higher harvest levels over this period. Conversely, the age of harvested males has remained fairly constant for >10 years. Sharp declines in female ages occurred in BMUs 24 and 25 in 2010.

A total of ~470 bears were marked with tetracycline baits in 2008; 4,023 rib and teeth samples from harvested bears were examined during 2008−2010, of which 113 (2.8%) were marked. A range of population estimates was obtained each year, depending on which recovery sample was used (Figure 6). The most reliable estimates indicate a population decline from 2002–2008.

DISCUSSION

Harvests of bears remained consistently high during 2003–2007 (Table 1), masking an apparent decline in the population. These high harvests (>3000 bears) were due to consistently high hunting success. A reduction in permits, and thus number of hunters, reduced the harvest during the next few years, and likely enabled the population to grow; however, no data on population size or trend is available after 2008.

The population is being managed at a level that provides good hunting opportunities but also socially tolerable nuisance activity. There is no target population number, but rather a range that meets these criteria. In fact, the target population is likely to fluctuate. With a smaller population size during the 1980s, nuisance activity was often intolerable (during poor food years, at least). Since 2002, nuisance complaints have been consistently low, reflecting consistently good natural food supplies as well as a change in behavior of people (better at removing attractants, such as garbage and birdseed, and also less apt to complain about bears). Thus, it is possible that the population could grow to a higher level (e.g., 25,000) and still be publicly acceptable.

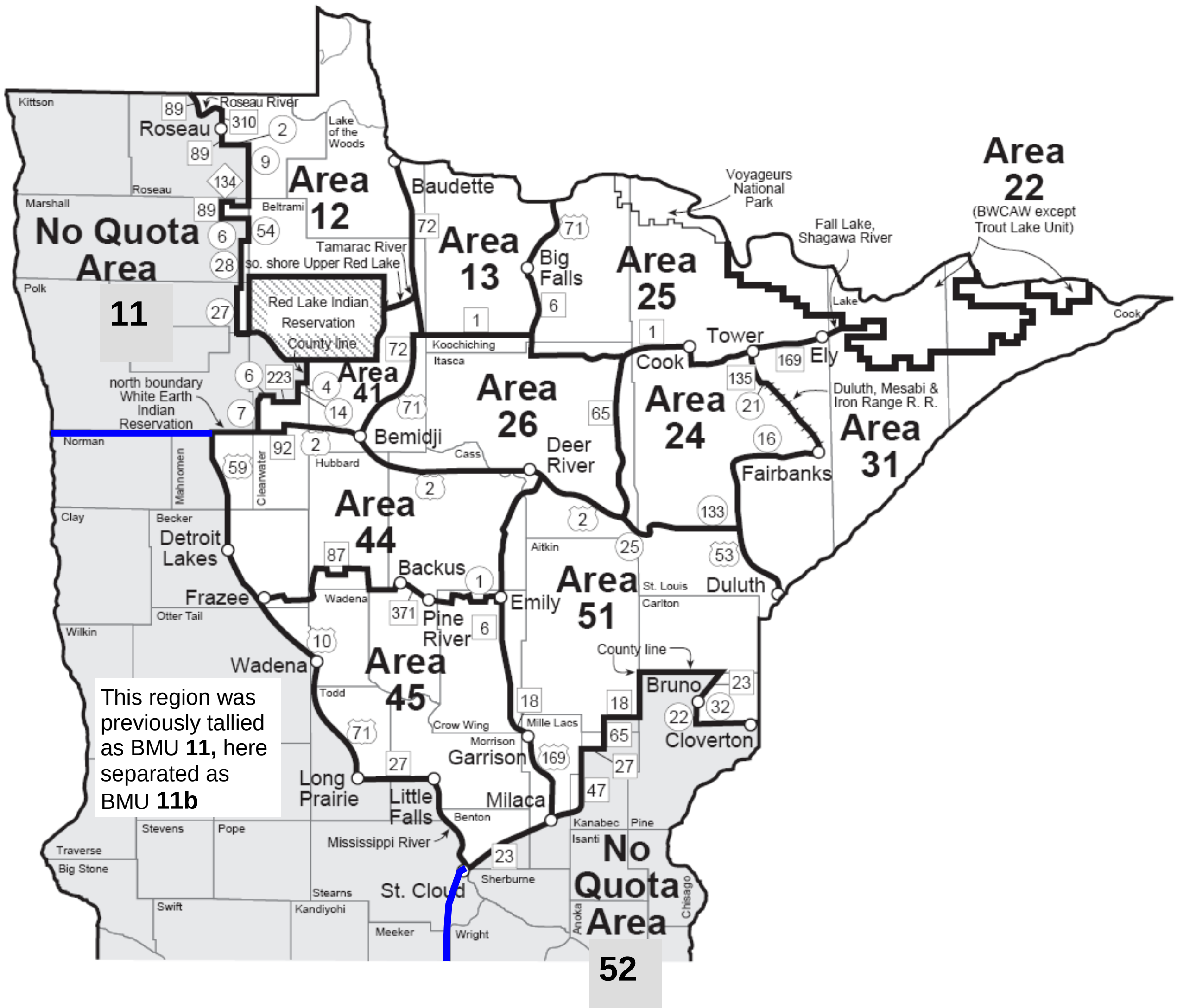


Figure 1. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1990–2010.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Permit applications	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]
Permits available	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500
Licenses purchased (total)	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689
Quota area [b]	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086
Quota surplus/military [b]												235	209	2554	1356	1591	1561	526	233	77[c]	83[c]
No-quota area [b]	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520
% Licenses bought [d]																					
Of permits available [d]	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6
Of permits issued [d]									84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2	73.8	74.5
Estimated no. hunters [e]	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200
Harvest	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699
Harvest sex ratio (%M) [f]	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59
Success rate (%) [g]																					
Total harvest/hunters	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29
Quota harvest/licenses	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008: *n* = 528, 2009 *n* = 835; 2010 *n* = 1194).

[b] Quota area established in 1982. No-quota area established in 1987. Surplus licenses from undersubscribed quota areas sold beginning in 2000; originally open only to unsuccessful permit applicants, but beginning in 2003, open to all. Total licenses = quota + quota surplus + no-quota + military (no permit needed) + youth.

[c] Free licenses for 10 and 11 year-olds were available beginning 2009 (2009: *n* = 45; 2010: *n* = 86), and included here with military licenses.

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3). Beginning in 2008, some permits were issued for area 99; these are no-hunt permits, just to increase preference, and are not included in this calculation.

[e] Number of licensed hunters x percent of license-holders hunting. Percent hunting is based on data from bear hunter surveys conducted during 1981–91, 1998 (86.8%), 2001(93.9%) and 2009 (95.3%).

[f] Sex ratio as reported by hunters; hunters classify about 10% of female bears as males, so the actual harvest has a lower %M than shown here. In good food years, the harvest is more male-biased.

[g] Success rates in 2001–2010 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2010, 38 hunters took more than 1 bear (34 took 2 bears on NQ license, 4 took 1 quota and 1 NQ bear [on 2 separate licenses]): thus, the 2699 bears were taken by 2661 different hunters, so success = 2661/9200 = 29%.

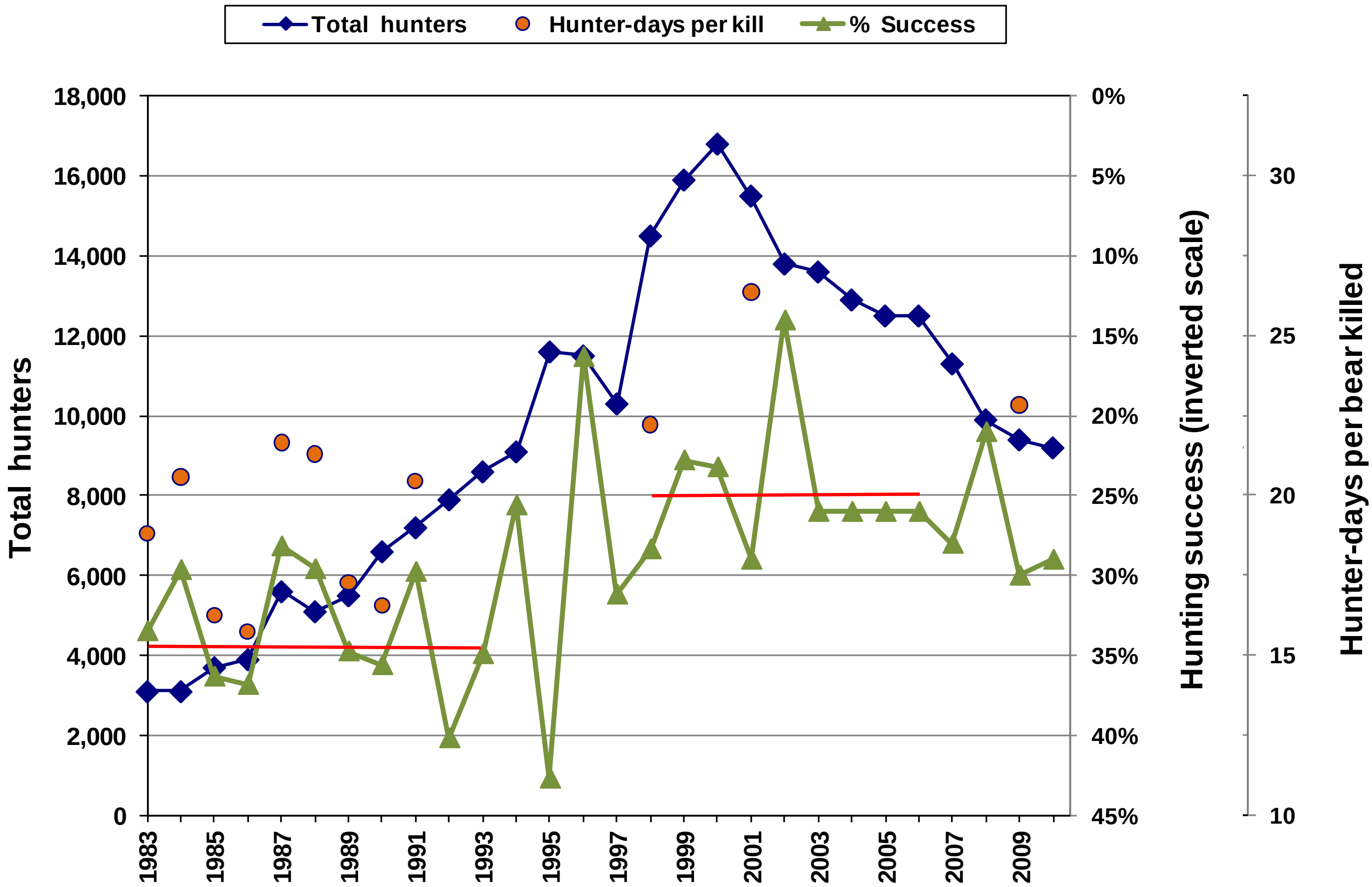


Figure 2. Relationship between hunting success (note inverted scale), hunter-days per bear killed, and hunter numbers, 1983–2010. Red horizontal lines show mean hunting success for periods with <9000 hunters vs >12,000 hunters. Other variation in hunting success is mainly attributable to food conditions.

Table 2. Number of bear hunting permits available per year, 2006–2010 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2010	2009	2008	2007	2006
12	450	450	450	500	550
13	600	600	650	700	800
22	100	150	150	150	150
24	550	650	750	900	1000
25	1200	1250	1550	1700	1900
26	900	1000	1150	1250	1500
31	1300	1300	1700	1900	2100
41	400	400	400	400	450
44	1100	1100	1350	1500	1700
45	400	600	1000	1200	1200
51	2500	2500	2700	3000	3500
Total	9500	10000	11850	13200	14850

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2006–2010[a]. Shaded values indicate undersubscribed areas (none in 2010).

BMU	2010		2009		2008		2007		2006	
	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought	Apps	Surplus bought
12	903	5[c]	876		857		811		1005	
13	753		700		709		745		680	120 100%
22	114		91	0[b]	85	50 77%	87	51 81%	92	58 100%
24	971		843		825		742	159 100%	624	367 98%
25	1811	5[c]	1694		1793	4[c]	1799		1789	112 100%
26	1959		1874		1999	2[c]	2028		1915	
31	2414		2423		2388	3[c]	2383		2290	
41	718		685		656		577		683	
44	2923		2787		2821		2669		2838	
45	937		941		873	128 100%	936	266 100%	840	360 100%
51	3950	1[c]	3822		3828		3568		2969	531 100%
Total	17453		16736		16834	178 92%	16345	476 98%	15725	1548 ~100%

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[C] Courtesy licenses issued by Commissioner, not actual surplus.
[d] Beginning in 2008, applicants could apply for area 99 in order to receive preference, but not buy a license; these are not included in this total.

Table 4. Percentage of lottery applicants with preference level 1 (1st-year applicant) that were drawn for a bear permit, 2006–2010. All preference level 2 applicants were drawn, except as indicated.

BMU	2010	2009	2008	2007	2006
12	23	29	37	46	43
13	77	84	92	94	100
22	88	100	100	100	100
24	49	75	91	100	100
25	60	72	86	94	100
26	15	32	43	53	72
31	35	43	68	79	92
41	31	37	47	59	56
44	0[a]	3	26	38	44
45	24	61	100	100	100
51	52	58	67	84	100

[a] 90% of preference level 2 applicants selected.

Table 5. Minnesota bear harvest tally [a] for 2010 by Bear Management Unit (BMU) and sex compared to harvests during 2005–2009 and record high harvests.

	2010											
BMU	M	(%M)	F	U	**Total**	**2009**	**2008**	**2007**	**2006**	**2005**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	72	(76)	23	0	95	140	101	124	70	165	120	263 (01)
13	89	(57)	66	0	155	149	129	163	151	205	159	258 (95)
22	5	(56)	4	0	9	7	7	15	15	8	10	41 (89)
24	68	(55)	56	0	124	151	100 [b]	134	194	144	145	288 (95)
25	197	(64)	110	0	307	344	298 [b]	369	421	404	367	584 (01)
26	128	(55)	104	0	232	228	137 [b]	315	314	285	256	513 (95)
31	217	(60)	146	0	363	384	248 [b]	398	482	445	391	697 (01)
41	36	(51)	35	0	71	104	77	104	40	104	86	201 (01)
44	122	(49)	126	0	248	255	196	333	192	273	250	643 (95)
45	30	(52)	28	0	58	42 [c]	72	113	118	107	90	178 (01)
51	294	(59)	207	0	501	416	344	557	721	505	509	895 (01)
Total	1258	(58)	905	0	2163	2220	1709	2625	2718	2759 [d]	2406	4288 (01)
No Quota [e]												
11	114	(64)	64	0	178	315	172	324 [f]	114	334	252	351 [d] (05)
11b [g]	8	(73)	3	0	11	9	3	4	6	1	5	
52	204	(59)	142	1	347	257	251	219	400	223	270	400 (06)
Total	326	(61)	209	1	536	581	426	547	520	581 [d]	531	678 (95)
State	1584	(59)	1114	1	**2699**	2801	2135	3172	3290 [d]	3340 [d]	2948	4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes sometimes differs from the registered sex (2010: 1876 [96%] unchanged; 43 $M_{(reg)} \rightarrow F_{(tooth)}$; 28 F→M). Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2010: 1981 of 2699 = 73%). Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally:

Year	Quota area	No-quota area
2005	179	31
2006	63	15
2007	27	9
2008	23	4
2009	19	14
2010	20	8

[b] Lowest harvest since 1996.

[c] Second lowest harvest in this BMU, since it was established in 1994.

[d] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value does not match column total because BMU data were uncorrected for lost registration data.

[e] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 28 in 2006, 27 in 2007, 14 in 2008, 3 in 2009, 14 in 2010). Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear, but these were recorded in the BMU where they were assigned, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[f] Second highest harvest for this area. Third highest was 321 bears in 2001.

[g] Subset of BMU 11 south of the main harvest area (Fig 1). Harvest trend increasing.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold [a], 2005–2010.

BMU	Mean success 2005-2009	2010		2009		2008		2007		2006		2005[b]	
		% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]	% Success	% 2 bears[c]
Quota	26												
12	33	30		39		32		36		19		41	
13	29	34[d]		32		28		31		24		32	
22	12	14		16[d]		8		14		14		10	
24	23	29		31[e]		20		20		25		20	
25	31	34		36		28[f]		31		30		30	
26	30	34		31		17[f]		36		30		34	
31	30	36		38[d]		21[f]		28		33		31	
41	28	25		34		27		35		13		31	
44	24	28		30		21		30		16		24	
45	12	21[e]		11[f]		11[f]		14		14		13	
51	23	27		23		19		27		28		18	
No Quota	21		(7)[g]	22[h]	(9)	17[f]	(9)	19	(12)	22	(9)	23	(10)
Statewide	25	27		28[d]		20		26		25		25	

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the rate of hunting by licensed hunters are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] For 2005, estimated registered harvest was used instead of known registered harvest due to a large loss of registration data.

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal only in the no-quota area since 2002.

[d] Highest success since 1997

[e] Highest success since 1995.

[f] Lowest success since 2002.

[g] Of the no-quota hunters in 2010, 11 took 2 bears in BMU 11 and 23 took 2 bears in BMU 52.

[h] Success rates in different parts of the no-quota area (Figure 1) are not distinguishable from harvest records because the number of people that hunted in each BMU is unknown. However, a hunter survey conducted following the 2009 hunting season indicated the following success rates: BMU 11 – 42%; BMU 11b – 17%; BMU 52 – 19%. These values are not directly comparable to values tabulated here due to a non-response bias in the survey (non-successful hunters are less likely to respond; respondents indicated overall success rate of 31% vs 22% calculated from harvest/licenses); nevertheless, they reflect differences in success rates among these BMUs that year (notably a year when harvest was high in BMU 11).

Table 7. Cumulative bear harvest (% of total harvest) by date, 1990–2010.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56 [a]	70	87
1997	Mon		76	88	97
1998	Tue		76	87	96
1999	Wed		69	81	95
2000	Wed	57	72	82	96
2001	Wed	67	82	88	98
2002	Sun		57 [a]	69	90
2003	Mon		72	84	96
2004	Wed		68	82	95
2005	Thu		72	81	94
2006	Fri		69	83	96
2007	Sat		69	82	96
2008	Mon		58 [a]	71	92
2009	Tue		74	86	96
2010	Wed		69	84	96

[a] The low proportion of total harvest taken during the opening week (<60%) reflects a high abundance of natural foods.

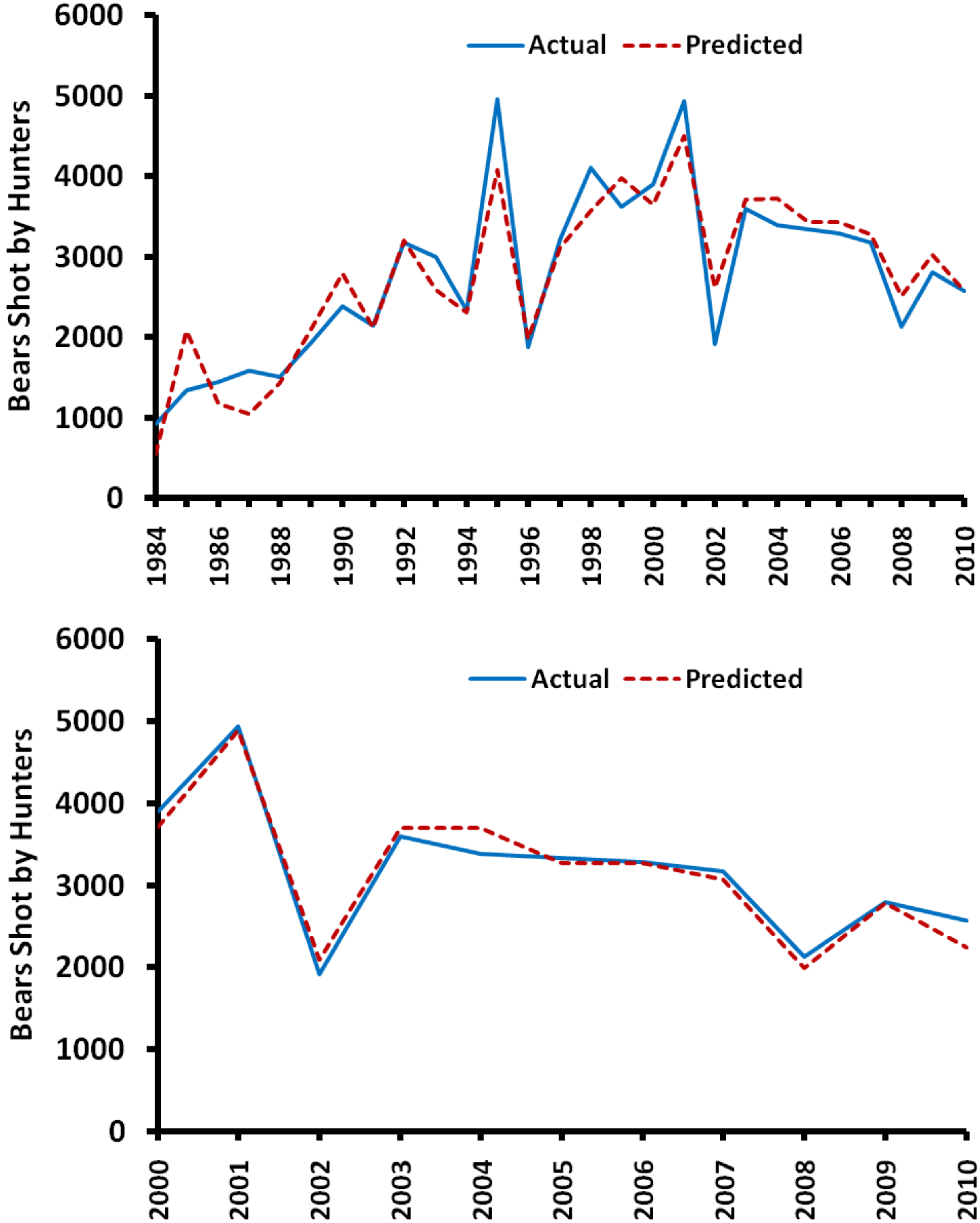


Figure 3. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984–2010 (R^2=0.86); (bottom graph) 2000–2010 (R^2=0.96).

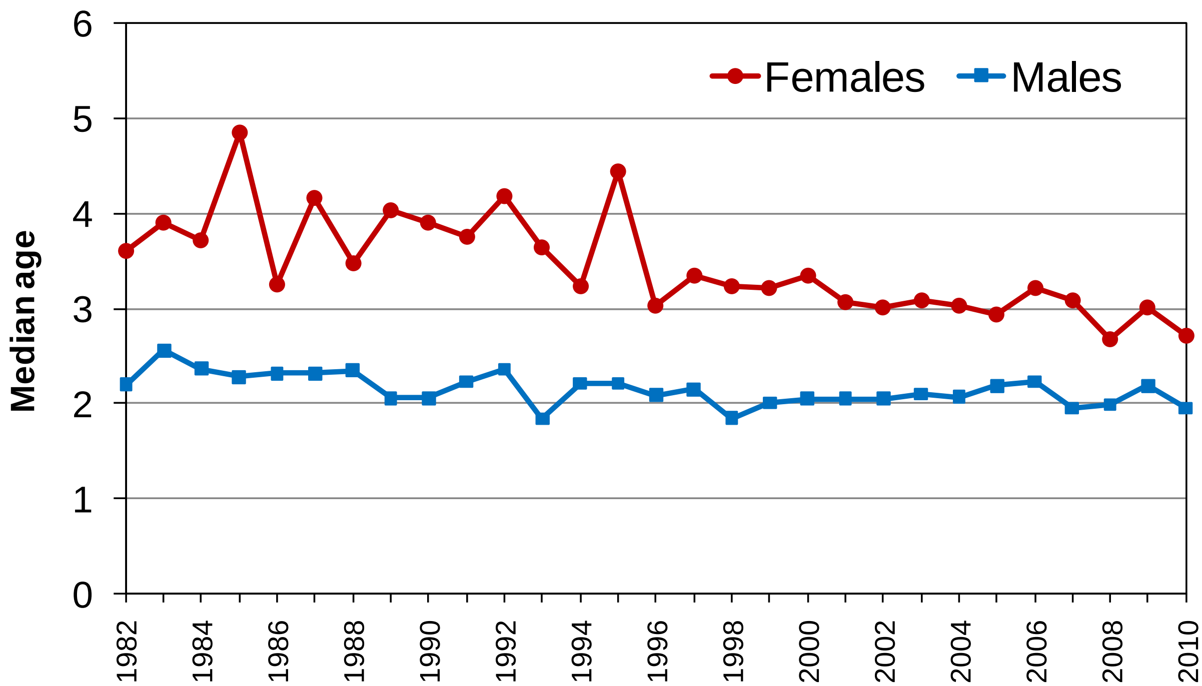


Figure 4. Statewide harvest structure: median ages (yrs) by sex, 1982–2010.

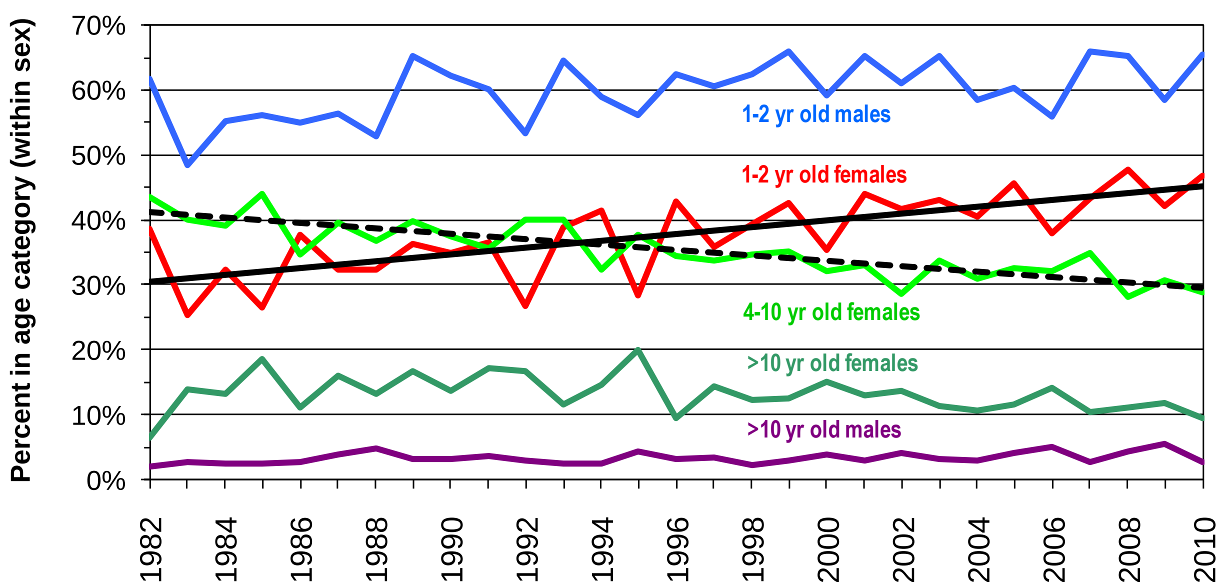


Figure 5. Statewide harvest structure: proportion of each sex in age category, 1982–2010. Trend lines are significant.

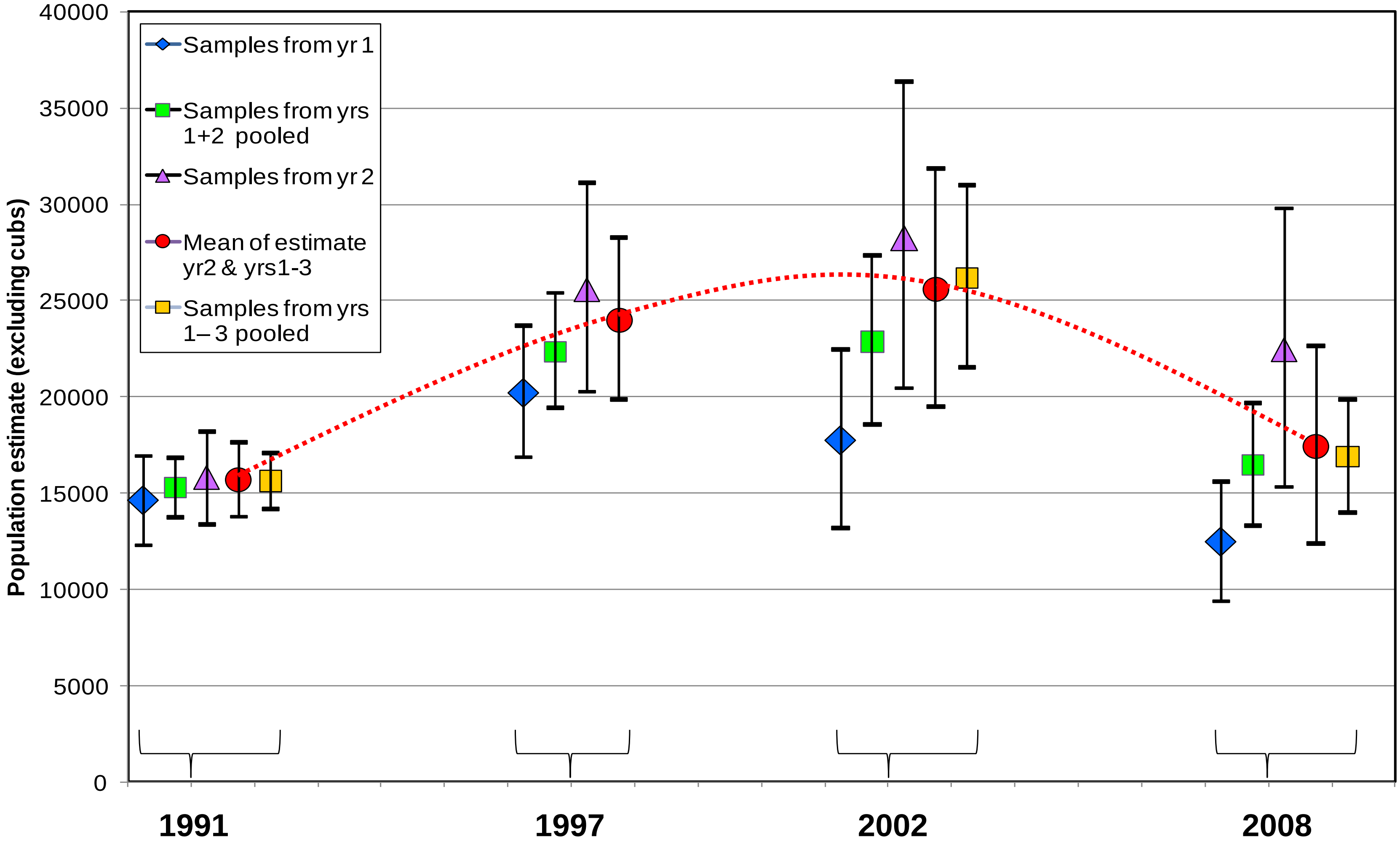


Figure 6. Statewide population estimates derived from tetracycline marking in 1991, 1997, 2002, and 2008. Each cluster of estimates pertains to the year of marking, with each point (and associated 95% CI) representing a different recapture sample (yr 1 = year of marking, yr 2 = year after marking). Simulation modeling suggested that estimates derived from samples pooled from multiple years (yellow squares),or the mean estimate from multiple years and yr 2 samples (red circles), are likely to be most accurate; a red trend line is drawn through the points presumed to be most accurate.

2010 MINNESOTA DEER HARVEST REPORT

Lou Cornicelli, Big Game / Season Program Consultant, Division of Fish and Wildlife

INTRODUCTION

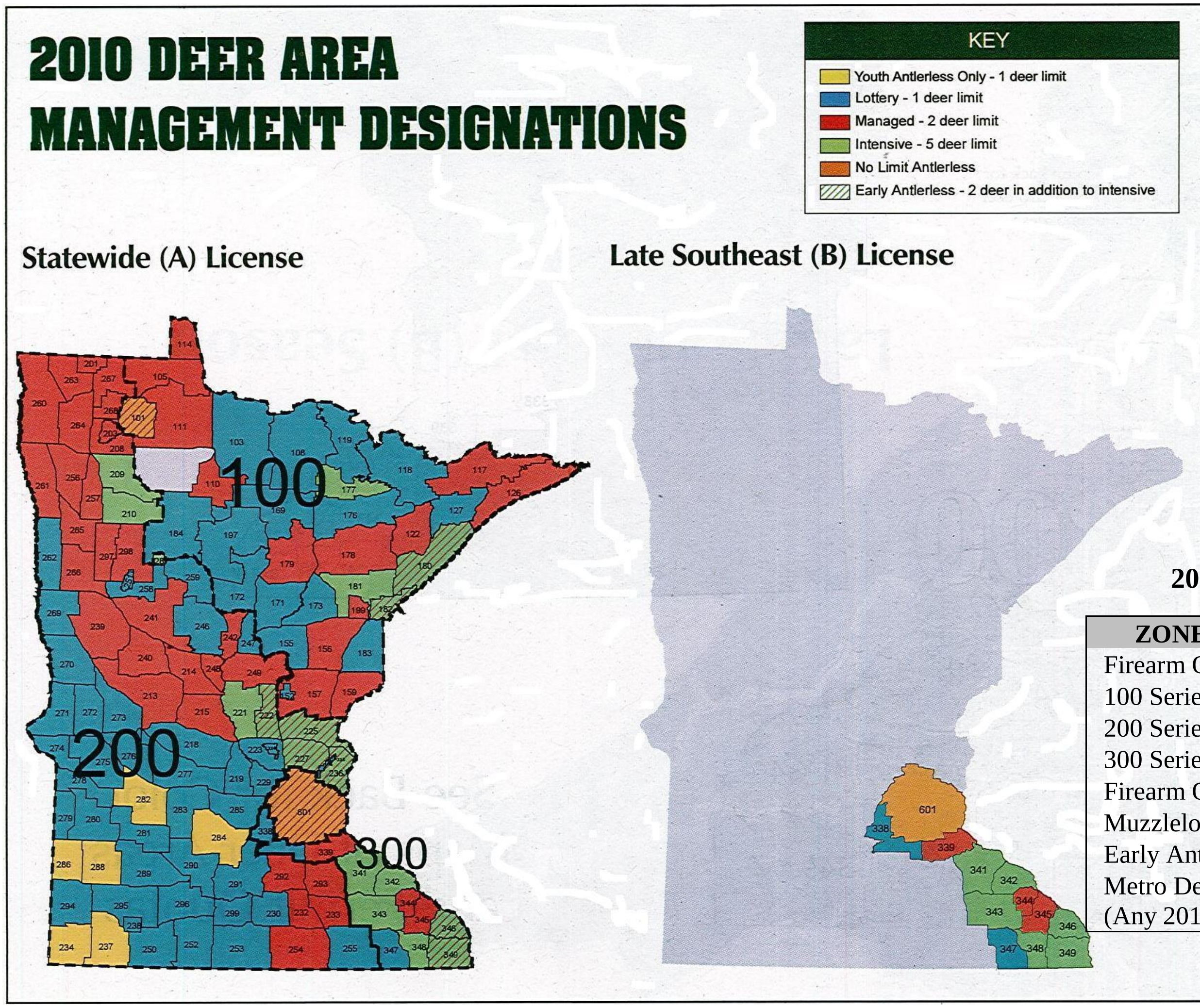
The white-tailed deer may be considered Minnesota's most popular wildlife species. Each year 500,000 hunters harvest over 190,000. In 2010, hunters registered 207,313 deer

METHODS

Every deer taken by hunting in Minnesota must be registered within 24 hours of the close of the season under which the deer was taken. Deer may be registered at any of the 825 to nearly 900 "Big Game Registration" stations available throughout the state. Starting in 2010, deer could be registered using the internet and telephone. Implementation of electronic licensing (ELS) has improved the efficiency and accuracy of deer harvest estimates and provides a more timely release of harvest information. Registered deer are recorded as adult buck, fawn buck, adult doe, or fawn doe. Additional information gathered at time of registration includes date of kill, deer permit area, and season.

RESULTS

Outcome of the 2010 deer harvest are presented in the following tables.



2010 Minnesota Firearms Deer Seasons

ZONE	DATES
Firearm Option Statewide (A)*	
100 Series	Nov. 6-21
200 Series	Nov. 6-14
300 Series	Nov. 6-14
Firearm Option Late Southeast (B)**	Nov. 20-28
Muzzleloader****	Nov. 27-Dec. 12
Early Antlerless Season***	Oct. 23-24
Metro Deer Management Area (601)***	Nov. 6-28
(Any 2010 firearms or muzzleloader.)	

Figure 1. 2010 Firearms and Archery Deer Seasons.

2010 Minnesota Archery Deer Season Dates: September 18-December 31.
Antlerless deer and legal bucks may be taken by archery, except only legal bucks may be taken in permit areas that have no either-sex permits or have youth-only either-sex permits.

Table 1. Statewide Firearms, Archery, and Muzzleloader Harvest, License Sales, and Success Rates, 1999-2010.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
REGULAR FIREARMS												
Resident License Sales	395,745	400,814	401,005	367,964	344,875	309,698	291,298	299,774	285,286	376,006	377,077	379,866
Non-Resident License Sales	9,970	10,595	10,972	10,835	11,334	12,036	12,523	12,520	12,520	11,883	11,759	11,908
Bonus Permit Sales	23,785	34,802	59,013	105,699	194,201	183,186	184,566	167,343	145,522	190,156	140,920	143,763
Multi-Zone Buck License Sales	43,903	42,669	41,921	35,658	32,929	32,359	28,233	15,984	15,051	N/A	N/A	N/A
Youth License Sales	2,038	3,215	4,011	2,884	34,463	51,347	50,501	49,599	49,242	50,397	56,678	59,726
All Season Deer License Sales		2,384	3,986	22,125	30,998	46,008	59,090	75,511	76,385	N/A	N/A	N/A
Total License Sales	475,441	495,289	519,601	545,165	648,800	634,634	626,211	620,731	584,006	628,442	586,434	595,263
Registered Buck Harvest[1]	92,584	102,961	98,894	101,333	110,440	116,612	95,594	95,695	97,528	85,646	83,820	88,027
Antlerless Permits Offered	177,380	232,595	286,540	365,667	31,625	30,760	28,830	18,925	18,830	32,325	60,100	60,083
Antlerless Permits Issued	135,852	180,490	196,603	192,907	25,386	24,111	25,656	18,925	18,830	32,325	60,100	60,083
Antlerless Permits App.	214,597	237,571	225,341	202,086	30,253	28,454	31,403	31,403	31,403	31,403	90,882	86,783
Registered AL Harvest[1]	71,681	88,492	98,169	102,280	147,420	123,278	119,363	135,981	118,860	98,147	78,525	78,525
Registered Total Harvest[1]	164,265	191,453	197,063	203,613	257,860	239,890	214,957	231,676	216,388	183,793	162,345	174,104
Registered % Successful[2]	34.8	38.6	37.9	37.3	39.7	37.8	34.3	37.3	37.1	35.1	32.1	35.6
	407,753	414,624	415,988	381,683	390,672	373,081	354,322	361,893	347,048	438,286	445,514	451,500
ARCHERY												
Resident License Sales	66,226	68,947	69,608	57,532	59,339	50,601	50,293	49,595	52,780	87,872	88,707	91,156
Non-Resident License Sales	1,073	1,271	1,288	1,275	1,428	1,144	1,207	1,286	1,509	1,509	1,610	1,638
Youth Archery Sales	N/A	N/A	N/A	N/A	3,748	7,261	7,489	7,688	7,663	9,005	9,157	9,577
Mgmt Permit License Sales	16,945	20,393	22,141	18,126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total License Sales	84,244	90,611	93,037	76,933	60,767	59,006	58,989	58,569	61,952	99,033	99,474	102,371
Total Harvest - All-Season License					2,356	3,489	4,563	8,284	6,900	N/A	N/A	N/A
Total Archery Harvest	13,376	15,776	15,884	14,744	21,691	20,726	23,538	25,360	24,161	22,632	20,629	22,057
Registered % Successful[2]	15.8	17.4	17.1	19.2	22.3	29.2	24.6	24.8	24.3	18.5	17.5	17.8
MUZZLELOADER												
Total Muzzleloader License Sales	--	11,972	13,043	11,764	9,142	10,512	9,226	10,781	9,867	64,673	63,282	55,640
Estimated All-Season Hunters	--	--	--	--	12,020	14,168	23,293	23,293	26,813	N/A	N/A	N/A
Total Muzzleloader Harvest	2,928	4,548	4,494	3,505	9,466	9,289	15,421	13,507	12,138	9,572	7,929	9,023
Registered % Successful[2]		38.0	34.5	29.8	44.7	37.6	47.4	39.6	28.2	13.4	11.3	14.3
Antlerless Permits Offered												1,212
Antlerless Permits App.												395
TOTAL Registered Harvest	180,569	211,777	217,452	222,050	290,525	260,604	255,736	270,778	260,434	221,837	194,186	207,313

[1] Does not include free landowner licenses

[2] Based on total license sales - does not include all-season deer

Table 2. Deer Harvest by License Type and Zone, 2010.

Firearms/Zone	Hunters	Harvest			Overall Success
		Bucks	Antlerless	Total	
1	152,998	36,850	30,120	66,970	39.7%
2	243,610	45,419	45,008	90,427	33.5%
3A	23,053	3,894	4,864	8,758	32.4%
3B	14,820	1,021	4,664	5,685	32.3%
Early Season	9,212	0	1,372	1,372	13.7%
Free Landowner[1]	3,631	0	1,330	1,330	36.6%
Muzzleloader[2]	63,282	3,038	5,985	9,023	14.3%
Archery[3]	102,371	7,485	14,572	22,057	17.8%
TOTAL[4]	**494,249**	**98,834**	**108,479**	**207,313**	37.4%

[1] Includes deer taken during regular firearms, muzzleloader, and archery seasons.

[2] Total number of people who bought only a muzzleloader license was 7,056.

[3] Includes Camp Ripley. Total number of people who bought only an archery license was 31,874.

[4] Due to the fact that a hunter can buy multiple licenses, hunter numbers are calculated using unique MNDNR numbers.

Table 3. Firearms Harvest and Harvest per Square Mile by Permit Area, 2010. Includes all firearm licenses but does not include early antlerless harvest.

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
101	1A	318	77	218	64	677	496	0.64	0.72	1.36
103	1A	799	63	322	46	1,230	1,824	0.44	0.24	0.67
105	1A	785	163	607	133	1,688	932	0.84	0.97	1.81
108	1A	1127	35	120	26	1,308	1,701	0.66	0.11	0.77
110	1A	1110	205	782	186	2,283	530	2.09	2.21	4.30
111	1A	558	77	307	49	991	1,440	0.39	0.30	0.69
114	1A	43	4	27	6	80	412	0.10	0.09	0.19
117	1A	27	3	5	2	37	1,129	0.02	0.01	0.03
118	1A	760	23	69	17	869	1,445	0.53	0.08	0.60
119	1A	793	56	242	32	1,123	946	0.84	0.35	1.19
122	1A	562	66	262	58	948	622	0.90	0.62	1.52
126	1A	494	42	220	23	779	979	0.50	0.29	0.80
127	1A	115	7	27	7	156	587	0.20	0.07	0.27
152	1A	133	26	55	13	227	62	2.16	1.53	3.68
155	1A	1552	224	829	187	2,792	639	2.43	1.94	4.37
156	1A	1978	453	1468	352	4,251	834	2.37	2.72	5.09
157	1A	2800	692	1982	557	6,031	904	3.10	3.57	6.67
159	1A	1435	306	1100	201	3,042	575	2.49	2.79	5.29
169	1A	1562	239	749	140	2,690	1,202	1.30	0.94	2.24
171	1A	1157	125	384	93	1,759	729	1.59	0.83	2.41
172	1A	1684	146	568	118	2,516	786	2.14	1.06	3.20
173	1A	967	132	471	86	1,656	617	1.57	1.12	2.68
176	1A	1636	84	355	53	2,128	1,150	1.42	0.43	1.85
177	1A	1036	248	913	210	2,407	553	1.87	2.48	4.36
178	1A	2644	537	1752	392	5,325	1,325	2.00	2.02	4.02
179	1A	1925	480	1588	333	4,326	939	2.05	2.56	4.61
180	1A	1296	221	782	185	2,484	999	1.30	1.19	2.49
181	1A	1806	426	1434	353	4,019	746	2.42	2.97	5.39
182	1A	427	74	339	72	912	280	1.53	1.73	3.26
183	1A	1317	192	680	124	2,313	675	1.95	1.48	3.43
184	1A	2841	244	788	173	4,046	1,318	2.16	0.91	3.07
197	1A	1022	114	404	91	1,631	1,343	0.76	0.45	1.21
199	1A	141	15	75	15	246	152	0.93	0.69	1.62
201	2A	97	15	68	23	203	169	0.57	0.63	1.20
203	2A	81	10	35	4	130	132	0.62	0.37	0.99
208	2A	215	59	152	37	463	379	0.57	0.65	1.22
209	2A	559	177	428	119	1,283	641	0.87	1.13	2.00
210	2A	1013	245	786	256	2,300	635	1.59	2.03	3.62
213	2A	1891	567	1540	445	4,443	1,161	1.63	2.20	3.83
214	2A	1349	449	1099	384	3,281	566	2.38	3.41	5.80
215	2A	988	373	853	322	2,536	730	1.35	2.12	3.47
218	2A	850	171	524	143	1,688	912	0.93	0.92	1.85
219	2A	555	135	350	66	1,106	427	1.30	1.29	2.59
221	2A	1044	396	794	357	2,591	647	1.61	2.39	4.01
222	2A	869	298	630	214	2,011	413	2.11	2.77	4.87
223	2A	520	101	269	81	971	385	1.35	1.17	2.52
224	2A	117	24	71	7	219	49	2.39	2.08	4.47
225	2A	1358	416	1046	255	3,075	635	2.14	2.70	4.84
227	2A	826	223	576	202	1,827	491	1.68	2.04	3.72

Table 3. (Continued).

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
229	2A	234	54	115	25	428	313	0.75	0.62	1.37
230	2A	220	29	120	19	388	464	0.47	0.36	0.84
232	2A	239	66	187	55	547	380	0.63	0.81	1.44
233	2A	184	51	140	36	411	386	0.48	0.59	1.06
234	2A	214	1	9	3	227	637	0.34	0.02	0.36
235	2A	54	4	13	4	75	37	1.47	0.57	2.04
236	2A	618	170	445	108	1,341	404	1.53	1.79	3.32
237	2A	239	3	12	5	259	737	0.32	0.03	0.35
238	2A	80	2	11	4	97	98	0.82	0.17	0.99
239	2A	1467	405	1214	339	3,425	1,110	1.32	1.76	3.09
240	2A	1728	462	1298	390	3,878	694	2.49	3.10	5.59
241	2A	3038	886	2456	736	7,116	1,047	2.90	3.90	6.80
242	2A	620	184	534	146	1,484	307	2.02	2.81	4.83
246	2A	2227	371	1166	286	4,050	860	2.59	2.12	4.71
247	2A	746	78	244	31	1,099	263	2.83	1.34	4.17
248	2A	377	102	283	91	853	229	1.65	2.08	3.73
249	2A	1288	482	1089	319	3,178	729	1.77	2.59	4.36
250	2A	341	19	115	14	489	730	0.47	0.20	0.67
251	2A	81	10	43	14	148	68	1.19	0.98	2.17
252	2A	250	30	106	18	404	735	0.34	0.21	0.55
253	2A	333	20	127	19	499	987	0.34	0.17	0.51
254	2A	464	93	371	61	989	946	0.49	0.55	1.05
255	2A	390	33	160	21	604	774	0.50	0.28	0.78
256	2A	446	101	368	92	1,007	654	0.68	0.86	1.54
257	2A	388	67	252	64	771	426	0.91	0.90	1.81
258	2A	858	152	403	100	1,513	381	2.25	1.72	3.97
259	2A	1486	202	694	146	2,528	546	2.72	1.91	4.63
260	2A	442	74	342	58	916	1,252	0.35	0.38	0.73
261	2A	151	15	133	20	319	796	0.19	0.21	0.40
262	2A	232	28	85	10	355	677	0.34	0.18	0.52
263	2A	360	55	187	55	657	513	0.70	0.58	1.28
264	2A	585	139	470	102	1,296	672	0.87	1.06	1.93
265	2A	421	88	356	110	975	495	0.85	1.12	1.97
266	2A	427	88	336	88	939	625	0.68	0.82	1.50
267	2A	206	39	132	26	403	472	0.44	0.42	0.85
268	2A	276	41	180	42	539	239	1.15	1.10	2.25
269	2A	211	30	114	23	378	652	0.32	0.26	0.58
270	2A	209	16	65	11	301	758	0.28	0.12	0.40
271	2A	263	24	104	17	408	646	0.41	0.22	0.63
272	2A	232	16	97	13	358	544	0.43	0.23	0.66
273	2A	450	72	240	38	800	634	0.71	0.55	1.26
274	2A	251	14	45	8	318	381	0.66	0.18	0.84
275	2A	390	17	76	14	497	777	0.50	0.14	0.64
276	2A	539	34	175	32	780	575	0.94	0.42	1.36
277	2A	1200	142	512	95	1,949	876	1.37	0.86	2.22
278	2A	471	29	153	27	680	422	1.12	0.50	1.61
279	2A	233	13	93	11	350	346	0.67	0.34	1.01

Table 3. (Continued).

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
280	2A	257	30	111	12	410	676	0.38	0.23	0.61
281	2A	452	26	121	11	610	579	0.78	0.27	1.05
282	2A	151	3	6	1	161	780	0.19	0.01	0.21
283	2A	300	14	52	4	370	640	0.47	0.11	0.58
284	2A	345	3	18	2	368	853	0.40	0.03	0.43
285	2A	369	57	200	31	657	580	0.64	0.50	1.13
286	2A	290	7	17	2	316	458	0.63	0.06	0.69
287	2A	56	34	145	28	263	51	1.11	4.09	5.19
288	2A	337	7	16	6	366	630	0.54	0.05	0.58
289	2A	157	8	30	4	199	820	0.19	0.05	0.24
290	2A	450	27	179	34	690	666	0.68	0.36	1.04
291	2A	653	62	308	56	1,079	832	0.79	0.51	1.30
292	2A	405	117	343	88	953	517	0.78	1.06	1.84
293	2A	466	110	360	94	1,030	512	0.91	1.10	2.01
294	2A	311	17	53	8	389	689	0.45	0.11	0.56
295	2A	518	32	119	14	683	855	0.61	0.19	0.80
296	2A	287	19	143	15	464	675	0.43	0.26	0.69
297	2A	195	31	148	18	392	449	0.43	0.44	0.87
298	2A	687	151	534	127	1,499	677	1.02	1.20	2.21
299	2A	242	21	97	15	375	389	0.62	0.34	0.96
338	3A	110	11	35	9	165	472	0.23	0.12	0.35
338	3B	41	26	106	25	198	472	0.09	0.33	0.42
339	3A	139	40	105	32	316	406	0.34	0.44	0.78
339	3B	41	30	76	34	181	406	0.10	0.35	0.45
341	3A	425	142	439	119	1,125	626	0.68	1.12	1.80
341	3B	152	160	411	128	851	626	0.24	1.12	1.36
342	3A	378	87	355	99	919	374	1.01	1.45	2.46
342	3B	129	117	371	100	717	374	0.34	1.57	1.92
343	3A	399	139	358	111	1,007	664	0.60	0.92	1.52
343	3B	90	111	234	77	512	664	0.14	0.64	0.77
344	3A	268	60	361	85	774	190	1.41	2.67	4.08
344	3B	53	43	186	42	324	190	0.28	1.43	1.71
345	3A	260	48	170	53	531	335	0.78	0.81	1.58
345	3B	64	73	238	63	438	335	0.19	1.12	1.31
346	3A	550	105	354	72	1,081	328	1.68	1.62	3.30
346	3B	128	108	368	86	690	328	0.39	1.71	2.10
347	3A	300	26	72	12	410	434	0.69	0.25	0.95
347	3B	71	42	166	28	307	434	0.16	0.54	0.71
348	3A	361	86	442	88	977	332	1.09	1.85	2.94
348	3B	64	68	268	56	456	332	0.19	1.18	1.37
349	3A	704	118	511	120	1,453	499	1.41	1.50	2.91
349	3B	188	117	567	139	1,011	499	0.38	1.65	2.03

Table 3. (Continued).

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless /Sq. Mile	Total/ Sq. Mile
601	Metro	628	154	521	105	1,408	1,756	0.36	0.44	0.80
900	Park	3	1	4	1	9				
901	Park	4	1	1	0	6				
902	Park	35	16	69	23	143				
903	Park	0	2	1	0	3				
904	Park	5	3	3	0	11				
905	Park	3	2	4	1	10				
906	Park	3	2	11	1	17				
907	Park	3	1	0	1	5				
908	Park	1	1	3	1	6				
909	Park	1	3	6	3	13				
910	Park	0	8	9	10	27				
911	Park	1	0	1	0	2				
913	Park	0	0	7	1	8				
914	Park	21	6	19	3	49				
915	Park	6	4	4	4	18				
916	Park	40	9	35	12	96				
918	Park	3	2	4	2	11				
919	Park	1	4	4	2	11				
920	Park	3	8	10	6	27				
921	Park	1	0	5	1	7				
922	Park	0	0	2	3	5				
923	Park	15	18	27	9	69				
924	Park	10	5	25	6	46				
925	Park	12	6	34	18	70				
926	Park	0	2	4	1	7				
927	Park	0	4	12	5	21				
928	Metro	10	4	5	1	20				
929	Metro	26	5	46	6	83				
930	Metro	8	5	30	13	56				
TOTAL		**88,027**	**17,318**	**55,114**	**13,645**	**174,104**	**83,282**	1.06	1.03	2.09

Table 4. Firearm Bonus Permit Harvest by Permit Area, 2010.
Managed Permit Areas.

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
105	1A	86	389	91	566
110	1A	118	459	107	684
111	1A	45	179	34	258
114	1A	0	16	3	19
117	1A	1	3	1	5
122	1A	30	136	31	197
126	1A	27	131	17	175
156	1A	238	785	209	1,232
157	1A	316	1,058	316	1,690
159	1A	136	578	114	828
178	1A	272	992	238	1,502
179	1A	286	914	204	1,404
199	1A	8	40	8	56
201	2A	8	41	17	66
203	2A	4	21	3	28
208	2A	33	90	19	142
213	2A	256	715	212	1,183
214	2A	240	550	204	994
215	2A	167	351	160	678
232	2A	27	88	29	144
233	2A	26	72	20	118
239	2A	197	616	200	1,013
240	2A	259	726	211	1,196

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
241	2A	507	1,476	440	2,423
242	2A	92	280	78	450
248	2A	49	139	57	245
249	2A	207	513	153	873
254	2A	37	202	37	276
256	2A	57	213	55	325
257	2A	35	160	41	236
260	2A	41	209	30	280
261	2A	10	78	15	103
263	2A	28	106	27	161
264	2A	79	265	57	401
265	2A	56	204	60	320
266	2A	46	192	58	296
267	2A	24	84	16	124
268	2A	26	104	25	155
292	2A	49	140	42	231
293	2A	51	177	57	285
297	2A	13	79	9	101
298	2A	82	288	66	436
339	3A	26	57	21	104
339	3B	16	35	19	70
344	3A	36	238	54	328
344	3B	15	59	19	93
345	3A	27	107	32	166
345	3B	27	102	28	157
Total		4,416	14,457	3,944	22,817

Table 4. Firearm Bonus Permit Harvest by Permit Area, 2010.

Intensive Permit Areas

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
101	1A	65	189	55	309
177	1A	172	591	154	917
180	1A	139	503	124	766
181	1A	297	922	256	1,475
182	1A	49	230	57	336
209	2A	129	331	104	564
210	2A	174	567	199	940
221	2A	234	489	239	962
222	2A	163	372	152	687
225	2A	241	653	161	1,055
227	2A	142	383	142	667
236	2A	95	295	80	470
287	2A	23	104	20	147
341	3A	96	316	87	499
341	3B	84	238	78	400
342	3A	62	264	78	404
342	3B	65	214	59	338
343	3A	78	261	84	423
343	3B	69	137	44	250
346	3A	70	256	60	386
346	3B	60	208	48	316
348	3A	57	325	66	448
348	3B	38	141	36	215
349	3A	93	358	95	546
349	3B	65	327	81	473
601	Metro	108	364	76	548
Total		2,868	9,038	2,635	14,541

Table 5. Early Antlerless Season Harvest by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	7	14	2	23
180	51	195	52	298
182	25	88	29	142
222	37	67	38	142
225	78	126	60	264
227	28	65	35	128
236	30	47	15	92
346	18	47	18	83
349	22	104	17	143
601	13	32	11	56
Total	309	785	277	1,371

Table 6. Summary of Firearms Special Hunts, 2010. Includes regular, youth, and bonus permits.

Area	Dates	Permits Issued	Harvest: Adult Male	Fawn Male	Adult Female	Fawn Female	Total
900 - Lake Vermilion State Park[1]	11/6-11/14	50	3	1	4	1	9
901 - Rice Lake Nat. Wildlife Refuge	11/6-11/21	40***	4	1	1	0	6
902 - St. Croix State Park[1]	11/12-11/21	450**	35	16	69	23	143
903 - Savanna Portage State Park	11/12-11/15	20***	0	2	1	0	3
904 - Gooseberry Falls State Park[1]	11/13-11/17	30*	5	3	3	0	11
905 - Split Rock Lighthouse State Park[1]	11/6-11/21	30*	3	2	4	1	10
906 - Tettegouche State Park[1]	11/6-11/21	125*	3	2	11	1	17
907 - Scenic State Park[1]	11/6-11/21	30*	3	1	0	1	5
908 - Hayes Lake State Park[1]	11/6-11/21	75*	1	1	3	1	6
909 - Lake Bemidji State Park[1]	11/6-11/21	30#	1	3	6	3	13
910 - Zippel Bay State Park[1]	11/6-11/9	55#	0	8	9	10	27
911 - Judge CR Magney SP[1]	11/6-11/21	N/A*	1	0	1	0	2
912 - Schoolcraft State Park[1]	11/16-11/21	N/A*	0	0	0	0	0
913 - Lake Carlos State Park[1]	11/6-11/9	20#	0	0	7	1	8
914 - William O'Brien State Park[1]	11/6-11/7	70*	21	6	19	3	49
915 - Lake Bronson State Park[1]	11/6-11/14	30**	6	4	4	4	18
916 - Maplewood State Park[1]	11/6-11/9	100*	40	9	35	13	97
917 - Rydell NWR	11/6-11/14	5	0	0	0	0	0
918 - Lake Alexander SNA[1]	11/6-11/14	40*	3	2	4	2	11
919 - Glacial Lakes State Park	11/6-11/7	30#	1	4	4	2	11
920 - Lake Louise State Park[1]	11/13-11/14	25**	3	8	10	6	27
921 - Beaver Creek Valley State Park[1]	11/6-11/7	20**	1	0	5	1	7
922 - Zumbro Falls SNA[1]	11/6-11/14	12#	0	0	2	3	5
923 - Forestville/Mystery Cave SP[1]	11/6-11/8	110**	15	18	27	9	69
924 - Frontenac State Park[1]	11/20-11/22	60**	10	5	25	6	46
925 - Whitewater State Park[1]	11/20-11/21	50**	12	6	34	18	70
926 - Zumbro Falls SNA[1]	11/20-11/28	12#	0	2	4	1	7
927 - Whitewater Refuge	11/20-11/28	60#	0	4	12	5	21
928 - Vermillion Highlands WMA[1]	11/6-11/19	25	10	4	5	1	20
929 - Elm Creek Park Reserve[1]	11/20-11/21	155*	26	46	5	6	83
930 -Lake Rebecca Park Reserve[1]	11/27-11/28	80*	8	30	5	13	56
TOTAL			215	188	319	135	857

1 Bonus permits available *Either sex ** Earn-A-Buck

***Antler Point Restriction #Antlerless Only

Table 7. Free Landowner Firearms Harvest by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
105	2	9	1	12
110	2	20	5	27
111	2	4	0	6
114	0	0	1	1
156	4	11	2	17
157	11	29	13	53
159	0	3	0	3
177	2	6	2	10
178	2	9	1	12
179	2	9	0	11
180	2	2	0	4
181	1	2	0	3
182	0	1	0	1
201	1	1	0	2
208	1	8	3	12
209	2	9	4	15
210	8	16	1	25
213	14	42	12	68
214	18	68	24	110
215	9	25	12	46
221	8	19	10	37
222	6	9	2	17
225	5	21	5	31
227	1	3	0	4
232	0	1	0	1
233	2	2	0	4
236	1	7	1	9
239	4	24	9	37
240	10	38	9	57

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
241	21	53	10	84
242	2	1	1	4
248	5	1	3	9
249	15	28	14	57
254	1	3	1	5
256	1	6	4	11
257	4	15	4	23
260	2	11	1	14
261	1	6	1	8
263	0	2	2	4
264	3	18	6	27
265	4	15	3	22
266	1	10	2	13
267	2	2	1	5
268	1	9	2	12
292	4	10	4	18
293	0	1	1	2
297	0	4	0	4
298	3	7	1	11
339	1	1	0	2
341	6	27	5	38
342	5	15	6	26
343	5	10	7	22
344	2	12	0	14
345	5	27	1	33
346	3	24	4	31
348	1	15	4	20
349	4	38	7	49
601	0	1	0	1
TOTAL	222	770	212	1,204

Table 8. Archery Harvest by Permit Area, 2010.
Includes Regular, Youth, All-Season, and Bonus Permits.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	6	1	7	1	15
103	11	0	12	0	23
105	22	5	33	0	60
108	22	5	21	4	52
110	17	11	59	7	94
111	3	0	9	2	14
114	4	2	6	0	12
117	1	1	0	0	2
118	15	3	14	1	33
119	4	1	8	1	14
122	4	2	21	1	28
126	22	2	32	2	58
152	1	0	2	2	5
155	54	12	36	7	109
156	77	16	115	25	233
157	130	39	168	34	371
159	73	19	127	17	236
169	22	5	30	6	63
171	28	5	28	3	64
172	35	12	44	5	96
173	23	4	17	2	46
176	33	5	19	7	64
177	24	16	96	15	151
178	90	19	143	23	275
179	77	34	173	17	301
180	96	21	170	20	307
181	121	46	232	32	431
182	206	124	567	136	1,033
183	44	2	30	4	80
184	117	11	62	8	198
197	21	3	11	3	38
199	5	0	7	1	13
201	2	0	0	1	3
203	0	0	2	0	2
208	6	0	4	2	12
209	41	12	73	16	142
210	29	13	117	10	169
213	534	64	405	44	1,047
214	76	20	110	25	231
215	112	44	173	32	361
218	100	9	56	5	170
219	87	10	59	5	161
221	87	71	280	57	495
222	62	50	161	48	321
223	127	22	77	14	240
224	14	3	9	1	27
225	119	57	290	69	535

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
234	19	0	0	0	19
235	14	6	7	8	35
236	225	83	376	70	754
237	23	0	1	0	24
238	6	0	12	1	19
239	73	20	120	15	228
240	82	16	154	29	281
241	164	56	284	44	548
242	84	42	176	21	323
246	71	9	61	6	147
247	60	6	63	5	134
248	44	16	61	9	130
249	80	42	110	27	259
250	26	3	21	2	52
251	2	0	4	0	6
252	27	5	28	2	62
253	44	2	36	4	86
254	64	11	83	7	165
255	83	13	25	4	125
256	15	3	31	3	52
257	13	5	20	7	45
258	34	3	14	3	54
259	41	4	32	2	79
260	9	0	22	0	31
261	17	0	6	3	26
262	20	2	13	1	36
263	6	0	8	3	17
264	18	1	25	2	46
265	12	4	30	5	51
266	20	3	39	2	64
267	7	1	21	0	29
268	13	3	11	0	27
269	22	2	10	4	38
270	17	0	6	0	23
271	20	5	5	3	33
272	18	1	4	1	24
273	45	3	14	0	62
274	15	4	26	3	48
275	24	2	14	3	43
276	34	3	21	2	60
277	138	12	112	10	272
278	43	4	26	2	75
279	9	2	8	3	22
280	20	0	21	1	42
281	45	5	21	2	73
282	11	0	2	0	13
283	29	3	21	2	55

Table 8. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
227	187	87	413	72	759
229	41	8	37	5	91
230	20	4	15	4	43
232	25	5	32	4	66
233	49	15	79	9	152
289	19	5	19	0	43
290	56	9	65	13	143
291	127	18	103	12	260
292	49	15	99	11	174
293	71	15	98	14	198
294	24	2	16	3	45
295	42	3	51	5	101
296	26	3	21	2	52
297	7	0	8	0	15
298	12	4	22	1	39
299	36	4	41	4	85
338	38	6	31	1	76

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
284	43	0	1	0	44
285	62	5	39	5	111
286	26	0	3	0	29
287	4	1	4	0	9
288	30	1	1	0	32
339	48	6	73	17	144
341	118	65	270	56	509
342	77	35	188	51	351
343	193	73	446	68	780
344	48	18	57	14	137
345	38	20	64	12	134
346	115	41	201	52	409
347	71	1	20	4	96
348	80	26	163	42	311
349	139	22	237	28	426
601	671	276	1201	266	2,414
970 *	103	32	128	27	290
971**	80	22	102	13	217
Total	**7,485**	**2,053**	**10,668**	**1,851**	**22,057**

*Camp Ripley First Hunt
**Camp Ripley Second Hunt

Table 9. Archery Harvest using Bonus Permits by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	0	2	0	2
105	4	24	0	28
110	10	44	6	60
111	0	8	1	9
114	1	1	0	2
117	1	2	0	3
122	2	18	0	20
126	0	16	2	18
156	8	83	18	109
157	25	112	26	163
159	11	100	12	123
177	14	83	10	107
178	12	102	19	133
179	21	121	14	156
180	15	135	20	170
181	41	195	29	265
182	107	529	128	764
199	0	3	1	4
201	0	0	1	1
208	0	4	1	5
209	8	60	11	79
210	9	105	7	121
213	23	178	16	217
214	14	90	19	123
215	31	146	23	200
221	63	240	53	356
222	39	147	42	228
225	49	261	59	369
227	75	356	70	501
232	3	26	3	32
233	12	66	9	87
236	73	337	65	475
239	14	100	10	124

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
240	12	130	20	162
241	43	231	33	307
242	35	130	16	181
248	8	45	7	60
249	32	79	16	127
254	9	63	4	76
256	1	21	1	23
257	1	11	4	16
260	0	12	0	12
261	0	5	3	8
263	0	3	1	4
264	1	20	2	23
265	2	24	5	31
266	1	32	2	35
267	1	14	0	15
268	1	8	0	9
287	1	4	0	5
292	8	80	11	99
293	11	83	10	104
297	0	4	0	4
298	3	19	0	22
339	5	58	15	78
341	61	248	52	361
342	34	178	47	259
343	67	408	61	536
344	17	46	14	77
345	11	51	9	71
346	39	189	50	278
348	24	150	40	214
349	21	221	27	269
601	237	1093	239	1569
TOTAL	**1,371**	**7,354**	**1,364**	**10,089**

Table 10. Summary of Archery Special Hunts, 2010 Includes Regular, Youth, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
970 - Camp Ripley	10/21 - 10/22	2,500	103	128	32	27	290
971 - Camp Ripley	10/30 - 10/31	2,500	80	102	22	13	217
972 - Crow-Hassan Park Reserve	11/12- 11/14	130	3	4	1	0	8
973 - Murphy-Hanrahan Park Reserve	11/12- 11/14	180	10	5	2	1	18
974 - Cleary Lake Regional Park	11/12- 11/14	55	1	1	0	0	2
975 - Vermillion Highlands WMA	9/18-10/31	60	1	2	0	0	3
976 - City of New Ulm	10/9 - 12/31	50	1	47	8	14	70
977 - City of Red Wing	9/18 - 12/31	Unl.	0	0	2	2	4
978 - City of Sandstone	9/18 - 12/31	Unl.	0	0	0	0	0
979 - City of St. Cloud	9/18 - 12/31	70	0	2	0	0	2
980 - City of Taylors Falls	9/18 - 12/31	Unl.	0	0	0	0	0
981 - City of Mankato	10/23 - 12/31	40	1	7	6	5	19
982 - City of Granite Falls	9/18 - 12/31	10	0	3	0	0	3
983 - City of Ortonville	9/18 - 12/31	30	2	18	0	0	20
984 - City of Canby	9/19 - 12/31	20	0	3	0	0	3
985 - City of Bemidji	9/18 - 12/31	40	0	7	3	0	10
986 - Kellog-Weaver Dunes SNA	9/18 - 12/31	10	0	0	0	0	0
987 - Hormel Nature Center	11/17 - 11/24	44	0	4	0	1	5
Total			202	333	76	63	674

*In many cases, city archery harvest is under-reported because individuals do not use the applicable number when registering their deer.

Table 11. Free Landowner Archery Harvest by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
110	0	1	0	1
157	0	1	0	1
213	0	2	0	2
214	0	2	1	3
215	0	1	0	1
221	1	3	0	4
236	0	1	0	1
239	0	1	0	1
240	1	3	0	4
241	1	2	0	3
248	0	1	1	2
249	1	2	0	3
292	0	1	0	1
293	0	1	0	1
342	0	0	1	1
343	0	1	0	1
346	0	1	0	1
348	0	2	0	2
TOTAL	4	26	3	33

Table 12. Muzzleloader Harvest by Permit Area, 2010.
Includes Regular, Muzzleloader, Youth, All-Season, and Bonus permits.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	8	5	13	3	29	223	32	8	16	7	63
103	10	1	7	2	20	225	58	28	110	27	223
105	11	5	28	5	49	227	59	24	118	38	239
108	7	0	2	1	10	229	11	2	19	7	39
110	12	5	27	3	47	230	7	3	11	0	21
111	7	4	14	1	26	232	13	7	33	8	61
114	2	0	0	0	2	233	23	9	30	7	69
117	0	0	2	0	2	234	21	0	0	0	21
118	22	0	2	0	24	235	3	0	1	1	5
119	9	2	4	1	16	236	40	27	92	28	187
122	4	1	9	0	14	237	31	1	0	0	32
126	13	8	40	10	71	238	7	0	2	0	9
127	0	1	0	0	1	239	47	23	96	19	185
152	0	2	0	0	2	240	42	17	101	15	175
155	9	4	11	4	28	241	76	38	209	40	363
156	29	13	51	7	100	242	27	14	46	11	98
157	30	27	83	26	166	246	28	5	21	4	58
159	16	9	32	6	63	247	19	2	11	1	33
169	28	2	14	2	46	248	34	5	24	5	68
171	8	0	9	1	18	249	36	23	67	29	155
172	18	2	5	3	28	250	36	3	13	0	52
173	14	1	4	0	19	251	3	0	0	1	4
176	6	3	5	0	14	252	29	3	13	2	47
177	13	10	43	12	78	253	43	3	21	0	67
178	31	13	62	15	121	254	39	17	66	14	136
179	23	16	61	22	122	255	28	3	11	3	45
180	30	19	53	15	117	256	16	4	22	3	45
181	28	10	44	6	88	257	15	3	22	2	42
182	10	3	21	4	38	258	23	2	7	2	34
183	21	3	17	5	46	259	29	13	32	4	78
184	54	8	16	3	81	260	23	5	36	4	68
197	12	4	10	4	30	261	8	0	17	2	27
199	4	0	4	1	9	262	24	1	10	0	35
201	1	1	4	3	9	263	20	0	17	2	39
203	5	1	11	2	19	264	36	3	32	6	77
208	12	1	8	3	24	265	17	6	26	5	54
209	37	8	37	10	92	266	29	6	43	5	83
210	35	16	71	12	134	267	9	2	13	2	26
213	72	32	155	25	284	268	11	2	11	1	25
214	38	18	79	19	154	269	31	2	18	1	52
215	53	41	103	20	217	270	13	5	2	2	22
218	58	5	39	7	109	271	22	0	9	2	33
219	46	9	32	11	98	272	9	0	4	1	14
221	37	20	91	23	171	273	28	2	14	0	44
222	22	14	72	19	127	274	28	0	2	2	32
275	26	1	4	4	35	292	32	12	60	14	118

Table 12. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
276	29	2	14	1	46
277	71	9	63	5	148
278	39	2	21	3	65
279	16	1	7	1	25
280	16	2	6	1	25
281	28	5	18	1	52
282	16	0	0	0	16
283	25	2	2	1	30
284	32	0	1	0	33
285	30	1	12	4	47
286	24	0	1	0	25
287	3	3	25	5	36
288	29	1	0	0	30
289	15	0	1	1	17
290	37	4	27	4	72
291	64	11	34	2	111
293	42	16	61	14	133
294	27	0	4	1	32
295	54	1	11	5	71
296	23	0	19	1	43
297	7	3	4	1	15
298	23	7	37	7	74
299	29	1	13	0	43
338	8	1	14	5	28
339	11	2	17	7	37
341	23	29	100	15	167
342	21	15	101	18	155
343	18	30	94	21	163
344	17	8	34	11	70
345	18	1	27	4	50
346	15	11	84	13	123
347	11	6	15	2	34
348	22	16	84	27	149
349	28	20	87	22	157
601	21	17	48	12	98
TOTAL	**3,038**	**908**	**4,013**	**862**	**8,821**

Table 13. Muzzleloader Harvest using Bonus Permits by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	4	11	3	18
105	4	14	2	20
110	3	13	1	17
111	3	5	1	9
122	0	3	0	3
126	6	18	6	30
156	5	29	4	38
157	12	36	13	61
159	6	13	1	20
177	6	27	9	42
178	5	20	8	33
179	9	26	12	47
180	14	40	11	65
181	5	28	2	35
182	2	18	4	24
199	0	1	1	2
201	1	3	1	5
203	1	9	2	12
208	0	4	1	5
209	7	25	10	42
210	11	50	10	71
213	18	86	8	112
214	9	48	6	63
215	26	69	11	106
221	12	61	14	87
222	9	55	10	74
225	17	72	24	113
227	15	83	27	125
232	4	13	1	18
233	4	13	4	21
236	19	56	18	93
239	8	51	12	71
240	6	44	8	58
241	21	120	26	167
242	9	28	7	44
248	5	11	4	20
249	10	33	19	62
254	11	38	9	58
256	3	14	2	19
257	2	10	2	14
260	1	23	1	25
261	0	15	1	16
263	0	10	2	12
264	2	16	2	20
265	3	18	3	24
266	4	30	1	35
267	2	11	1	14
268	1	9	0	10
287	2	17	4	23
292	5	32	5	42
293	9	39	11	59
297	2	2	0	4
298	3	16	5	24
339	1	12	1	14
341	23	71	11	105
342	9	72	13	94
343	23	74	16	113
344	7	21	8	36
345	1	13	4	18
346	7	63	6	76
348	12	66	22	100
349	15	69	19	103
601	12	28	7	47
TOTAL	**456**	**2,025**	**457**	**2,938**

Table 14. Summary of Muzzleloader Special Hunts, 2010.
Includes Regular, Youth, All-Season, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
935 - Jay Cooke SP[1]	12/4-12/8	120*	6	8	25	5	38
936 - Crow Wing SP[1]	12/3-12/5	45***	3	4	10	4	18
937 - Soudan SP[1]	11/27-12/12	20*	0	0	2	0	2
938 - City of Tower[1]	11/27-12/12	30*	1	1	4	0	5
939 - Lake Shetek SP[1]	12/4-12/5	15**	0	4	6	5	15
940 - Lake Maria SP[1]	12/4-12/6	25***	3	2	7	4	13
941 - Nerstrand Big Woods SP[1]	11/27-11/28	50***	7	7	22	8	37
942 - Sibley SP	12/4-12/5	40**	0	3	9	3	15
943 - Rice Lake SP	11/27-11/28	50**	0	9	23	5	37
944 - Vermilion Highlands WMA[1]	11/27-12/12	25*	4	2	3	0	5
945 - Big Stone SP[1]	12/4 - 12/5	10**	0	2	11	4	17
TOTAL			24	42	122	38	202

[1] Bonus permits available *Either Sex **Antlerless Only ***Earn-A-Buck

Table 15. Free Landowner Muzzleloader Harvest by Permit Area, 2010.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
110	0	1	0	1
177	0	1	0	1
179	0	1	0	1
208	0	1	0	1
209	0	1	0	1
210	0	1	0	1
213	2	3	2	7
214	0	1	3	4
215	0	2	2	4
221	1	1	0	2
225	0	1	0	1
227	1	1	0	2
233	1	0	0	1
239	1	3	1	5
240	1	6	0	7
241	0	7	0	7
249	0	2	0	2
254	0	1	0	1
256	0	1	0	1
257	0	1	0	1
264	0	2	0	2
265	1	0	0	1
267	0	1	0	1
292	0	2	0	2
293	1	2	0	3
298	1	2	0	3
341	0	2	0	2
342	1	8	0	9
343	0	0	1	1
344	0	1	0	1
345	0	3	0	3
346	0	5	2	7
348	0	1	3	4
349	1	2	0	3
Total	**12**	**67**	**14**	**93**

Table 16. Summary of Youth Firearm Hunts and NW Youth Season, 2010.

			Harvest				
Area	**Dates**	**Permits Issued**	**Adult Male**	**Adult Female**	**Fawn Male**	**Fawn Female**	**Total**
950 - Camp Ripley Archery	10/8-10/10	150	2	5	0	0	7
951 - Arden Hills A	10/21-10/22	30	Hunt was Cancelled				0
952 - Arden Hills B	10/23-10/24	30	Hunt was Cancelled				0
954 - Lake Bemidji SP	10/16-10/17	20	0	2	0	0	2
955 - Lake Alexander TNC	10/8-10/10	20	0	0	0	0	0
956 - St. Croix SP	10/30-10/31	90	17	7	1	3	28
957 - Rydell NWR	10/23-10/24	20	3	4	1	0	8
958 - Savanna Portage SP	10/30-10/31	20	4	2	0	0	6
959 - Buffalo River SP	10/23-10/24	10	1	1	0	0	2
960 - Tettegouche SP	10/16-10/17	10	0	1	0	0	1
961 - Itasca SP	10/16-10/17	75	1	1	0	0	2
965 - Banning SP	10/30-10/31	6	3	1	0	0	4
967 - Father Hennepin SP A	10/30-10/31	3	0	2	0	0	2
968 - Father Hennepin SP B	12/4-12/5	3	0	0	0	0	0

Youth Deer Season - October 21 - 24, unlimited permits

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	6	15	0	0	21
105	26	22	8	2	58
111	4	13	2	4	23
201	3	1	0	0	4
203	3	1	1	1	6
208	7	10	4	1	22
209	8	19	6	3	36
256	12	11	3	2	28
257	8	7	5	3	23
260	11	24	5	5	45
263	9	16	1	2	28
264	20	22	9	4	55
267	4	9	3	0	16
268	10	7	1	1	19
338	4	4	3	1	12
339	8	2	2	0	12
341	15	16	9	6	46
342	11	5	5	2	23
343	11	17	7	1	36
344	5	5	2	1	13
345	7	6	2	3	18
346	9	9	7	3	28
347	8	10	1	3	22
348	6	5	4	0	15
349	13	16	10	5	44
601	9	15	3	4	31
Total	237	287	103	57	684

Table 17. Total Deer Harvest by Permit Area, 2010.
Includes all license types, permits, and special hunts.

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	338	267	90	70	765
103	820	341	64	48	1,273
105	844	690	181	140	1,855
108	1156	143	40	31	1,370
110	1139	868	221	196	2,424
111	572	343	83	56	1,054
114	49	33	6	6	94
117	28	7	4	2	41
118	797	85	26	18	926
119	806	254	59	34	1,153
122	570	292	69	59	990
126	529	292	52	35	908
127	115	27	8	7	157
152	134	57	28	15	234
155	1616	876	240	198	2,930
156	2084	1634	482	384	4,584
157	2960	2233	758	617	6,568
159	1524	1259	334	224	3,341
169	1612	793	246	148	2,799
171	1193	421	130	97	1,841
172	1737	617	160	126	2,640
173	1004	492	137	88	1,721
176	1675	379	92	60	2,206
177	1073	1052	274	237	2,636
178	2765	1957	569	430	5,721
179	2025	1823	530	372	4,750
180	1422	1201	312	272	3,207
181	1955	1710	482	391	4,538
182	643	1015	226	241	2,125
183	1382	727	197	133	2,439
184	3012	866	263	184	4,325
197	1055	425	121	98	1,699
199	150	86	15	17	268
201	103	73	16	27	219
203	89	49	12	7	157
208	240	174	64	43	521
209	645	557	203	148	1,553
210	1077	974	274	278	2,603
213	2497	2101	663	514	5,775
214	1463	1288	487	428	3,666
215	1153	1129	458	374	3,114
218	1008	619	185	155	1,967
219	688	441	154	82	1,365
221	1168	1165	487	437	3,257
222	953	930	399	319	2,601
223	679	362	131	102	1,274
224	131	80	27	8	246
225	1535	1572	579	411	4,097
227	1072	1172	362	347	2,953
229	286	171	64	37	558
230	247	146	36	23	452
232	277	252	78	67	674
233	256	249	75	52	632
234	254	9	1	3	267
235	73	22	11	13	119
236	883	960	310	221	2,374
237	293	13	4	5	315
238	93	25	2	5	125
239	1587	1430	448	373	3,838
240	1852	1553	495	434	4,334
241	3278	2950	980	820	8,028
242	732	757	240	178	1,907
246	2327	1248	385	296	4,256
247	825	318	86	37	1,266
248	456	370	123	105	1,054
249	1404	1266	547	375	3,592
250	403	149	25	16	593
251	86	47	10	15	158
252	306	147	38	22	513
253	420	184	25	23	652
254	567	520	121	82	1,290
255	501	196	49	28	774
256	489	432	111	100	1,132
257	424	301	80	76	881
258	915	424	157	105	1,601
259	1556	758	219	152	2,685
260	485	424	84	67	1,060
261	176	156	15	25	372
262	276	108	31	11	426
263	395	228	56	62	741
264	659	549	152	114	1,474
265	450	412	98	120	1,080
266	476	418	97	95	1,086
267	226	175	45	28	474
268	310	209	47	44	610
269	264	142	34	28	468
270	239	73	21	13	346
271	305	118	29	22	474
272	259	105	17	15	396
273	523	268	77	38	906
274	294	73	18	13	398
275	440	94	20	21	575
276	602	210	39	35	886
277	1409	687	163	110	2,369
278	553	200	35	32	820
279	258	108	16	15	397
280	293	138	32	14	477
281	525	160	36	14	735

Table 17. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
282	178	8	3	1	190
283	354	75	19	7	455
284	420	20	3	2	445
285	462	252	63	40	817
286	340	21	7	2	370
287	63	174	38	33	308
288	396	17	9	6	428
289	191	50	13	5	259
290	543	271	40	51	905
291	844	445	91	70	1,450
292	486	502	144	113	1,245
293	579	519	141	122	1,361
294	362	73	19	12	466
295	614	181	36	24	855
296	336	183	22	18	559
297	209	160	34	19	422
298	722	593	162	135	1,612
299	307	151	26	19	503
338	201	190	47	41	479
339	247	273	80	90	690
341	733	1236	405	324	2,698
342	616	1020	259	270	2,165
343	711	1149	360	278	2,498
344	391	643	131	153	1,318
345	387	505	144	135	1,171
346	817	1063	290	244	2,414
347	461	283	76	49	869
348	533	962	200	213	1,908
349	1072	1522	309	331	3,234
601	1329	1817	463	398	4,007
900	3	4	1	1	9
901	4	1	1	0	6
902	35	69	16	23	143
903	0	1	2	0	3
904	5	3	3	0	11
905	3	4	2	1	10
906	3	11	2	1	17
907	3	0	1	1	5
908	1	3	1	1	6
909	1	6	3	3	13
910	0	9	8	10	27
911	1	1	0	0	2
913	0	7	0	1	8

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
914	21	19	6	3	49
915	6	4	4	4	18
916	40	35	9	13	97
918	3	4	2	2	11
919	1	4	4	2	11
920	3	10	8	6	27
921	1	5	0	1	7
922	0	2	0	3	5
923	15	27	18	9	69
924	10	25	5	6	46
925	12	34	6	18	70
928	0	6	1	1	8
926	0	4	2	1	7
927	0	12	4	5	21
928	10	5	4	1	20
929	11	19	1	3	34
930	7	14	4	4	29
935	6	25	8	5	44
936	3	10	4	4	21
937	0	2	0	0	2
938	1	4	1	0	6
939	0	6	4	5	15
940	3	7	2	4	16
941	7	22	7	8	44
942	0	9	3	3	15
943	0	23	9	5	37
944	4	3	2	0	9
945	0	11	2	4	17
950	2	5	0	0	7
954	0	2	0	0	2
956	17	7	1	3	28
957	3	4	1	0	8
958	4	2	0	0	6
959	1	1	0	0	2
960	0	1	0	0	1
961	1	1	0	0	2
965	3	1	0	0	4
967	0	2	0	0	2
969	0	0	2	0	2
970	103	128	32	27	290
971	80	102	22	13	217
975	1	2	0	0	3
976	0	6	2	1	9
977	0	0	2	2	4
979	0	2	0	0	2
981	0	0	1	0	1
984	0	2	0	0	2
985	0	7	3	0	10
987	0	4	0	1	5
TOTAL	**98,834**	**71,010**	**20,742**	**16,727**	**207,313**

Table 18. Estimated firearm hunter numbers, density, and harvest by Permit Area, 2010.

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
101	1,696	496	3.4	1.4
103	3,411	1,824	1.9	0.7
105	3,727	932	4.0	1.8
108	4,871	1,701	2.9	0.8
110	4,182	530	7.9	4.3
111	2,909	1,440	2.0	0.7
114	185	412	0.4	0.2
117	158	1,129	0.1	0.03
118	3,722	1,445	2.6	0.6
119	3,939	946	4.2	1.2
122	2,107	622	3.4	1.5
126	1,984	979	2.0	0.8
127	583	587	1.0	0.3
152	936	62	15.2	3.7
155	7,080	639	11.1	4.4
156	8,941	834	10.7	5.1
157	12,538	904	13.9	6.7
159	6,934	575	12.1	5.3
169	9,470	1,202	7.9	2.2
171	6,297	729	8.6	2.4
172	10,444	786	13.3	3.2
173	4,537	617	7.4	2.7
176	6,922	1,150	6.0	1.9
177	4,002	553	7.2	4.4
178	9,830	1,325	7.4	4.0
179	9,157	939	9.8	4.6
180	6,156	999	6.2	2.5
181	6,800	746	9.1	5.4
182	1,956	280	7.0	3.3
183	7,524	675	11.2	3.4
184	13,087	1,318	9.9	3.1
197	5,388	1,343	4.0	1.2
199	534	152	3.5	1.6
201	409	169	2.4	1.2
203	302	132	2.3	1.0
208	1,108	379	2.9	1.2
209	2,456	641	3.8	2.0
210	4,265	635	6.7	3.6
213	8,870	1,161	7.6	3.8
214	6,390	566	11.3	5.8
215	5,843	730	8.0	3.5
218	5,101	912	5.6	1.9
219	3,120	427	7.3	2.6
221	4,783	647	7.4	4.0
222	4,525	413	11.0	4.9
223	2,920	385	7.6	2.5
224	640	49	13.1	4.5
225	6,570	635	10.3	4.8
227	4,361	491	8.9	3.7
229	1,481	313	4.7	1.4
230	1,383	464	3.0	0.8
232	1,275	380	3.4	1.4
233	991	386	2.6	1.1
234	680	637	1.1	0.4
235	349	37	9.5	2.0
236	3,233	404	8.0	3.3
237	918	737	1.2	0.4
238	281	98	2.9	1.0
239	7,205	1,110	6.5	3.1
240	7,265	694	10.5	5.6
241	12,629	1,047	12.1	6.8
242	2,722	307	8.9	4.8
246	11,283	860	13.1	4.7
247	3,457	263	13.1	4.2
248	1,841	229	8.1	3.7
249	5,585	729	7.7	4.4
250	1,563	730	2.1	0.7
251	518	68	7.6	2.2
252	1,293	735	1.8	0.5
253	1,930	987	2.0	0.5
254	2,553	946	2.7	1.0
255	1,712	774	2.2	0.8
256	2,339	654	3.6	1.5
257	1,831	426	4.3	1.8
258	4,098	381	10.8	4.0
259	7,257	546	13.3	4.6
260	2,162	1,252	1.7	0.7
261	826	796	1.0	0.4
262	983	677	1.5	0.5
263	1,852	513	3.6	1.3
264	3,213	672	4.8	1.9
265	1,961	495	4.0	2.0
266	2,173	625	3.5	1.5
267	1,067	472	2.3	0.9
268	1,320	239	5.5	2.3
269	1,157	652	1.8	0.6

Table 18. (Continued).

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
270	985	758	1.3	0.4
271	945	646	1.5	0.6
272	1,121	544	2.1	0.7
273	2,423	634	3.8	1.3
274	883	381	2.3	0.8
275	1,861	777	2.4	0.6
276	2,953	575	5.1	1.4
277	5,779	876	6.6	2.2
278	2,108	422	5.0	1.6
279	1,170	346	3.4	1.0
280	1,480	676	2.2	0.6
281	2,420	579	4.2	1.1
282	663	780	0.8	0.2
283	1,304	640	2.0	0.6
284	1,204	853	1.4	0.4
285	2,299	580	4.0	1.1
286	1,012	458	2.2	0.7
287	604	51	11.9	5.2
288	1,511	630	2.4	0.6
289	841	820	1.0	0.2
290	2,379	666	3.6	1.0
291	3,541	832	4.3	1.3
292	2,650	517	5.1	1.8
293	2,440	512	4.8	2.0
294	1,078	689	1.6	0.6
295	2,135	855	2.5	0.8
296	1,644	675	2.4	0.7
297	1,292	449	2.9	0.9
298	3,768	677	5.6	2.2
299	1,410	389	3.6	1.0
338	1,809	472	3.8	0.8
339	1,705	406	4.2	1.2
341	4,846	626	7.7	3.2
342	3,635	374	9.7	4.4
343	4,195	664	6.3	2.3
344	2,980	190	15.7	5.8
345	2,591	335	7.7	2.9
346	3,938	328	12.0	5.4
347	2,744	434	6.3	1.7
348	3,754	332	11.3	4.3
349	5,676	499	11.4	4.9
601	2,647	1,756	1.5	0.8

Table 19. Deer harvest per square mile by season, 2010.

Permit Area	Area Size (sq mi)	Archery Harvest/mi^2	Firearm Harvest/mi^2	Muzz. Harvest/mi^2	EA Harvest/mi^2	Total Harvest/mi^2
101	496	0.03	1.36	0.06	0.05	1.50
103	1,824	0.01	0.67	0.01		0.70
105	932	0.06	1.81	0.05	0.00	1.93
108	1,701	0.03	0.77	0.01		0.81
110	530	0.18	4.30	0.09		4.57
111	1,440	0.01	0.69	0.02	0.00	0.72
114	412	0.03	0.19	0.00		0.23
117	1,129	0.00	0.03	0.00		0.04
118	1,445	0.02	0.60	0.02		0.64
119	946	0.01	1.19	0.02		1.22
122	622	0.05	1.52	0.02		1.59
126	979	0.06	0.80	0.07		0.93
127	587	0.00	0.27	0.00		0.27
152	62	0.08	3.68	0.03		3.80
155	639	0.17	4.37	0.04		4.58
156	834	0.28	5.09	0.12		5.49
157	904	0.41	6.67	0.18		7.27
159	575	0.41	5.29	0.11		5.81
169	1,202	0.05	2.24	0.04		2.33
171	729	0.09	2.41	0.02		2.52
172	786	0.12	3.20	0.04		3.36
173	617	0.07	2.68	0.03		2.79
176	1,150	0.06	1.85	0.01		1.92
177	553	0.27	4.36	0.14		4.77
178	1,325	0.21	4.02	0.09		4.32
179	939	0.32	4.61	0.13		5.06
180	999	0.31	2.49	0.12	0.30	3.21
181	746	0.58	5.39	0.12		6.08
182	280	3.69	3.26	0.14	0.51	7.59
183	675	0.12	3.43	0.07		3.61
184	1,318	0.15	3.07	0.06		3.28
197	1,343	0.03	0.00	0.02		0.05
199	152	0.09	0.00	0.06		0.14
201	169	0.02	1.20	0.05		1.27
203	132	0.02	0.99	0.14		1.15
208	379	0.03	1.22	0.06		1.32
209	641	0.22	2.00	0.14		2.37
210	635	0.27	3.62	0.21		4.10
213	1,161	0.90	3.83	0.24		4.97
214	566	0.41	5.80	0.27		6.48
215	730	0.49	3.47	0.30		4.26
218	912	0.19	1.85	0.12		2.16
219	427	0.38	2.59	0.23		3.20
221	647	0.77	4.01	0.26		5.03
222	413	0.78	4.87	0.31	0.34	6.30
223	385	0.62	2.52	0.16		3.31
224	49	0.55	4.47	0.00		5.02
225	635	0.84	4.84	0.35	0.42	6.45

Table 19. (Continued).

Permit Area	Area Size (sq mi)	Archery Harvest/mi^2	Firearm Harvest/mi^2	Muzz. Harvest/mi^2	EA Harvest/mi^2	Total Harvest/mi^2
227	491	1.54	3.72	0.49	0.26	6.01
229	313	0.29	1.37	0.12		1.78
230	464	0.09	0.84	0.05		0.97
232	380	0.17	1.44	0.16		1.77
233	386	0.39	1.06	0.18		1.64
234	637	0.03	0.36	0.03		0.42
235	37	0.95	2.04	0.14		3.13
236	404	1.87	3.32	0.46	0.23	5.88
237	737	0.03	0.35	0.04		0.43
238	98	0.19	0.99	0.09		1.28
239	1,110	0.21	3.09	0.17		3.46
240	694	0.40	5.59	0.25		6.24
241	1,047	0.52	6.80	0.35		7.67
242	307	1.05	4.83	0.32		6.20
246	860	0.17	4.71	0.07		4.95
247	263	0.51	4.17	0.13		4.81
248	229	0.57	3.73	0.30		4.60
249	729	0.36	4.36	0.21		4.92
250	730	0.07	0.67	0.07		0.81
251	68	0.09	2.17	0.06		2.32
252	735	0.08	0.55	0.06		0.70
253	987	0.09	0.51	0.07		0.66
254	946	0.17	1.05	0.14		1.36
255	774	0.16	0.78	0.06		1.00
256	654	0.08	1.54	0.07		1.69
257	426	0.11	1.81	0.10		2.01
258	381	0.14	3.97	0.09		4.20
259	546	0.14	4.63	0.14		4.92
260	1,252	0.02	0.73	0.05		0.81
261	796	0.03	0.40	0.03		0.47
262	677	0.05	0.52	0.05		0.63
263	513	0.03	1.28	0.08		1.39
264	672	0.07	1.93	0.11		2.11
265	495	0.10	1.97	0.11		2.18
266	625	0.10	1.50	0.13		1.74
267	472	0.06	0.85	0.06		0.97
268	239	0.11	2.25	0.10		2.47
269	652	0.06	0.58	0.08		0.72
270	758	0.03	0.40	0.03		0.46
271	646	0.05	0.63	0.05		0.73
272	544	0.04	0.66	0.03		0.73
273	634	0.10	1.26	0.07		1.43
274	381	0.13	0.84	0.08		1.05
275	777	0.06	0.64	0.05		0.74
276	575	0.10	1.36	0.08		1.54

Table 19. (Continued).

Permit Area	Area Size (sq mi)	Archery Harvest/mi^2	Firearm Harvest/mi^2	Muzz. Harvest/mi^2	EA Harvest/mi^2	Total Harvest/mi^2
277	876	0.31	2.22	0.17		2.70
278	422	0.18	1.61	0.15		1.94
279	346	0.06	1.01	0.07		1.15
280	676	0.06	0.61	0.04		0.71
281	579	0.13	1.05	0.09		1.27
282	780	0.02	0.21	0.02		0.24
283	640	0.09	0.58	0.05		0.71
284	853	0.05	0.43	0.04		0.52
285	580	0.19	1.13	0.08		1.40
286	458	0.06	0.69	0.05		0.81
287	51	0.18	5.19	0.71		6.08
288	630	0.05	0.58	0.05		0.68
289	820	0.05	0.24	0.02		0.32
290	666	0.21	1.04	0.11		1.36
291	832	0.31	1.30	0.13		1.74
292	517	0.34	1.84	0.23		2.41
293	512	0.39	2.01	0.26		2.66
294	689	0.07	0.56	0.05		0.68
295	855	0.12	0.80	0.08		1.00
296	675	0.08	0.69	0.06		0.83
297	449	0.03	0.87	0.03		0.94
298	677	0.06	2.21	0.11		2.38
299	389	0.22	0.00	0.11		0.33
338	472	0.16	0.77	0.06		0.99
339	406	0.35	1.23	0.09		1.67
341	626	0.81	3.16	0.27		4.23
342	374	0.94	4.37	0.41		5.73
343	664	1.18	2.29	0.25		3.71
344	190	0.72	5.78	0.37		6.88
345	335	0.40	2.89	0.15		3.44
346	328	1.25	5.40	0.38	0.25	7.28
347	434	0.22	1.65	0.08		1.95
348	332	0.94	4.31	0.45		5.69
349	499	0.85	4.94	0.31	0.29	6.39
601	1,756	1.38	0.80	0.06	0.03	2.26
Total	83,282	0.03	2.08	0.11	0.02	2.23

Table 20. 2010 Antlerless Lottery Distribution Report.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
103	1	1,158	1	0	1,158	1,909	17.1%
	2	421	3	0	421		
	3	3	0	0	3		
		1,582	**4**	**0**	**1,582**		
108	1	796	7	796	0	98	0.0%
	2	1,099	5	1,007	92		
	3	5	0	0	5		
	4	1	0	0	1		
		1,901	**12**	**1,803**	**98**		
118	1	866	3	866	0	95	0.0%
	2	453	0	364	89		
	3	5	0	0	5		
	4	1	0	0	1		
		1,325	**3**	**1,230**	**95**		
119	1	1,235	5	1,042	193	934	0.0%
	2	734	4	0	734		
	3	7	0	0	7		
		1,976	**9**	**1,042**	**934**		
127	1	151	0	21	130	145	0.0%
	2	15	0	0	15		
		166	**0**	**21**	**145**		
152	1	297	0	0	297	450	27.1%
	2	26	0	0	26		
	3	4	0	0	4		
	5	1	0	0	1		
		328	**0**	**0**	**328**		
155	1	2,224	6	457	1,767	3,364	0.0%
	2	1,588	6	0	1,588		
	3	8	5	0	8		
	4	1	0	0	1		
		3,821	**17**	**457**	**3,364**		
169	1	4,338	26	616	3,722	4,335	0.0%
	2	564	6	0	564		
	3	39	0	0	39		
	4	6	0	0	6		
	5	2	0	0	2		
	6	1	0	0	1		
	7	1	0	0	1		
		4,951	**32**	**616**	**4,335**		
171	1	2,565	13	1,928	637	1,441	0.0%
	2	784	8	0	784		
	3	20	0	0	20		
		3,369	**21**	**1,928**	**1,441**		
172	1	5,132	47	3,518	1,614	1,919	0.0%
	2	262	0	0	262		
	3	34	0	0	34		
	4	7	0	0	7		
	5	2	0	0	2		
		5,437	**47**	**3,518**	**1,919**		
173	1	1,670	9	306	1,364	1,932	0.0%
	2	560	10	0	560		
	3	8	1	0	8		
		2,238	**20**	**306**	**1,932**		

Table 20. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
176	1	2,027	8	2,027	0	965	0.0%
	2	1,139	8	183	956		
	3	9	0	0	9		
		3,175	**16**	**2,210**	**965**		
183	1	2,764	12	0	2,764	4,286	21.4%
	2	589	11	0	589		
	3	17	0	0	17		
	4	1	0	0	1		
		3,371	**23**	**0**	**3,370**		
184	1	6,055	41	2,698	3,357	3,606	0.0%
	2	212	0	0	212		
	3	37	0	0	37		
		6,304	**41**	**2,698**	**3,606**		
197	1	2,240	8	37	2,203	2,395	0.0%
	2	161	0	0	161		
	3	27	0	0	27		
	4	3	0	0	3		
	5	1	0	0	1		
		2,432	**8**	**37**	**2,394**		
218	1	2,429	4	662	1,767	2,224	0.0%
	2	429	6	0	429		
	3	22	3	0	22		
	4	6	3	0	6		
		2,880	**16**	**662**	**2,224**		
219	1	1,363	4	0	1,363	2,095	32.9%
	2	38	4	0	38		
	3	5	1	0	5		
	4	1	1	0	1		
		1,407	**10**	**0**	**1,406**		
223	1	1,186	1	0	1,186	2,195	44.7%
	2	27	2	0	27		
	3	1	0	0	1		
	4	1	0	0	1		
		1,215	**3**	**0**	**1,214**		
224	1	277	2	0	277	349	17.2%
	2	12	1	0	12		
		289	**3**	**0**	**289**		
229	1	515	2	0	515	1,229	56.3%
	2	18	0	0	18		
	3	4	0	0	4		
		533	**2**	**0**	**537**		
230	1	483	0	274	209	425	0.0%
	2	209	0	0	209		
	3	5	0	0	5		
	4	2	0	0	2		
	6	0	1	0	0		
		699	**1**	**274**	**425**		
234	1	27	0	0	27	45	28.9%
	2	5	0	0	5		
	3	0	1	0	0		
		32	**1**	**0**	**32**		
235	1	66	2	66	0	20	0.0%
	2	41	0	21	20		
		107	**2**	**87**	**20**		

Table 20. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
237	1	63	2	26	37	**50**	**0.0%**
	2	13	0	0	13		
		76	**2**	**26**	**50**		
238	1	50	0	50	0	**23**	**0.0%**
	2	47	1	47	0		
	3	21	0	0	21		
	4	2	0	0	2		
		120	**1**	**97**	**23**		
246	1	5,095	7	1,629	3,466	**5,189**	**6.4%**
	2	1,359	13	0	1,359		
	3	27	5	0	27		
	4	3	0	0	3		
		6,484	**25**	**1,629**	**4,855**		
247	1	1,720	1	1,361	359	**463**	**0.0%**
	2	99	4	0	99		
	3	5	5	0	5		
		1,824	**10**	**1,361**	**463**		
250	1	232	2	232	0	**340**	**0.0%**
	2	359	4	49	310		
	3	29	0	0	29		
	4	1	1	0	1		
		621	**7**	**281**	**340**		
251	1	216	12	0	216	**274**	**11.7%**
	2	25	0	0	25		
	3	1	0	0	1		
		242	**12**	**0**	**242**		
252	1	200	1	200	0	**215**	**0.0%**
	2	190	0	126	64		
	3	149	0	0	149		
	4	1	1	0	1		
	5	1	0	0	1		
		541	**2**	**326**	**215**		
253	1	368	1	368	0	**239**	**0.0%**
	2	335	0	211	124		
	3	107	1	0	107		
	4	2	0	0	2		
	5	3	0	0	3		
	6	3	0	0	3		
		818	**2**	**579**	**239**		
255	1	614	2	8	606	**627**	**0.0%**
	2	19	1	0	19		
	3	1	1	0	1		
	4	1	0	0	1		
		635	**4**	**8**	**627**		
258	1	1,855	4	0	1,426	**1,882**	**0.0%**
	2	454	12	0	454		
	3	1	0	0	1		
	4	1	0	0	1		
		2,311	**16**	**0**	**1,882**		
259	1	3,576	11	1,498	2,078	**2,753**	**0.0%**
	2	657	12	0	657		
	3	18	0	0	18		
		4,251	**23**	**1,498**	**2,753**		

Table 20. (Continued).

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
262	1	217	1	116	101	254	0.0%
	2	152	0	0	152		
	3	1	0	0	1		
		370	**1**	**116**	**254**		
269	1	307	1	13	294	517	0.0%
	2	216	0	0	216		
	3	5	1	0	5		
	4	2	1	0	2		
		530	**3**	**13**	**517**		
270	1	153	0	2	151	345	0.0%
	2	108	0	0	108		
	3	83	0	0	83		
	4	3	0	0	3		
		347	**0**	**2**	**345**		
271	1	125	1	0	125	349	1.7%
	2	95	0	0	95		
	3	83	0	0	83		
	4	39	1	0	39		
	5	1	0	0	1		
		343	**2**	**0**	**343**		
272	1	191	0	157	34	299	0.0%
	2	120	0	0	120		
	3	100	1	0	100		
	4	43	0	0	43		
	6	2	0	0	2		
		456	**1**	**157**	**299**		
273	1	1,112	2	4	1,108	1,182	0.0%
	2	63	1	0	63		
	3	10	0	0	10		
	4	1	0	0	1		
		1,186	**3**	**4**	**1,182**		
274	1	103	0	103	0	65	0.0%
	2	82	0	82	0		
	3	91	0	72	19		
	4	42	0	0	42		
	5	4	0	0	4		
		322	**0**	**257**	**65**		
275	1	187	2	187	0	86	0.0%
	2	154	4	154	0		
	3	171	0	171	0		
	4	89	0	16	73		
	5	13	0	0	13		
		614	**6**	**528**	**86**		
276	1	547	2	547	0	521	0.0%
	2	503	2	415	88		
	3	429	0	0	429		
	4	4	0	0	4		
		1,483	**4**	**962**	**521**		
277	1	1,342	3	1,342	0	1,546	0.0%
	2	1,101	3	205	896		
	3	637	1	0	637		
	4	9	0	0	9		
	5	2	0	0	2		
	6	1	0	0	1		
	7	1	0	0	1		
		3,093	**7**	**1,547**	**1,546**		

Table 20. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
278	1	320	2	320	0	402	0.0%
	2	379	2	379	0		
	3	365	0	7	358		
	4	42	1	0	42		
	5	1	0	0	1		
	6	1	0	0	1		
		1,108	**5**	**706**	**402**		
279	1	156	0	156	0	219	0.0%
	2	203	1	152	51		
	3	162	1	0	162		
	4	4	0	0	4		
	5	1	0	0	1		
	6	1	0	0	1		
		527	**2**	**308**	**219**		
280	1	171	1	171	0	217	0.0%
	2	189	1	189	0		
	3	154	0	19	135		
	4	80	0	0	80		
	5	2	0	0	2		
		596	**2**	**379**	**217**		
281	1	379	0	379	0	334	0.0%
	2	243	2	243	0		
	3	245	0	20	225		
	4	107	0	0	107		
	6	2	1	0	2		
		976	**3**	**642**	**334**		
282	1	41	0	3	38	50	0.0%
	2	12	0	0	12		
		53	**0**	**3**	**50**		
283	1	144	2	144	0	44	0.0%
	2	134	1	134	0		
	3	109	0	104	5		
	4	37	0	0	37		
	5	2	0	0	2		
		426	**3**	**382**	**44**		
284	1	52	0	52	0	49	0.0%
	2	48	0	4	44		
	3	2	0	0	2		
	4	3	0	0	3		
		105	**0**	**56**	**49**		
285	1	596	1	504	92	653	0.0%
	2	506	3	0	506		
	3	41	0	0	41		
	4	7	0	0	7		
	5	5	1	0	5		
	6	2	0	0	2		
		1,157	**5**	**504**	**653**		
286	1	85	1	14	71	97	0.0%
	2	24	0	0	24		
	3	1	2	0	1		
	4	1	1	0	1		
		111	**4**	**14**	**97**		
288	1	67	1	27	40	92	0.0%
	2	51	1	0	51		
	3	1	1	0	1		
	4	0	3	0	0		
		119	**6**	**27**	**92**		

Table 20. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
289	1	81	2	81	0	22	0.0%
	2	83	2	83	0		
	3	66	0	66	0		
	4	23	0	8	15		
	5	7	0	0	7		
		260	**4**	**238**	**22**		
290	1	414	5	414	0	376	0.0%
	2	335	7	335	0		
	3	353	1	50	303		
	4	71	0	0	71		
	6	2	0	0	2		
		1,175	**13**	**799**	**376**		
291	1	755	3	755	0	697	0.0%
	2	686	1	356	330		
	3	350	0	0	350		
	4	13	0	0	13		
	5	3	0	0	3		
	7	1	0	0	1		
		1,808	**4**	**1,111**	**697**		
294	1	134	4	134	0	44	0.0%
	2	119	0	119	0		
	3	71	0	37	34		
	4	10	0	0	10		
		334	**4**	**290**	**44**		
295	1	266	1	266	0	244	0.0%
	2	337	3	337	0		
	3	331	0	103	228		
	4	12	0	0	12		
	5	1	0	0	1		
	6	3	0	0	3		
		950	**4**	**706**	**244**		
296	1	188	0	188	0	261	0.0%
	2	242	1	242	0		
	3	249	1	55	194		
	4	64	0	0	64		
	7	3	0	0	3		
		746	**2**	**485**	**261**		
299	1	288	2	288	0	207	0.0%
	2	281	0	210	71		
	3	135	0	0	135		
	6	1	0	0	1		
		705	**2**	**498**	**207**		
338A	1	278	0	266	12	150	0.0%
	2	129	0	0	129		
	3	8	0	0	8		
	4	1	0	0	1		
		416	**0**	**266**	**150**		
338B	1	257	2	0	257	626	50.8%
	2	49	1	0	49		
	3	2	0	0	2		
		308	**3**	**0**	**308**		
347A	1	341	2	0	341	500	29.2%
	2	12	1	0	12		
	3	1	0	0	1		
		354	**3**	**0**	**354**		
347B	1	405	3	0	405	1,124	63.1%
	2	10	0	0	10		
		415	**3**	**0**	**415**		
TOTAL		**86,783**	**489**	**31,979**	**54,381**	**60,083**	

Table 21. 2010 Muzzleloader Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
103	1	62	0	0	62	91	20.9%
	2	10	0	0	10		
		72	**0**	**0**	**72**		
108	1	26	0	26	0	2	0.0%
	2	11	0	9	2		
		37	**0**	**35**	**2**		
118	1	49	0	49	0	5	0.0%
	2	14	0	9	5		
		63	**0**	**58**	**5**		
119	1	101	0	65	36	66	0.0%
	2	29	0	0	29		
	3	1	0	0	1		
		131	**0**	**65**	**66**		
127	1	5	0	0	5	5	0.0%
		5	**0**	**0**	**5**		
152	1	32	0	0	32	50	34.0%
	2	1	0	0	1		
		33	**0**	**0**	**33**		
155	1	128	0	12	116	136	0.0%
	2	20	0	0	20		
		148	**0**	**12**	**136**		
169	1	176	0	17	159	165	0.0%
	2	4	0	0	4		
	3	2	0	0	2		
		182	**0**	**17**	**165**		
171	1	125	1	74	51	59	0.0%
	2	8	0	0	8		
		133	**1**	**74**	**59**		
172	1	215	0	140	75	81	0.0%
	2	6	0	0	6		
		221	**0**	**140**	**81**		
173	1	68	0	8	60	68	0.0%
	2	8	0	0	8		
		76	**0**	**8**	**68**		
176	1	97	0	75	22	35	0.0%
	2	13	0	0	13		
		110	**0**	**75**	**35**		
183	1	144	0	0	144	214	25.2%
	2	15	0	0	15		
	3	1	0	0	1		
		160	**0**	**0**	**160**		
184	1	235	0	98	137	144	0.0%
	2	6	0	0	6		
	3	1	0	0	1		
		242	**0**	**98**	**144**		
197	1	98	0	0	98	105	2.9%
	2	3	0	0	3		
	3	1	0	0	1		
		102	**0**	**0**	**102**		
218	1	303	1	43	260	276	0.0%
	2	15	0	0	15		
	3	1	0	0	1		
		319	**1**	**43**	**276**		
219	1	225	0	0	225	405	43.7%
	2	3	0	0	3		
		228	**0**	**0**	**228**		

Table 21. (Continued).

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
223	1	145	0	0	145	305	51.5%
	2	3	0	0	3		
	Total	**148**	**0**	**0**	**148**		
224	1	1	0	0	1	1	0.0%
	Total	**1**	**0**	**0**	**1**		
229	1	94	1	0	94	271	64.2%
	2	3	0	0	3		
	Total	**97**	**1**	**0**	**97**		
230	1	92	0	30	62	75	0.0%
	2	13	0	0	13		
	Total	**105**	**0**	**30**	**75**		
234	1	3	0	0	3	5	40.0%
	Total	**3**	**0**	**0**	**3**		
235	1	15	0	15	0	5	0.0%
	2	6	0	2	4		
	3	1	0	0	1		
	Total	**22**	**0**	**17**	**5**		
238	1	10	0	9	1	2	0.0%
	2	1	1	0	1		
	Total	**11**	**1**	**9**	**2**		
246	1	339	1	56	283	311	0.0%
	2	27	0	0	27		
	3	1	0	0	1		
	Total	**367**	**1**	**56**	**311**		
247	1	131	0	98	33	37	0.0%
	2	4	0	0	4		
	Total	**135**	**0**	**98**	**37**		
250	1	65	0	33	32	60	0.0%
	2	22	0	0	22		
	3	6	0	0	6		
	Total	**93**	**0**	**33**	**60**		
251	1	21	0	0	21	26	19.2%
	Total	**21**	**0**	**0**	**21**		
252	1	45	0	40	5	35	0.0%
	2	29	0	0	29		
	3	1	0	0	1		
	Total	**75**	**0**	**40**	**35**		
253	1	118	0	105	13	61	0.0%
	2	45	0	0	45		
	3	3	0	0	3		
	Total	**166**	**0**	**105**	**61**		
255	1	135	0	0	135	173	20.8%
	2	1	0	0	1		
	3	1	0	0	1		
	Total	**137**	**0**	**0**	**137**		
258	1	126	0	18	108	118	0.0%
	2	10	0	0	10		
	Total	**136**	**0**	**18**	**118**		
259	1	326	0	103	223	247	0.0%
	2	22	0	0	22		
	3	2	0	0	2		
	Total	**350**	**0**	**103**	**247**		
262	1	49	0	11	38	46	0.0%
	2	8	0	0	8		
	Total	**57**	**0**	**11**	**46**		
269	1	82	0	0	82	108	14.8%
	2	9	0	0	9		
	3	1	1	0	1		
	Total	**92**	**1**	**0**	**92**		

Table 21. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
270	1	41	0	0	41	55	12.7%
	2	3	0	0	3		
	3	3	0	0	3		
	4	1	0	0	1		
		48	**0**	**0**	**48**		
271	1	28	0	0	28	51	13.7%
	2	13	0	0	13		
	3	2	0	0	2		
	4	1	1	0	1		
		44	**1**	**0**	**44**		
272	1	50	0	15	35	51	0.0%
	2	10	0	0	10		
	3	4	0	0	4		
	4	2	0	0	2		
		66	**0**	**15**	**51**		
273	1	143	0	0	143	168	11.9%
	2	5	0	0	5		
		148	**0**	**0**	**148**		
274	1	30	0	30	0	10	0.0%
	2	9	0	2	7		
	3	3	0	0	3		
		42	**0**	**32**	**10**		
275	1	77	0	72	5	14	0.0%
	2	7	0	0	7		
	3	2	0	0	2		
		86	**0**	**72**	**14**		
276	1	139	0	116	23	79	0.0%
	2	40	0	0	40		
	3	16	0	0	16		
		195	**0**	**116**	**79**		
277	1	312	0	183	129	254	0.0%
	2	103	0	0	103		
	3	22	0	0	22		
		437	**0**	**183**	**254**		
278	1	135	0	119	16	98	0.0%
	2	68	0	0	68		
	3	13	0	0	13		
	4	1	0	0	1		
		217	**0**	**119**	**98**		
279	1	46	0	35	11	31	0.0%
	2	15	0	0	15		
	3	5	0	0	5		
		66	**0**	**35**	**31**		
280	1	44	0	44	0	33	0.0%
	2	23	0	1	22		
	3	11	0	0	11		
		78	**0**	**45**	**33**		
281	1	113	0	96	17	66	0.0%
	2	40	0	0	40		
	3	8	0	0	8		
	6	1	0	0	1		
		162	**0**	**96**	**66**		
283	1	45	0	45	0	6	0.0%
	2	6	0	2	4		
	3	1	0	0	1		
	4	1	0	0	1		
		53	**0**	**47**	**6**		
284	1	2	0	2	0	1	0.0%
	2	1	0	0	1		
		3	**0**	**2**	**1**		

Table 21. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
285	1	120	0	53	67	**97**	**0.0%**
	2	30	0	0	30		
		150	**0**	**53**	**97**		
286	1	1	0	0	1	**3**	**0.0%**
	2	2	0	0	2		
		3	**0**	**0**	**3**		
288	1	8	0	2	6	**8**	**0.0%**
	2	2	0	0	2		
		10	**0**	**2**	**8**		
289	1	28	0	28	0	**3**	**0.0%**
	2	4	0	2	2		
	3	1	0	0	1		
		33	**0**	**30**	**3**		
290	1	123	0	120	3	**74**	**0.0%**
	2	49	0	0	49		
	3	22	0	0	22		
		194	**0**	**120**	**74**		
291	1	224	0	173	51	**153**	**0.0%**
	2	96	0	0	96		
	3	5	0	0	5		
	7	1	0	0	1		
		326	**0**	**173**	**153**		
294	1	34	0	34	0	**6**	**0.0%**
	2	4	0	0	4		
	3	2	0	0	2		
		40	**0**	**34**	**6**		
295	1	113	0	113	0	**56**	**0.0%**
	2	49	0	8	41		
	3	15	0	0	15		
		177	**0**	**121**	**56**		
296	1	67	0	58	9	**39**	**0.0%**
	2	19	0	0	19		
	3	9	0	0	9		
	4	2	0	0	2		
		97	**0**	**58**	**39**		
299	1	91	0	79	12	**43**	**0.0%**
	2	31	0	0	31		
		122	**0**	**79**	**43**		
338ML	1	72	0	0	72	**224**	**63.8%**
	2	9	0	0	9		
		81	**0**	**0**	**81**		
347ML	1	100	0	0	100	**376**	**72.3%**
	2	2	0	0	2		
	3	2	0	0	2		
		104	**0**	**0**	**104**		
TOTAL		**7,260**	**7**	**2,577**	**4,683**	**5,792**	

Table 22. 2010 Special Permit Areas for Firearms Hunters.

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	Bonus Permits
900 - Lake Vermilion State Park	1	15	0	0	15	50	No
	2	3	0	0	3		
	4	1	0	0	1		
		19	**0**	**0**	**19**		
901 - Rice Lake Nat. Wildlife Refuge	1	52	0	39	13	40	Yes
	2	27	0	0	27		
		79	**0**	**39**	**40**		
902 - St. Croix State Park	1	699	1	433	266	450	Yes
	2	176	0	0	176		
	3	8	0	0	8		
		883	**1**	**433**	**450**		
903 - Savanna Portage State Park	1	14	0	1	13	20	Yes
	2	6	0	0	6		
	3	1	0	0	1		
		21	**0**	**1**	**20**		
904 - Gooseberry Falls State Park	1	43	0	16	27	30	Yes
	2	5	0	0	5		
		48	**0**	**16**	**32**		
905 - Split Rock Lighthouse State Park	1	17	0	0	17	30	Yes
		17	**0**	**0**	**17**		
906 - Tettegouche State Park	1	80	0	0	80	125	Yes
	2	3	0	0	3		
		83	**0**	**0**	**83**		
907 - Scenic State Park	1	32	0	0	32	30	Yes
	2	1	0	0	1		
		33	**0**	**0**	**33**		
908 - Hayes Lake State Park	1	23	0	0	23	75	Yes
		23	**0**	**0**	**23**		
909 - Lake Bemidji State Park	1	32	0	0	32	30	Yes
		32	**0**	**0**	**32**		
910 - Zippel Bay State Park	1	54	0	0	54	55	Yes
	2	1	0	0	1		
		55	**0**	**0**	**55**		
913 - Lake Carlos State Park	1	43	0	30	13	20	Yes
	2	10	0	0	10		
		53	**0**	**30**	**23**		
914 - William O'Brien State Park	1	127	0	108	19	70	Yes
	2	51	0	0	51		
		178	**0**	**108**	**70**		
915 - Lake Bronson State Park	1	56	0	29	27	30	Yes
	2	3	0	0	3		
		59	**0**	**29**	**30**		
916 - Maplewood State Park	1	179	0	179	0	100	Yes
	2	152	0	152	0		
	3	124	0	39	85		
	4	17	0	0	17		
		472	**0**	**370**	**102**		
917 - Rydell NWR	1	3	0	0	3	5	Yes
		3	**0**	**0**	**3**		
918 - Lake Alexander SNA	1	64	0	37	27	40	Yes
	2	12	0	0	12		
	3	1	0	0	1		
		77	**0**	**37**	**40**		
919 - Glacial Lakes State Park	1	44	0	14	30	30	Yes
		44	**0**	**14**	**30**		

Table 22. (Continued).

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	Bonus Permits
920 - Lake Louise State Park	1	42	0	37	5	25	Yes
	2	18	0	0	18		
	3	3	0	0	3		
		63	**0**	**37**	**26**		
921 - Beaver Creek Valley State Park1	1	61	0	61	0	20	Yes
	2	17	0	0	17		
	3	3	0	0	3		
		81	**0**	**61**	**20**		
922 - Zumbro Falls SNA	1	11	0	1	10	12	Yes
	2	2	0	0	2		
		13	**0**	**1**	**12**		
923 - Forestville/Mystery Cave SP	1	134	0	64	70	110	Yes
	2	40	0	0	40		
		174	**0**	**64**	**110**		
924 - Frontenac State Park	1	92	0	57	35	60	Yes
	2	24	0	0	24		
	3	1	0	0	1		
		117	**0**	**57**	**60**		
925 - Whitewater State Park	1	92	0	90	2	50	Yes
	2	45	0	0	45		
	3	3	0	0	3		
		140	**0**	**90**	**50**		
926 - Zumbro Falls SNA	1	20	0	10	10	12	Yes
	2	2	0	0	2		
		22	**0**	**10**	**12**		
927 - Whitewater Refuge	1	66	0	16	50	60	Yes
	2	13	0	0	13		
		79	**0**	**16**	**63**		
928 - Vermillion Highlands WMA	1	55	0	54	1	25	Yes
	2	34	0	11	23		
	3	1	0	0	1		
		90	**0**	**65**	**25**		
929 - Elm Creek Park Reserve	1	278	0	256	22	155	Yes
	2	128	0	0	128		
	3	5	0	0	5		
		411	**0**	**256**	**155**		
930 -Lake Rebecca Park Reserve	1	142	0	106	36	80	No
	2	44	0	0	44		
	3	1	0	0	1		
		187	**0**	**106**	**81**		
		3,556	**1**	**1,840**	**1,716**	**1,839**	

Table 23. 2010 Special Permit Areas for Muzzleloader Hunters.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	Bonus Permits
935 - Jay Cooke SP	1	208	0	208	0	120	Yes (4)
	2	110	0	6	104		
	3	15	0	0	15		
	4	1	0	0	1		
		334	**0**	**214**	**120**		
936 - Crow Wing SP	1	99	0	99	0	40	Yes (4)
	2	67	0	67	0		
	3	45	0	6	39		
	4	2	0	0	2		
		213	**0**	**172**	**41**		
937 - Soudan SP	1	19	0	6	13	20	Yes (1)
	2	7	0	0	7		
		26	**0**	**6**	**20**		
938 - City of Tower	1	13	0	0	13	20	No
	2	1	0	0	1		
		14	**0**	**0**	**14**		
939 - Lake Shetek SP	1	17	0	17	0	15	Yes (4)
	2	17	0	17	0		
	3	17	0	0	17		
		51	**0**	**34**	**17**		
940 - Lake Maria SP	1	90	0	90	0	25	Yes (4)
	2	48	0	24	24		
	3	1	0	0	1		
		139	**0**	**114**	**25**		
941 - Nerstrand Big Woods SP	1	100	0	100	0	50	Yes (1)
	2	53	0	36	17		
	3	32	0	0	32		
	4	2	0	0	2		
		187	**0**	**136**	**51**		
942 - Sibley SP	1	73	0	56	17	50	Yes (1)
	2	35	0	0	35		
		108	**0**	**56**	**52**		
943 - Rice Lake SP	1	88	0	88	0	20	Yes (1)
	2	10	0	0	10		
	3	10	0	0	10		
		108	**0**	**88**	**20**		
944 - Vermilion Highlands WMA	1	73	0	58	15	25	Yes (1)
	2	10	0	0	10		
		83	**0**	**58**	**25**		
945 - Big Stone SP	1	29	0	22	7	10	Yes (1)
	2	3	0	0	3		
		32	**0**	**22**	**10**		
TOTAL		**1,212**	**0**	**842**	**370**	**395**	
GRAND TOTAL		**98,811**	**497**	**37,238**	**61,150**	**68,109**	

2010 MINNESOTA ELK HARVEST REPORT

Lou Cornicelli, Big Game Program Coordinator
Joel Huener, Assistant Wildlife Area Manager
Christine Reisz, Assistant Area Wildlife Manager

INTRODUCTION

A limited number of licenses are offered to Minnesota residents to hunt elk. Currently, there are 2 established zones; 1) Kittson County, and 2) near Grygla, Minnesota (Figures 1 and 2). Within those 2 zones, there were 2 hunts each. The early hunt is structured so that it falls within the breeding season when bull elk are most vulnerable. The late season is used as a mechanism to harvest antlerless elk because patterns are more predictable and elk are in larger groups.

METHODS

All elk hunters are required to attend a mandatory orientation and if successful, they must register their animal through the local DNR office. Kill locations are mapped and various data are collected, including age/sex as well as biological samples for disease testing and other monitoring projects.

RESULTS

A total of 11 licenses were available and 871 individuals applied for the opportunity to hunt elk (Table 1). As the number of either-sex licenses is limited, DNR receives an application for the area only. After winners are selected, the time period and license type is distributed through a second random drawing. In 2010, a total of 8 elk were harvested in the both zones (Table 2). Long-term elk harvest for the 2 zones is depicted in Table 3.

Table 1. License allocation and applications numbers for 2 Minnesota elk hunting zones, 2010.

Zone	Either-Sex	Antlerless	Total	Total Applicants
10 – Grygla	2	5	7	644
20 – Kittson	1	3	4	227
Total	**3**	**8**	**11**	**871**

Table 2. Distribution of the 2010 Minnesota elk harvest. License allocation totals represent the actual number sold, not the number authorized through rule.

Grygla Hunt Zone

Season	Either-Sex Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken
September 18 - 26	2	0	1 (6x7)	N/A	1
December 4 - 12	0	5	N/A	3	3
Total	**2**	**5**	**1**	**3**	**4**

Kittson Hunt Zone

Season	Either-Sex Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken
September 18 - 26	1	1	1 (6x6)	1	2
December 4 - 12	0	2	N/A	2	2
Total	**1**	**3**	**1**	**3**	**4**

Table 3. Grygla and Kittson County elk harvests, 1987-2010.

Grygla

	Bulls (or Either-Sex)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
1987	2	1	2	1
1996	2	2	7 (1 alternate)	6
1997	5 (2 alternate)	1	5 (2 alternate)	2
1998	4 (2 alternate)	2	0	0
2004	1	1	4	2
2005	1	0	4	0
2006	2	2	6	2
2007	0	0	6	6
2008	2	2	10	6
2009	2	3*	12	11
2010	2	1	5	3
Total	23	15	61	39

*One bull was a sub-legal spike and was legally tagged as an antlerless animal.

Kittson County (Combined)

	Bulls (or Either-Sex)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
2008	1	1	10	10
2009	12	9*	4	5
2010	1	1	3	3
Total	14	11*	17	18

*One additional bull (6x7) was wounded but not retrieved in 2009. It was found dead later and is counted in the total.

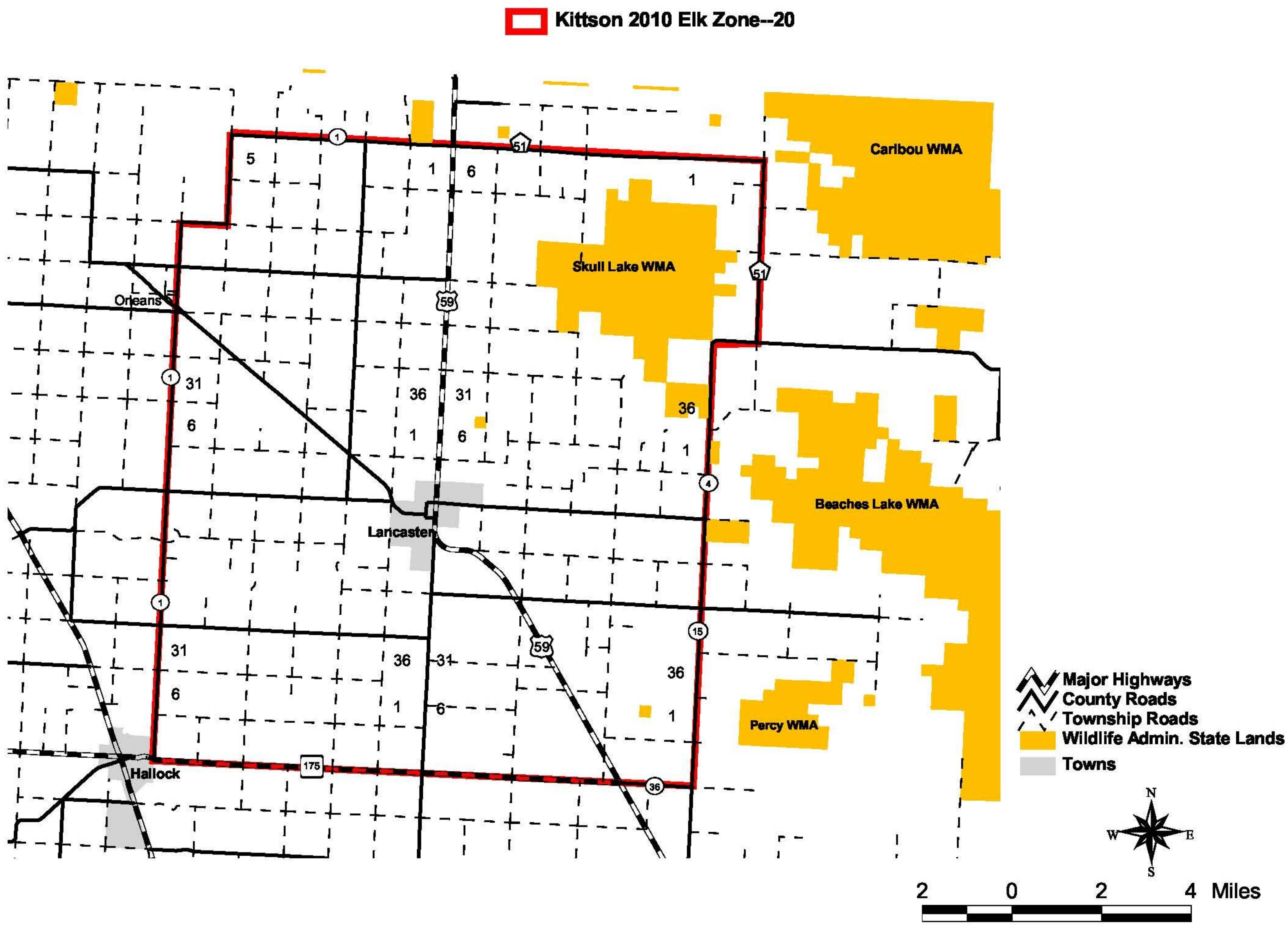


Figure 1. Kittson Hunt Zone.

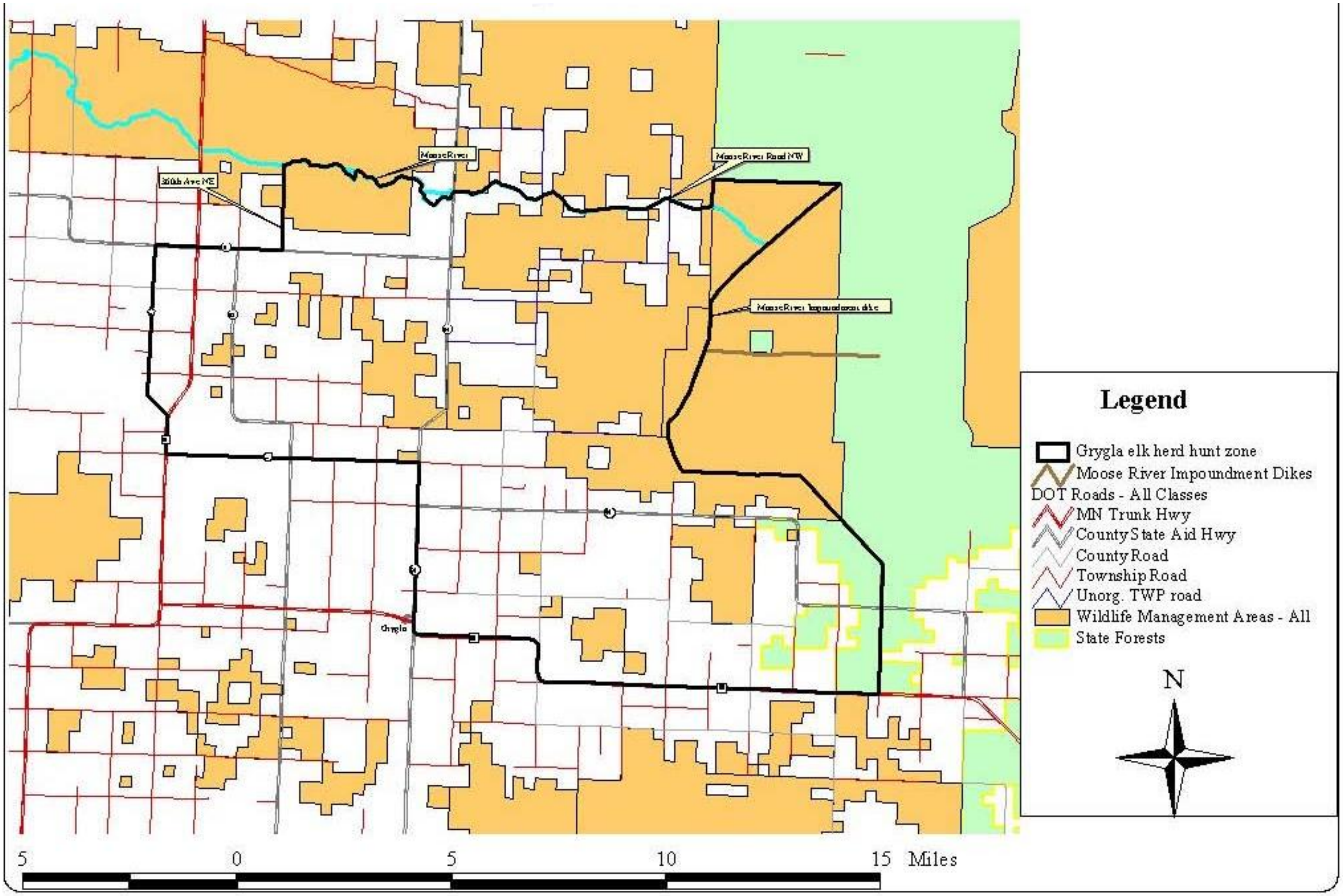


Figure 2. Grygla Hunt Zone.

2010 MINNESOTA MOOSE HARVEST

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year, a limited number of permits are issued that allow Minnesota residents to hunt moose. The following report is intended to document the number of hunters applying for permits, the number of permits issued, a hunting party's chance of receiving a permit, hunter success rate, and a breakdown of the harvest by hunting zone. Permit areas for state hunters are presented in Figure 1. Information on permit numbers and moose harvested by members of the 1854 Treaty Authority or Fond du Lac band of Lake Superior Chippewa within the 1854 Ceded Territory is also provided.

METHODS

All successful State hunters are required to register their moose at one of 9 registration stations and provide information on the location where they killed their moose, date of kill, and sex of moose harvested.

RESULTS

In 2010, State hunters harvested 109 moose in northeastern Minnesota. No season was held in northwestern Minnesota. Of the 2,415 parties that applied for this year's moose hunt, 213 (9%) were drawn, and 212 purchased licenses (Table 1). Hunters were restricted to harvesting bulls in this year's hunt. Table 1 also lists the number of permits offered by hunting zone, chance of being selected for a permit, and hunter success. The 1854 Treaty Authority issued 58 permits and band members killed 12 moose (8 bulls and 4 cows). The Fond du Lac band issued 65 permits and the preliminary harvest (as of 10/26/2010) was 21 moose (18 bulls and 3 cows). The Fond du Lac season closes 12/31/2010.

DISCUSSION

The success rate of State hunters in 2010 was 51%, an increase of 5% over 2009 (Tables 1 and 2). This was the fourth year of hunting for bulls only. The success rate for members of the 1854 Treaty Authority was 21%, down 8% from last year. The preliminary success rate for the Fond du Lac band was 32%, as of 10/26/2010, down 6%.

Table 1. Moose harvested, licenses offered and sold, application rate, and party success, in 2010 moose hunt by State hunters in northeastern Minnesota

Zone	Bulls	Cows	Total	Licenses Offered	Licenses Sold	Party Applications*	Chances for Permit	% Success
20	0	0	0	11	11	57	19%	0%
21	3	0	3	6	6	109	6%	50%
22	3	0	3	5	5	26	19%	60%
23	0	0	0	2	2	14	14%	0%
24	6	0	6	8	8	158	5%	75%
25	5	0	5	10	10	237	4%	50%
26	1	0	1	4	4	19	21%	25%
27	1	0	1	5	5	42	12%	20%
28	2	0	2	9	8	61	15%	25%
29	4	0	4	6	6	87	7%	67%
30	3	0	3	7	7	120	6%	43%
31	10	0	10	18	18	319	6%	56%
32	3	0	3	3	3	21	14%	100%
33	2	0	2	6	6	86	7%	33%
34	0	0	0	2	2	38	5%	0%
36	3	0	3	10	10	34	29%	30%
37	2	0	2	3	3	15	20%	67%
60	1	0	1	4	4	25	16%	25%
61	6	0	6	10	10	55	18%	60%
62	10	0	10	19	19	166	11%	53%
63	1	0	1	4	4	23	17%	25%
64	4	0	4	8	8	49	16%	50%
70	7	0	7	7	7	123	6%	100%
72	8	0	8	10	10	144	7%	80%
73	3	0	3	6	6	62	10%	50%
74	4	0	4	4	4	57	7%	100%
76	4	0	4	6	6	79	8%	67%
77	4	0	4	10	10	87	11%	40%
79	5	0	5	5	5	25	20%	100%
80	4	0	4	5	5	77	6%	80%
Total	109	0	109	213	212	2415	9%	51%

*Number of 2, 3, or 4 person parties - rejected applications

Table 2. Applicants, permit numbers, moose harvested, and success rates of state moose hunters since 1993.

	Northwest				Northeast				
Year	Party Applicants	Permits	Moose Harvested	Party Success	Party Applicants	Permits	Licenses Purchased	Moose Harvested	Party Success
1993	6,558	446	422	95%	2,934	315	315	264	84%
1994	8,208	262	244	93%	3,022	189	189	155	82%
1995	7,622	191	171	90%	3,181	188	188	156	83%
1996	2,476	39	38	97%	3,830	207	207	156	75%
1997		No Season			3,958	198	198	152	77%
1998		No Season			4,157	182	182	125	69%
1999		No Season			3,919	189	189	136	72%
2000		No Season					No Season		
2001		No Season			3,164	182	176	125	71%
2002		No Season			2,580	208	202	141	70%
2003		No Season			2,328	224	217	144	66%
2004		No Season			3,062	246	240	151	63%
2005		No Season			3,060	284	276	164	59%
2006		No Season			2,952	279	269	161	60%
2007		No Season			2,566	233	229	115	50%
2008		No Season			2,706	247	245	110	45%
2009		No Season			2,746	225	223	103	46%
2010		No Season			2,415	213	212	109	51%

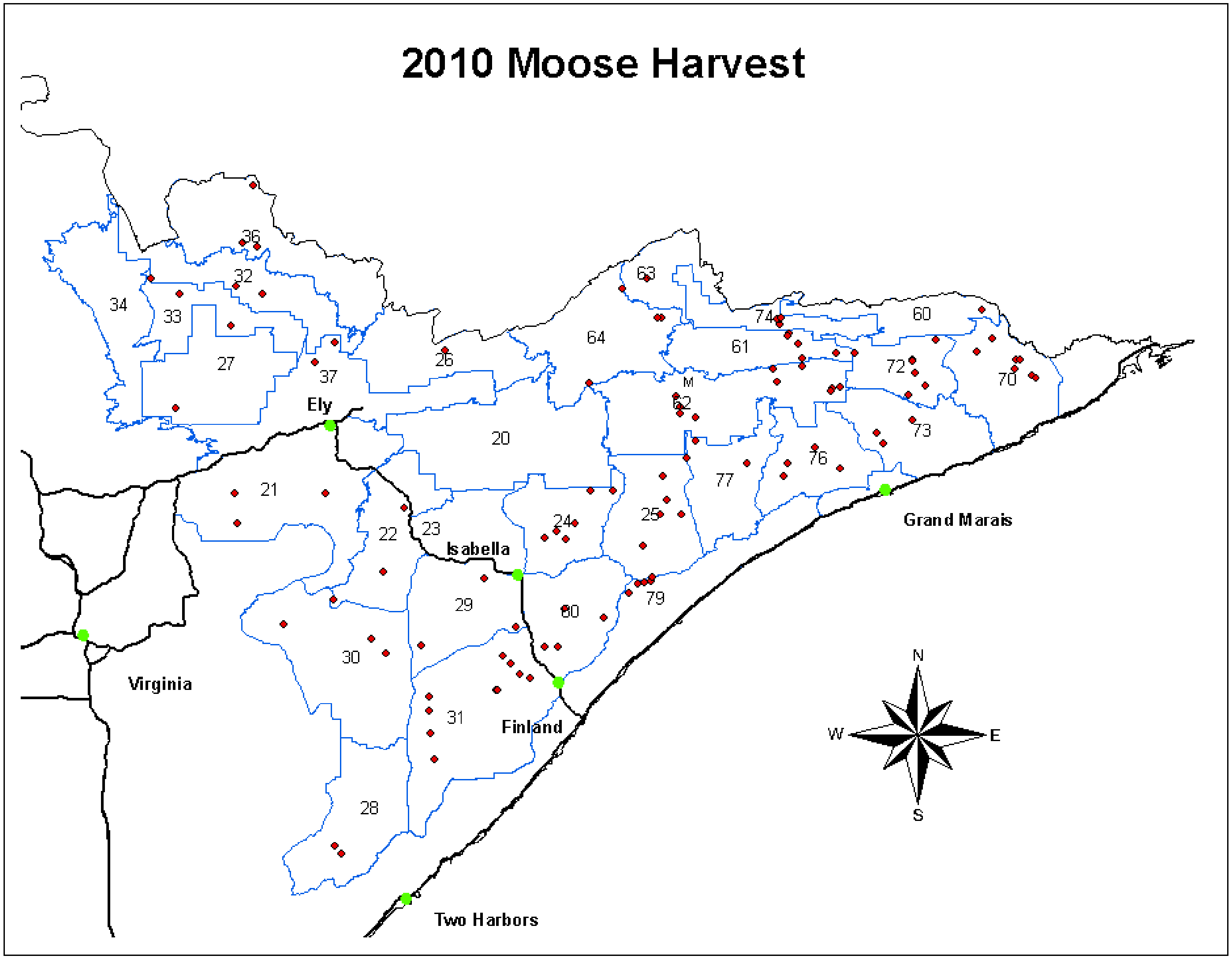


Figure 1. Permit areas for state moose hunters, 2010.

MINNESOTA SANDHILL CRANE HARVEST REPORT, 2010

Margaret Dexter, Wildlife Research Unit

Two distinct populations of sandhill cranes (*Grus Canadensis*) occur in Minnesota. Sandhill cranes in NW Minnesota are part of the mid-continent population; sandhill cranes in the remainder of the state are part of the Eastern population. Sandhill cranes that breed and stage during fall in NW Minnesota are part of the midcontinent population. This population is managed via a cooperative management plan with the U.S. Fish and Wildlife Service, Mississippi, Central, and Pacific Flyway Councils.

A limited season for mid-continent sandhill cranes was opened in Minnesota for the fall of 2010. The season was open from the first Saturday in September through October 10. The area open for hunting was limited to the Northwest Goose Zone (Figure 1). Hunters were required to purchase a sandhill crane permit, available over the counter for $3.00, and be HIP certified. A limit was set at 2 per day and 4 in possession. Sandhill crane permit holders were selected to receive a harvest survey from the U.S. Fish and Wildlife Service after the season. This survey was used to monitor harvest levels and hunting activity.

A total of 1,962 sandhill crane hunting permits ($3.00) were issued during fall 2010. Names and addresses from all permit holders were submitted to the USFWS Harvest Surveys Section and 50% of purchasers were mailed a sandhill crane harvest survey. Results from this survey indicated 964 active crane hunters, 3,331 crane hunter-days, and a harvest of 830 cranes in Minnesota.

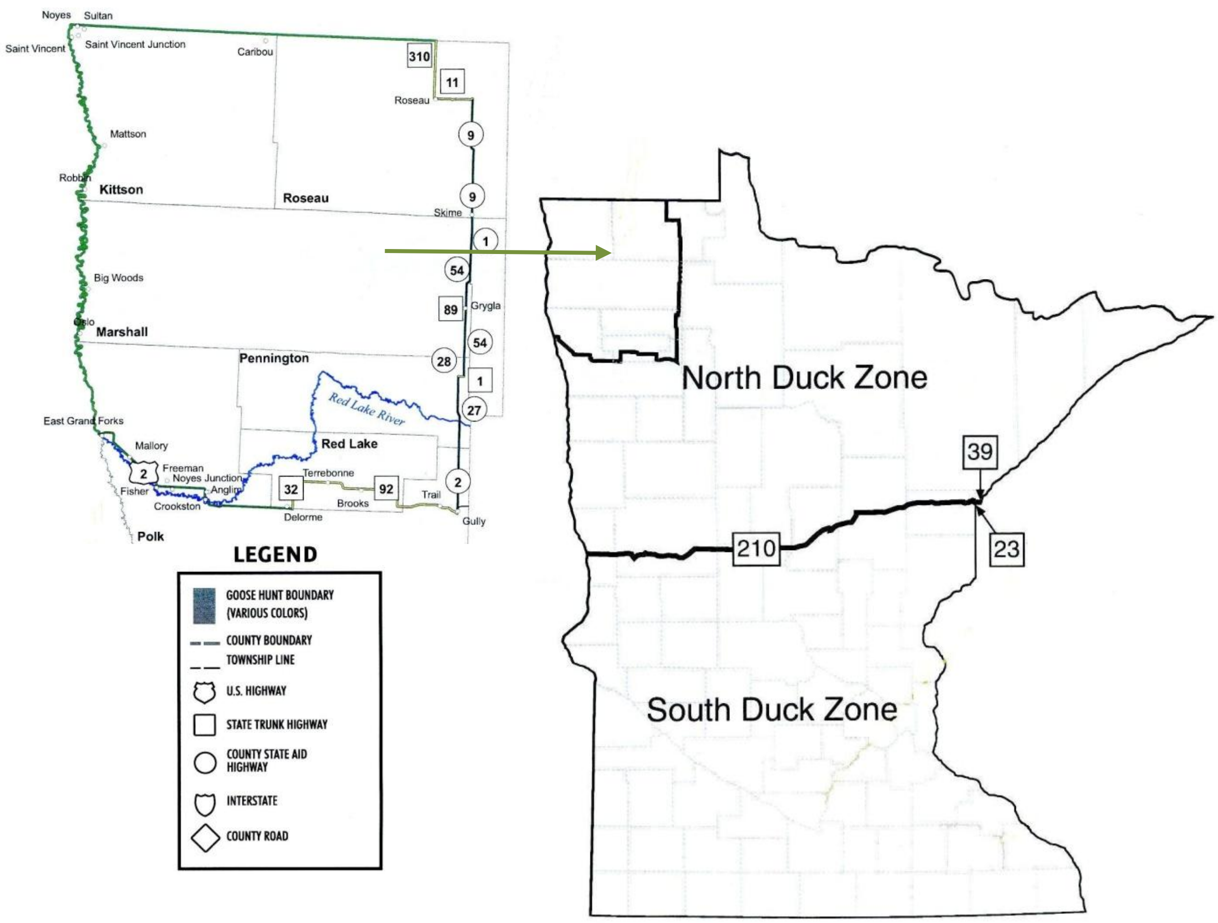


Figure 1. Sandhill crane hunting zone, 2010.

TRAPPING HARVEST STATISTICS

Division of Fish and Wildlife
500 Lafayette Road, Box 20
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2010 TRAPPER HARVEST SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources, Research Surveys and Statistics unit annually conduct a survey of trapper license holders to assess annual harvest rates. Annual harvest estimates from survey data provide the basis for future trapping regulations and season structure. Beginning with the 1999-2000 season survey cards were sent to all trappers with a valid mailing address.

METHODS

The Research Surveys and Statistics unit requests a list of all active trapper license holders from the Electronic License System database in late February. The sample consists of all valid Regular, Junior and Non-resident Trapper License holders. For the 2010-11 trapping season there were 5,409 Resident Regular Trappers, 363 Resident Junior Trappers, 847 Resident Senior Trappers, 249 "active" Lifetime Trappers, and 7 Nonresident (MN landowners) Trapper license holders. Of the 6,885 valid licenses, 6,875 had usable addresses for purposes of the survey. The survey sample is in essence a census but the response rate is < 100%. If non-response (including undeliverable surveys) is completely random, then respondents can be treated as a random sample and results expanded to the entire sampling frame for all licensed trappers. For consistency with previous analyses, the response data was treated as a random sample.

Trappers that returned the survey questionnaire within three weeks were marked returned and eliminated from follow-up mailings. Follow-up mailings were sent to non-respondents at intervals of three weeks. There were three follow-up mailings to non-respondents.

Completed and returned questionnaires were checked for completeness, consistency, and biological practicability. Cards were marked with numeric county codes corresponding to the trapper's written information. Data from each usable card was converted to an electronic database. Data were checked for errors, duplicate responses, and /or missing data. The following assumptions were made in data coding:

1) If an individual checked the box indicating (s)he did not trap, but harvest information was provided, it was assumed that the individual did trap.
2) If a range was given for "number of days trapped" or "number of animals harvested", the median of the range, rounded to the nearest even integer was recorded.
3) If a trapper indicated spending time trapping for a species, but left "number trapped" blank, the # trapped was entered as missing data.
4) If a trapper indicated taking a species, but left "number of days trapped" blank, then "number of days trapped" was recorded as missing data.
5) If more than one county was indicated for "county trapped in most", the first county listed was recorded. However, if the several counties listed were indicated to apply to all species trapped, then counties were recorded in sequential order in relation to species hunted.
6) If "county trapped in most" was left unanswered or not legible, the county was recorded as missing data.

Data from all usable cards were tabulated and statistically analyzed by the St. Paul staff, using SAS statistical analysis software programs.

RESULTS

Attached are the survey results for Harvest Statewide and by License type (Tables 1 – 5).

Table 1. Trapper response to mail surveys, 1989-90 through 2010-11.

Year	Number mailed	Number not delivered	Delivered questionnaires completed and returned: Number	Delivered questionnaires completed and returned: Percent
1989-90	3,302	120	2,804	88.1
1990-91	2,294	102	1,875	85.5
1991-92	2,643	149	2,062	82.7
1992-93	2,080	76	1,681	83.9
1993-94	2,828	100	2,194	80.4
1994-95	2,382	76	1,876	81.5
1995-96	3,244	118	2,467	80.3
1996-97	4,071	132	3,017	76.6
1997-98	3,500	96	2,629	77.2
1998-99	3,900	117	2,878	76.4
1999-00	3,110	74	2,313	76.2
2000-01	5,262	146	3,941	77.0
2001-02	5,482	127	4,132	78.6
2002-03	5,655	210	4,148	76.0
2003-04	5,812	197	4,234	75.4
2004-05	6,267	235	4,547	75.4
2005-06	6,060	88	4,396	73.6
2006-07	8,508	139	5,835	69.9
2007-08	6,342	104	4,326	69.9
2008-09	6,203	86	4,166	68.1
2009-10	6,144	70	4,425	71.7
2010-11	6,875	94	4,844	71.4

Table 2. Use of trapper licenses, 2098-99 through 2010-11.

		Return from mail survey	Projections from license sales
1998-99	Trapped	2,398 (88.6%)	5,541
	Did not trap	480 (16.7%)	1,111
		2,878 (100.0%)	6,652[a]
1999-00	Trapped	1,927 (83.5%)	4,122
	Did not trap	381 (16.5%)	814
		2,308 (100.0%)	4,936[a]
2000-01	Trapped	2,897 (75.9%)	4,051
	Did not trap	920 (24.1%)	1,286
		3,817 (100.0%)	5,337[a]
2001-02	Trapped	3,332 (81.5%)	4,510
	Did not trap	754 (18.5%)	1,024
		4,086 (100.0%)	5,534[a]
2002-03	Trapped	3,344 (80.6%)	4,615
	Did not trap	804 (19.4%)	1,111
		4,148 (100.0%)	5,726[a]
2003-04	Trapped	3,412 (81.1%)	4,737
	Did not trap	793 (18.9%)	1,104
		4,205 (100.0%)	5,841[a]
2004-05	Trapped	3,697 (81.9%)	5,136
	Did not trap	815 (18.1%)	1,135
		4,512 (100.0%)	6,271[a]
2005-06	Trapped	3,495 (80.0%)	4,930
	Did not trap	875 (20.0%)	1,233
		4,370 (100.0%)	6,163[a]
2006-07	Trapped	4,782 (81.9%)	7,008
	Did not trap	1,053 (18.1%)	1,549
		5,835 (100.0%)	8,557[a]
2007-08	Trapped	3,322 (77.2%)	5,533
	Did not trap	980 (22.8%)	1,634
		4,302 (100.0%)	7,167[a]
2008-09	Trapped	3,154 (75.7%)	5,319
	Did not trap	1,012 (24.3%)	1,708
		4,166 (100.0%)	7,027[a]
2009-10	Trapped	3,202 (72.7%)	4,467
	Did not trap	1,202 (27.3%)	1,677
		4,404 (100.0%)	6,144[a]
2010-11	Trapped	3,546 (73.2%)	5,032
	Did not trap	1,298 (26.8%)	1,843
		4,844 (100.0%)	6,875[a]

[a] excludes duplicates.

Table 3. Estimated number of trappers of various furbearers, 1998-99 through 2010-11.

	Estimated number of trappers												
	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Muskrat	3121	2137	2052	2419	2137	2117	2269	2351	4228	2371	2393	2088	2760
Mink	2772	1919	1867	2117	1945	1917	2085	1864	3033	2168	2044	1541	1847
Short-tailed weasel	366	383	318	411	408	473	470	349	864	595	511	417	546
Long-tailed weasel	347	330	272	313	312	374	299	211	694	434	345	254	333
Raccoon (Sept -Feb)	2769	1880	1599	2249	2427	2384	2505	2315	3766	3189	3150	2320	2567
Raccoon (Mar -Aug)[a]	463	315	343	334	354	338	406	322					
Striped skunk	994	681	563	955	1052	1102	1161	1023	1644	1485	1488	949	1130
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	234	178	135	250	237	292	310	219	347	330	293	206	229
Opossum	643	458	484	610	754	934	1037	957	1511	1392	1169	701	645
Red fox (Sept -Feb)	1186	1033	986	1093	1319	1290	1179	991	1608	1320	1232	1006	1068
Red fox (Mar -Aug)[a]	137	107	89	91	111	113	110	85					
Gray fox	386	308	468	277	421	441	451	407	806	654	657	529	555
Coyote	576	552	491	606	813	812	826	857	1379	1203	1141	888	998
Beaver (Oct 10- Feb 11)	2483	1891	1695	2054	1844	1883	2171	1965	2659	2008	1877	1650	1722
Beaver (Mar 10- Apr 10)	1907	1320	1425	1345	1296	1233	1449	1455	1710	1408	1257	1260	1367

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

Table 4. Estimated take per trapper of various furbearers, 1997-98 through 2010-2011.

	Estimated take per successful trapper reporting that species													
	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Muskrat	58	42	46	42	42	35	33	32	39	58	32	34	47	65
Mink	11	13	14	12	14	10	9	10	10	9	9	8	9	8
Short-tailed weasel	10	7	5	8	10	7	7	6	6	9	7	7	8	9
Long-tailed weasel	5	5	5	5	7	4	5	3	3	5	5	3	3	5
Raccoon (Sept -Feb)	24	23	20	20	27	25	22	23	21	21	23	23	19	22
Raccoon (Mar Aug)[a]	14	15	14	11	19	12	15	12	11					
Striped skunk	10	9	8	8	8	8	8	8	7	7	7	7	7	7
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	2	2	2	2	2	2	2	1	2	1	2	1	2	2
Opossum	9	11	13	11	8	11	12	14	12	14	12	10	7	7
Red fox (Sept -Feb)	7	5	6	6	6	6	5	4	4	4	3	3	3	3
Red fox (Mar -Aug)[a]	4	3	4	4	5	5	6	3	3					
Gray fox	3	3	2	2	2	2	2	2	2	2	2	2	2	2
Coyote	3	3	4	4	4	4	5	4	5	4	4	4	4	4
Beaver (Oct 10-Feb 11)	16	16	16	15	18	13	12	13	13	13	11	11	11	10
Beaver (Mar 10 - Apr 10)	32	29	27	26	31	26	21	26	24	24	19	22	20	21

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

Table 5. Minnesota trapper license sales and estimated annual harvest, 1996-97 through 2010-2011[a]

	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Trapper license sales [b]	6,675	6,996	6,652	4,936	5,337	5,534	5,725	5,841	6,271	6,163	8,557	7,167	7,027	6,158	6,885
Estimated harvest [c]															
Muskrat	201,794	188,189	131,439	97,333	85,555	100,819	75,190	69,131	72,079	91,271	243,360	75,439	80,157	98,524	180,505
Mink	34,612	32,449	36,152	26,808	22,590	28,684	19,894	16,716	21,478	18,048	26,084	18,626	16,647	13,207	13,853
Short-tailed weasel	4,196	6,401	2,400	1,763	2,586	4,160	2,895	3,519	2,679	2,223	8,145	4,155	3,515	3,128	4,914
Long-tailed weasel	2,065	3,880	1,863	1,619	1,354	2,243	1,138	1,781	1,007	651	3,494	2,013	1,118	838	1,732
Raccoon (Oct - Feb)	68,810	71,705	63,680	37,435	32,460	60,292	61,221	53,534	56,848	48,966	78,571	73,498	71,893	45,118	57,245
Raccoon (Mar -Aug)[f]	4,936	8,986	6,849	4,263	3,702	6,468	4,137	4,933	4,940	3,594					
Striped skunk	11,168	10,027	9,181	5,266	4,580	7,168	7,901	8,474	8,704	6,881	10,773	10,811	10,354	6,194	8,023
Eastern spotted skunk [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	594	446	400	319	205	407	358	552	455	339	461	499	424	316	344
Opossum	6,453	5,201	6,916	5,907	5,351	5,127	8,491	11,251	14,313	11,754	20,442	17	11,296	4,963	4,193
Red fox (Oct - Feb)	12,477	9,995	6,347	6,508	6,165	6,870	7,851	6,721	4,684	3,528	6,783	4,060	3,500	2,984	3,311
Red fox (Mar -Aug)[f]	529	680	458	379	357	447	612	635	334	222					
Gray fox	974	1,163	976	743	468	525	892	915	898	797	1,703	1,360	1,320	1,084	1,110
Coyote	3,148	2,720	1,637	2,372	2,112	2,369	3,641	3,805	3,607	3,915	5,315	5,355	4,532	3,797	4,292
Beaver (Oct 10- Feb 11)	38,113	47,370	38,720	30,564	24,802	35,963	23,592	22,801	28,716	26,029	33,966	21,813	21,075	18,178	17,048
Beaver (Mar 10-Apr 10)	48,235	65,472	55,262	36,189	37,455	41,829	33,721	26,363	37,861	35,252	41,652	26,286	27,815	25,008	29,118
Registered harvest															
Otter	2,219	2,145	1,946	1,635	1,578	2,301	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1814
Lynx [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Bobcat [e]	223	359	103	206	231	250	544	483	631	590	890	702	853	884	1012
Fisher	1,773	2,761	2,695	1,725	1,674	2,119	2,660	2,517	2,552	2,388	3,251	1,682	1,712	1,259	903
Marten	1,625	2,261	2,299	2,423	1,629	1,928	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1842

[a] Includes data for all seasons from October through April of years indicated.

[b] Separate licenses were issued for juveniles (13-17 years old) and adults (18 and older), beginning in 1982. Nonresident (MN Landowner) licenses started in 2004. Senior trapping licenses were first issued in 2007. Lifetime Licenses became available for free when renewing lifetime sports or small game licenses in 2007. As of April, 2011 - 6,885 trapping licenses were sold in 2010 363 (5.3%) were juvenile licenses, 5,420 (78.7%) were Regular adult licenses, 847 (12.3%) were Senior licenses, 247(3.6%) were Lifetime licenses, and 8 (<1%) were Nonresident (MN Landowner) licenses. Duplicate licenses excluded.

[c] Based upon trappers' responses to mail surveys.

[e] Registered harvest for bobcat includes animals taken by hunting. [f] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

[g] Lynx (1984) and Eastern spotted skunk (1996) listed as Special Concern and threatened species (respectively) and are fully protected.

MINNESOTA FUR BUYERS SURVEY FOR THE 2010-2011 HUNTING AND TRAPPING SEASON

Jason Abraham, Wildlife Furbearer Program Coordinator
Margaret Dexter, Wildlife Policy and Research Unit

INTRODUCTION

Fur buyers are individuals licensed by the State of Minnesota to buy and sell raw fur. They are required to keep complete records of all transactions and activities related to buying, selling, and disposing of raw furs. Each year buyers are sent a questionnaire asking them to submit information regarding the “average” price they paid to trappers for various furbearers the previous season.

METHODS

In August 2011, questionnaires were mailed to the 39 licensed fur buyers in Minnesota. The survey asked them to report the number and type of fur purchased from Minnesota trappers and hunters in 2010-11 and the “average price” paid to those hunters and trappers based on all furs purchased. A total of 25 usable surveys were received, for a return rate of 64 percent. Calculations of average pelt price for each species (Table 1) were weighted according to the number of pelts purchased by each buyer. Average pelt prices for the past 15 years are summarized in Table 2. Total estimated value of the furbearer harvest to trappers and hunters in 2010-11 was $614,036.25, a 16 percent decrease from 2009-2010.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2010-11.

Species	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	26339	3.00	6.00	5.33
Mink Female	1059	5.00	12.00	9.33
Mink male	1604	5.00	18.00	13.66
Raccoon	15170	7.00	15.00	10.87
Red Fox	723	8.00	18.00	13.35
Gray Fox	202	8.00	17.00	14.64
Coyote	2270	7.00	20.13	9.47
Bobcat	82	45.00	87.50	71.44
River Otter	287	25.00	55.00	34.53
Beaver 10-2	2567	5.00	15.05	11.95
Beaver 3-4	6571	6.00	15.56	14.50
L.T. Weasel	10	1.50	1.50	1.50
S.T. Weasel	350	0.50	3.50	2.87
Striped Skunk	69	2.00	4.00	3.29
Badger	79	1.00	20.59	10.43
Opossum	119	0.25	15.00	2.64
Fisher Male	124	25.00	47.50	38.19
Fisher Female	106	29.44	45.00	37.31
Marten Male	140	33.13	40.00	39.80
Marten Female	94	25.00	45.00	36.57
Deer Hides	18121	0.00	5.11	4.41
Bear Hides	34	0.00	50.00	33.38

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 1999-00 through 2010-11.

	Average pelt prices paid hunters and trappers in Minnesota (dollars)											
Species	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Muskrat	1.57	1.83	2.32	2.11	2.05	1.9	2.81	$5.79	2.96	1.85	4.43	5.33
Mink (female)	8.22	7.7	6.76	6.52	7.23	10.22	10.23	$13.18	9.05	7.45	8.02	9.33
Mink (male)	11.61	11.15	9.34	9.55	11.41	11.34	14.29	$18.04	12.32	9.14	9.37	13.66
S.T. Weasel	2.16	2.3	2.41	2.63	2.53	2.52	2.6	$3.58	3.18	3.57	3.02	1.50
L.T. Weasel	2.34	1.8	2.98	1.94	3.34	3.05	2.56	$4.35	5	2.21	3.12	2.87
Raccoon	5.09	8.86	9.53	10.33	11.45	10.49	9.61	$11.92	14.32	9.34	9.18	10.87
Striped Skunk	4.4	4.79	3.91	5.81	4.66	3.95	3.77	$4.46	5.27	7.12	8.62	9.47
Badger	7.3	10.15	9.39	13.18	14.23	12.94	13.4	$15.71	13.92	7.70	8.81	10.43
Opossum	0.96	0.97	1.19	1.22	1.23	1.51	1.4	$1.52	1.76	1.21	1.30	2.64
Red Fox	11.82	14.45	17.07	22.08	20.02	17.28	16.96	$17.68	14.69	11.79	10.85	13.35
Gray Fox	7.06	7.52	8.36	9.05	13.64	12.58	15	$22.36	30.09	14.08	11.55	14.64
Coyote	9.42	12.4	13.37	16.12	18.37	15.24	13.57	$17.76	13.51	7.12	8.62	9.47
Bobcat	24.23	33.09	46	71.54	95.9	98.99	95.74	$101.07	93.41	74.74	42.77	71.44
Beaver (fall-winter)	11.51	14.66	12.74	10.05	12.57	13.62	14.48	$18.35	14.6	14.63	12.49	11.95
Beaver (spring)	11.02	12.8	12.47	9.99	11.09	13.8	16.49	$14.81	17.77	9.36	14.47	14.50
Otter	41.41	50.52	46.19	61.16	85.33	87.23	88.89	$42.85	29.49	24.33	35.65	34.53
Fisher (male)	19.45	20.14	23.18	26.7	27.15	30.02	36.03	$76.33	63.09	22.27	34.45	38.19
Fisher (female)	19.91	19.01	22.86	25.44	25.71	27.47	31.46	$67.82	48.24	37.22	34.90	37.31
Marten (male)	24.89	27.56	24.1	28	30.09	30.65	37.47	$74.04	58.72	30.61	26.76	39.80
Marten (female)	21.27	21.25	22.52	27.3	26.7	27.42	31.53	$66.09	50.05	28.19	29.95	36.57
Deer Hides	6.32	6.46	2.86	3.48	5.41	3.95	4.14	$4.51	3.92	3.53	4.44	4.41
Bear Hides	33.87	39.81	36.1	40.56	41.55	46.61	39.3	$43.03	36.57	29.81	43.00	33.38

REGISTERED FURBEARER HARVEST STATISTICS

Forest Wildlife Populations and Research Group
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REGISTERED FURBEARER HARVEST STATISTICS
2010-11 Report

Drawing by Gilbert Proulx

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring harvest is an important component of population management for many wildlife populations. For many species, harvest represents a large proportion of overall mortality. Obtaining harvest information can be useful for documenting changes in the distribution and abundance of animals, as well as the effects of changes in harvest seasons, harvest techniques, and habitat. The level of detail or accuracy necessary in harvest information may vary across species, depending on such factors as density, harvest pressure, habitat sensitivity of the species, and reproductive potential.

In Minnesota, detailed harvest information is collected on 4 carnivores – fisher, marten, bobcat, and river otter. These species have lower reproductive potential, naturally occur at low to moderate densities, have comparatively 'restricted' distributions, and/or may be more subject to effects of habitat change. Hence, detailed harvest information is desirable to help ensure sustainable populations. For approximately the past 33 years, such data has been collected for these species.

METHODS

Fur-harvesters are required to bring pelts from harvested animals (fisher, marten, bobcat, and otter) in to fur registration stations within 48 hours of the close of the season. Upon registration, information is collected on the sex, date, and harvest location (township), and the pelt is tagged to verify it has been registered.

RESULTS

Currently, harvest of fisher, marten, and bobcat is allowed in approximately the northern 60% of the state (Figure 1). Changes to season parameters this year included: 1) allowing otter harvest statewide with a consistent limit of 4 otter per trapper (Figure 1), and 2) a reduction in the fisher limit from 5 to 2 (Table 1). The fisher and marten harvest season length remained at 9 days, shortened from 16 days starting in 2007 (Table 1). All harvest summaries are provided in the following tables.

NOTE: This report does not include tribal harvests, or any confiscations.

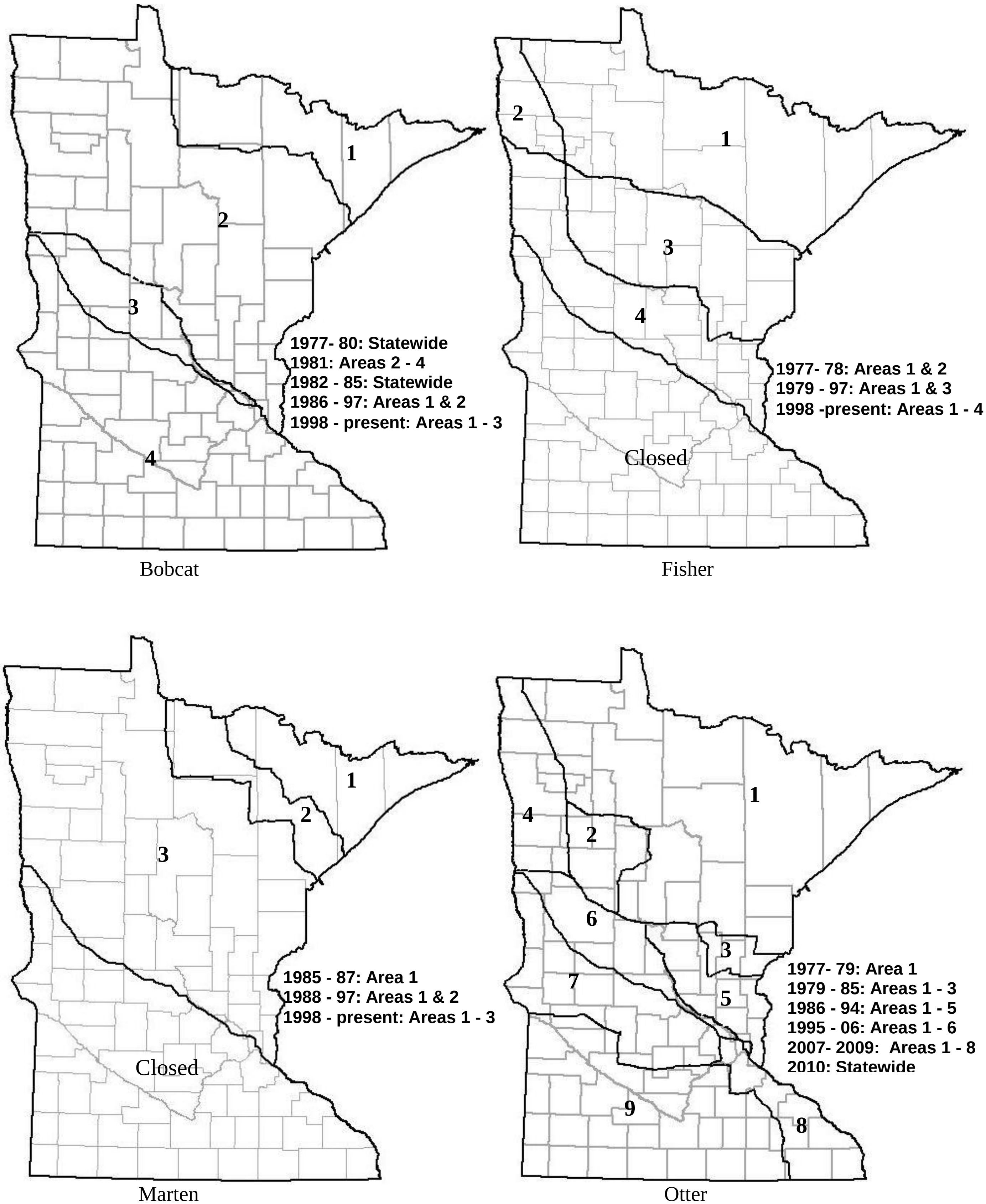

Figure 1. Open trapping areas for fisher, marten, bobcat, and otter, 1977 - present.

Table 1. Registered furbearer seasons and harvests, 1982-2010.

	Bobcat				Fisher				Marten				Otter			
Year	Season	Days	Limit	Harvest	Season	Days	Limit	Harvest	Season	Days	Limit	Harvest	Season[a]	Days	Limit	Harvest
1982-83	12/1-1/23	54	5	274	12/1-12/10	10	1	912	CLOSED				11/13-11/27	15	2	385
1983-84	12/1-1/22	53	5	208	12/1-12/11	11	1	631	CLOSED				11/12-11/26	15	2	408
1984-85	12/1-1/20	51	5	280	12/1-12/16	16	1	1289	CLOSED				11/17-12/1	15	2	529
1985-86	11/30-1/19	51	5	119	11/30-12/15	16	1	678	11/30-12/15	16	1	430	11/16-12/15	30	3	559
1986-87	11/29 -1/3	36	5	160	11/29-12/14	16	1	1067	11/29-12/14	16	1	798	11/1-11/30	30	3	777
1987-88	11/28-1/3	37	5	212	11/28-12/13	16	1	1641	11/28-12/13	16	1	1363	10/24-11/29	37	3	1386
1988-89	11/26-1/1	37	5	141	11/26-12/11	16	1	1025	11/26-12/11	16	2	2072	10/29-11/27	30	3	922
1989-90	12/2-1/7	37	5	129	12/2-12/17	16	1	1243	12/2-12/17	16	2	2119	10/28-12/17	51	3	1294
1990-91	12/1-1/6	37	5	84	12/1-12/16	16	1	746	12/1-12/16	16	2	1349	10/27-1/6	71	3	888
1991-92	11/30-1/5	37	5	106	11/30-12/15	16	1	528	11/30-12/15	16	1	686	10/26-1/5	71	3	855
1992-93	11/28-1/3	37	5	168	11/28-12/13	16	1	778	11/28-12/13	16	2	1602	10/24-1/3	71	4	1368
1993-94	12/4-1/9	37	5	201	12/4-12/19	16	2	1159	12/4-12/19	16	2	1438	10/23-1/9	78	4	1459
1994-95	12/3-1/8	37	5	238	12/3-12/18	16	2	1772	12/3-12/18	16	2	1527	10/29-1/8	71	4	2445
1995-96	12/2-1/7	37	5	134	12/2-12/17	16	2	942	12/2-12/17	16	2	1500	10/28-1/7	71	4	1435
1996-97	11/30 -1/5	37	5	223	11/30-12/15	16	2	1773	11/30-12/15	16	2	1625	10/26-1/5	71	4	2219
1997-98	11/29-1/4	37	5	359	11/29-12/14	16	2	2761	11/29-12/14	16	2	2261	10/25-1/4	71	4	2145
1998-99	11/28-12/13	16	5	103	11/28-12/13	16	2	2695	11/28-12/13	16	2	2299	10/24-1/3	71	4	1946
1999-00	12/4-1/9	37	5	206	12/4-12/19	16	2	1725	12/4-12/19	16	4	2423	10/23-1/9	78	4	1635
2000-01	12/2-1/7	37	5	231	12/2-12/17	16	4	1674	12/2-12/17	16	4	1629	10/28-1/7	71	4	1578
2001-02	11/24-1/6	44	5	250	11/24-12/9	16	4	2119	11/24-12/9	16	4	1928	10/27-1/6	71	4	2301
2002-03	11/30-1/5	37	5	544	11/30-12/15	16	5	2660	11/30-12/15	16	5	2839	10/26-1/5	71	4	2145
2003-04	11/29-1/4	37	5	483	11/29-12/14	16	5	2521	11/29-12/14	16	5	3214	10/25-1/4	71	4	2766
2004-05	11/27-1/9	44	5	631	11/27-12/12	16	5	2552	11/27-12/12	16	5	3241	10/23-1/9	78	4	3450
2005-06	11/26-1/8	44	5	590	11/26-12/11	16	5	2388	11/26-12/11	16	5	2653	10/29-1/8	71	4	2846
2006-07	11/25-1/7	44	5	890	11/25-12/10	16	5	3251	11/25-12/10	16	5	3788	10/28-1/7	71	4	2720
2007-08	11/24-1/6	44	5	702	11/24-12/2	9	5	1682	11/24-12/2	9	5	2221	10/27-1/6	71	2/4	1861
2008-09	11/29-1/4	37	5	853	11/29-12/7	9	5	1712	11/29-12/7	9	5	1823	10/25-1/4	71	2/4	1938
2009-10	11/28-1/3	37	5	884	11/28-12/6	9	5	1259	11/28-12/6	9	5	2073	10/24-1/3	71	2/4	1544
2010-11	11/27-1/9	44	5	1012	11/27-1/5	9	2	903	11/27-1/5	9	5	1842	10/23-1/9	78	4	1814

[a] In some years, otter season opens 1 week earlier in a north zone as compared to a south zone. Otter season dates in this table reflect the start of the north zone.

[b] From 2007-2009, otter limits differ between a southeast zone (limit=2; Area 8, Fig. 1) and the remainder of the open area (limit=4)

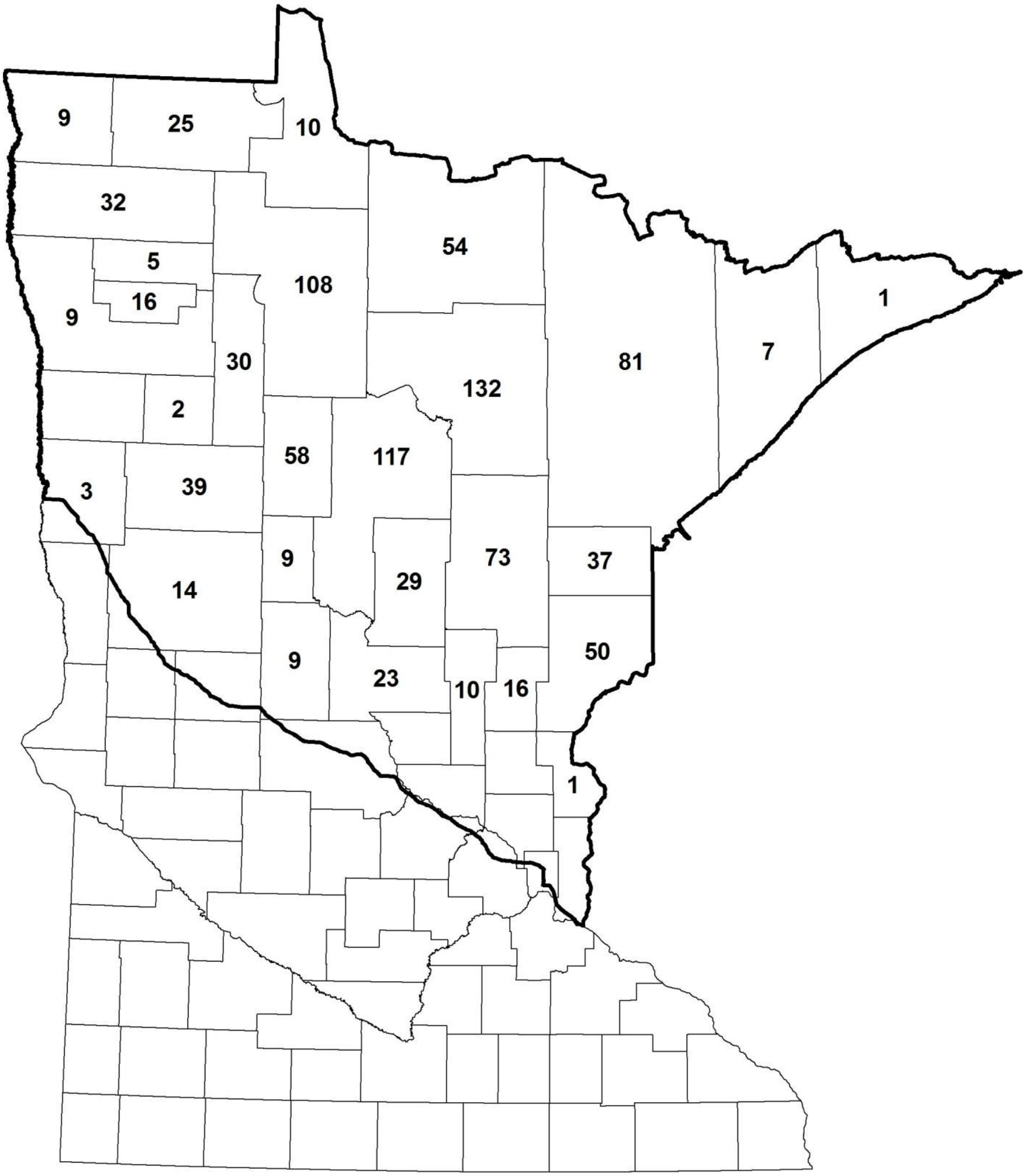

Figure 2. Bobcat harvest by county, 2010-11.

Table 2. Bobcat harvest by county and sex, 2010-11.

County	Sex*			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Aitkin	34	39		73	3.66
Becker	15	24		39	2.70
Beltrami	47	56	5	108	3.54
Benton	0	0		0	0.00
Carlton	10	27		37	4.23
Cass	42	75		117	4.85
Chisago	1	0		1	0.23
Clay	1	2		3	0.28
Clearwater	13	17		30	2.91
Cook	0	1		1	0.06
Crow Wing	16	13		29	2.51
Hubbard	28	31		59	5.90
Isanti	0	0		0	0.00
Itasca	60	69	3	132	4.51
Kanabec	7	9		16	3.00
Kittson	7	2		9	0.81
Koochiching	13	41		54	1.71
Lake	1	6		7	0.31
Lake of the Woods	4	5	1	10	0.56
Mahnomen	0	2		2	0.34
Marshall	11	20		31	1.71
Mille Lacs	3	7		10	1.47
Morrison	11	12		23	2.00
Norman	0	0		0	0.00
Otter Tail	8	6		14	0.63
Pennington	2	2	1	5	0.81
Pine	22	28		50	3.49
Polk	2	7		9	0.45
Red Lake	10	6		16	3.69
Roseau	9	17		26	1.55
St. Louis	35	46		81	1.20
Sherburne	0	0		0	0.00
Stearns	0	0		0	0.00
Todd	3	6		9	0.92
Wadena	3	6		9	1.66
Unknown	1	1		2	
Total	419	583	10	1012	

* Trapper/hunter reported sex ratios in this table are **NOT** adjusted according to results from DNR carcass analyses

Table 3. Comparison of bobcat harvest by county, 2000-2010.

County	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Aitkin	32	20	35	19	37	32	46	56	64	82	73
Becker	6	28	26	19	28	19	46	24	37	25	39
Beltrami	16	26	63	47	66	34	90	33	49	70	108
Benton	0	0	0	0	0	0	0	1	5	2	0
Carlton	12	14	11	20	27	25	34	25	45	44	37
Cass	11	17	59	48	56	103	137	50	98	115	117
Chisago	0	0	1	0	0	0	0	3	0	0	1
Clay	0	0	0	1	0	0	0	0	0	1	3
Clearwater	0	6	24	19	18	18	42	25	43	27	30
Cook	0	0	1	1	2	3	0	0	1	0	1
Crow Wing	13	4	20	15	19	18	27	21	36	38	29
Hubbard	4	10	31	21	35	22	69	40	49	81	59
Isanti	0	0	0	2	0	1	0	0	0	0	0
Itasca	40	33	74	76	93	68	113	86	72	106	132
Kanabec	11	8	10	9	17	11	14	16	23	11	16
Kittson	6	7	5	8	6	3	5	4	9	4	9
Koochiching	11	12	23	25	14	22	16	37	31	25	54
Lake	1	0	0	0	1	2	1	0	1	2	7
Lake of the Woods	3	0	6	4	6	3	2	9	12	16	10
Mahnomen	1	1	0	3	7	2	7	8	0	4	2
Marshall	2	4	24	14	20	16	19	32	18	15	31
Mille Lacs	2	0	10	4	11	9	8	13	11	10	10
Morrison	8	4	6	14	18	18	17	23	28	13	23
Norman	0	0	0	0	0	0	1	0	0	1	0
Otter Tail	0	1	0	0	5	1	7	9	7	7	14
Pennington	1	1	1	0	6	3	2	11	9	6	5
Pine	21	23	49	44	59	47	59	87	101	49	50
Polk	1	0	2	2	4	1	3	0	4	9	9
Red Lake	2	0	1	1	0	6	1	0	0	7	16
Roseau	12	18	22	28	27	28	36	32	18	19	26
St. Louis	9	7	30	25	37	44	45	39	58	56	81
Sherburne	0	0	0	0	0	0	0	0	0	1	0
Stearns	0	0	0	0	0	0	0	1	0	0	0
Todd	0	1	3	6	5	7	12	6	14	10	9
Wadena	0	5	7	8	3	17	16	9	7	21	9
Unknown	4	0	0	0	4	7	15	2	3	7	2
Total	229	250	544	483	631	590	890	702	853	884	1012

Table 4. Bobcat harvest by sex and week, 2010-11 season.

	Sex*				% of	Cumulative
Date	Male	Female	Unknown	Total	Total	%
Nov.27 - Dec.3	75	103	3	181	17.89	17.89
Dec.4 - Dec.10	104	134	1	239	23.62	41.50
Dec.11 - Dec.17	62	91		153	15.12	56.62
Dec.18 - Dec.24	78	92		170	16.80	73.42
Dec.25 - Dec.31	47	52	1	100	9.88	83.30
Jan.1 - Jan.9**	42	87	3	132	13.04	96.34
Unknown	11	24	2	37	3.66	100%
Total	419	583	10	1012	100%	

* Trapper/hunter reported sex ratios in this table are **NOT** adjusted according to results from DNR carcass analyses
** 9-day interval

Table 5. Distribution of bobcat harvest* among takers, 1986-2010.

Number (%) of Takers	Number Taken 1	2	3	4	5	Total Takers
1986-87	92 (77)	18 (15)	9 (8)	0 (0)	1 (1)	120
1987-88	104 (72)	23 (16)	10 (7)	6 (4)	2 (1)	145
1988-89	88 (82)	11 (10)	7 (7)	1 (1)	1 (1)	108
1989-90	56 (69)	13 (16)	5 (6)	3 (4)	4 (5)	81
1990-91	47 (77)	9 (15)	1 (2)	4 (7)	0 (0)	61
1991-92	42 (64)	15 (23)	4 (6)	3 (5)	2 (3)	66
1992-93	69 (64)	21 (20)	9 (9)	5 (5)	2 (2)	106
1993-94	90 (70)	17 (13)	13 (10)	7 (5)	2 (2)	201
1994-95	103 (68)	25 (17)	12 (8)	6 (4)	5 (3)	151
1995-96	67 (74)	13 (14)	5 (6)	4 (4)	2 (2)	91
1996-97	115 (73)	28 (18)	85 (5)	2 (1)	4 (3)	157
1997-98	129 (61)	43 (20)	17 (8)	12 (6)	9 (5)	210
1998-99	59 (77)	11 (14)	2 (3)	3 (4)	1 (2)	76
1999-00	113 (76)	21 (14)	10 (6)	4 (3)	1(1)	149
2000-01	99 (69)	23 (16)	7 (5)	5 (4)	9 (6)	143
2001-02	101 (71)	23 (16)	12 (8)	1 (1)	5 (4)	142
2002-03	185 (60)	64 (21)	33 (10)	15 (5)	12 (4)	309
2003-04	171 (64)	40 (15)	25 (10)	20 (7)	11 (4)	267
2004-05	193 (59)	55 (17)	32 (10)	25 (7)	24 (7)	329
2005-06	198 (60)	67 (20)	33 (10)	15 (5)	18 (5)	331
2006-07	265 (57)	90 (19)	44 (9)	25 (5)	42 (9)	466
2007-08	212 (58)	71 (19)	30 (8)	16 (4)	38 (10)	367
2008-09	236 (55)	88 (21)	43 (10)	25 (6)	37 (9)	429
2009-10	223 (53)	80 (19)	40 (9)	30 (7)	51 (12)	424
2010-11	242 (50)	103 (21)	58 (12)	35 (7)	49 (10)	487

* Product of categories above may not equal total harvest due to some missing names/license numbers

Table 6. Bobcat harvest by method of take, 1984-2010.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
1984-85	280	252	90	156	1.6		28	10	22	1.3	
1985-86	119	83	70	62	1.3		36	30	27	1.3	
1986-87	160	119	74	89	1.3		41	26	31	1.3	
1987-88	214	177	83	118	1.5		37	17	26	1.4	
1988-89	140	94	67	76	1.2		46	33	32	1.4	
1989-90	129	90	70	49	1.8		39	30	28	1.4	
1990-91	83	61	73	43	1.4		22	27	17	1.3	
1991-92	102	59	58	31	1.9		43	42	33	1.3	
1992-93	168	133	79	85	1.6		35	21	23	1.5	
1993-94	201	147	73	88	1.7		54	27	41	1.3	
1994-95	238	189	79	120	1.6		49	21	31	1.6	
1995-96	134	73	54	53	1.4		61	46	38	1.6	
1996-97	203	133	66	91	1.5		70	34	53	1.3	
1997-98	357	313	88	176	1.8		44	12	34	1.3	
1998-99	103	95	92	67	1.4		8	8	8	1.0	
1999-00	206	155	75	114	1.4		51	25	36	1.4	
2000-01	231	140	61	85	1.6		91	39	58	1.6	
2001-02	250	208	83	116	1.8	41	42	17	27	1.6	68
2002-03	544	500	92	279	1.8	38	44	8	32	1.4	57
2003-04	483	415	86	230	1.8	46	68	14	40	1.7	65
2004-05	631	542	86	279	1.9	43	89	14	53	1.7	60
2005-06	583	435	75	250	1.7	37	148	25	85	1.7	65
2006-07	890	779	88	391	2.0	45	111	12	81	1.4	57
2007-08	702	524	75	266	2.0	40	178	25	110	1.6	48
2008-09	853	689	81	334	2.1	42	164	19	99	1.7	59
2009-10	884	736	83	340	2.2	43	148	17	91	1.6	58
2010-11	1012	817	81	372	2.2	40	195	19	123	1.6	50

[a] Total harvest reported here may not be equal to total harvest in other tables due to incomplete method-of-take data.

[b] Trapper/hunter reported sex ratios in this table are **NOT** adjusted according to results from DNR carcass analyses

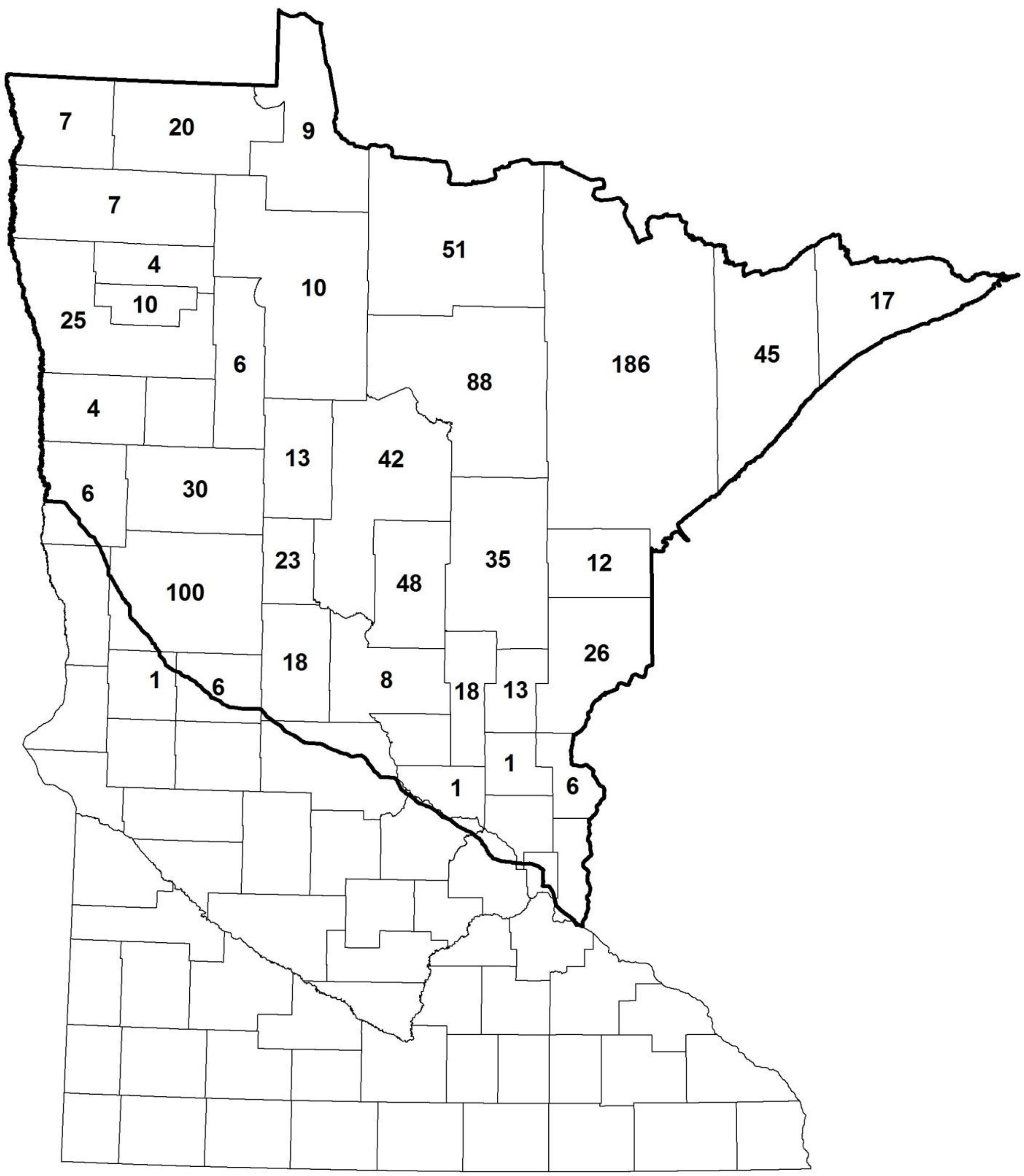

Figure 3. Fisher harvest by county, 2010-11.

Table 7. Fisher harvest by county and sex, 2010-11 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Aitkin	20	15		35	1.76
Anoka	0	0		0	0.00
Becker	19	11		30	2.08
Beltrami	4	6		10	0.33
Benton	0	0		0	0.00
Carlton	8	4		12	1.37
Cass	29	14		43	1.78
Chisago	3	3		6	1.36
Clay	4	2		6	0.57
Clearwater	3	3		6	0.58
Cook	9	8		17	1.06
Crow Wing	32	16		48	4.15
Douglas	4	2		6	0.83
Grant	1	0		1	0.17
Hubbard	9	4		13	1.30
Isanti	0	1		1	0.22
Itasca	40	48		88	3.01
Kanabec	6	7		13	2.44
Kittson	6	1		7	0.63
Koochiching	29	22		51	1.62
Lake	13	32		45	1.97
Lake of the Woods	6	3		9	0.51
Mahnomen	0	0		0	0.00
Marshall	3	4		7	0.39
Mille Lacs	9	9		18	2.64
Morrison	4	4		8	0.69
Norman	4	0		4	0.46
Otter Tail	56	44		100	4.49
Pennington	2	2		4	0.65
Pine	20	6		26	1.81
Polk	13	12		25	1.25
Red Lake	6	4		10	2.31
Roseau	12	8		20	1.19
St. Louis	92	94		186	2.76
Sherburne	1	0		1	0.22
Stearns	0	0		0	0.00
Todd	7	11		18	1.84
Wadena	13	10		23	4.23
Washington	0	0		0	0.00
Unknown	1	1	4	6	
Total	488	411	4	903	

Table 8. Comparison of fisher harvest by county, 1999-2010.

County	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Aitkin	84	68	103	122	124	96	97	156	67	75	50	35
Anoka	0	0	0	0	1	0	0	0	0	2	0	0
Becker	32	42	46	96	88	92	49	87	57	36	44	30
Beltrami	70	60	73	117	74	71	47	54	40	15	22	10
Benton	0	0	0	0	1	0	1	1	0	3	2	0
Carlton	23	27	37	48	42	40	35	49	13	19	15	12
Cass	123	122	134	225	205	186	149	209	80	77	57	43
Chisago	0	3	2	6	5	6	2	18	7	4	10	6
Clay	0	0	0	0	0	0	0	1	0	3	0	6
Clearwater	13	15	45	45	52	41	35	54	19	37	13	6
Cook	19	19	33	27	28	24	40	35	29	10	11	17
Crow Wing	53	71	82	106	106	113	79	140	81	116	42	48
Douglas	0	1	0	0	3	3	3	6	2	5	2	6
Grant	0	0	0	0	0	0	0	0	0	0	0	1
Hubbard	34	34	64	59	62	32	20	51	20	38	18	13
Isanti	0	0	0	0	0	2	3	5	1	5	9	1
Itasca	248	288	298	354	319	323	320	405	195	195	166	88
Kanabec	11	4	4	19	21	13	15	26	11	26	20	13
Kittson	3	3	7	3	11	2	7	2	5	8	5	7
Koochiching	150	159	156	178	171	179	209	221	105	115	96	51
Lake	46	62	54	72	74	87	85	87	49	54	49	45
Lake of the Woods	83	71	48	115	78	33	63	74	17	42	21	9
Mahnomen	3	0	12	16	14	13	9	27	25	6	3	0
Marshall	10	27	19	18	21	25	18	26	19	26	6	7
Mille Lacs	0	4	3	16	22	14	16	20	15	17	18	18
Morrison	2	0	1	6	3	7	5	23	21	14	10	8
Norman	6	0	0	1	1	11	6	4	9	12	7	4
Otter Tail	0	0	1	12	40	52	60	158	110	152	67	100
Pennington	2	4	4	10	18	42	22	22	16	8	2	4
Pine	36	37	29	44	54	56	42	82	39	74	30	26
Polk	6	8	24	46	65	47	38	72	61	49	31	25
Red Lake	2	18	16	15	16	29	34	32	29	23	23	10
Roseau	111	157	180	106	141	114	110	127	84	89	58	20
St. Louis	546	369	608	734	611	740	688	898	407	283	296	186
Sherburne	0	0	0	0	2	0	0	0	0	0	3	1
Stearns	0	0	0	0	0	1	0	0	0	1	1	0
Todd	0	0	2	5	14	18	23	21	13	33	22	18
Wadena	8	0	31	39	32	31	40	44	27	37	23	23
Washington	0	0	0	0	0	0	0	0	1	0	0	0
Unknown	2	1	1	0	2	9	18	14	8	3	7	6
Total	1,726	1,674	2,117	2,660	2,521	2,552	2,388	3,251	1,682	1,712	1,259	903

Table 9. Fisher harvest by date and sex, 2010-11 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 27	1	2		3	0.33	0.33
Nov. 28	38	44		82	9.08	9.41
Nov. 29	93	54		147	16.28	25.69
Nov. 30	61	47		108	11.96	37.65
Dec. 1	82	68		150	16.61	54.26
Dec. 2	54	56		110	12.18	66.45
Dec. 3	42	47		89	9.86	76.30
Dec. 4	52	40		92	10.19	86.49
Dec. 5	41	37		78	8.64	95.13
Unknown	24	16	4	44	4.87	100%
Total	488	411	4	903	100%	

Table 10. Distribution of fisher harvest* among trappers, 1993-2010.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993-94	239 (34)	460 (66)	----	----	----	699	1.7
1994-95	321 (31)	725 (69)	----	----	----	1046	1.7
1995-96	232 (40)	355 (60)	----	----	----	587	1.6
1996-97	321 (31)	726 (69)	----	----	----	1047	1.7
1997-98	351 (23)	1205 (77)	----	----	----	1556	1.8
1998-99	443 (28)	1141 (72)	----	----	----	1584	1.7
1999-00	397 (37)	664 (63)	----	----	----	1061	1.6
2000-01	301(38)	251 (31)	129 (16)	121 (15)	----	802	2.1
2001-02	294 (33)	271 (31)	146 (17)	168 (19)	----	879	2.2
2002-03	336 (35)	234 (25)	138 (15)	117 (12)	123 (13)	948	1.8
2003-04	403 (39)	249 (24)	150 (15)	107 (11)	115 (11)	1024	1.7
2004-05	390 (37)	260 (25)	184 (17)	95 (9)	132 (12)	1061	1.7
2005-06	407 (40)	251 (24)	150 (15)	102 (10)	118 (11)	1028	1.7
2006-07	510 (37)	328 (24)	208 (15)	150 (11)	171 (13)	1367	1.7
2007-08	416 (50)	193 (23)	104 (12)	68 (8)	57 (7)	838	1.7
2008-09	382 (48)	182 (23)	91 (11)	65 (8)	79 (10)	799	1.6
2009-10	372 (55)	156 (23)	69 (10)	42 (6)	38 (6)	677	1.6
2010-11	330 (54)	279 (46)	----	----	----	591	1.5

* Product of categories above may not equal total harvest due to some missing name/license numbers

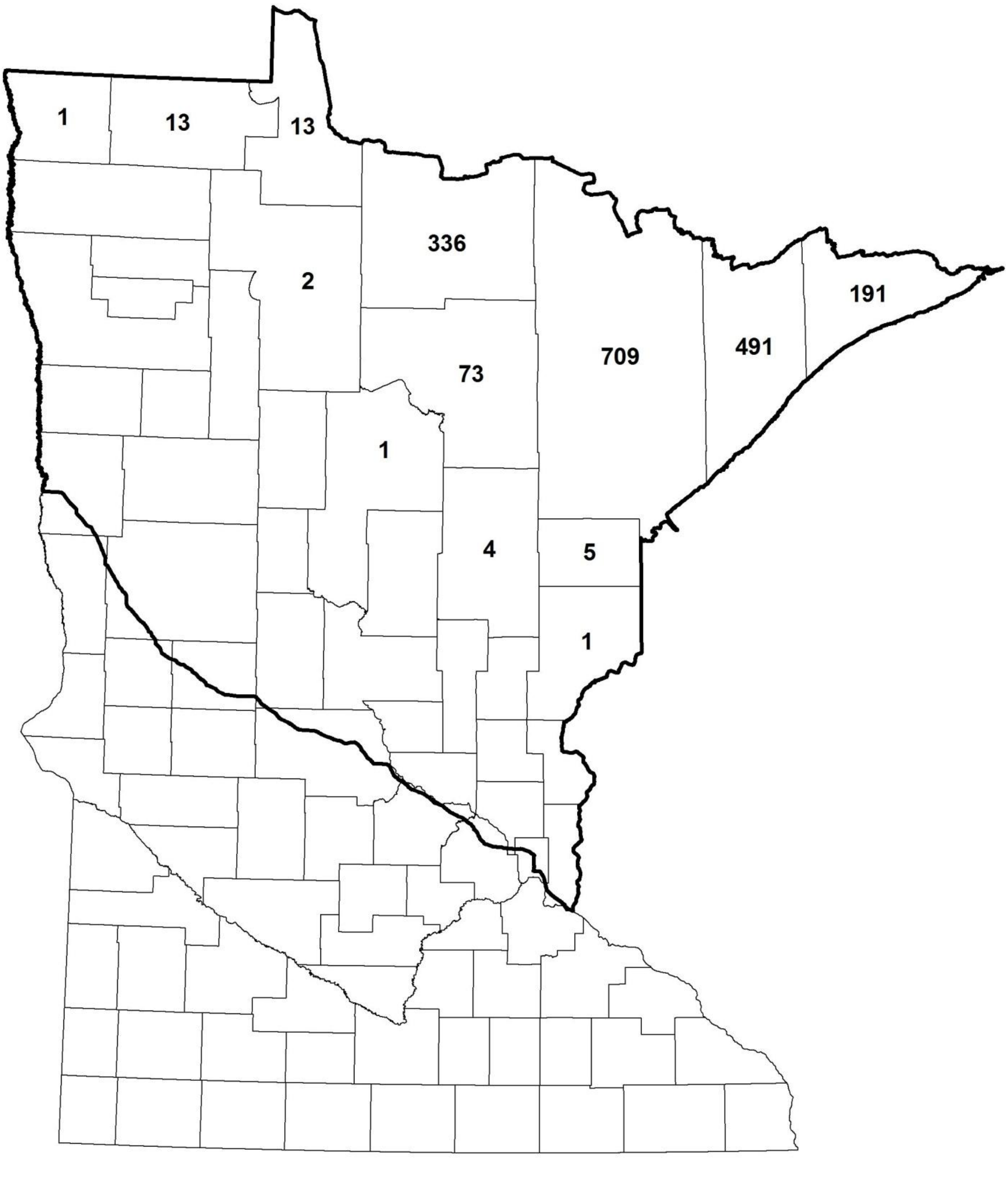

Figure 4. Marten harvest by county, 2010-11.

Table 11. Marten harvest by county and sex, 2010-11 season.

County	Sex			Total	Harvest/ 100 Mile^2
	Male	Female	Unknown		
Aitkin	2	2		4	0.20
Beltrami	2	0		2	0.07
Carlton	1	4		5	0.57
Cass	0	1		1	0.04
Clearwater	0	0		0	0.00
Cook	129	62		191	11.90
Crow Wing	0	0		0	0.00
Itasca	47	26		73	2.50
Kanabec	0	0		0	0.00
Kittson	1	0		1	0.09
Koochiching	214	122		336	10.66
Lake	313	178		491	21.46
Lake of the Woods	8	5		13	0.73
Mahnomen	0	0		0	0.00
Marshall	0	0		0	0.00
Pennington	0	0		0	0.00
Pine	1	0		1	0.07
Red Lake	0	0		0	0.00
Roseau	8	5		13	0.77
St. Louis	468	239	2	709	10.52
Unknown	0	0	2	2	
Total	1,194	644	4	1,842	

Table 12. Comparison of marten harvest by county in Minnesota, 1999-2010.

County	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Aitkin	2	2	3	5	6	6	6	13	4	12	5	4
Beltrami	37	2	24	30	38	65	17	19	8	6	10	2
Carlton	6	5	11	4	11	1	10	6	1	4	8	5
Cass	2	3	1	3	2	3	1	4	0	1	2	1
Clearwater	0	0	0	0	1	1	0	0	0	0	0	0
Cook	240	190	164	228	411	318	369	446	269	151	244	191
Crow Wing	3	0	0	0	0	0	0	0	0	0	1	0
Itasca	114	82	102	147	141	136	98	155	74	72	91	73
Kanabec	0	0	0	0	0	0	0	2	0	0	0	0
Kittson	0	0	0	0	0	0	0	0	0	0	0	1
Koochiching	492	306	327	525	534	549	418	592	348	300	354	336
Lake	284	323	243	492	541	551	536	892	520	438	496	491
Lake of the Woods	58	15	13	104	71	122	54	46	31	17	17	13
Mahnomen	0	0	0	0	0	2	0	0	0	0	0	0
Marshall	1	1	1	1	1	5	3	0	1	0	4	0
Pennington	0	2	0	0	0	0	0	0	1	0	0	0
Pine	0	0	0	0	1	2	1	1	1	0	0	1
Red Lake	0	3	0	0	0	0	0	0	0	0	0	0
Roseau	51	98	48	116	104	127	51	31	69	46	32	13
St. Louis	1,131	596	991	1,184	1,352	1,346	1,065	1,579	885	769	803	709
Unknown	2	1	0	0	0	7	24	2	9	7	6	2
Total	2,423	1,629	1,928	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842

Table 13. Marten harvest by date and sex, 2010-11 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 27	6	2	1	9	0.49	0.49
Nov. 28	145	60	2	207	11.24	11.73
Nov. 29	190	100	1	291	15.80	27.52
Nov. 30	165	94		259	14.06	41.59
Dec. 1	198	95		293	15.91	57.49
Dec. 2	134	89		223	12.11	69.60
Dec. 3	144	90		234	12.70	82.30
Dec. 4	106	57		163	8.85	91.15
Dec. 5	86	48		134	7.27	98.43
Unknown	20	9		29	1.57	100%
Total	1,194	644	4	1,842	100%	

Table 14. Distribution of marten harvest* among trappers, 1993-2010.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993-94	76 (10)	681 (90)	----	----	----	757	1.9
1994-95	165 (20)	681 (80)	----	----	----	846	1.8
1995-96	78 (10)	711 (90)	----	----	----	789	1.9
1996-97	157 (18)	734 (82)	----	----	----	891	1.8
1997-98	161 (13)	1050 (87)	----	----	----	1211	1.9
1998-99	187 (15)	1056 (85)	----	----	----	1243	1.8
1999-00	164 (17)	318 (34)	213 (23)	246 (26)	----	941	2.6
2000-01	188 (28)	190 (28)	123 (18)	173 (26)	----	674	2.4
2001-02	147 (23)	175 (27)	138 (21)	187 (29)	----	647	2.6
2002-03	149 (21)	138 (19)	147 (21)	123 (17)	160 (22)	717	1.9
2003-04	126 (15)	135 (16)	159 (19)	170 (20)	265 (31)	855	1.8
2004-05	165 (17)	153 (16)	171 (18)	164 (18)	282 (30)	935	1.8
2005-06	191 (22)	158 (18)	139 (16)	156 (18)	215 (25)	859	1.8
2006-07	206 (18)	201 (17)	226 (19)	203 (17)	335 (29)	1171	1.8
2007-08	176 (23)	160 (21)	147 (19)	141 (18)	142 (19)	766	2.0
2008-09	153 (24)	139 (22)	108 (17)	110 (17)	122 (19)	632	1.9
2009-10	121 (19)	105 (16)	106 (17)	134 (21)	173 (27)	639	1.9
2010-11	95 (17)	77 (14)	120 (22)	92 (17)	170 (31)	554	1.8

* Product of categories above may not equal total harvest due to some unknown name/license numbers

Table 15. Number of trappers with different fisher/marten combinations, 2010-11. (Combined limit = 5, not to exceed 2 fisher)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		56	46	45	35	170
	1	211	24	19	18	59	
	2	193	15	11	58		
	3						
	4						
	5				Total takers of at least 1 fisher or marten		960

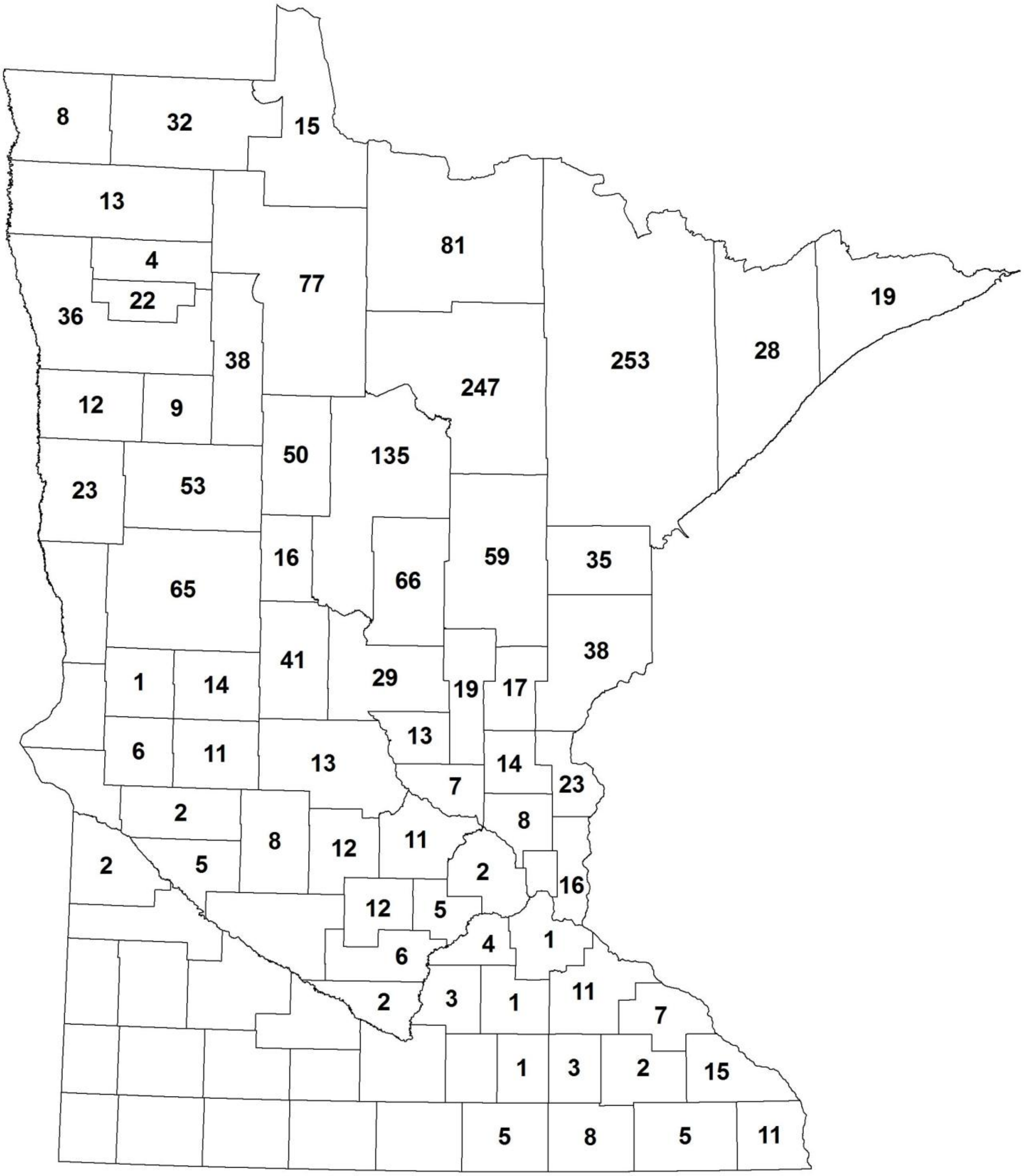

Figure 5. Otter harvest by county, 2010-11.

Table 16. Otter harvest by county and sex, 2010-11 season.

County	Sex: Male	Female	Unknown	Total	Harvest/ 100 Mile^2
Aitkin	32	27		59	2.96
Anoka	5	3		8	1.80
Becker	34	19		53	3.67
Beltrami	44	33		77	2.52
Benton	6	7		13	3.15
Big Stone	0	0		0	0.00
Carlton	19	16		35	4.00
Carver	5	0		5	1.33
Cass	65	70		135	5.60
Chippewa	3	2		5	0.85
Chisago	13	10		23	5.20
Clay	12	11		23	2.18
Clearwater	20	18		38	3.69
Cook	15	4		19	1.18
Crow Wing	33	33		66	5.71
Dakota	0	1		1	0.17
Dodge	1	2		3	0.68
Douglas	9	5		14	1.94
Fillmore	2	3		5	0.58
Freeborn	3	2		5	0.69
Goodhue	5	4	2	11	1.41
Grant	1	0		1	0.17
Hennepin	2	0		2	0.33
Houston	8	3		11	1.93
Hubbard	31	21		52	5.20
Isanti	7	7		14	3.10
Itasca	133	114		247	8.44
Kanabec	13	4		17	3.19
Kandiyohi	4	4		8	0.93
Kittson	6	2		8	0.72
Koochiching	51	27	3	81	2.57
Lac Qui Parle	2	0		2	0.26
Lake	15	13		28	1.22
Lake of the Woods	12	3		15	0.84
Le Sueur	2	1		3	0.63
McLeod	7	5		12	2.38
Mahnomen	5	4		9	1.54
Marshall	9	4		13	0.72
Meeker	4	8		12	1.86
Mille Lacs	11	8		19	2.79
Morrison	19	9	1	29	2.52
Mower	4	4		8	1.13
Nicollet	1	1		2	0.43
Norman	10	2		12	1.37
Olmsted	0	2		2	0.31
Otter Tail	36	29		65	2.92
Pennington	2	2		4	0.65
Pine	25	13		38	2.65
Polk	20	15	1	36	1.80
Pope	5	6		11	1.53
Red Lake	14	8		22	5.08
Rice	0	1		1	0.19
Roseau	20	12		32	1.91
St. Louis	149	104		253	3.75

Table 16 (continued). Otter harvest by county and sex, 2010-11 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Scott	4	0		4	1.09
Sherburne	4	3		7	1.55
Sibley	2	4		6	1.00
Stearns	7	6		13	0.94
Steele	1	0		1	0.23
Stevens	3	3		6	1.04
Swift	0	2		2	0.27
Todd	21	20		41	4.19
Traverse	0	0		0	0.00
Wabasha	3	4		7	1.27
Wadena	8	8		16	2.95
Washington	12	4		16	3.78
Wilkin	0	0		0	0.00
Winona	5	10		15	2.34
Wright	9	2		11	1.54
Unknown	0	2		2	
Total	1,033	774	7	1,814	

Table 17. Comparison of otter harvest by county, 1999-2010.

County	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Aitkin	103	82	100	78	87	113	132	124	53	65	54	59
Anoka	25	14	17	17	13	32	22	16	26	18	26	8
Becker	64	45	125	104	105	178	107	117	54	55	39	53
Beltrami	103	74	108	127	173	216	170	154	105	80	74	77
Benton	2	7	10	6	7	19	14	16	9	11	3	13
Big Stone	0	0	0	0	0	0	0	0	0	2	1	0
Carlton	45	29	33	40	38	53	36	39	36	29	30	35
Carver	0	0	0	0	0	0	0	0	2	5	6	5
Cass	109	107	197	189	198	255	231	236	124	160	90	135
Chippewa	0	0	0	0	0	0	0	0	0	0	0	5
Chisago	13	12	26	18	22	20	28	33	16	15	18	23
Clay	7	3	1	7	7	15	18	35	8	14	7	23
Clearwater	29	25	47	61	52	62	48	41	39	35	19	38
Cook	30	26	26	31	41	56	46	39	13	12	16	19
Crow Wing	77	76	96	108	119	141	102	111	63	99	76	66
Dakota	0	0	0	0	0	0	0	0	0	5	7	1
Dodge	0	0	0	0	0	0	0	0	0	0	0	3
Douglas	1	1	1	0	12	27	16	30	18	28	11	14
Fillmore	0	0	0	0	0	0	0	0	6	1	1	5
Freeborn	0	0	0	0	0	0	0	0	0	0	0	5
Goodhue	0	0	0	0	0	0	0	0	3	3	7	11
Grant	0	0	0	0	0	0	0	0	3	3	6	1
Hennepin	0	0	0	0	0	0	0	0	1	3	6	2
Houston	0	0	0	0	0	0	0	0	9	15	11	11
Hubbard	23	19	61	64	70	91	80	72	59	72	41	52
Isanti	20	28	33	33	27	35	38	30	30	17	18	14
Itasca	220	296	337	310	382	483	362	334	205	201	191	247
Kanabec	29	32	56	40	38	57	79	62	44	29	23	17
Kandiyohi	0	0	0	0	0	0	0	0	2	6	6	8
Kittson	0	0	1	2	3	3	3	5	11	2	3	8
Koochiching	63	107	118	96	164	167	131	118	70	95	61	81
Lac Qui Parle	0	0	0	0	0	0	0	0	0	0	0	2
Lake	44	70	57	57	81	88	65	60	35	34	45	28
Lake of the Woods	36	18	17	21	42	31	34	24	30	17	8	15
Le Sueur	0	0	0	0	0	0	0	0	0	0	0	3
McLeod	0	0	0	0	0	0	0	0	6	6	8	12
Mahnomen	10	10	17	7	23	24	29	26	24	7	7	9
Marshall	8	16	13	35	34	29	18	7	6	2	0	13
Meeker	0	0	0	0	0	0	0	0	13	13	16	12
Mille Lacs	15	12	20	22	33	48	51	21	33	26	28	19
Morrison	30	17	45	36	46	64	77	60	45	43	31	29

Table 17 (continued). Comparison of otter harvest by county, 1999-2010.

County	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Mower	0	0	0	0	0	0	0	0	0	0	0	8
Nicollet	0	0	0	0	0	0	0	0	0	0	0	2
Norman	2	4	3	4	1	16	17	11	9	17	11	12
Olmsted	0	0	0	0	0	0	0	0	0	2	3	2
Otter Tail	20	14	51	32	45	113	85	81	50	82	32	65
Pennington	10	2	6	12	16	18	33	15	9	0	1	4
Pine	21	35	42	61	78	99	51	111	50	74	37	38
Polk	21	34	60	63	72	104	45	47	32	25	19	36
Pope	0	0	0	0	0	0	0	0	11	12	12	11
Red Lake	8	22	18	27	35	58	26	30	19	8	20	22
Rice	0	0	0	0	0	0	0	0	0	0	0	1
Roseau	37	40	36	27	72	69	60	53	32	53	23	32
St. Louis	353	255	453	316	483	508	428	344	290	251	233	253
Scott	0	0	0	0	0	0	0	0	3	3	1	4
Sherburne	14	10	11	11	24	25	15	29	26	10	17	7
Sibley	0	0	0	0	0	0	0	0	0	0	0	6
Stearns	7	5	5	17	13	22	21	33	9	38	24	13
Steele	0	0	0	0	0	0	0	0	0	0	0	1
Stevens	0	0	0	0	0	0	0	0	1	3	1	6
Swift	0	0	0	0	0	0	0	0	9	4	5	2
Todd	16	22	24	30	49	53	63	81	35	37	32	41
Traverse	0	0	0	0	0	0	0	0	1	0	2	0
Wabasha	0	0	0	0	0	0	0	0	15	7	18	7
Wadena	13	3	23	23	35	34	38	32	15	19	15	16
Washington	4	4	4	12	10	8	11	16	18	19	11	16
Wilkin	0	0	0	0	0	0	0	0	2	0	0	0
Winona	0	0	0	0	0	0	0	0	11	19	13	15
Wright	0	0	0	1	2	3	2	5	7	9	8	11
Unknown	3	2	3	0	14	13	14	22	6	18	12	2
Totals	1,635	1,578	2,301	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814

Table 18. Otter harvest by sex and week, 2010-11 season.

Date	Sex			Total	% of	Cumulative
	Male	Female	Unknown	Harvest	Total	%
Oct.23 - Oct.29	91	78		169	9.32	9.32
Oct.30 - Nov.5	241	184		425	23.43	32.75
Nov.6 - Nov.12	193	120	1	314	17.31	50.06
Nov.13 - Nov.19	139	108	2	249	13.73	63.78
Nov.20 - Nov.26	89	76		165	9.10	72.88
Nov.27 - Dec.3	87	81		168	9.26	82.14
Dec.4 - Dec.10	65	41		106	5.84	87.98
Dec.11 - Dec.17	43	21		64	3.53	91.51
Dec.18 - Dec.24	28	27		55	3.03	94.54
Dec.25 - Dec.31	21	19		40	2.21	96.75
Jan.1 - Jan.9*	22	14	1	37	2.04	98.79
Unknown	14	5	3	22	1.21	100%
Total	1,033	774	7	1,814	100%	

* 9-day interval.

Table 19. Distribution of otter harvest[*] among trappers in the northern zone, 1993-2010.

Number (%) of Takers	Number Taken					
	1	2	3	4	Total Takers	Ave. Take
1993-94	193 (33)	115 (19)	100 (17)	184 (31)	592	2.5
1994-95	250 (27)	185 (20)	143 (15)	349 (38)	927	2.6
1995-96	183 (31)	134 (23)	88 (15)	180 (31)	585	2.5
1996-97	257 (29)	205 (23)	140 (16)	283 (32)	885	2.5
1997-98	304 (33)	235 (26)	117 (13)	255 (28)	911	2.4
1998-99	263 (32)	183 (23)	139 (17)	226 (28)	811	2.4
1999-00	222 (33)	124 (19)	99 (15)	217 (33)	662	2.5
2000-01	206 (32)	122 (19)	108 (17)	201 (32)	637	2.5
2001-02	147 (23)	175 (27)	138 (21)	187 (29)	647	2.6
2002-03	253 (33)	147 (19)	122 (16)	241 (32)	763	2.5
2003-04	269 (27)	201 (20)	152 (16)	361 (37)	983	2.6
2004-05	302 (25)	235 (19)	182 (15)	498 (41)	1217	2.7
2005-06	291 (27)	213 (20)	186 (17)	386 (36)	1076	2.6
2006-07	372 (34)	216 (19)	194 (17)	328 (30)	1110	2.4
2007-08	308 (39)	153 (19)	119 (15)	207 (26)	787	2.3
2008-09	293 (37)	157 (20)	121 (15)	216 (27)	787	2.3
2009-10	237 (38)	131 (21)	93 (15)	171 (27)	632	2.3
2010-11	263 (34)	166 (22)	130 (17)	206 (27)	765	2.4

[*] Product of categories above may not equal total harvest due to some unknown name/license numbers