STATUS OF WILDLIFE POPULATIONS, FALL 2013

(Including 2003-2013 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.

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This is the 37th 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. Due to staffing changes and workload considerations some reports were not available at time of publication.

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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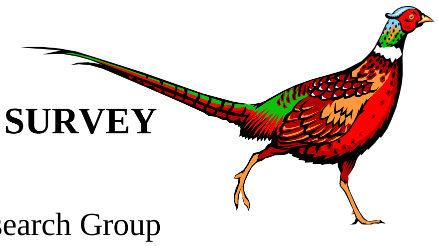


2013 MINNESOTA AUGUST ROADSIDE SURVEY

Rachel Curtis, Farmland Wildlife Populations and Research Group

ABSTRACT

Population indices for ring-necked pheasants, gray partridge, and mourning doves decreased from last year, and remained below long-term averages. The population index for cottontail rabbits increased from 2012 but continued to be below the long-term average. The white-tailed jackrabbit index was similar to last year and was also below the long-term average. The population index for white-tailed deer increased from 2012 and was well above the long-term average. The sandhill crane index was similar to last year.

Conservation Reserve Program (CRP) enrollment in Minnesota declined by 171,254 acres from 2012. Increases in enrollment of other farm programs and acquisition of public lands partially offset CRP losses, yielding a net loss of 153,328 acres of protected habitat for wildlife. There was a net loss of 58,081 acres of protected habitat within the pheasant range. The winter of 2012-13 had slightly colder than normal temperatures and was followed by an extended, cold spring. Thus, conditions for overwinter survival of farmland wildlife were below average and early nesting conditions were poor in 2013.

The 2013 pheasant index (27.2 birds/100 mi) decreased 29% from 2012 and was 64% below the 10-year average, 72% below the long-term average, and 91% below the benchmark years of 1955-64. Indices over the past 3 years suggest the pheasant population has declined considerably since 2005 with comparable indices to those calculated in the mid-1980s. The 2012 hen pheasant index was 40% below last year and 70% below the 10-year average. The number of broods observed was 45% below last year, and 71% below the 10-year average. The number of chicks per brood increased from 4.4 in 2012 to 5.4 in 2013. The low hen:cock ratio might suggest that hens were undercounted in the survey, which may be due to the late nesting. Projecting from the roadside index, an estimated 246,000 roosters may be harvested this fall. The best opportunity for harvesting pheasants appears to be in the West Central, East Central, and Southwest regions.

The gray partridge index decreased 77% from last year, was 82% below the 10-year mean and 92% below the long-term average. Gray partridge counts were highest in the Southwest and South Central regions. The cottontail rabbit index was 17% higher than last year, but 22% below the 10-year average, and 23% 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 in 2013 and was 87% below the long-term average. The 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 and South Central region. The number of mourning doves observed in 2013 was 20% lower than last year, 23% below the 10-year average and 35% below the long-term average. In contrast, the white-tailed deer index was 46% higher than last year, 38% above the 10-year average and 116% higher than the long-term average. Sandhill crane indices were comparable to 2012.

INTRODUCTION

This report summarizes the 2013 Minnesota August roadside survey. The survey is conducted annually during the first half of August by Minnesota Department of Natural Resources (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 observed. 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 are used to monitor annual changes and long-term trends in regional and range-wide populations. Results are 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 would like to thank the many cooperators for their efforts in completing routes in 2013; without them the survey would not be possible. Julie Luttrell provided assistance by contacting potential cooperators and mailing packages. Tonya Klinkner offered logistical assistance including entering data. 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, and John Saxhaug of U.S. Fish and Wildlife Services supplied the county by county refuge data. I also thank Kurt Haroldson and Nicole Davros for all their assistance in coordinating and compiling this report.

WEATHER SUMMARY

The winter of 2012-2013 had slightly colder than normal temperatures that extended into May for the farmland region of Minnesota. Snow cover was intermittent from December through early May in the southern regions of the state and was persistent during these months in the Central and Northwest regions. Snow depths exceeded 6 inches for 20 consecutive weeks in the Northwest region (Minnesota Climatology Working Group [MCWG], Minnesota snow map). In addition, monthly temperatures averaged 2°F below normal (range 2ºF to -8ºF departure from normal, MCWG, Monthly temperature summary) in all farmland regions from December through March. Cold conditions continued through April and May, and spring precipitation was normal to above normal in the month of June. The Southeast region had particularly high precipitation in April and May (2.6 and 4.9 inches above normal, respectively). Overall, the conditions for over-winter survival of wildlife were below average throughout most of the farmland region in 2013 and conditions for production of young were poor due to extended cold, wet weather in the spring and excessive rain in May.

HABITAT CONDITIONS

There have been considerable changes in habitat across Minnesota since 2012. Conservation Reserve Program (CRP) enrollment declined by 171,254 acres statewide, with losses in northwestern Minnesota's prairie chicken range (129,250 acres lost) compounded by a loss of 63,700 acres in Minnesota's pheasant range. There were also losses in Reinvest in Minnesota (RIM) and Wetlands Reserve Program (WRP). Acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) only partially offset CRP, RIM, and WRP losses, yielding a net loss of 153,328 acres of protected habitat statewide. In Minnesota's pheasant range, 10,465 new acres protected as WMAs and WPAs offset losses in farm program enrollments resulting in a net loss of 58,081 acres. Within the pheasant range, protected habitats account for about 6% of the landscape (range: 3-10%; 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 a major concern for future wildlife populations, with nearly 400,000 acres in Minnesota scheduled to expire in the next 3 years. The future of farmland retirement programs remains under threat due to competing economic opportunities (e.g., high land rental rates, ethanol production).

New funding from the Legacy Amendment has accelerated acquisition of WMAs and WPAs throughout Minnesota's farmland zone. In addition, the Working Lands Initiative (DNR Working Lands Initiative) continues to protect and expand large wetland-grassland complexes in selected counties in western Minnesota.

SURVEY CONDITIONS

Observers completed all 171 routes in 2013. 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 98% of the survey routes, which was similar to 2012 (97%), and better than the 10-year average (93%). Clear skies (<30% cloud cover) were present at the start of 84% of routes, with wind speeds <7 mph recorded for 96% of routes. The survey period was extended to August 16th[th] to allow all routes to be completed. Overall, survey conditions were described as excellent in 2013.

RING-NECKED PHEASANT

The average number of pheasants observed (27.2/100 mi) decreased 29% from 2012, and remained 64% below the 10-year average (Figure 2A), 72% below the long-term average (Table 2) and 91% below the benchmark years of 1955-64. Indices over the past 3 years suggest the pheasant population has declined considerably since 2005 with comparable indices to those calculated in the mid-1980s (Figure 2A). Total pheasants observed per 100 miles ranged from 7.4 in the Southeast to 50.7 in the Southwest region (Table 3). The most substantial decreases in counts from last year occurred in the West Central (-43%) and East Central regions (-48%; Table 3).

The range-wide hen index (3.5 hens/100 mi) was 40% below last year and 70% below the 10-year average (Table 2). The hen index varied from 0.8 hens/100 miles in the Southeast to 5.9 hens/100 miles in the Southwest region. The hen index was higher than last year for the Southwest, South Central and Southeast regions. The range-wide cock index (5.1 cocks/100 mi) was higher than 2012 (16%) but 39% below the 10-year average (Table 2). The 2013 hen:cock ratio was 0.68, which was below average (1.44 ± 0.36 [SD]) for the CRP years (1987-2012).

The number of pheasant broods observed (3.4/100 mi) was 45% below last year, 71% below the 10-year average and 74% below the long-term average (Table 2). The brood index remains well below the benchmark years of 1955-64 (34.8 broods/100 mi). Regional brood indices ranged from 1.3 broods/100 miles in the Southeast to 6.7 broods/100 miles in the Southwest region. Average brood size in 2013 (5.4 ± 0.3 [SE] chicks/brood) was higher than last year (4.4 ± 0.2 [SE] chicks/brood) and the 10-year mean (4.6 ± 0.1 [SE] chicks/brood), and was comparable to the long-term average (5.5 ± 0.1 [SE] chicks/brood; Table 2). The median hatch date for pheasants was approximately June 20 (n = 236), 11 days later than the 10-year average (Table 2). Estimated median age of broods observed was 6 weeks (range: 1-12 weeks).

The reduction in pheasant counts may be partially attributed to both colder than normal winter temperatures and snow cover that persisted into late April and early May in some regions. In addition, heavy rainfall in May likely contributed to delayed nesting effort and reduced nest success early in the breeding season. Consequently, a decline in the range-wide pheasant index due to weather was expected. However, the high cock index and low hen:cock ratio might suggest that hens were undercounted in the survey. Historically, hens that were successful nesting later in the season tend to be underrepresented in roadside data and it is possible that hens were still nesting or under cover with young chicks during the survey period. Pheasant numbers will be higher than forecasted if hens were underrepresented in these roadside surveys. Projecting from the roadside index, an estimated 246,000 roosters may be harvested this fall (Figure 2A). The best opportunity for harvesting pheasants appears to be in the West Central, East Central, and Southwest regions.

GRAY PARTRIDGE

Range-wide, the gray partridge index (1.1 partridge/100 miles) was 77% lower than last year, 82% below the 10-year average and 92% below the long-term average (Table 2, Figure 2B). The partridge index ranged from 0.0 birds/100 miles in the West Central, East Central, and Northwest regions to 3.6 birds/100 miles in the Southwest region (Table 3). Observations of gray partridge broods were too few for analysis by age class (n=3 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 and South Central regions will offer the best opportunity for harvesting gray partridge in 2013.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (4.6 rabbits/100 mi) was 17% higher than last year, but 22% below the 10-year average and 23% below the long-term average (Table 2, Figure 3A). The cottontail rabbit index ranged from 0.6 rabbits/100 miles in the Northwest to 9.5 rabbits/100 miles in the South Central region (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 (0.2 rabbits/100 mi) did not change from 2012 or the 10-year average, but was 87% 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 and South Central regions (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 (20.7 deer/100 mi) was 46% higher than last year, 38% above the 10-year average and 116% above the long-term average (Table 2, Figure 4A). The deer index ranged from 10.6 deer/100 mi in the South Central region to 36.6 deer/100 mi in the Northwest (Table 3).

MOURNING DOVE

The number of mourning doves observed (168 doves/100 mi) in 2013 was 20% lower than last year, 23% below the 10-year average and 35% below the long-term average (Table 2, Figure 4B). The mourning dove index ranged from 76 doves/100 miles in the East Central region to 246 doves/100 miles in the Southwest region (Table 3). The number of mourning doves heard along U.S. Fish and Wildlife Service call-count survey (CCS) routes (n = 13) in Minnesota was 5.6% lower than 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 2004-2013 and declined 1.5% per year (95% CI: -2.2 to -0.7%) during 1966-2013 (Seamans et al. 2013).

SANDHILL CRANE

The sandhill crane index averaged 11.4 cranes/100 miles and 1.1 juvenile cranes/100 miles, which was comparable to the indices observed in 2012 (Table 2). Crane indices ranged from 0.0 cranes/100 miles in the Southwest region to 54.5 cranes/100 miles in the East Central region (Table 3). Regional crane indices for both the total number of cranes and juveniles increased from last year in the East Central region, and decreased in the Northwest (Table 3). Juvenile cranes were observed in the Central (2.3/100 mi), East Central (7.1/100 mi), West Central (0.4/100 mi), South Central (0.1/100 mi), and Northwest (0.2/100 mi) regions.

OTHER SPECIES

Other incidental sightings: trumpeter swan (Brown, Le Sueur, and Meeker Counties), Cooper's hawk (Lincoln County), mink (Dodge County), greater prairie chicken (Clay and Norman Counties), red-headed woodpecker (Steele County), bald eagle (Brown and Jackson Counties), and upland sandpiper (Martin, Polk, Redwood, and Wilkin Counties).

LITERATURE CITED

Seamans, M. E., R. D. Rau, and T. A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

[MCWG] Minnesota Climatology Working Group. 2013. MCWG Home Page http://climate.umn.edu/. Accessed on August 5, 2013.

Table 1. Abundance (total acres) and density (acres/mi2) of undisturbed grassland habitat within Minnesota's pheasant range, 2013[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi2
WC[b]	284,215	39,243	19,244	11,626	19,458	188,310	109,247	671,343	9.9	63.2
SW	94,866	25,286	12,625	1,616	471	20,624	58,454	213,942	5.7	36.2
C	127,804	15,320	20,620	5,585	2,595	88,535	47,627	308,086	5.1	32.6
SC	84,169	28,237	11,273	7,706	7,855	8,843	33,055	181,137	4.5	28.7
SE	68,832	2,733	6,971	657	774	36,597	52,847	169,410	4.6	29.3
EC	3,676	0	1,140	0	4	4,993	87,581	97,394	3.0	19.4
Total	663,561	110,819	71,873	27,190	31,156	347,902	388,811	1,641,312	6.0	38.1

a. Unpublished data, Tabor Hoek, BWSR, 1 August 2013.

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, 1955-2013.

Species	Change from 2012[a]					Change from 10-year average[b]				Change from long-term average[c]			
Subgroup	*n*	2012	2013	%	95% CI	*n*	2003-12	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	150	38.0	27.2	-29	±19	148	76.3	-64	±13	150	98.8	-72	±8
Cocks	150	4.4	5.1	16	±27		8.5	-39	±13		11.2	-54	±12
Hens	150	5.8	3.5	-40	±21		11.8	-70	±14		14.3	-76	±9
Broods	150	6.3	3.4	-45	±20		11.9	-71	±13		13.0	-74	±8
Chicks per brood	236	4.4	5.4	22			4.6	17			5.5	-2	
Broods per 100 hens	129	107.8	98.5	-9			100.5	-2			101.4	-3	
Median hatch date	236	Jun 7	Jun 20				Jun 09						
Gray partridge	169	4.6	1.1	-77	±58	167	5.8	-82	±27	150	15.2	-92	±16
Eastern cottontail	169	4.0	4.6	17	±26	167	6.0	-22	±15	150	6.7	-23	±15
White-tailed jackrabbit	169	0.2	0.2	15	±141	167	0.3	-23	±83	150	1.7	-87	±21
White-tailed deer	169	14.2	20.7	46	±20	167	15.2	38	±17	169	9.6	116	±28
Mourning dove	169	210.1	168.0	-20	±14	167	216.7	-23	±11	150	271.0	-35	±12
Sandhill crane													
Total cranes	169	9.8	11.4	15	±52								
Juveniles	169	1.3	1.1	-10	±57								

[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 = 1955-2012, except for deer = 1974-2012. Estimates for all species except deer based on routes (*n*) surveyed ≥40 years; estimates for deer based on routes surveyed ≥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, 1955-2013.

Region	Change from 2012[a]					Change from 10-year average[b]				Change from long-term average[c]			
Species	*n*	2012	2013	%	95% CI	*n*	2003-12	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	19	1.9	0.0			19	0.6	-100	±93	19	3.5	-100	±67
Eastern cottontail		0.2	0.6	200	±519		0.8	-21	±95		0.8	-22	±93
White-tailed jackrabbit		0.6	0.2	-67	±140		0.5	-56	±89		0.6	-68	±76
White-tailed deer		27.1	36.6	35	±61		44.2	-17	±28		29.5	24	±42
Mourning dove		78.4	102.4	31	±86		83.4	23	±92		121.3	-16	±66
Sandhill crane		40.4	22.7	-44	±49								
West Central													
Ring-necked pheasant	36	52.7	30.0	-43	±36	34	81.9	-61	±28	36	102.5	-71	±15
Gray partridge		0.6	0.0				1.7	-100	±66		9.6	-100	±22
Eastern cottontail		2.1	1.7	-21	±66		3.1	-43	±33		4.1	-59	±22
White-tailed jackrabbit		0.2	0.00				0.3	-100	±59		2.2	-100	±19
White-tailed deer		13.6	20.9	54	±46		13.6	61	±46		9.1	129	±76
Mourning dove		228.5	211.8	-7	±33		257.4	-18	±26		375.2	-44	±17
Sandhill crane		0.9	1.4	62	±96								
Central													
Ring-necked pheasant	30	29.7	20.7	-30	±40	29	65.2	-67	±26	29	74.3	-71	±20
Gray partridge		3.9	0.1	-97	±140		2.4	-94	±71		9.6	-99	±43
Eastern cottontail		3.2	2.9	-8	±64		6.1	-50	±23		6.3	-52	±27
White-tailed jackrabbit		0.0	0.1				0.1	41	±273		1.2	-89	±32
White-tailed deer		13.2	18.1	37	±49		8.6	114	±70		4.8	282	±135
Mourning dove		238.7	129.9	-46	±39		202.4	-35	±28		234.3	-44	±25
Sandhill crane		22.0	20.4	-7	±92								
East Central													
Ring-necked pheasant	14	55.2	28.9	-48	±43	14	56.9	-49	±31	14	84.6	-66	±27
Gray partridge		0.3	0.0				0.0				0.1	-100	±135
Eastern cottontail		12.6	7.7	-39	±64		10.5	-27	±65		8.8	-12	±74
White-tailed jackrabbit		0.0	0.0				0.0				0.2	-100	±57
White-tailed deer		17.4	24.0	37	±56		15.4	56	±68		8.6	178	±130
Mourning dove		92.5	76.1	-18	±55		103.9	-27	±35		125.9	-40	±34
Sandhill crane		11.7	54.5	365	±275								

Table 3. Continued.

Region / Species	Change from 2012					Change from 10-year average				Change from long-term average			
	n	2012	2013	%	95% CI	*n*	2003-12	%	95% CI	*n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	52.4	50.7	-3	±60	19	150.7	-66	±29	19	116.6	-57	±21
Gray partridge		9.9	3.6	-64	±109		20.7	-83	±37		41.1	-91	±23
Eastern cottontail		3.8	5.3	39	±84		7.3	-28	±43		8.0	-34	±34
White-tailed jackrabbit		0.2	0.2	0	±305		0.8	-75	±91		3.8	-94	±27
White-tailed deer		18.3	28.4	55	±47		14.7	94	±50		8.5	233	±85
Mourning dove		229.8	245.9	7	±32		316.8	-22	±26		311.2	-21	±28
Sandhill crane		0.0	0.0										
South Central													
Ring-necked pheasant	32	33.7	27.1	-20	±36	32	79.4	-66	±29	32	129.5	-79	±17
Gray partridge		9.5	3.3	-66	±114		10.5	-69	±51		18.8	-83	±23
Eastern cottontail		4.8	9.5	100	±49		8.7	9	±29		7.6	26	±34
White-tailed jackrabbit		0.3	0.3	0	±207		0.2	34	±181		1.7	-86	±31
White-tailed deer		6.0	10.6	77	±66		5.5	92	±67		3.5	203	±112
Mourning dove		315.5	230.2	-27	±24		277.4	-17	±20		258.5	-11	±43
Sandhill crane		1.3	1.6	30	±85								
Southeast													
Ring-necked pheasant	19	3.6	7.4	106	±156	20	21.0	-65	±37	20	72.0	-90	±32
Gray partridge		6.1	0.2	-97	±163		5.1	-96	±69		13.8	-99	±31
Eastern cottontail		4.8	5.9	22	±65		7.2	-19	±40		7.7	-25	±34
White-tailed jackrabbit		0.0	0.0				0.1	-100	±103		0.6	-100	±42
White-tailed deer		11.4	15.0	32	±42		15.5	-32	±35		10.2	54	±43
Mourning dove		150.7	96.3	-36	±27		181.4	-46	±18		220.3	-55	±15
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 = 1955-2012, except for Northwest region (1982-2012) and white-tailed deer (1974-2012). Estimates based on routes (*n*) surveyed ≥40 years (1955-2012), 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.

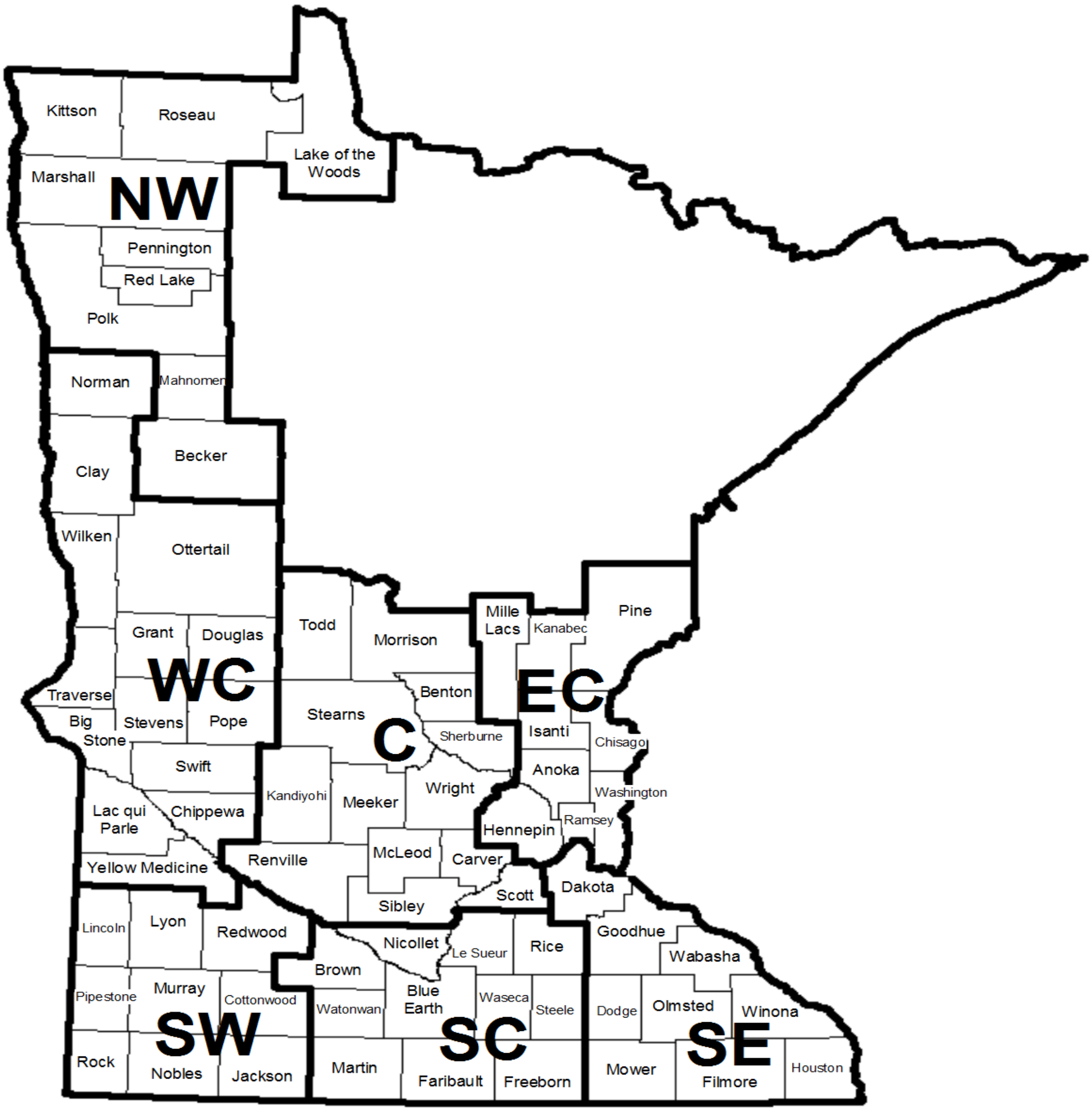


Figure 1. Survey regions for Minnesota's August roadside survey, 2013.

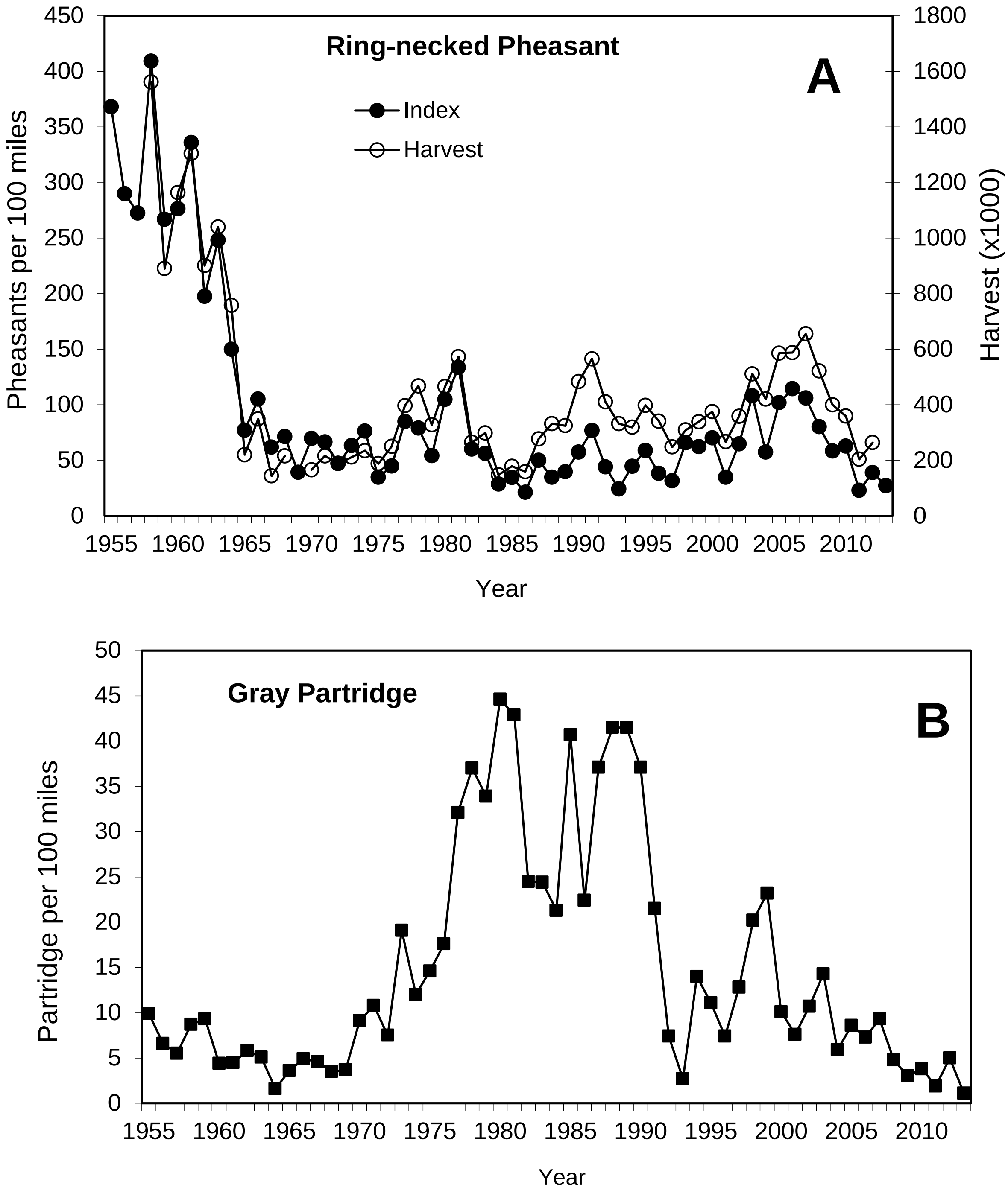
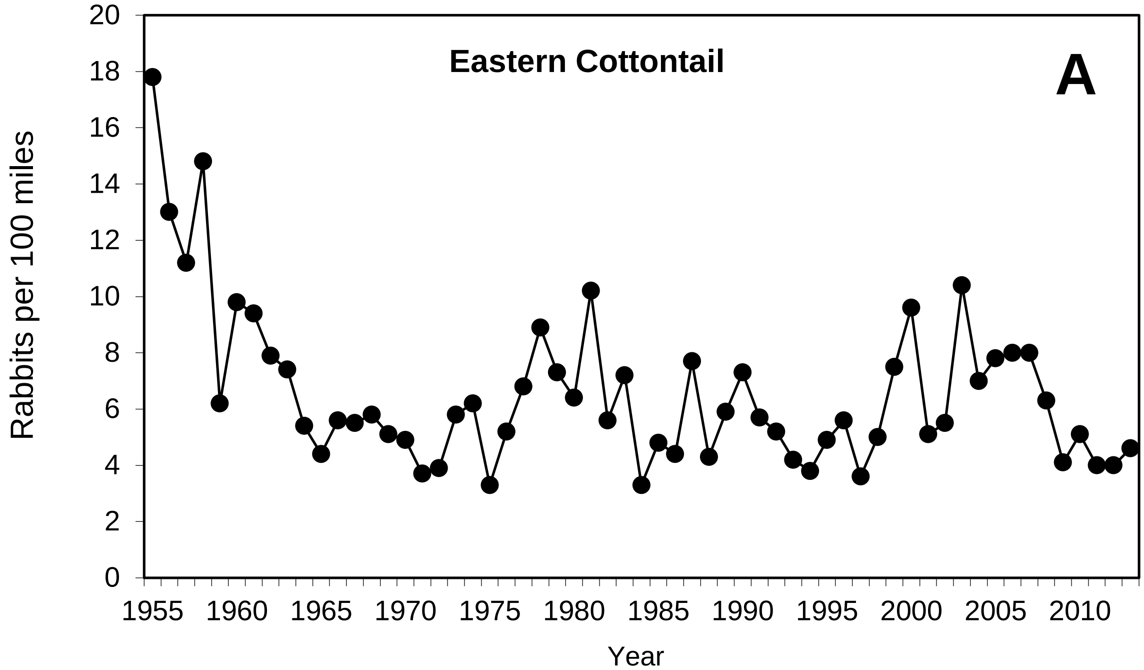


Figure 2. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 1955-2013. Does not include the Northwest region. Based on all survey routes completed.



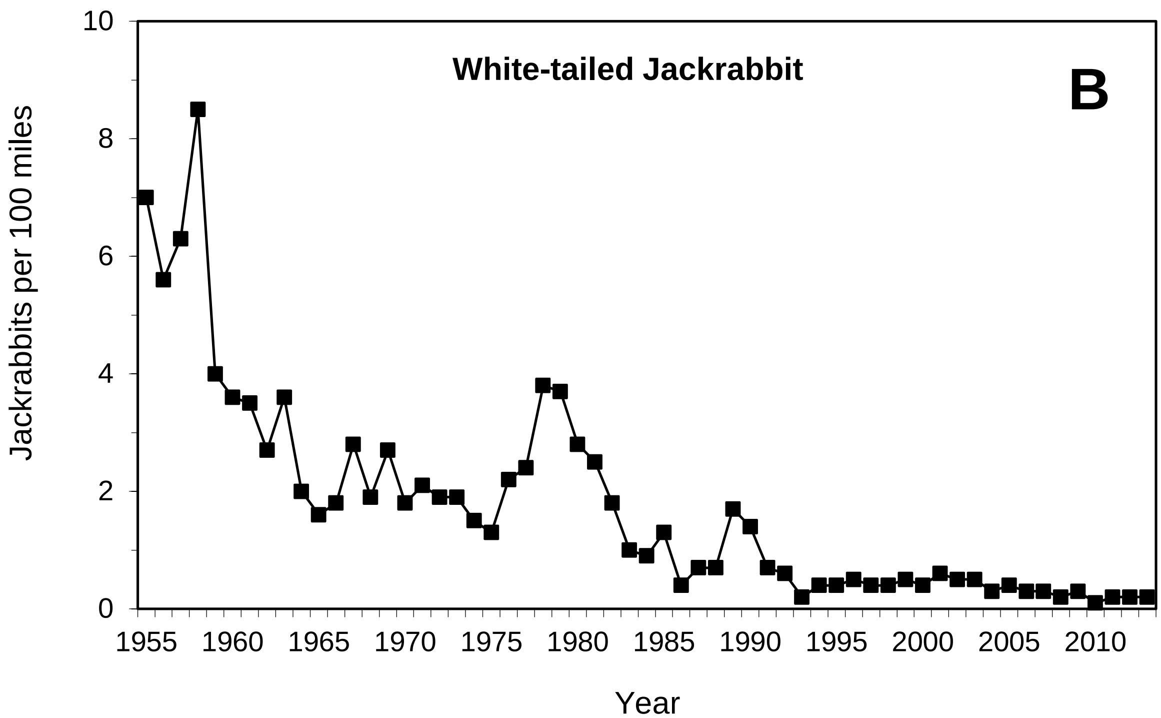


Figure 3. Range-wide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven in Minnesota, 1955-2013. Does not include the Northwest region. Based on all survey routes completed.

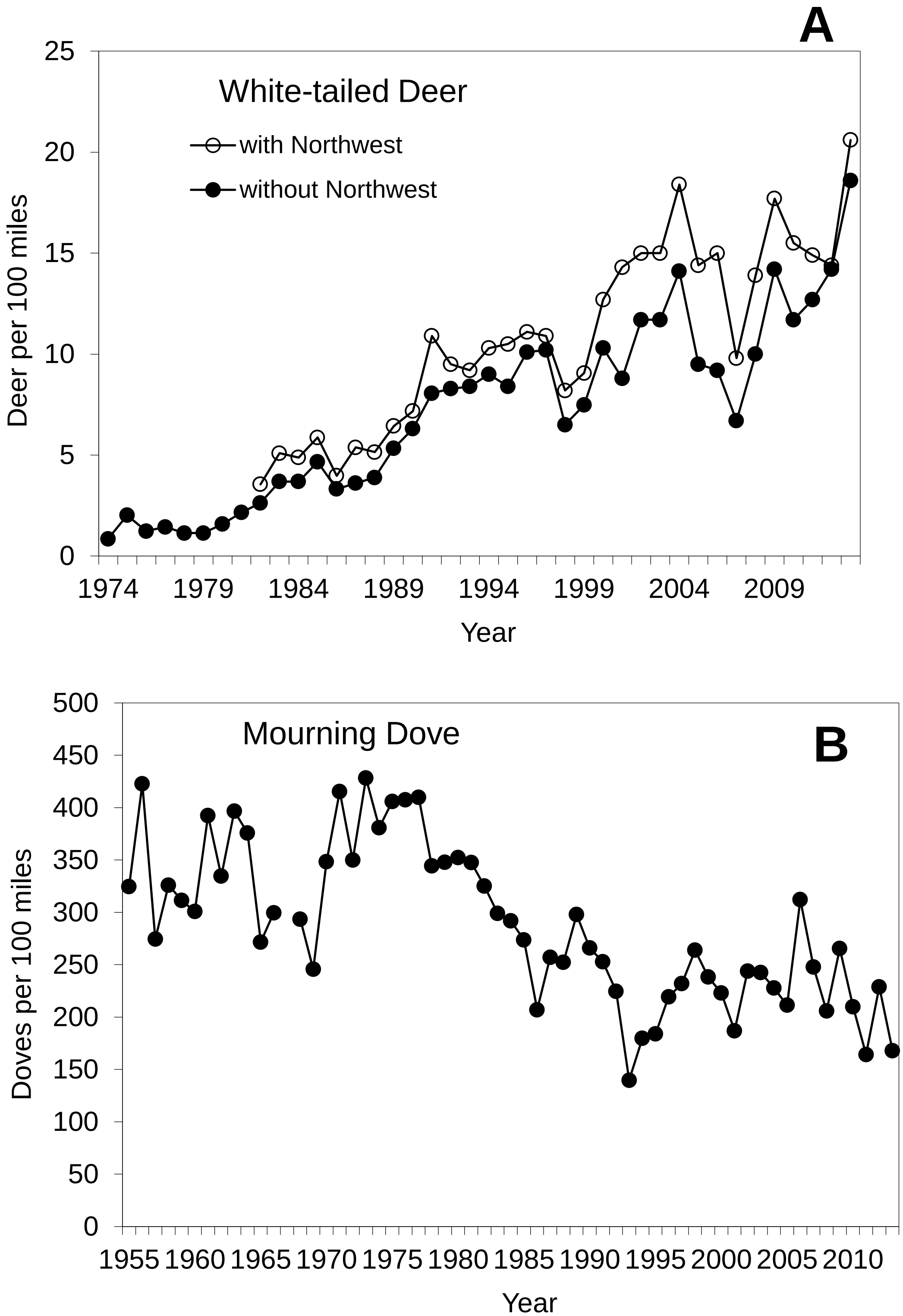


Figure 4. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2013. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA - 2013

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) describes the structure of and data inputs for the population model used on white-tailed deer in Minnesota, and 2) discusses general trends of deer density and current abundance.

METHODS

I arbitrarily pooled permit areas (PAs) into 12 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 where hunters could hunt either-sex, 3) managed, 4) intensive, and 5) no limit antlerless (Figure 2). The strategy employed during a given year depended upon where the population density was in relation to the population density goal. The Twin Cities metro region (PA 601) and PA 182 were not modeled due to limited hunting opportunities and light harvest pressure, and PAs 199, 203, 224, 235, 238, 251, 287, and 344 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 was partitioned into 4 sex-age classes (fawns, adults, males, and females). The 12-month annual cycle was divided into 4 periods representing important biological events in the deer's life (hunting season, winter, reproduction, and summer). The primary purposes of the population model were to 1) organize and synthesize data on deer populations, 2) advance the understanding of Minnesota's deer population through population analysis, 3) provide population estimates and simulate vital rates for 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 and forested regions. Although summer mortality rates were low, they did represent a reduction in the annual deer population. 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. Because these deer herds are heavily exploited by deer hunters, 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 Midwest 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 Population Management

Northwest Management Units

Karlstad Unit – Deer numbers have generally declined in this unit and most populations are at or slightly below the goal density (Table 1). Thus, management strategies applied during the 2013 hunting season were relatively conservative compared to those used 5-8 years ago. Deer populations immediately to the west of PA 101 were well below goal due to prior TB management efforts but management strategies are more conservative in 2013 to allow populations to increase.

Crookston/TRF Unit – With the exception of PA 261, modeling suggests deer numbers are increasing throughout the unit. Therefore, management strategies were more aggressive in 2013 than in the PAs to the north. Deer numbers are still within goal, but it is likely that more aggressive management strategies will be employed in 2014 to address higher deer densities.

Mahnomen Unit – Deer densities have been relatively stable in this unit and remain slightly below goal. Consequently, most permit areas were designated as lottery to allow populations to increase. Deer densities are lower in this unit than in other more eastern units due to less woody cover being available.

Central Management Units

Morris Unit – Conservative management strategies used over the past few years have allowed deer populations to increase. However, deer densities remain below goal in 4 PAs. Lottery management strategies are being used throughout the unit but more antlerless permits are being issued in 2013. Although more permits are being issued, modeling projections suggest deer densities will continue to increase over the year provided a severe winter does not occur.

Osakis Unit – Deer densities have been stable to slightly increasing over the past few years in this unit. More conservative management strategies have been used in the past 2 years to reduce the antlerless harvest. Management strategies used in 2013 are more aggressive and the intent is to stabilize deer numbers throughout the unit. Due to more woody cover than PAs toward the west, deer densities are considerably higher ranging from 9-29 deer per square mile.

Cambridge Unit – Deer densities in this unit are stable to slightly increasing despite remaining aggressive with harvest management strategies over the past few years. Deer densities remain above goal in the north metro PAs where PAs have been designated as Intensive for the past 10 years and early antlerless seasons have been used for 5 of the past 10 years. More aggressive management strategies are likely warranted in the near future if deer density goals remain lower than current deer densities.

Hutchinson Unit – Deer densities have been increasing in this unit over the past 5-7 years and are near goal levels. More aggressive management strategies were used in 2013 in attempt to increase the antlerless harvest and stabilize deer numbers. Deer densities vary from 4-11 deer per square mile.

Southern Management Units

Minnesota River Unit – Modeling suggests these deer herds are all increasing. Harvest trends in the eastern PAs around New Ulm and Mankato to Jordan support the increasing modeling trends. However, the population statistics in the western PAs do not support the increasing trends shown by the population models. It is conceivable that the severe winters that occurred in 2010 and 2011 had a greater impact in the western areas than in the eastern areas and deer densities are not growing as fast as the models are suggesting in the western areas.

Slayton Unit – Conservative management strategies used over the past 5 years have significantly reduced the antlerless harvests to allow populations to increase. Numeric buck harvests substantially increased throughout the unit which is indicative of higher deer densities. All population statistics support the increasing trends shown by the population models and most PAs have been recalibrated through distance sampling techniques. Hunter and landowner surveys suggest deer densities should be stabilized so more aggressive management strategies were used this year in attempt to stop population growth rates and stabilize deer numbers.

Waseca Unit – Deer densities have been very stable throughout this unit over the past 5-10 years. All deer populations are at or near population goals and deer densities range from 3-7 deer per square mile. In general, management strategies are more aggressive in 2013 but expected harvests should keep deer numbers relatively stable through 2014.

Rochester Unit – Deer densities are at or are approaching desired goal densities throughout the unit. Management strategies being used in 2013 are comparable to those used in 2012 with the intent to keep deer numbers relatively stable. The 4-points-to-a-side antler-point restriction implemented in 2010 was effective at reducing the kill of young bucks and had substantial support by hunters. Consequently, the antler restriction will continue to be used in 2013 and the effectiveness of the regulation will be monitored in the future.

Forest Unit – Winter severity indices (WSIs) were relatively high in extreme northern Minnesota. Some wildlife managers were concerned about the impact winter had on the deer herd, particularly in the most northern PAs towards the east. The winter was unique in that it was relatively mild through February but then deep snow was on the ground through most of April. Modeling suggests deer numbers are stable to slightly increasing throughout most of the forest zone, and most population statistics agree with those trends. For the most part, management strategies used in 2013 are comparable to those used in 2012. In general, management strategies are more aggressive in the southern portion of the forest zone where WSIs were lower and more conservative in the northern permit areas.

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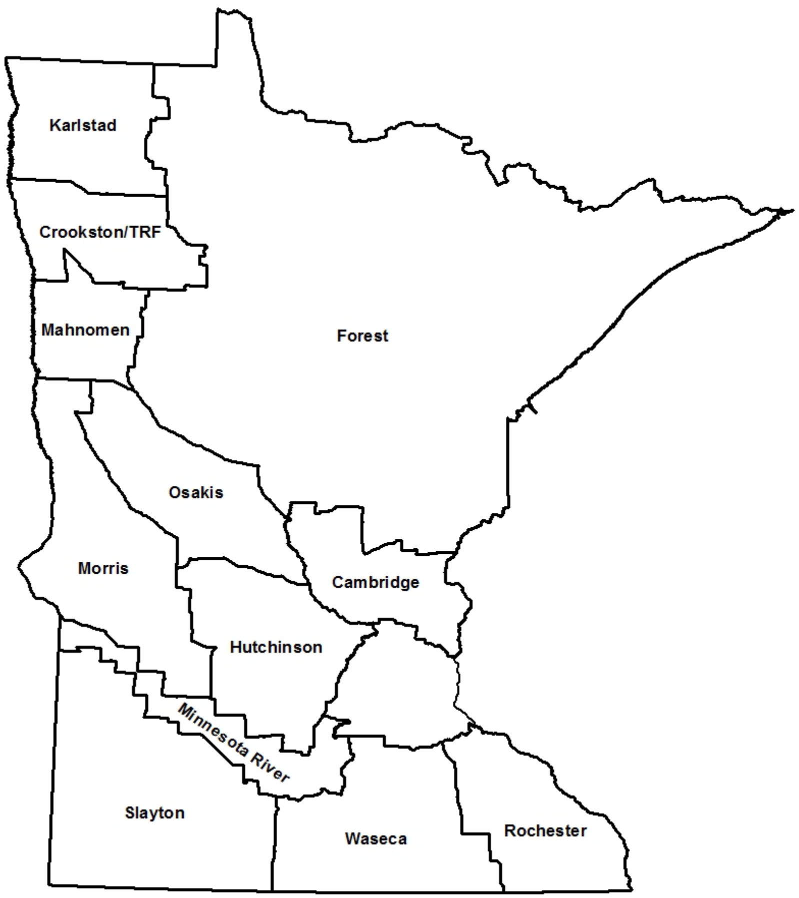

Figure 1. Deer management units in Minnesota, 2012.

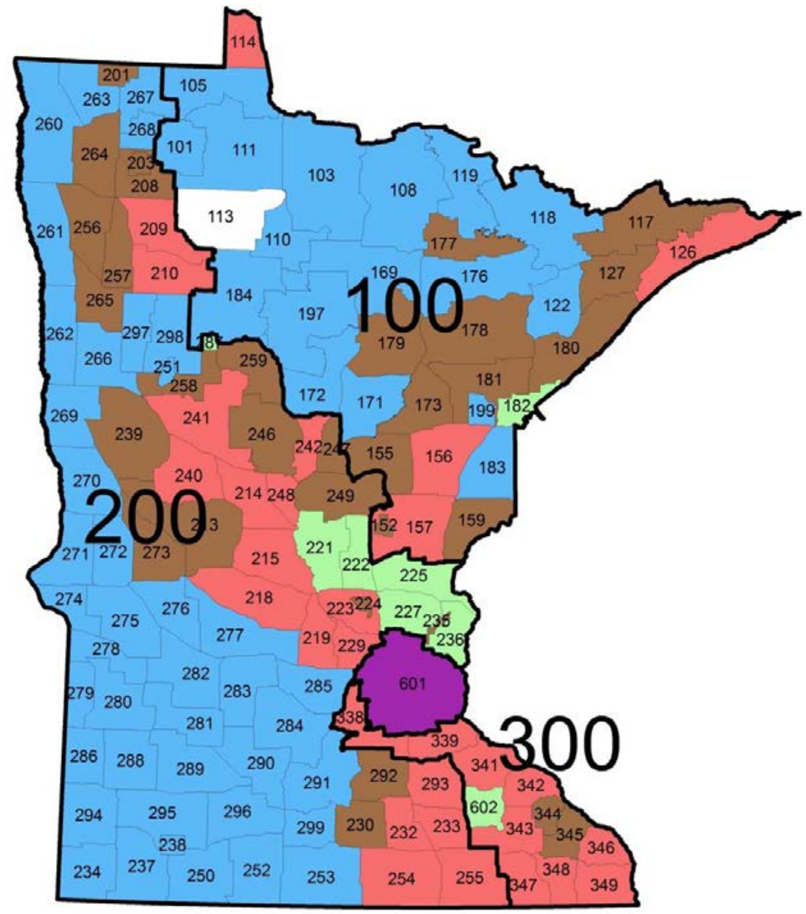

Figure 2. Deer management strategies used in permit areas throughout Minnesota, 2013. Permit areas are numbered and management strategies are color-coded. Permit areas are designated as: 1) lottery if colored blue, 2) hunter's choice if colored brown, 3) managed if colored red, 4) intensive if colored green, and 5) unlimited antlerless if colored purple.

Table 1. Pre-fawn deer density (deer/mi^2) as simulated from population modeling in each permit area in Minnesota, 2008-2013.

Region		Pre-fawning Density					
Permit Area	**Area (mi^2)**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Karlstad							
201	155	6	6	6	5	5	5
208	443	4	4	4	4	3	2
260	1249	4	4	3	3	3	3
263	512	5	5	5	4	3	2
264	669	7	7	6	5	6	6
267	472	3	3	3	2	2	2
268	230	9	9	8	7	7	6
Total	3,838	6	6	5	5	4	4
Crookston							
209	576	9	9	9	7	7	9
210	485	12	12	11	11	10	13
256	654	5	5	5	5	5	7
257	413	8	7	6	6	6	9
261	795	2	2	2	2	2	2
Total	3,053	7	7	7	6	6	8
Mahnomen							
262	677	2	2	2	2	2	2
265	494	9	10	10	9	8	8
266	617	5	6	6	5	4	4
297	438	3	2	3	2	3	3
Total	2,226	5	5	5	5	4	4
Morris							
269	651	2	2	2	2	2	3
270	749	1	2	2	1	2	2
271	634	2	2	3	3	2	3
272	531	1	2	2	2	2	2

Region		Pre-fawning Density					
Permit Area	Area (mi^2)	2008	2009	2010	2011	2012	2013
273	575	4	5	4	4	4	5
274	360	3	3	4	3	3	5
275	766	3	3	5	5	5	6
276	544	4	4	4	4	5	6
282	779	1	1	1	1	1	2
Total	5,589	2	2	3	3	3	3
Osakis							
213	1058	11	12	13	10	11	12
214	557	19	19	19	19	20	20
215	702	9	10	10	10	10	10
239	924	10	9	10	8	9	9
240	642	18	18	18	15	16	18
Total	3,879	13	14	14	12	13	14
Cambridge							
221	642	13	13	13	12	12	12
222	412	15	15	15	15	15	14
223	376	9	9	9	10	10	12
225	619	16	16	16	14	14	14
227	472	12	13	14	13	13	14
229	287	6	6	7	6	6	7
236	374	16	16	16	16	16	17
Total	2,895	12	13	13	12	12	13
Hutchinson							
218	813	6	7	7	7	7	8
219	393	7	8	9	9	10	11
229	288	6	6	7	6	6	7
277	885	4	5	6	5	4	6
283	614	2	3	3	3	3	4

Region		Pre-fawning Density					
Permit Area	Area (mi^2)	2008	2009	2010	2011	2012	2013
284	837	2	2	3	3	3	4
285	550	3	4	4	4	4	5
Total	4,380	4	5	6	5	5	6
Minnesota River							
278	397	6	6	7	6	6	7
281	575	3	3	4	4	4	5
290	662	3	3	4	4	4	5
291	806	4	4	5	4	4	5
Total	2,440	4	4	5	5	5	6
Slayton							
234	637	2	2	2	3	3	3
237	729	2	2	2	2	2	3
250	712	2	2	2	2	3	3
279	345	3	4	3	3	4	5
280	675	2	2	2	2	3	3
286	447	3	3	3	3	3	4
288	625	2	2	2	2	3	3
289	816	2	1	1	1	2	2
294	687	2	2	2	2	2	3
295	839	2	2	2	2	3	3
296	666	2	2	2	2	3	3
Total	7,178	2	2	2	2	3	3
Waseca							
230	453	3	3	3	4	3	4
232	377	5	4	4	4	5	5
233	390	4	4	4	4	5	5
252	715	2	2	2	2	3	3
253	974	2	2	2	2	2	3

Region		Pre-fawning Density					
Permit Area	Area (mi^2)	2008	2009	2010	2011	2012	2013
254	931	3	3	3	3	3	3
255	774	3	3	3	3	3	4
292	481	8	7	7	6	6	6
293	506	7	7	7	7	7	7
299	386	4	4	5	4	4	5
Total	5,987	4	4	4	4	4	5
Rochester							
338	452	4	5	5	5	5	6
339	409	5	5	6	5	5	5
341	596	10	10	10	10	11	12
342	352	13	13	14	14	14	14
343	663	11	11	10	10	10	11
345	326	10	9	8	8	9	10
346	319	21	20	19	19	17	16
347	434	9	8	7	8	8	8
348	332	18	15	14	14	14	14
349	492	22	21	20	19	19	18
Total	4,564	12	12	12	11	11	11
Forest							
103	1824	6	6	5	5	4	5
105	932	14	13	11	10	8	8
108	1701	9	9	6	6	7	7
110	530	26	23	22	19	20	21
111	1440	4	3	2	2	2	3
117	1129	2	2	2	3	3	3
118	1445	5	4	4	4	4	5
119	946	7	5	5	4	5	5
122	622	5	5	5	5	5	6
126	979	4	4	4	3	3	4
127	587	3	3	3	3	3	3

Region		Pre-fawning Density					
Permit Area	Area (mi^2)	2008	2009	2010	2011	2012	2013
155	639	12	12	13	14	14	14
156	834	15	14	14	14	14	13
157	904	22	21	21	20	20	20
159	575	18	17	16	15	14	15
169	1202	10	9	9	9	9	9
171	729	10	9	9	10	10	10
172	786	15	13	13	13	13	13
173	617	9	9	9	9	10	10
176	1150	9	8	9	8	9	9
177	553	21	16	17	14	15	16
178	1325	18	16	16	14	13	13
179	939	15	15	15	14	14	13
180	999	9	8	8	8	8	8
181	746	18	17	17	14	13	15
183	675	12	11	11	11	11	12
184	1318	18	16	16	16	16	17
197	1343	8	7	7	5	5	6
241	1047	36	34	33	30	30	32
242	307	22	22	22	22	21	20
246	860	14	14	15	15	15	14
247	263	17	17	18	18	18	18
248	229	24	24	25	25	25	24
249	729	10	11	12	11	11	11
258	381	23	19	19	18	18	19
259	546	25	23	24	23	21	21
298	677	17	15	13	11	12	13
Total	32,907	13	11	11	11	11	11

2013 WHITE-TAILED DEER SURVEYS

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John H. Giudice, Wildlife Biometrics Unit

INTRODUCTION

Management goals for animal populations are frequently expressed in terms of population size (Lancia et al. 1994). Accurate estimates of animal abundance allow for documentation of population trends, provide the basis for setting harvest quotas (Miller et al. 1997), and permit assessment of population and habitat management programs (Storm et al. 1992).

The Minnesota Department of Natural Resources (MNDNR) uses simulation modeling within 125 permit areas (PA) to estimate and track changes in white-tailed deer (*Odocoileus virginianus*) abundance and, subsequently, to develop harvest recommendations to keep deer populations within goal levels. In general, model inputs include estimates of initial population size, and spatial and temporal estimates of survival and reproduction for various age and sex cohorts. Because simulated population estimates are subject to drift as model input errors accumulate over time, it is imperative to periodically recalibrate the starting population within these models with independent deer population estimates (Grund and Woolf 2004).

Our objective was to provide independent estimates of deer abundance in select deer PAs that are within 20% of the true population size with 90% confidence (Lancia et al. 1994). Abundance data are used to recalibrate population models to improve population management.

METHODS

We estimated deer populations in selected PAs using a quadrat-based, aerial survey design. Quadrat surveys have been used to estimate populations of caribou (*Rangifer tarandus*; Siniff and Skoog 1964), moose (*Alces alces*; Evans et al. 1966), and mule deer (*O. heimonus*; Bartmann et al. 1986) in a variety of habitat types. Within each PA, quadrats were delineated by Public Land Survey section boundaries. In PAs with marginal deer habitat (i.e., limited woody cover, predominance of row-crop agriculture) and no survey history, we stratified the sampling frame into 2 or 3 density categories (low, high; low, medium, high) using the local wildlife manager’s knowledge of deer abundance and distribution. In PAs with abundant woody cover and past survey data, we used regression trees (Fabrizi and Trivisano 2007, Fieberg and Lenarz 2012), the R programming language (R Core Team 2013), and R package ’stratification’ (Baillargeon and Rivest 2012) to stratify the sampling frame into 2 categories (low, high) based upon past helicopter counts of deer and abundance of woody cover within each quadrat. Woody cover data were derived from the 2006 National Land Cover database (Fry et al. 2011). In some PAs, an additional stratum was constructed to encompass State Park boundaries where applicable. We used optimal allocation, R package ‘spsurvey’ (Kincaid and Olsen 2012), and a generalized random tessellation stratified procedure (GRTS; Stevens and Olsen 2004) procedure to draw spatially balanced samples within each PA.

During all surveys, we used Bell OH-58 helicopters and attempted to maintain flight altitude at 60 m above ground level and airspeed at 64-80 km/hr. A pilot and 2 observers searched for deer along transects spaced at 270-m intervals until they were confident all “available” deer were observed. When animals fled the helicopter, direction of movement was noted to avoid double counting. We used a real-time, moving-map software program (DNRSurvey; Wright et al. 2011), coupled to a global positioning system receiver and a convertible tablet computer, to guide transect navigation and record deer locations, direction of movement, and aircraft flight paths directly to ArcGIS (Environmental Systems Research Institute, Redlands, CA) shapefiles. To minimize visibility bias, we completed surveys during winter (December-March) when snow cover measured at least 15 cm and we varied survey intensity as a function of cover and deer numbers (Gasaway et al. 1986). We estimated deer abundance using R package ‘spsurvey’ (Kincaid and Olsen 2012). We evaluated precision using coefficient of variation (CV), defined as standard deviation of the population estimate divided by the population estimate, and relative error, defined as the 90% confidence interval bound divided by the population estimate (Krebs 1999).

We implemented double sampling (Eberhardt and Simmons 1987, Thompson 2002) on a subsample of quadrats in each PA to estimate sightability of deer from the helicopter. For each PA, we sorted the sample of survey quadrats by woody cover abundance, excluded quadrats likely to contain no deer (e.g., low stratum quadrats or quadrats where woody cover < 0.17 km^2), and selected a 4% systematic subsample of sightability quadrats. Immediately after completing the operational survey on each sightability quadrat, a second more intensive survey was flown at reduced speed (48-64 km/hr) to identify animals that were missed (but assumed available) on the first survey (Gasaway et al. 1986). We used geo-referenced deer locations, group size, and movement information from DNRSurvey (Wright et al. 2011) to “mark” deer (groups) observed in the operational survey and help estimate the number of “new” (missed) animals detected in the sightability survey. We used a binary logistic model to estimate average detection probabilities (i.e., the conditional probability of detection given animals are present in the sampling unit and available for detection) for each PA. We computed population estimates adjusted for both sampling and sightability.

RESULTS AND DISCUSSION

We completed 4 surveys during 2013 (Table 1). PAs 260 and 270 were stratified by expected deer density based upon input from local wildlife managers. PAs 264 and 344 were stratified using the relationship between woody cover abundance per quadrat and historic deer density. In PA 344, sampling rate exceeded 20% to incorporate additional quadrats within Whitewater State Park. With the exception of PA 270, population estimates were precise and met precision goals (relative error $\leq$ 20%; Table 1). Deer were observed in 36%, 75%, and 83% of survey quadrats within PAs 260, 264, and 344, respectively, but only 21% of quadrats in PA 270 (Table 2). In addition, the number of deer groups observed and mean number observed per “occupied” quadrat was less in PA 270 compared to other PAs. Conversely, mean group size in PA 270 was nearly 3-fold higher than in other areas (Table 2). Finally, the majority of deer (58%) within PA 270 were observed in only 4 plots and 27% were observed within a single plot. Deep snow cover caused deer to group together in large clusters within this PA, decreasing precision of the population estimate. Kufeld et al. (1980) described similar challenges with precision due to nonuniformity of mule deer distribution within strata in Colorado.

Estimates of sightability ranged from 0.755 (SE = 0.020) in PA 264 to 0.864 (SE = 0.013) in PA 260 and averaged 0.800 (SE = 0.025; Table 1), which are similar to sightability estimates during 2009-2011 (range = 0.655-0.909). Correcting for sightability increased relative variance (CV [%]) of population estimates by 1.3-5.7%, which was a reasonable tradeoff between decreased bias and increased variance, although costs associated with the sightability surveys are also important. However, we caution that our sightability estimates are conditional on animals being available for detection (Johnson 2008, Nichols et al. 2009). Unfortunately, like many other wildlife surveys, we have no estimates of availability or how it varies over space and time. Our approach also assumes that sightability is constant across animals and quadrats. Heterogeneity in detection probabilities can lead to biased estimates of abundance. Common methods for correcting for heterogeneous detection probabilities include distance sampling, mark-recapture methods, and logistic-regression sightability models (based on radio-marked animals). We did not have marked animals in our populations, and relatively high densities of deer in our survey areas would present serious logistical and statistical problems for distance-sampling and double-observer methods. Therefore, our double-sampling approach is a reasonable alternative to using unadjusted counts or applying more complicated methods whose assumptions are tenuous. Nevertheless, our "adjusted" population estimates must still be viewed as approximations to the truth.

ACKNOWLEDGEMENTS

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Table 1. Deer population and density (deer/mi^2) estimates derived from aerial surveys in Minnesota, 2013.

Permit area	Sampling rate	Detection rate	Population estimate		CV (%)	Relative error (%)[a]	Density estimate	
			N	90% CI			Mean	90% CI
260	0.20	0.864	4,710	4,100 – 5,320	7.8	12.8	3.7	3.2 – 4.1
264	0.20	0.755	9,190	7,910 – 10,470	8.5	14.0	14.2	12.2 – 16.2
270	0.20	0.817	2,760	1,960 – 3,560	17.7	29.1	3.6	2.6 – 4.7
344[b]	0.27	0.763	4,800	4,070 – 5,530	9.2	15.1	24.5	20.8 – 28.2

[a]Relative precision of population estimate. Calculate as 90% CI bound/*N*.
[b]Includes Whitewater State Park.

Table 2. Sampling metrics from aerial deer surveys in Minnesota, 2013.

Permit area	Total quadrats	Sample quadrats	Occupied[a] quadrats	Deer observed	Deer groups observed	Groups / occupied quadrat			Group size / occupied quadrat			Maximum quadrat count
						min	mean	max	min	mean	max	
260	1,286	258	92	2,085	341	1	4	13	1	6	65	132
264	647	130	98	1,893	504	1	5	17	1	4	32	92
270	758	152	32	1,460	84	1	3	6	1	17	155	395
344	196	53	44	1,169	194	1	4	11	1	6	38	89

[a]Number of quadrats with >1 deer observed.

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, 2012

John Erb, Minnesota, 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 37th year 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 tablet 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 258 routes were completed this year (Figure 1). There were 2,384 operable scent stations examined on the 258 4.3 km routes. Route density varied from 1 route per 601 km^2 in the Forest Zone to 1 route per 1,261 km^2 in the Farmland Zone (Figure 1).

Statewide, route visitation rates (% of routes with detection) were highest for red foxes (40%), followed by skunks (38%), raccoons (30%), coyotes (25%), domestic cats (24%), domestic dogs (19%), wolves (14%), and bobcats (12%). Regionally, route visitation rates were as follows: red fox – Farmland (FA) 28%, Transition (TR) 41%, Forest (FO) 45%; coyote – FA 48%, TR 41%, FO 8%; skunk – FA 46%, TR 50%, FO 28%; raccoon – FA 48%, TR 42%, FO 17%; domestic cat – FA 56%, TR 29%, FO 9%; and domestic dog – FA 24%, TR 20%, FO 5%.

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 this year was an increase in the Forest Zone striped skunk index (Figure 4), which follows a significant decrease last year. In addition, the increase in the Transition Zone wolf index approached significance (Figure 3), although the Transition Zone represents a comparatively small percentage of wolf range in Minnesota.

In the Farmland Zone, the red fox index remained well below its long-term average, whereas the Farmland coyote index remains well above its long-term average and was the highest yet recorded (Figure 2). Indices for most other species are near long-term averages, though the raccoon index has generally remained above-average in recent years (Figure 2).

In the Transition Zone, the red fox index has undergone fluctuations, but is currently near its long-term average (Figure 3). The Transition Zone coyote index continues an upward trend, with the point estimate for this year's track index the highest yet recorded. The indices for most other species are near their long-term average, although detection rates for domestic dogs have declined for several years (Figure 3).

In contrast to the other zones, the Forest Zone coyote index reached its lowest level since the survey began, although the decline was not a significant change from last year (Figure 4). Red fox and raccoon indices remain near their long-term average (Figure 4). The Forest Zone wolf index declined, though not significantly, and has remained above the long-term average for 3 years (Figure 5). Although the Transition Zone represents a small portion of wolf range and confidence intervals are large, the point estimate for the Transition Zone wolf index was the highest yet recorded (Figure 5). The Forest Zone bobcat index continues to increase to record levels whereas the Transition Zone bobcat index has declined appreciably the last 2 years to near its long–term average (Figure 5).

ACKNOWLEDGEMENTS

I wish to thank all of the cooperators who participated in the 2012 survey: DNR Division of Wildlife staff; Superior National Forest Aurora District; Agassiz, Rydell, Sherberne, and Tamarac National Wildlife Refuges; USFWS Detroit Lakes Wetland Management District; 1854 Treaty Authority, Red Lake, and Leech Lake Tribal Natural Resource Departments; St. Croix National Scenic Waterway; Lori Schmidt and Vermillion Community College; Jim Pederson and Marshall County Central High School; Peter Jacobson and Faribault High School; and Richard Nelles and Tom Stuber.

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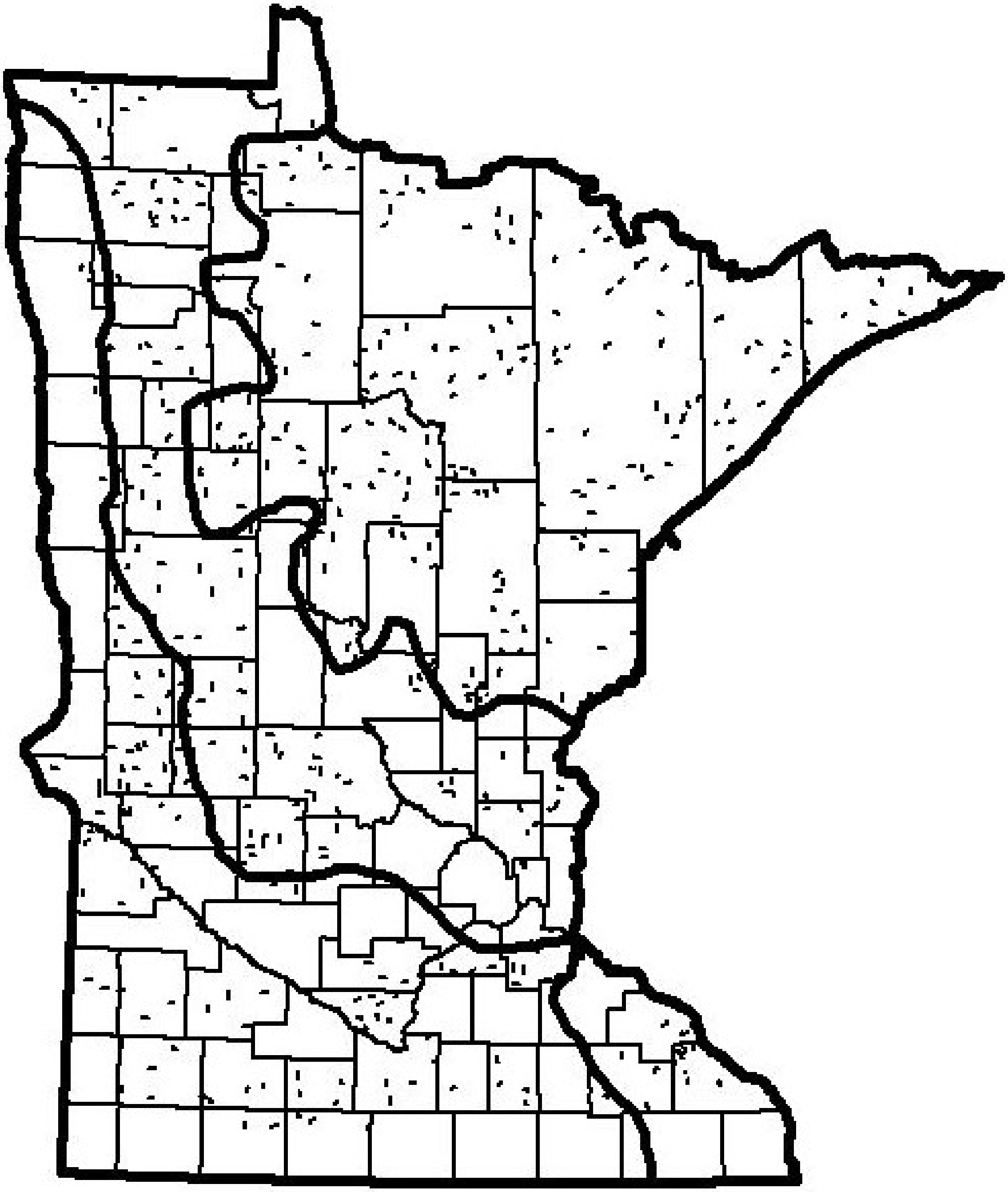

ɪn Specifics

Route Density	Station Nights
1/1,261 km^2	510
1/996 km^2	602
1/601 km^2	1,272
1/840 km^2	2,384

lights

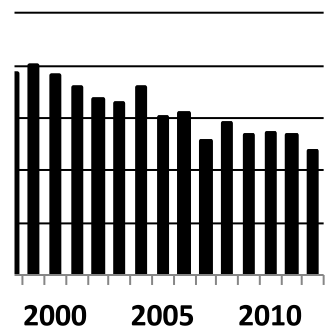

Figure 1. Locations of existing scent station routes (not all completed every year). Insets show 2012 route specifics and the number of station-nights per year since 1983.

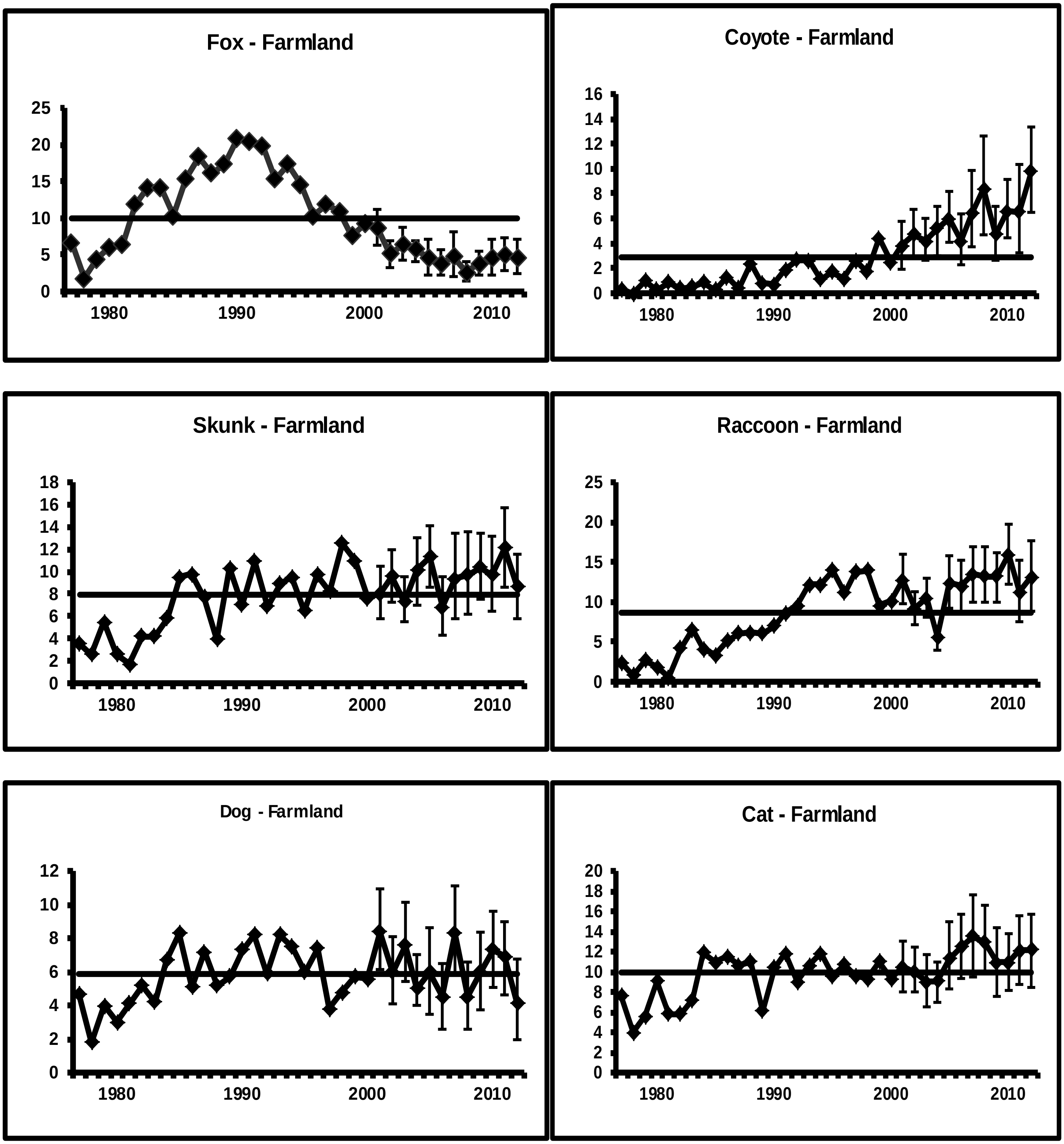

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2012. Horizontal line represents long-term mean.

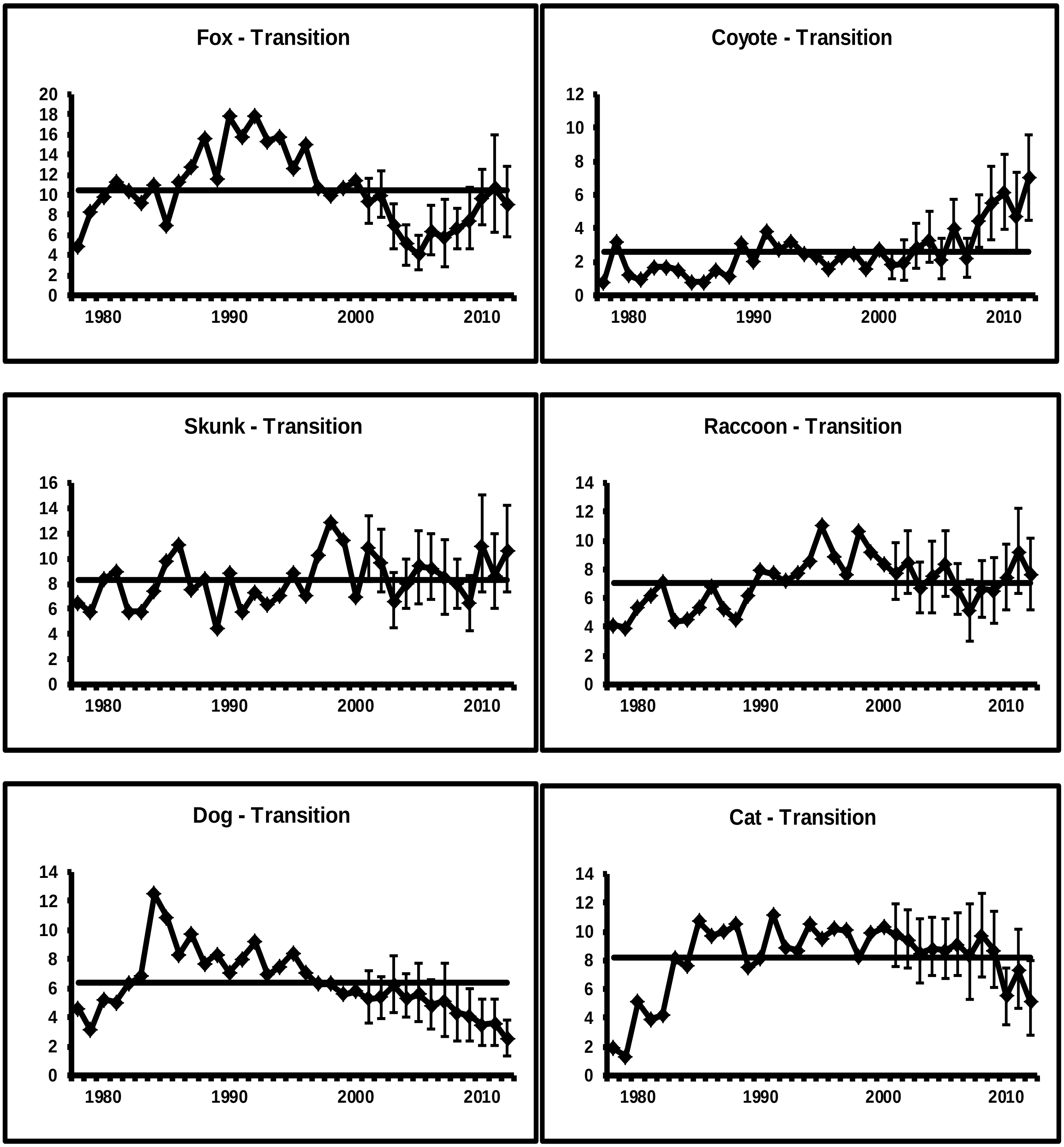

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2012. Horizontal line represents long-term mean.

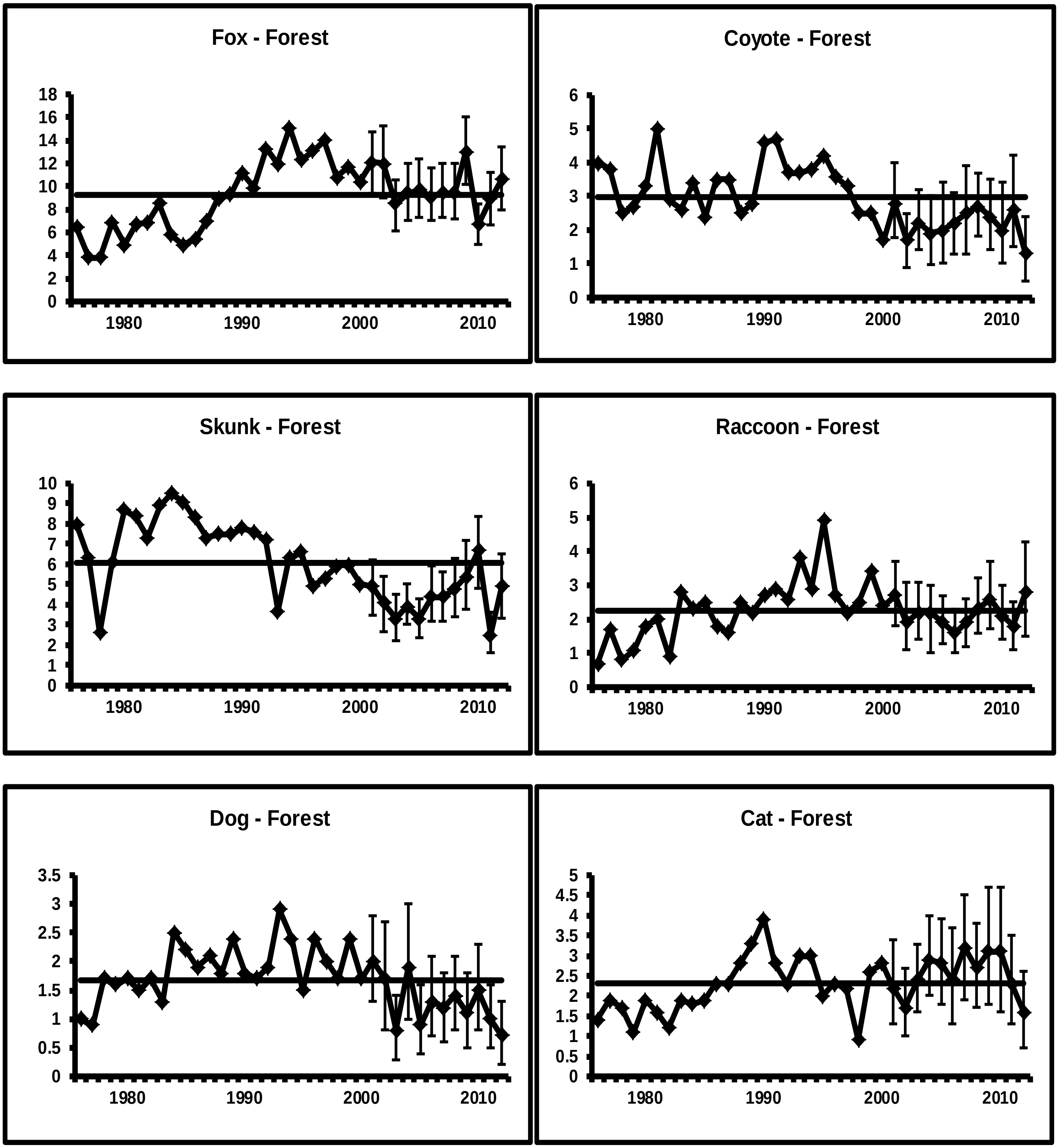

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2012. Horizontal line represents long-term mean.

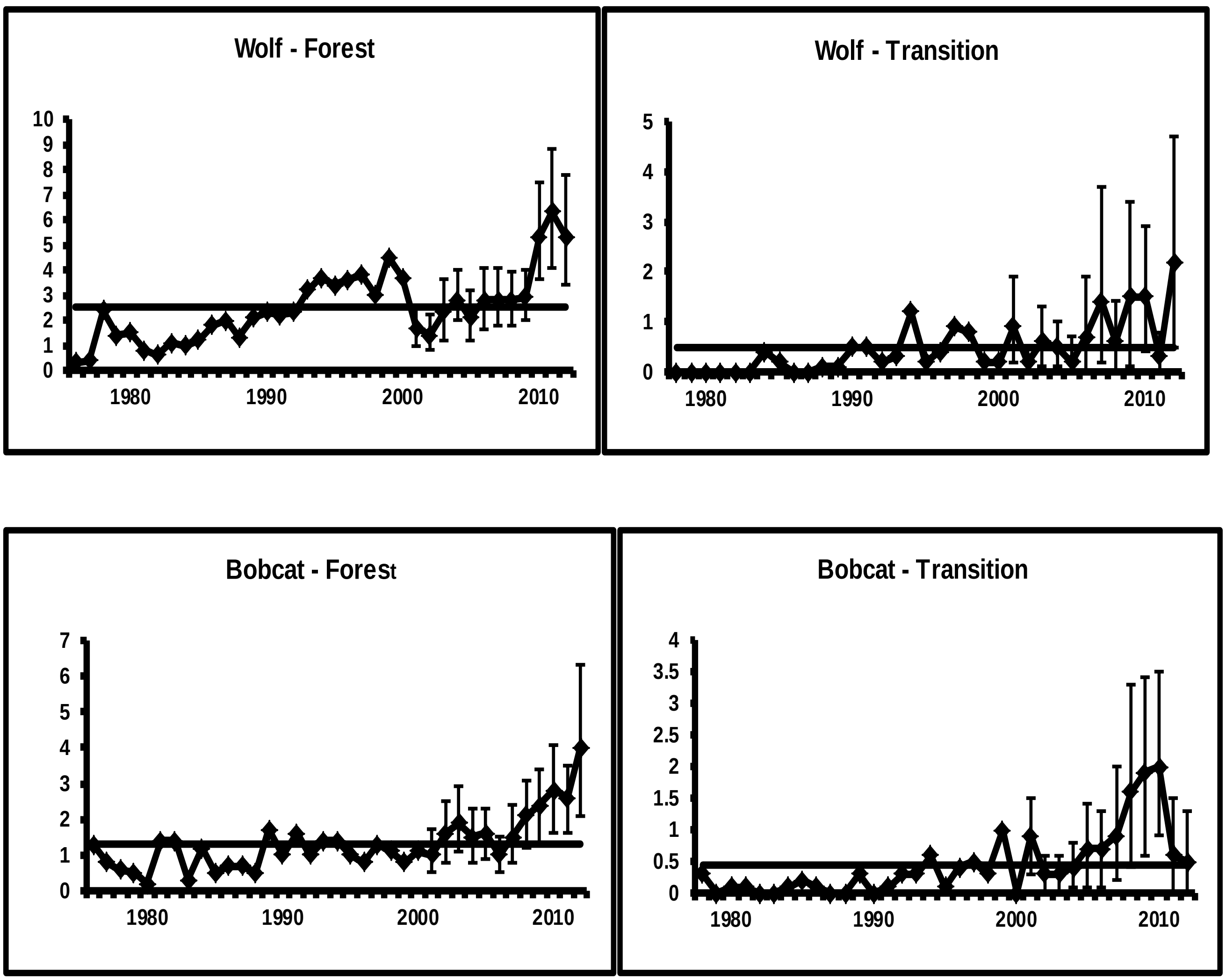

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2012. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2012

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 presumed to reflect 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 hares (*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 tracks to be left, 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. Dating back to 1974, hare survey data has also been obtained via counts of hares observed on ruffed grouse drumming count surveys conducted in spring. Post-1993 data for both the spring and winter hare indices are presented for comparison in this report.

In the second graph for each species, I illustrate the percentage of *routes* where each species was detected (hereafter, the ‘distribution index’). This measure is computed to help assess whether any notable changes in the above-described 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

Forty-three of the 60 routes (Figure 2) were completed this year. Survey routes took an average of 2.2 hours to complete. Total snow depths averaged 6” for completed routes and mean overnight low temperature the night preceding the surveys was 4°F, both measures slightly below their long-term averages (Figure 3). Survey routes were completed between November 26th and March 6th, with a mean survey date of January 1st (Figure 3).

Neither fisher nor marten track indices changed significantly, and both remain near their lowest level since the survey’s inception (Figure 4). Fishers were detected on 4.7% of the route segments, and along 51% of the routes (Figure 4). This represents the smallest percentage of routes with fisher detection since the survey began. However, numerous sources of information indicate that fishers have been expanding in distribution and abundance along the southern and western edge of their Minnesota range, an area currently with few or no track survey routes. Hence, fisher indices in this report are likely indicative of fisher population trends only in the previous ‘core’ of fisher range, not in the southern and western periphery where they appear to be increasing. Marten were detected on 5.6% of the route segments, and 47% of the survey routes (Figure 4).

In spite of a significant increase in bobcat (*Lynx rufus*) harvest in recent years, bobcat track indices increased again though the changes were not statistically significant. Bobcats were detected on 4.6% of the route segments and 58% of the survey routes, the most since the survey began (Figure 4). Wolf indices did not change significantly, but index point estimates reached or remained near record levels the past 2 years. Wolves were detected on 12% of the route segments and 91% of the survey routes (Figure 4).

No notable changes were observed in red fox or coyote indices, with indices for both species near their long-term averages (Figure 4). Weasel (*Mustela erminea* and *Mustela frenata*) indices continue to be characterized as exhibiting a downward trend with periodic irruptions (Figure 4). Although historic data (pre-1994; not presented here) for snowshoe hares clearly exhibited 10-year cycles, in recent times the cycle appears to have dampened though hints of the cycle remain. Cycle peaks have historically occurred, on average, near the beginning of each decade. Data from the past 2 years is consistent with this pattern, but with the low to moderate cyclic increases being superimposed on a generally increasing trend since 1994 (Figure 4).

DISCUSSION

Reliable interpretation of changes in these 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.

Based on confidence intervals, there were no statistically significant changes from last year. In general, fisher and marten indices remain near their low point, with neither species appearing to be positively responding to the reduced fisher-marten harvest seasons over the past 6 years. Wolf and bobcat indices have increased in recent years to peak levels, whereas red fox and coyote indices are near their long-term averages. Trends are suggested for both weasels (decreasing) and snowshoe hares (increasing), but with indications of cyclic increases every ~ 8 years (weasels) or ~10 years (hares).

Confidence interval data for previous years will continue to be calculated and incorporated as time permits. Various changes or issues are being considered related to the logistical practicality of the survey in the foreseeable future, adequacy of route sample size and distribution, research to evaluate current survey assumptions or standardization, design alternatives to address spatial correlation of track segments along routes, 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).

ACKNOWLEDGEMENTS

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

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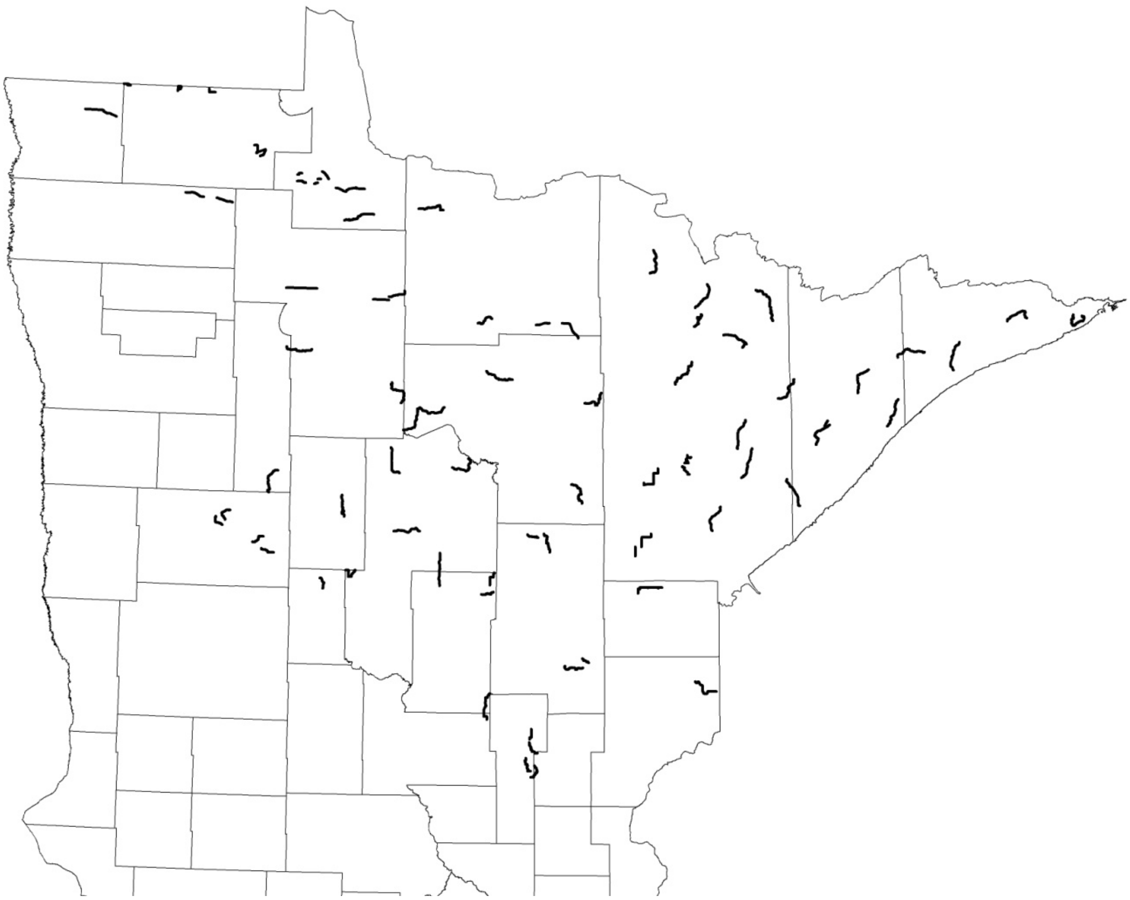

Figure 1. Locations of established furbearer winter track survey routes in northern Minnesota.

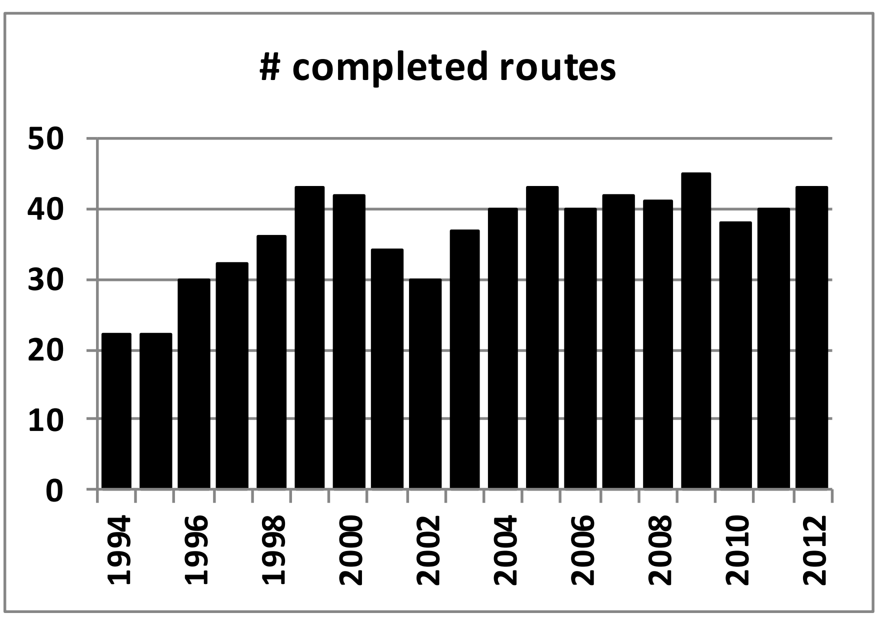

Figure 2. Number of winter track routes surveyed in Minnesota, 1994-2012.

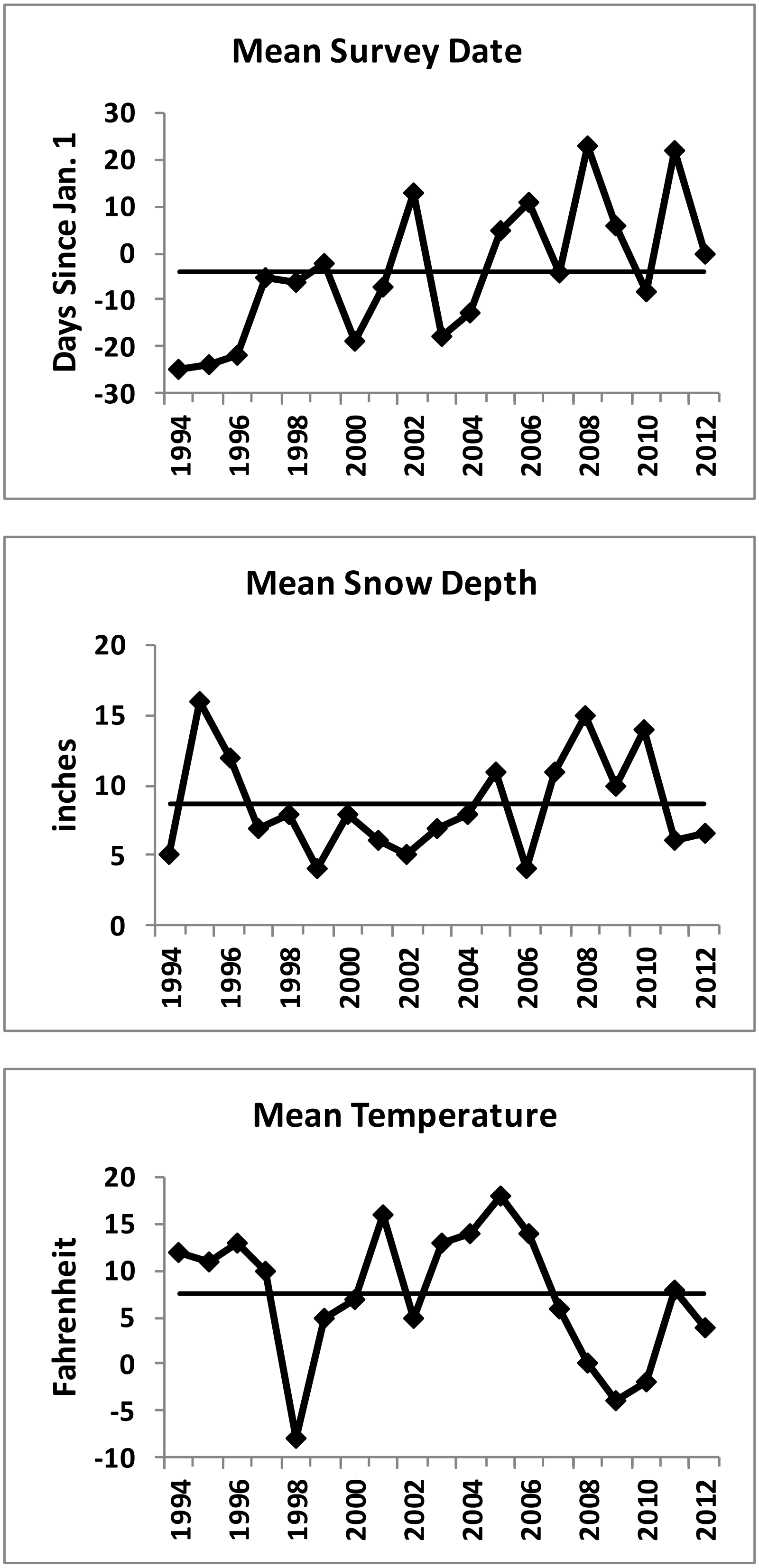

Figure 3. Average survey date, snow depth, and temperature for track routes completed in Minnesota, 1994-2012. Horizontal line represents long-term mean.

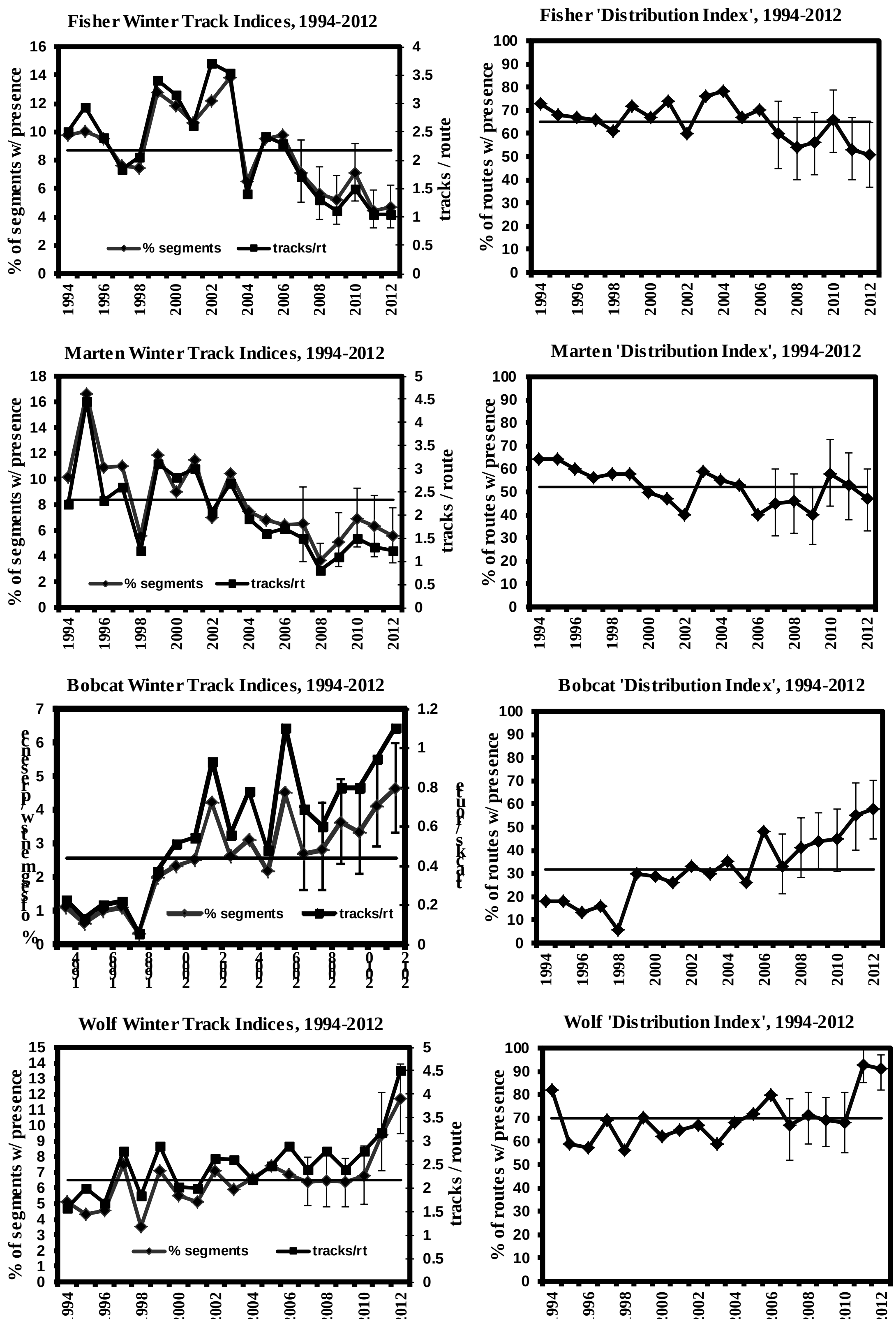

Figure 4. Winter track indices for selected species in Minnesota, 1994-2012. Confidence intervals only presented for % segments and % routes with track presence. Horizontal lines represent long-term average for percentage of segments and routes with presence.

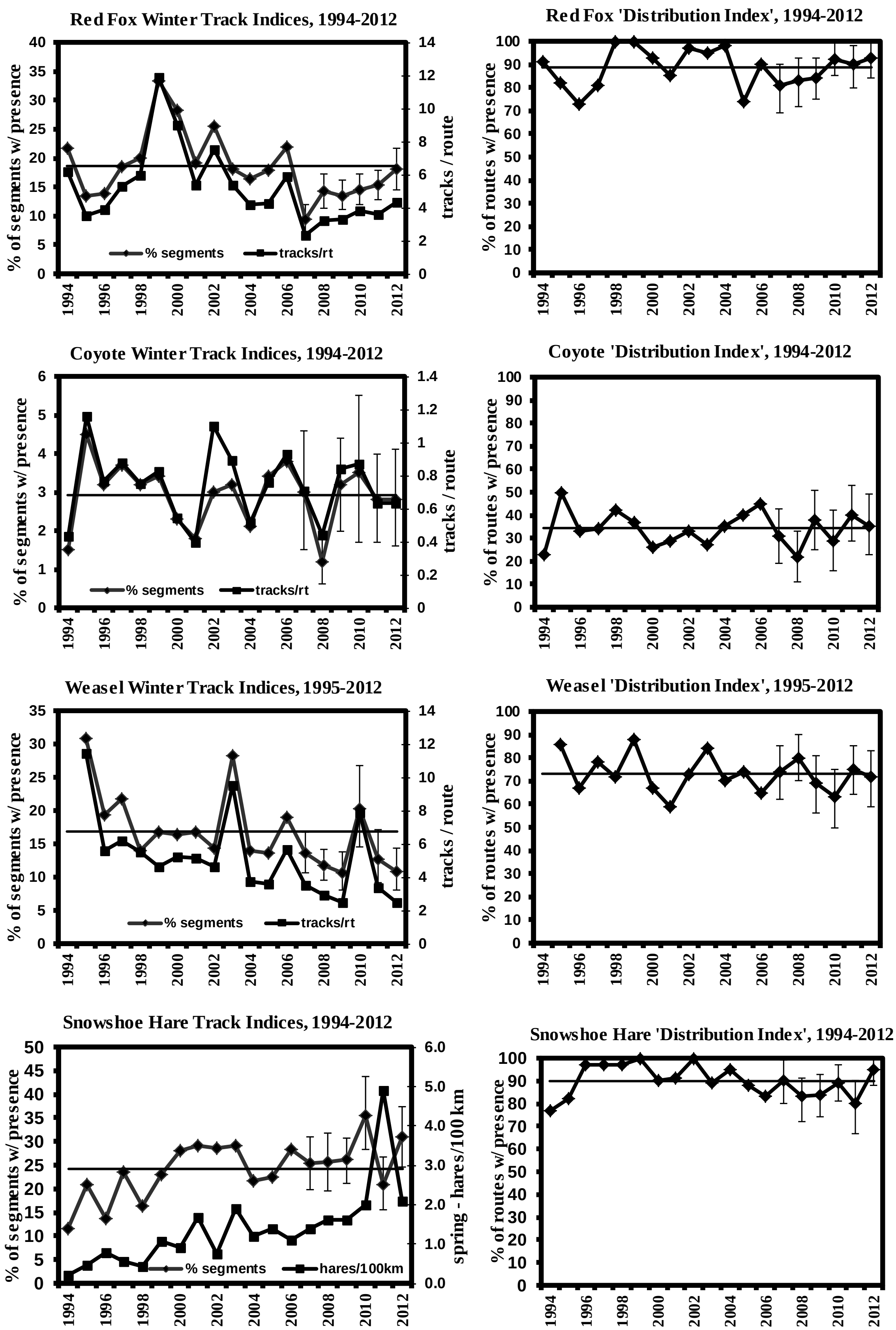

Figure 4 (continued).

FOREST WILDLIFE POPULATIONS

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2013 MINNESOTA SPRING GROUSE SURVEYS

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Each spring, the Minnesota DNR coordinates statewide ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) surveys with the help of wildlife managers, cooperating agencies, and organizations (e.g., tribal agencies, U.S. Forest Service, college wildlife clubs). In 2013, ruffed grouse surveys were conducted between 16 April and 29 May, which was later than usual, but it allowed the peak of drumming activity to be captured during the unusually late spring. Mean ruffed grouse drums per stop (dps) were 0.9 (95% confidence interval = 0.7–1.0) and declined 10% from the previous year. This was expected, given that the birds have been in a declining phase of the 10-year cycle since the last peak in 2009.

Sharp-tailed grouse surveys were conducted between 23 March and 15 May 2013, with 1,284 birds observed at 139 leks. The mean numbers of sharp-tailed grouse/lek were 4.8 (3.8-5.9) in the East Central (EC) survey region, 10.5 (9.3–11.7) in the Northwest (NW) region, and 9.2 (8.2–10.2) statewide. Comparisons between leks observed in consecutive years (2012 and 2013) were similar in the NW region and statewide, but in the EC region sharp-tailed grouse counts declined substantially.

INTRODUCTION

The ruffed grouse (*Bonasa umbellus*) is the most popular game bird in Minnesota, with an annual harvest averaging >500,000 birds (~150,000 -1.4 million birds). Ruffed grouse hunter numbers have been as high as 92,000 during the last decade, although hunter numbers did not peak with the recent peak in grouse numbers, as they have traditionally. Sharp-tailed grouse (*Tympanuchus phasianellus*) are also popular among hunters, with an annual harvest of 6,000-22,000 birds since the early-1990s and 5,000-10,000 hunters in Minnesota.

The Minnesota DNR coordinates grouse surveys each year to monitor changes in grouse populations through time. These surveys provide a reasonable index to population trends, when the primary source of variation in counts among years is change in densities. However, weather, habitat conditions, observer ability, and grouse behavior, also vary over time and can influence survey counts. Thus, making inferences from survey data over short time periods (e.g., a few years) can be tenuous. Nevertheless, over longer time periods and when large changes in index values occur, these surveys can provide a reasonable index to long-term grouse population trends. Spring surveys, in combination with hunter harvest statistics, provide evidence that the ruffed grouse population cycles at approximately 10-year intervals.

The first surveys of ruffed grouse in Minnesota occurred in the mid-1930s, and the first spring survey routes were established along roadsides in 1949. By the mid-1950s, ~50 routes were established with ~70 more routes added during the late-1970s and early-1980s. Since that time, spring drumming counts have been conducted annually to survey ruffed grouse in the forested regions of the state where ruffed grouse habitat occurs. Drumming is a low sound produced by males as they beat their wings rapidly and in increasing frequency to signal the location of their territory. These drumming displays also attract females that are ready to begin nesting, so the frequency of drumming increases in the spring during the breeding season. The sound produced when male grouse drum is easy to hear and thus drumming counts are a convenient way to survey ruffed grouse populations in the spring.

Sharp-tailed grouse were first surveyed in Minnesota between the early-1940s and 1960. The current survey is based on counts at dancing grounds during the spring and was first conducted in 1976. Male sharp-tailed grouse display, or dance, together in open areas to attract females in the spring. This display consists of the males stomping their feet with out-stretched wings. Females visit the dancing grounds to select males for breeding. These dancing grounds, or leks, are reasonably stable in location from year to year, allowing surveyors to visit and count individuals each spring. Surveys are conducted in openland portions of the state where sharp-tailed grouse persist, although they were formerly much more widely distributed in Minnesota at the early part of the 20th century.

METHODS

Ruffed Grouse

Surveys for ruffed grouse were conducted along 117 of 167 possible established routes throughout the state. Each route consisted of 10 listening stops at approximately 1.6-km (1-mile) intervals. The placement of routes on the landscape was determined from historical survey routes, which were originally placed near ruffed grouse habitat in low traffic areas. Annual sampling of these historical routes provides information about temporal changes along the routes, but may not be representative of the counties or regions where the routes occurred.

Survey observers were solicited from among state, federal, tribal, private, and student biologists. Each observer was provided a set of instructions and route location information. No formal survey training was conducted but all observers had a professional background in wildlife science, and most had previously participated in the survey. Participants were asked to conduct surveys at sunrise during peak drumming activity (in April or May) on days that had little wind and no precipitation. Each observer drove the survey route once and listened for drumming at each stop for 4 minutes. Observers recorded the number of drums heard at each stop (not necessarily the number of individual grouse), along with information about phenology and weather at the time of the survey.

The number of drums heard per stop (dps) was used as the survey index value. I determined the mean dps for each route, for each of 4 survey regions (Figure 1), and for the entire state. For each survey region, I calculated the mean of route-level means for all routes partially or entirely within the region. Routes that traversed regional boundaries were included in the means for both regions. Because the number of routes within regions was not related to any proportional characteristic, I used the weighted mean of index values for the 4 Ecological Classification Sections (ECS) in the Northeast region and the 7 ECS sections in the state. The geographic area of the section was used as the weight for each section mean (i.e., Lake Agassiz, Aspen Parklands = 11,761 km^2, Northern Minnesota and Ontario Peatlands = 21,468 km^2, Northern Superior Uplands = 24,160 km^2, Northern Minnesota Drift and Lake Plains = 33,955 km^2, Western Superior Uplands = 14,158 km^2, Minnesota and Northeast Iowa Morainal (MIM) = 20,886 km^2, and Paleozoic Plateau (PP) = 5,212 km^2). The area used to weight drum index means for the MIM and PP sections was reduced to reflect the portion of these areas within ruffed grouse range (~50%) using subsection boundaries. A 95% confidence interval (CI) was calculated to convey the uncertainty of each mean index value using 10,000 bootstrap samples of route-level means for survey regions and the whole state. Confidence interval boundaries were defined as the 2.5th and 97.5th percentiles of bootstrap frequency distributions.

Sharp-tailed Grouse

Wildlife Managers and volunteers surveyed known sharp-tailed grouse lek locations in their work areas in the Northwest (NW) and East Central (EC) portions of the state (Figure 2). The NW region consisted of Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley ECS sections. The EC region consisted of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior Uplands sections. Some leks may have been missed, but most managers believed that they included most of the leks in their work area. Given the uncertainty in the proportion of leks missed, especially those occurring outside traditional areas, the survey may not necessarily reflect sharp-tailed grouse numbers in larger areas such as counties or regions.

Each cooperator was provided with instructions and asked to conduct surveys on ≥1 day in an attempt to obtain a maximum count of male sharp-tailed grouse attendance at each lek. Observers were asked to conduct surveys within 2.5 hours of sunrise under clear skies and during low winds (<16 km/hr, or 10 mph) when lek attendance and ability to detect leks were expected to be greatest. Data recorded during each lek visit included the number of males, females, and birds of unknown sex.

The number of sharp-tailed grouse per dancing ground was used as the index value and was averaged for the NW region, the EC region, and statewide, using known males and birds of unknown sex. Observations of just 1 grouse were not included. Data from former survey years were available for comparison, however, survey effort and success varied among years rendering comparisons of the full survey among years invalid. Therefore, to make valid comparisons between 2 consecutive years, only counts of birds from dancing grounds that were surveyed during both years were considered. Confidence intervals (95%) were calculated using 10,000 bootstrap samples of lek counts for each region and statewide.

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 14 cooperating organizations including DNR Divisions of Fish & Wildlife and Parks & Trails; Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Grand Portage, 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 County Land Department; and UPM Blandin Paper Mill, participated in surveys. Cooperators surveyed routes between 16 April and 29 May 2013. Most routes (75%) were surveyed between 6 May and 16 May, with the median date (10 May) much later than in previous years (compare to April 25 last year, and May 1 and 3 in 2009 and 2011). Excellent (61%), Good (32%), and Fair (6%) survey conditions were reported for 111 routes reporting conditions, which has been consistent in recent years.

Statewide counts of ruffed grouse drums averaged 0.9 dps (95% confidence interval = 0.7–1.0 dps) during 2013 (Figure 3). Drum counts were 0.9 (0.8–1.1) dps in the Northeast (n = 97 routes), 0.7 (0.4–0.9) dps in the Northwest (n =8), 0.9 (0.3–1.6) dps in the Central Hardwoods (n = 13), and 0.4 (0.1–0.6) dps in the Southeast (n = 7) regions (Figure 4a-d).

Statewide drum counts declined 10% this year. This decline was expected based on the current position of the population within the 10-year cycle, with the most recent peak in drum counts during 2009. Thus, in the context of the long-term survey data, which is the appropriate context for interpretation of these results, the ruffed grouse population decline is part of a larger cycling pattern, with the expected low point in the cycle occurring within the next few years.

Sharp-tailed Grouse

A total of 1,284 male sharp-tailed grouse and grouse of unknown sex was counted at 139 leks (Table 1) during 23 Mar-15 May 2013. Fewer leks (9%) were observed in 2013 than during 2012, in part due to DNR Wildlife staff vacancies in northwestern Minnesota. Leks with ≥2 grouse were observed an average of 2.0 times.

The statewide index value of 9.2 (8.2–10.2) was centrally located among values observed since 1980 (Figure 5). In the EC survey region, 163 grouse were counted on 32 leks, and 1,121 grouse were counted on 107 leks in the NW region. The index value (i.e., grouse/lek) in the NW region was similar to 2012, but a decline was noted in the EC region (Table 1). Counts at leks observed during both years were the same statewide and in the NW region, but declined (50%) in the EC region (Table 2). This marks the third year of significant declines in the EC region, and counts are lower than they have been during the preceding 10 years. However, in the context of the 10-year grouse cycle, these values are comparable to lows obtained in 1986 (5.7) and 1995 (5.1). Sharp-tailed grouse population index values peaked with those for ruffed grouse in 2009, although sharp-tailed grouse peaks can follow those of ruffed grouse by as much as 2 years.

ACKNOWLEDGEMENTS

I would like to thank DNR staff, partners, and volunteer cooperators for help with grouse surveys. Laura Gilbert helped enter data. Gary Drotts, John Erb, and Rick Horton organized an effort to enter the ruffed grouse survey data for 1982–2004, and Doug Mailhot and another volunteer helped enter the data. I would also like to thank Mike Larson for his assistance in the transition coordinating the surveys this year, and for making helpful comments on this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

Table 1. Sharp-tailed grouse / lek (≥2 males) at all leks observed during spring surveys each year 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
2012	9.2	8.2–10.3	153	10.7	9.3–12.3	100	6.3	5.4–7.3	53
2013	9.2	8.2–10.2	139	10.5	9.3–11.7	107	4.8	3.8–5.9	32

[a] Survey regions; see Figure 1.
[b] 95% CI = 95% confidence interval
[c] *n* = number of leks in the sample.

Table 2. Difference in the number of sharp-tailed grouse / lek observed during spring surveys of the same lek in consecutive years 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
2011 - 2012	-2.0	-2.9– -1.1	170	-1.7	-2.9– -0.4	112	-2.4	-3.3– -1.6	58
2012 - 2013	-0.8	-2.0– 0.4	140	0.4	-1.3– 2.3	88	-2.9	-4.2– -1.8	52

[a] Survey regions; see Figure 1.
[b] Consecutive years for which comparable leks were compared.
[c] 95% CI = 95% confidence interval
[d] *n* = number of leks in the sample.

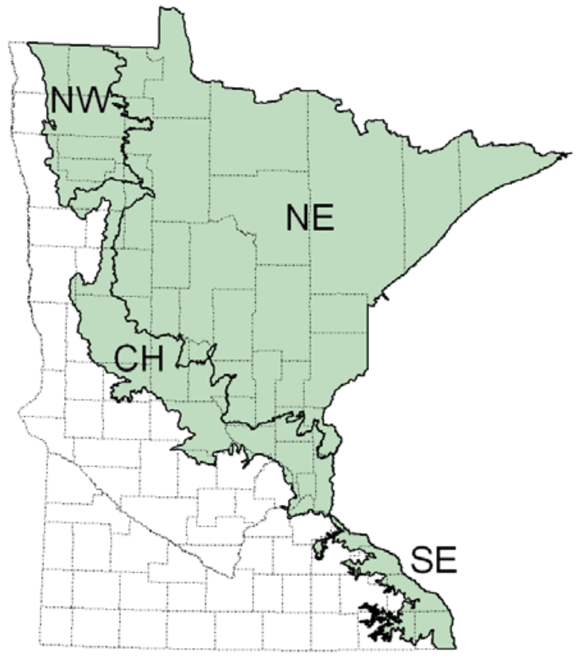


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

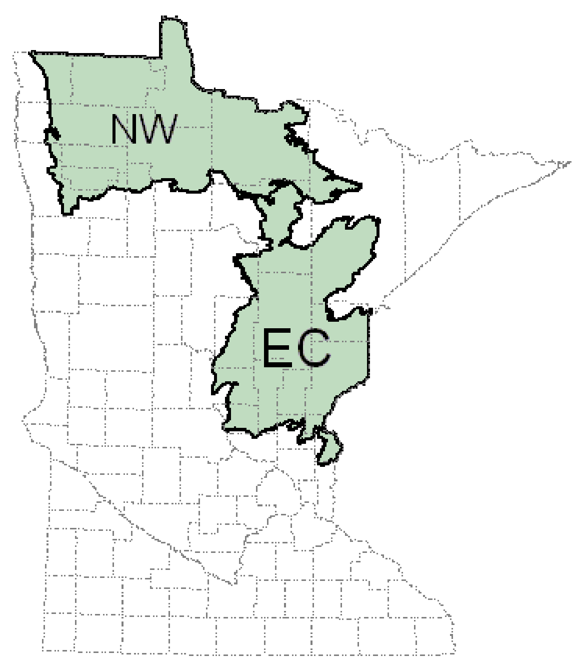


Figure 2. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

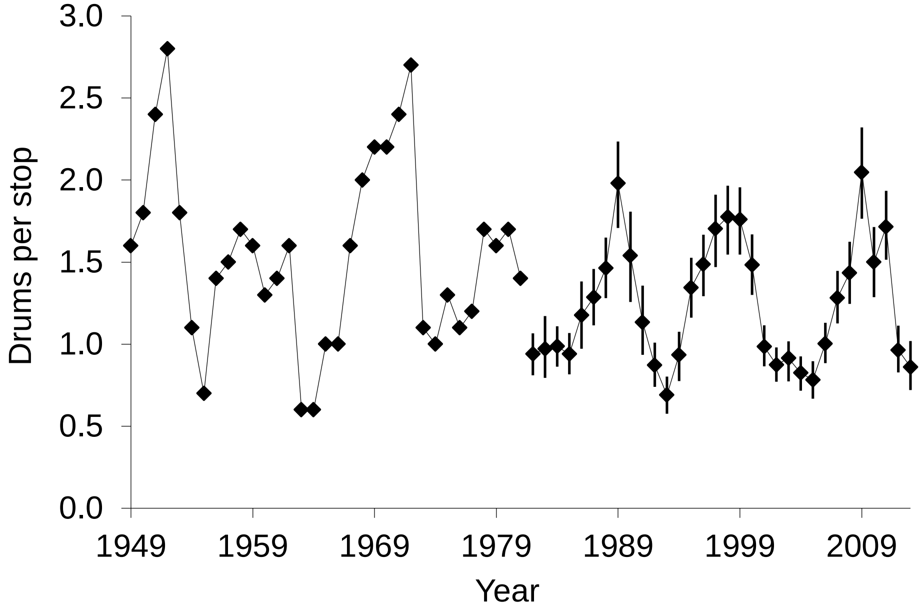
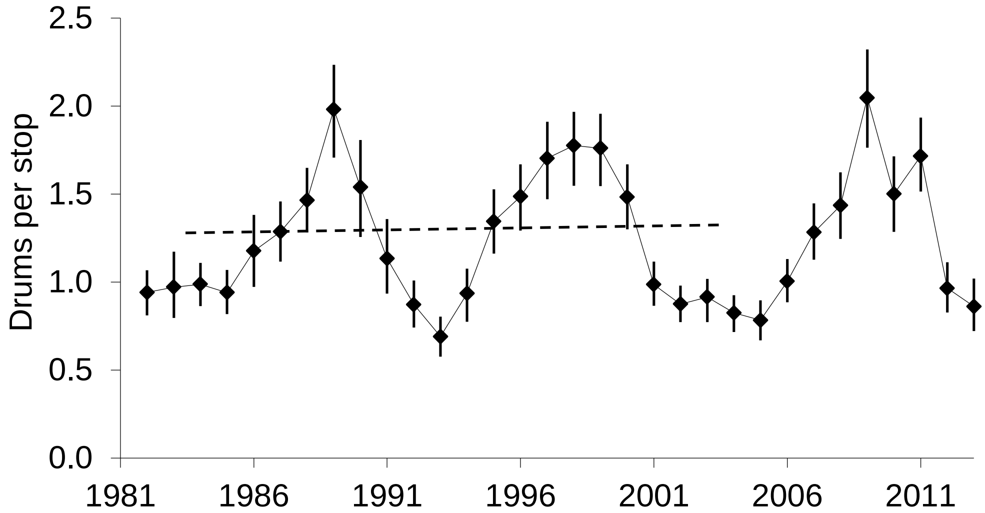


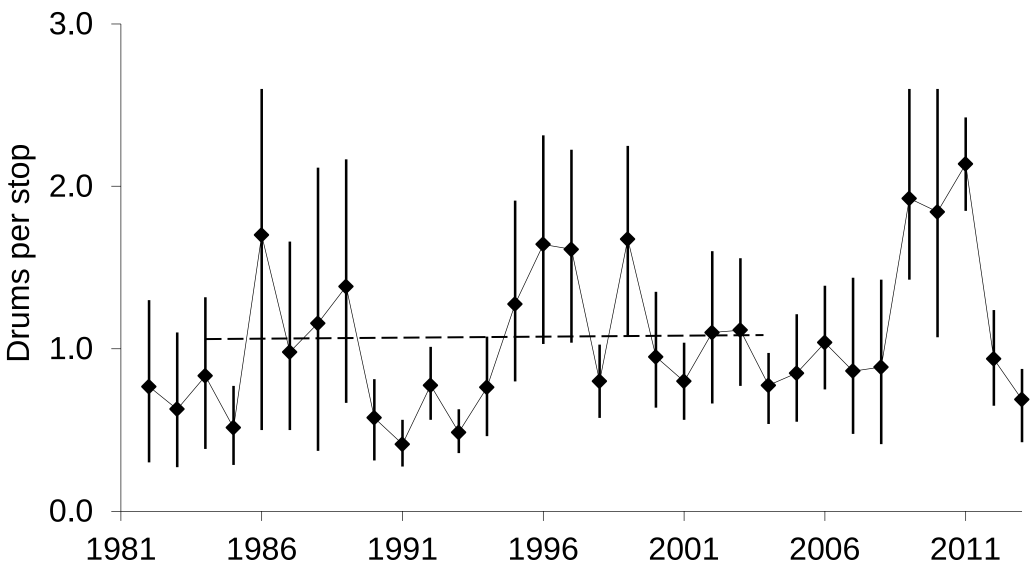
Figure 3. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not an artifact of the change in analysis methods.

a.



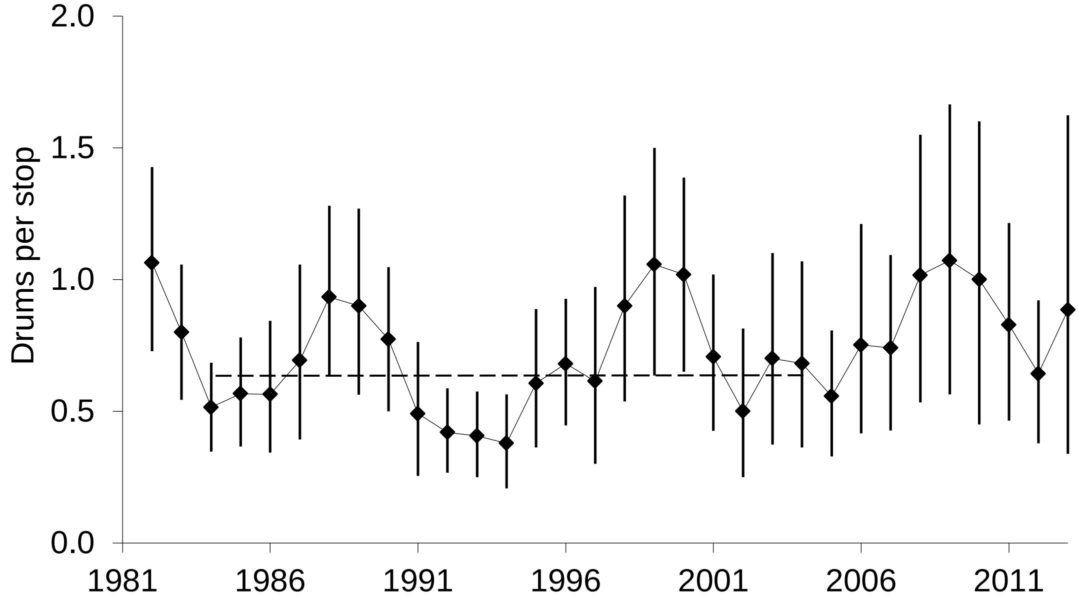
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1986
1991
1996
2001
2006
2011

b.



3.0
2.0
1.0
0.0
Drums per stop
1981
1986
1991
1996
2001
2006
2011

c.



d.

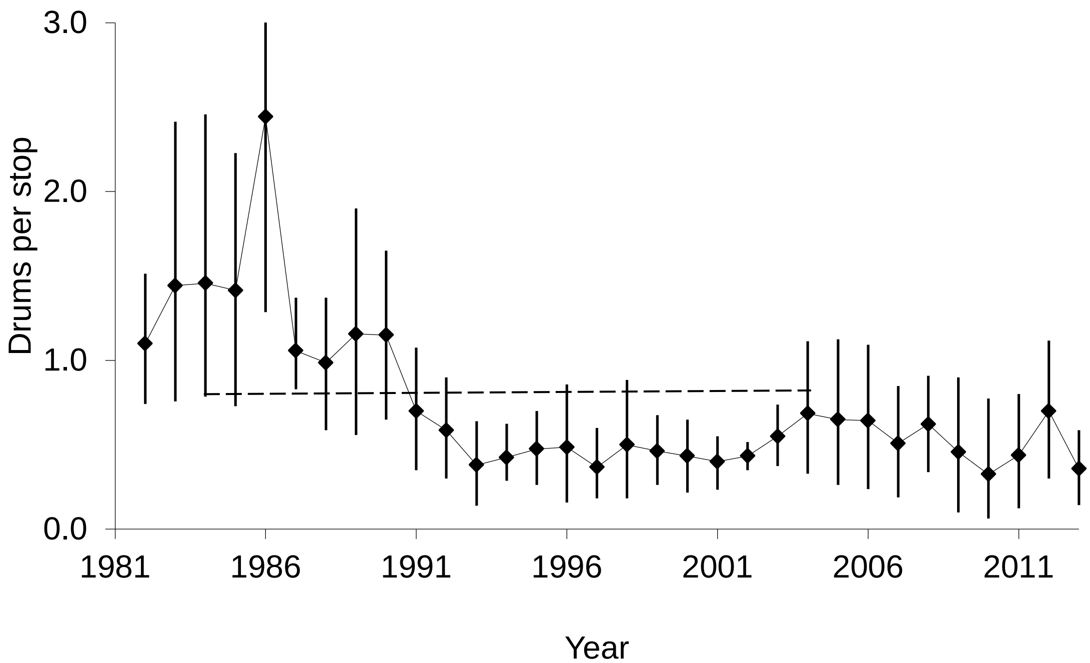


Figure 4a, b, c, d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2004 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In the bottom panel, the CI for 1986 extends beyond area depicted in the figure.

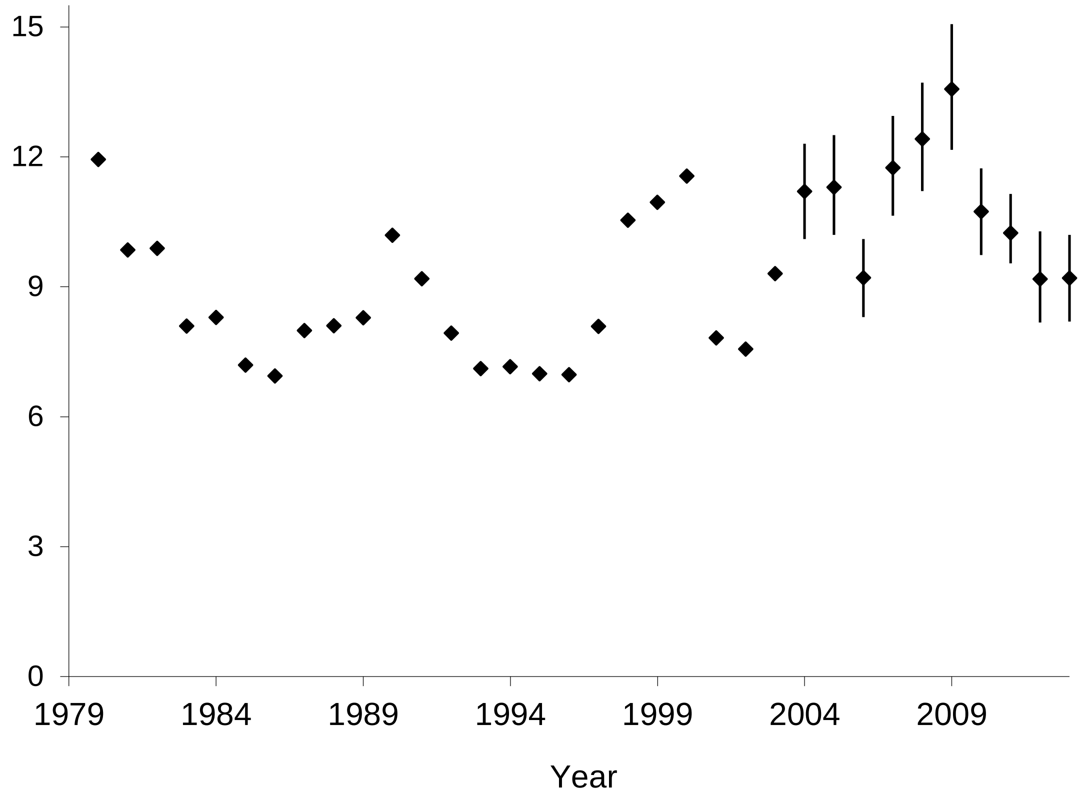


Figure 5. **Sharp-tailed grouse** counted in spring lek surveys statewide during 1980–2013. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year.

2013 MINNESOTA PRAIRIE-CHICKEN SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Greater prairie-chickens (*Tympanuchus cupido pinnatus*) were surveyed in 15 of 17 survey blocks during the spring of 2013. Observers located 188 booming grounds and counted 1,415 male prairie-chickens and 528 birds of unknown sex. Estimated densities of 0.10 (0.06-0.14) booming grounds/km^2 and 11.4 (9.9-13.0) males/booming ground within the survey blocks were similar to densities during recent years and during the 10 years preceding modern hunting seasons (i.e., 1993–2002).

INTRODUCTION

Historically, greater prairie-chicken (*Tympanuchus cupido pinnatus*) range in Minnesota was restricted to the southeastern portion of the state. However, dramatic changes in their range occurred in the 19th century as settlers expanded and modified the landscape with farming and forest removal, providing abundant food sources and access to new areas. However, as grass continued to be lost from the landscape, prairie-chicken populations began to decline, their range contracted, and hunting closed after 1942. In an attempt to bolster populations and expand prairie-chicken range, the Minnesota Department of Natural Resources (DNR) conducted a series of translocations in the Upper Minnesota River Valley during 1998-2006. Today, the beach ridges of glacial Lake Agassiz hold most of Minnesota's prairie-chickens, but their populations do extend southward (Figure 1). Hunting was re-opened using a limited-entry season in 2003, and approximately 120 prairie-chickens are now harvested annually.

With the opening of the new hunting season, the DNR had a greater interest in the monitoring of prairie-chicken populations, which the Minnesota Prairie-Chicken Society (MPCS) had been coordinating since 1974. The DNR, in collaboration with MPCS members, began coordinating prairie-chicken surveys and adopted a standardized survey design in 2004. These surveys are conducted at small open areas called leks, or booming grounds, where male prairie-chickens display for females in the spring and make a low-frequency booming vocalization that can be heard for miles.

Prairie-chickens continue to be surveyed to monitor changes in population densities over time. However, density estimates can be costly and difficult to obtain, so instead we count individuals and make the assumption that changes in density are the primary source of variation in counts among years. If true, counts should provide a reasonable index to long-term trends in prairie-chicken populations. However, counts are also influenced by weather, habitat conditions, observer ability, and bird behavior among other factors, which make it difficult to make inferences over short periods of time (e.g., a few annual surveys) or from small changes in index values. Nevertheless, over long time periods and when changes in index values are large, inferences from prairie-chicken surveys are more likely to be valid.

METHODS

Cooperating biologists and volunteers surveyed booming grounds in 15 of 17 designated survey blocks in western Minnesota (Figure 2) during late-March through mid-May. Each survey block was nonrandomly selected so that surveys would be conducted in areas where habitat was expected to be good (i.e., grassland was relatively abundant) and booming grounds were known to occur. Each surveyor attempted to find and observe each booming ground repeatedly in his assigned block, which was comprised of 4 sections of the Public Land Survey (approximately 4,144 ha). We obtained multiple counts at each booming ground in the morning because male attendance at leks varies throughout the season and throughout the day.

During each survey, observers obtained visual counts of males, females, and birds of unknown sex from a distance with binoculars. Sex was determined through behavior; males display conspicuously, and females do not. If no birds were displaying during the survey period, then sex was recorded as unknown. When a reliable count could not be obtained visually because vegetation or topography prevented it, birds were flushed for counts and sex was recorded as unknown. Most birds for which sex was unknown were likely male because female attendance at leks is sporadic, and they are less conspicuous during lek attendance than displaying males.

In the analysis, I used counts of males and unknowns at each booming ground but not females. Booming grounds were defined as having ≥2 males, so observations of single males were not counted as leks. Data were summarized by hunting permit area and spring survey block. The survey block data were separated into a core group and a periphery group for analysis. The core group had a threshold density of approximately 1.0 male/km^2 during 2010, and was located proximally to other such blocks (Figure 2). I compared densities of leks and prairie-chickens to estimated densities from previous years.

I also encouraged surveyors to submit observations of booming grounds outside the survey blocks because these observations may provide additional information that is helpful to prairie-chicken management. These data were included in estimates of minimum abundance of prairie-chickens. However, these data were not used in the analysis of lek and prairie-chicken densities because effort and methods may have differed from those used in the survey blocks.

RESULTS & DISCUSSION

Observers from DNR Division of Fish and Wildlife, the U.S. Fish & Wildlife Service, and The Nature Conservancy, as well as many unaffiliated volunteers counted prairie-chickens between 24 March and 16 May 2013. Observers located 188 booming grounds and observed 1,415 male prairie-chickens and 528 birds of unknown sex within and outside survey blocks during 2013 (Table 1). These counts represent a minimum number of prairie-chickens in Minnesota during 2013, but because survey effort outside of survey blocks is not standardized among years, these counts should not be compared among years or permit areas.

Within the standardized survey blocks, 794 males and birds of unknown sex were counted on 69 booming grounds during 2013 (Table 2). Each lek was observed an average of 2.0 times (median = 2), with 44% of booming grounds observed just once. Densities of prairie-chickens in the 10 core survey blocks were 0.13 (0.08–0.19) booming grounds/km^2 and 12.1 (10.4–13.9) males/booming ground (Table 2, Figure 2). In 5 of the 7 peripheral survey blocks, densities were 0.04 (0.02–0.07) booming grounds/km^2 and 8.5 (5.4–11.7) males/booming ground.

Table 1. Minimum abundance of prairie-chickens within and outside hunting permit areas in Minnesota during spring 2013. Lek and bird counts are not comparable among permit areas or years.

Permit Area	Area (km^2)	Leks	Males	Unk [a]
803A	1,411	17	139	0
804A	435	13	43	122
805A	267	50	206	264
806A	747	13	48	36
807A	440	23	174	54
808A	417	16	263	0
809A	744	16	196	0
810A	505	12	133	0
811A	706	11	59	22
812A	914	2	30	0
813A	925	9	57	30
PA subtotal	7,511	182	1,348	528
Outside PAs[b]	NA[c]	6	67	0
Grand total	NA[c]	188	1,415	528

[a] Unk. = prairie-chickens for which sex was unknown, but which were probably males.
[b] Counts done outside permit areas (PA).
[c] NA = not applicable because the area outside permit areas was not defined.

The density of 0.10 (0.06-0.14) booming grounds/km^2 in all survey blocks during 2013 was similar to densities during recent years (Table 2, Figure 3) and the average of 0.08 (0.06–0.09) booming grounds/km^2 during the 10 years preceding recent hunting seasons (i.e., 1993–2002). Similarly, the density of 11.4 (9.9-13.0) males/booming ground in all survey blocks during 2013 was comparable to densities during recent years and similar to the average of 11.5 (10.1–12.9) males/booming ground observed during 1993–2002 (Table 2, Figure 3). These counts should not be regarded as estimates of abundance because detection probabilities of leks and birds have not been estimated. However, if we assume that detection probabilities are similar among years, then this index can be used to monitor changes in abundance among years.

Table 2. Prairie-chicken counts within survey blocks in Minnesota.

			2013		Change from 2012[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	7	62	1	21
	Polk 2	42.0	14	148	6	38
	Norman 1	42.0	2	16	-1	-6
	Norman 2	42.2	7	70	1	14
	Norman 3	41.0	5	58	-4	-20
	Clay 1	46.0	6	97	0	24
	Clay 2	41.0	2	49	0	10
	Clay 3	42.0	6	86	-2	9
	Clay 4	39.0	2	27	-1	-5
	Wilkin 1	40.0	5	67	-1	-8
	Core subtotal	415.0	56	680	-1	77
Periphery	Mahnomen	41.7	2	16	NA[d]	NA[d]
	Becker 1	41.4	NA	NA	NA	NA
	Becker 2	41.7	2	34	-3	3
	Wilkin 2	41.7	2	15	0	-17
	Wilkin 3	42.0	4	29	1	-6
	Otter Tail 1	41.0	3	20	2	8
	Otter Tail 2	40.7	NA	NA	NA	NA
	Periphery subtotal	290.6	13[e]	114[e]	0[e]	-16
Grand total		705.5	69[e]	794[e]	-1[e]	61[e]

[a] The 2012 count was subtracted from the 2013 count, so positive values indicate increases.
[b] Survey blocks were categorized as within the core or periphery of the Minnesota prairie-chicken range based upon bird densities and geographic location.
[c] Includes birds recorded as being of unknown sex but excludes lone males.
[d] Surveys were not conducted in this block during 2012.
[e] These totals only reflect blocks for which count data were available.

ACKNOWLEDGMENTS

I would like to thank cooperators within the DNR, The Nature Conservancy, the US Fish and Wildlife Service, and numerous volunteers who conducted and helped coordinate the prairie-chicken survey. This survey was funded in part by the Wildlife Restoration (Pittman-Robertson) Program W-69-S-13 Project #16. Mike Larson provided assistance and comments which improved this report.

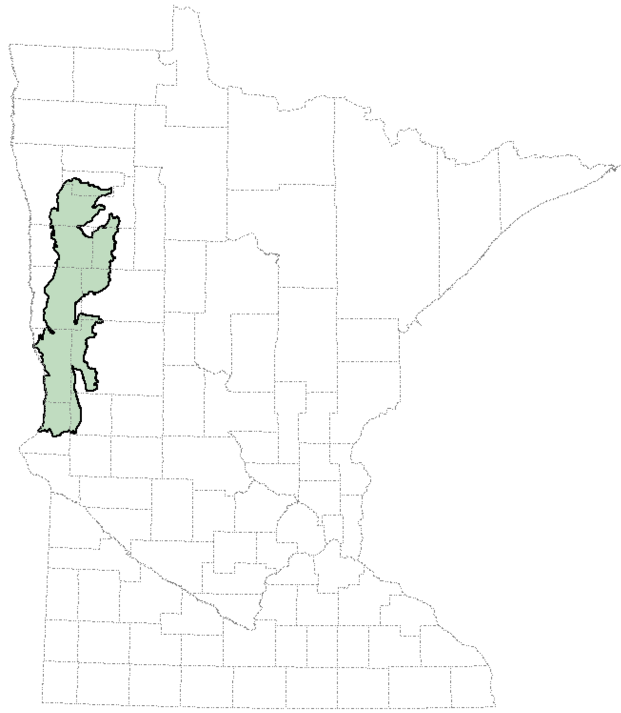


Figure 1. Primary greater prairie-chicken range in Minnesota (shaded area) relative to county boundaries. The range boundary was based on Ecological Classification System Land Type Associations and excludes some areas known to be occupied by prairie-chickens.

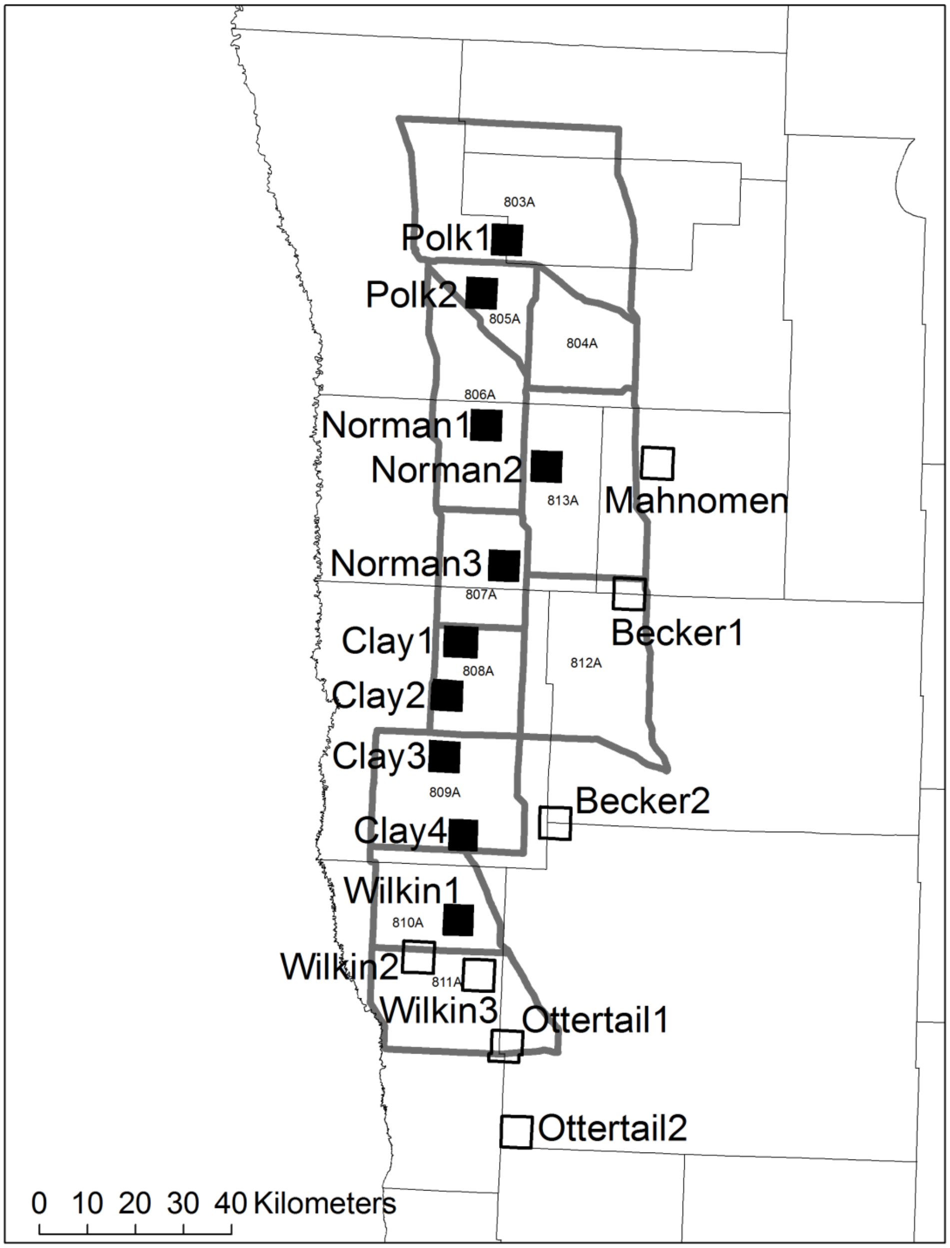


Figure 2. Prairie-chicken lek survey blocks (41 km^2, labeled squares) and hunting permit areas (thick grey lines) in western Minnesota. Survey blocks were either in the core (black) or periphery (white) of the range with a threshold of 1.0 male/km^2 in 2010, and were named after their respective counties (thin black lines). Permit areas were revised in 2013 to eliminate 801A and 802A, modify 803A, and add 812A and 813A. See previous reports for former permit area boundaries.

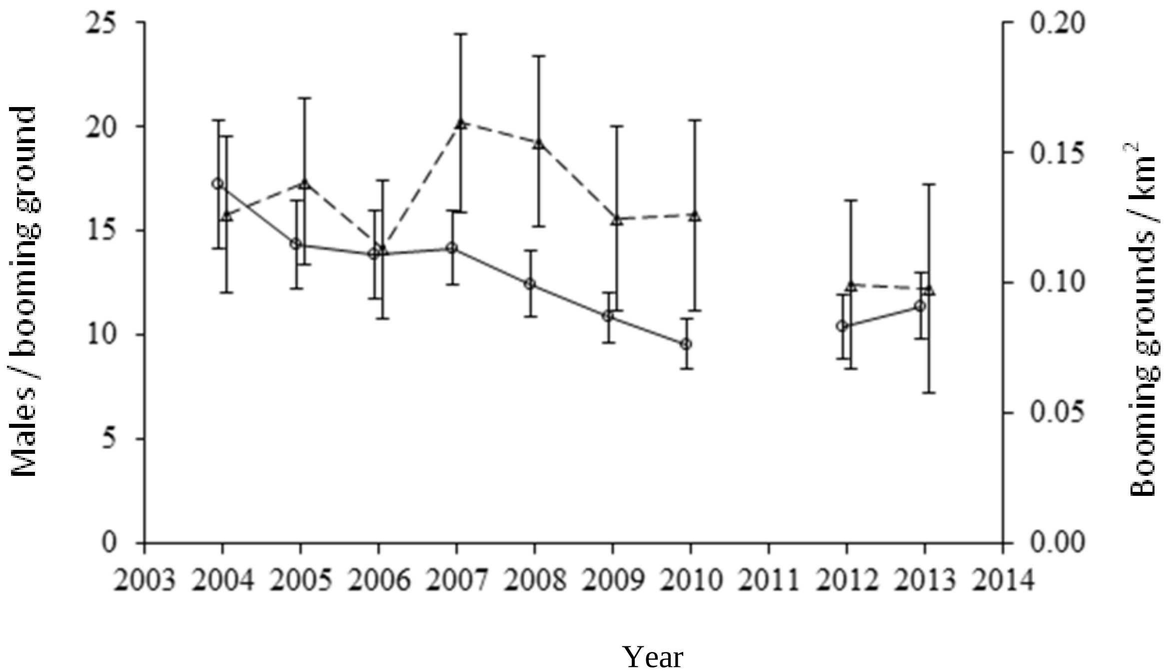


Figure 3. Mean prairie-chicken males/booming ground (circles connected by solid line) and booming grounds/km^2 (triangles connected by dashed line) in survey blocks in Minnesota with 95% confidence intervals. Counts for 6 of the survey blocks in 2011, including 4 blocks in the core, were not available for this report.

2013 AERIAL MOOSE SURVEY

Glenn D. DelGiudice, 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 fluctuations in the status of Minnesota's largest deer species. The primary objectives of this annual survey are to estimate moose numbers, calf:cow and bull:cow ratios. We use these data to determine and examine the population's trend and composition, to contribute to our understanding of moose ecology, and to set the harvest quota for the subsequent hunting season.

METHODS

We estimated moose numbers, age and sex ratios by flying transects within a stratified random sample of survey plots (Figure 1). Survey plots were last stratified as low, medium, and high moose density 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 or the presence of a vulval patch (Mitchell 1970), nose coloration, bell size and shape, 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.

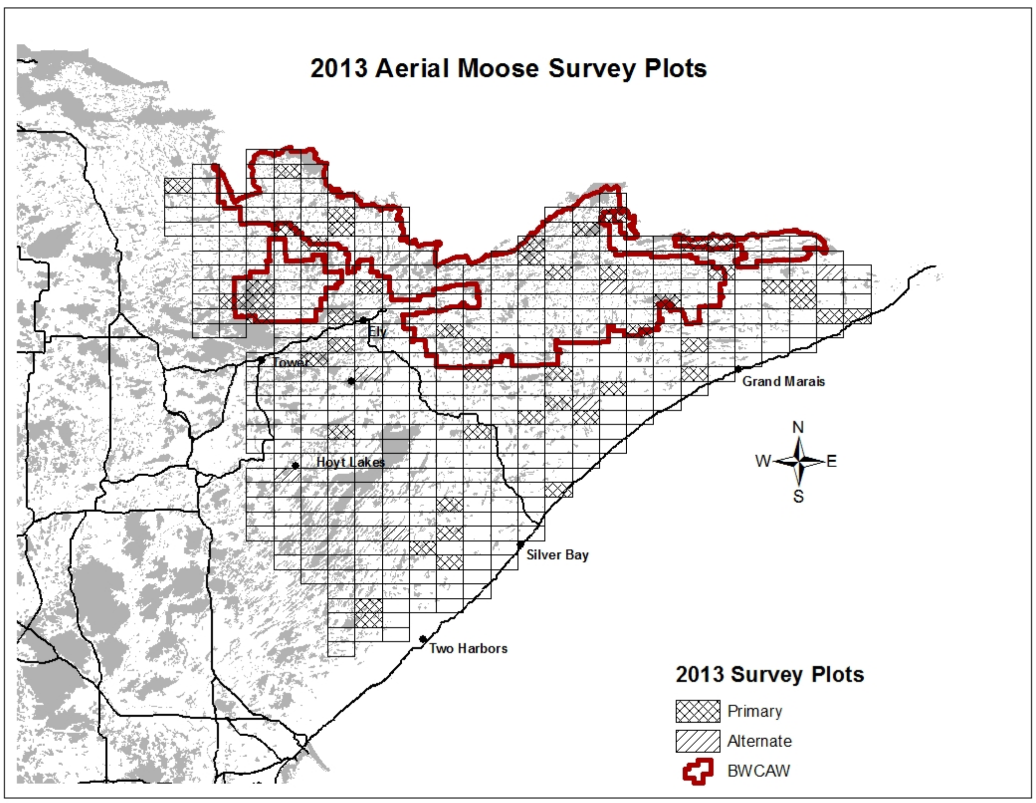


Figure 1. Northeast moose survey area and sample plots (cross hatching) flown in the 2013 aerial moose survey. The red line delineates the boundary of the Boundary Waters Canoe Area Wilderness.

In previous years, we used 3 strata based on expected moose density (low, medium, and high) in an effort to optimize precision of our survey estimates. In 2012, we added a 4th stratum to represent a series of 9 plots that have undergone disturbance by wild fire, prescribed burning, and timber harvest. Each year, these same 9 plots will be surveyed in an effort to evaluate the effect of disturbance on moose density over time.

We accounted for visibility bias by using a sightability model (Giudice et al. 2012). We developed this model between 2004 and 2007 using moose that were radiocollared as part of research on the dynamics of the northeastern moose population. Logistic regression indicated that the covariate "visual obstruction" (VO) was the most important covariate in determining whether radiocollared moose were observed. We defined VO as the proportion of vegetation within a circle (10-m 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, VO 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.

Recent research indicated that variance calculations used in earlier analyses underestimated the total variance of survey estimates (Fieberg 2012). We reanalyzed survey data from 2004 to 2011 using the package Sightability Model in Program R (R Development Core Team 2011, Fieberg 2012) to recalculate confidence intervals. Based on this approach, confidence intervals are asymmetrical around the estimates. Minor corrections to our sightability model also modified population estimates slightly (0-4%) from those previously reported.

RESULTS AND DISCUSSION

We initiated the survey on 3 January and completed it on 15 January 2013. It consisted of 9 actual survey days. Sixty-seven percent of plots were surveyed under snow conditions classified as "good," 33% as marginal, and 0% as "poor," not dissimilar from the past 2 years' surveys. During the survey flights, observers detected 251 moose for 49 plots (653 mi^2) flown, including 109 bulls, 99 cows, 34 calves, and 9 unidentified moose. Estimates of the calf:cow and bull:cow ratios adjusted for sampling-only were 0.33 and 1.23, respectively (Table 1). In 2012, the first year 49 plots (versus 40 in the previous 5 years) were surveyed, 344 moose were observed, including 144 bulls, 140 cows, 55 calves, and 5 unidentified.

After adjusting for sampling and sightability, we estimated the population in northeastern Minnesota at 2,760 (2,120 – 3,580) moose (Table 1). Based on the log rate of change (-0.427, -0.762, -0.093 [90% confidence limits]), the 2013 population estimate was significantly lower (35%) than the 2012 estimate. Gasaway and Dubois (1987) indicated that even with relatively precise survey estimates, a change of at least 20% may be required to detect a significant change in population size. However, time series analysis of estimates since 2005 indicates a significant downward trend (Figure 2, $P = 0.0005$). This corroborates several data sets which suggest the northeastern Minnesota moose population is declining. Lenarz et al. (2010) had 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. The 2013 estimate indicates a significant (52%) decline in the population since 2010, not inconsistent with that finding (Table 1).

Table 1. Estimated moose numbers, 90% confidence interval, and calves:cow, percent calves, percent cows with twins, and bulls:cow observed from aerial surveys in northeastern Minnesota, 2005-2013.

Survey	Estimate	90% Confidence Interval	Calves: Cow	% Calves	% Cows w/ twins	Bulls: Cow
2005	8,160	5,960 – 11,170	0.52	19	9	1.04
2006	8,840	6,670 – 11,710	0.34	13	5	1.09
2007	6,860	5,230 – 9,000	0.29	13	3	0.89
2008	7,890	5,970 – 10,420	0.36	17	2	0.77
2009	7,840	6,190 – 9,910	0.32	14	2	0.94
2010	5,700	4,480 – 7,250	0.28	13	3	0.83
2011	4,900	3,810 – 6,290	0.24	13	1	0.64
2012	4,230	3,190 – 5,600	0.36	15	6	1.08
2013	2,760	2,120 – 3,580	0.33	14	3	1.23

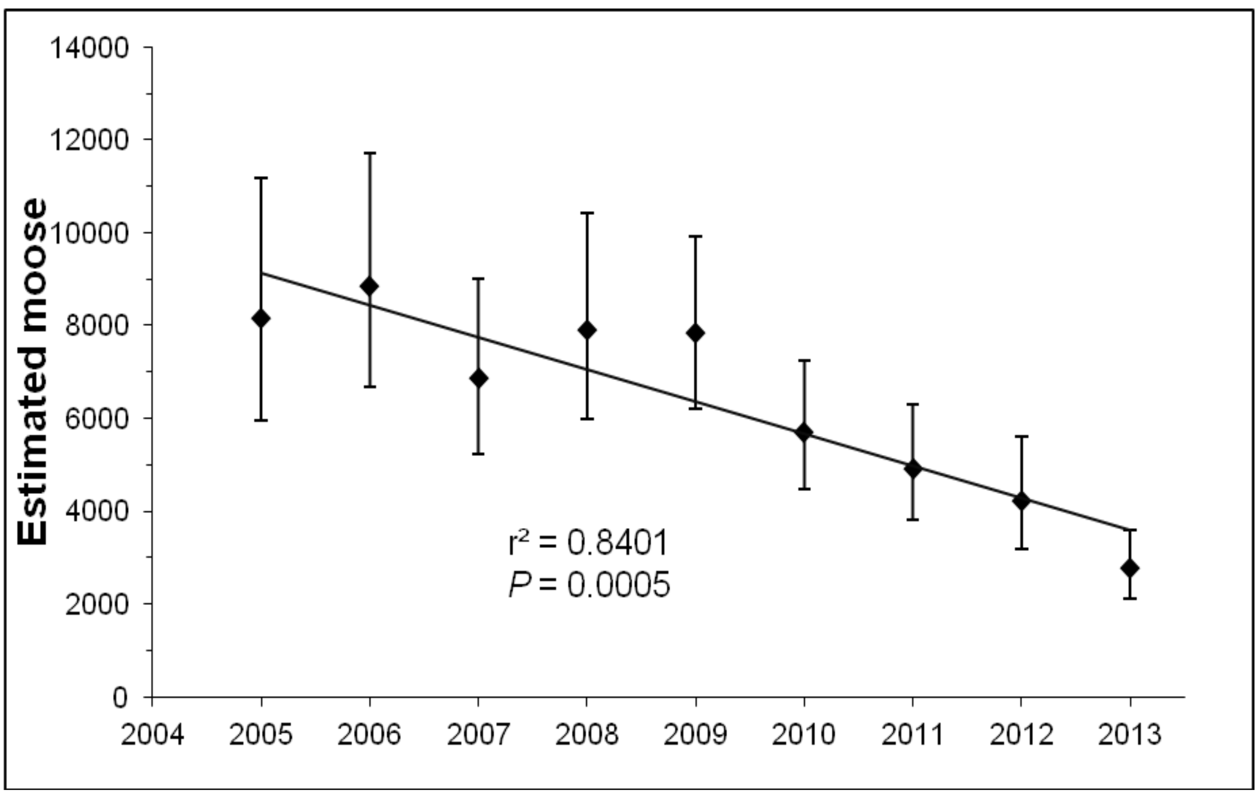


Figure 2. Point estimates, 90% confidence intervals, and trend line of estimated moose numbers in northeastern Minnesota, 2005-2013. (Note: The 2005 survey was the first to be flown with helicopters, and to include a sightability model and a uniform grid of east-west oriented rectangular 5 x 2.67 mi^2 plots).

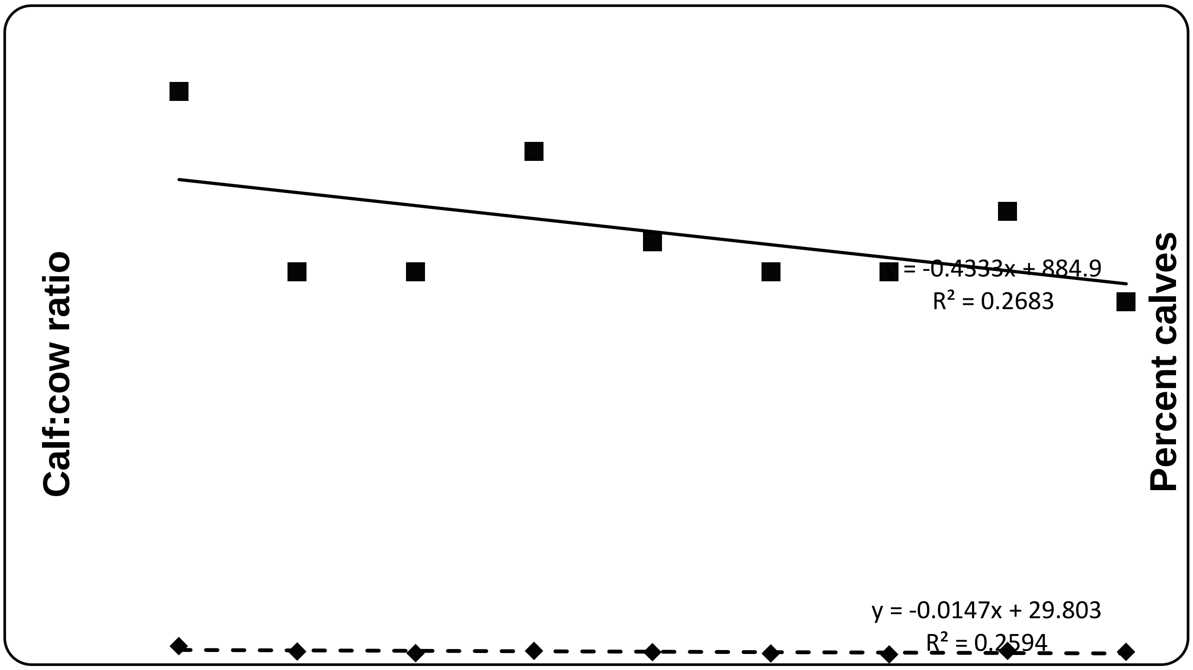


Figure 3. Estimated calf:cow ratios (solid diamonds, dashed trend line) and percent calves (solid squares, solid trend line) from aerial moose surveys in northeastern Minnesota, 2005-2013.

Estimated calf recruitment from this year's survey remained *relatively* high and similar to last year's estimate (Table 1). The calf:cow ratio in mid-January 2013 was 0.33 and calves represented 14% of the total moose observed (Table 1). Only 3% of the cow moose were accompanied by twins (Table 1), down from 6% in 2012. In 2012, the close agreement between calf:cow ratio and % calves (r = 0.94, $P < 0.001$) indicated that classification of adult moose to sex is accurate. Despite the apparent stability of calf survival through to the January 2013 survey compared to the 2012 survey, it is important to note that annual adult survival is more important to the population growth rate than calf survival (Lenarz et al. 2010). Further, *annual* recruitment of the calves is not actually determined until the next spring calving season when winter survey-observed calves become yearlings. At this point little is known about the survival rates of moose calves during the period between the annual winter survey and subsequent spring calving.

The estimated bull:cow ratio (Table 1; Figure 4) increased considerably since 2011 and is the highest it's ever been since 2005. Further, this year's estimated bull:cow ratio indicates that adult bulls may somewhat outnumber adult females, although there is a great deal of variability associated with these annual ratio estimates. Consequently, there is no clear upward or downward long-term trend (2005-2013) in bull:cow ratios. Despite the higher bull:cow ratios during this year's survey, the number of bulls observed over 49 survey plots surveyed decreased 24% from last year's (2012) 49 plots flown, and was less (31%) than the average annual number of bulls observed (158) from 2007 to 2011.

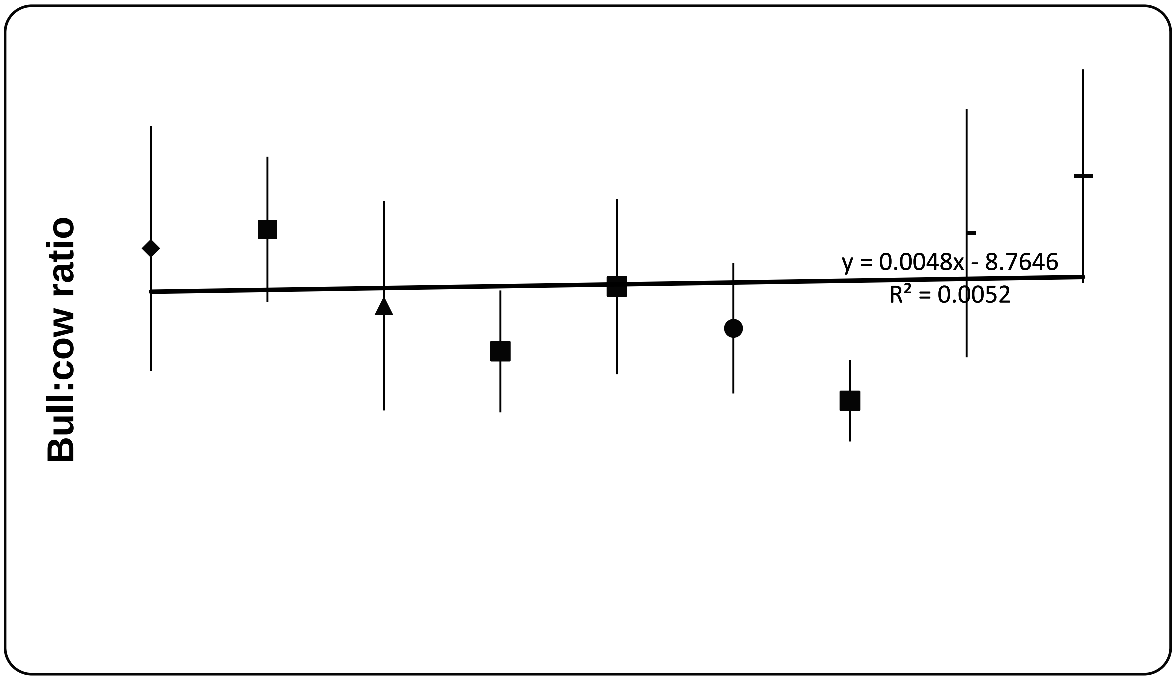


Figure 4. Estimated bull:cow ratios, 90% confidence intervals, and trend line from aerial moose surveys in northeastern Minnesota, 2005-2013.

ACKNOWLEDGMENTS

These surveys would not be possible without the excellent partnership between the Division of Enforcement, the Division of Fish and Wildlife, the Fond du Lac Band of Lake Superior Chippewa and the 1854 Treaty Authority. In particular, I would like to thank Thomas Pfingsten, Chief Pilot, for coordinating all of the aircraft and pilots; Tom Rusch for coordinating flights and survey crews; and Mike Schrage (Fond du Lac Band of Lake Superior Chippewa) and Andy Edwards (1854 Treaty Authority) for securing supplemental survey funding from their respective groups. Enforcement pilots, Brad Maas, John Heineman, Thomas Pfingsten, and Luke Ettl skillfully piloted the aircraft during the surveys, and Tom Rusch, Andy Edwards, Mike Schrage, and Nancy Gellerman flew as observers; their efforts are gratefully appreciated. I also want to thank John Giudice who continues to provide critical statistical consultation and analyses. I also want to acknowledge Barry Sampson for creating the process to generate the GIS survey maps and GPS coordinates for the transect lines, and Bob Wright, Brian Haroldson and Chris Pouliot for the creation of the program DNRSurvey. Bob also modifies the software as needed and provides refresher training for survey observers using DNRSurvey each year.

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WETLAND WILDLIFE POPULATIONS

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2013 WATERFOWL BREEDING POPULATION SURVEY MINNESOTA

Steve Cordts, Minnesota DNR, Waterfowl Staff Specialist

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 2013 aerial survey portion was flown from May 12 to May 27. Both the start and end dates were about 10 days later than normal due to the extremely late spring and late ice out. Spring ice-out dates were 10-20 days later than average across the state and ~6 weeks later than 2012. Temperatures were well below normal in April with above average snowfall. Temperatures in May were also below normal with above average precipitation, most of which was rain in mid to late May. Spring wetland conditions were very dry early spring but improved in mid to late May with significant rainfall events. Overall, wetland numbers (Types II-V) increased 13% compared to 2012 and were near both the 10-year (-3%) and long-term (+2%) averages.

The 2013 estimated mallard breeding population was 293,000, which was 30% higher than last year's estimate of 225,000 mallards, but statistically unchanged (P=0.36). Mallard numbers were 14% above the 10-year average and 30% above the long-term average of 226,000 breeding mallards. The 2013 estimated blue-winged teal population was 144,000, which was 33% higher than last year's estimate of 109,000 blue-winged teal, but statistically unchanged (P=0.53). Blue-winged teal numbers remained 19% below the 10-year average and 33% below the long-term average of 216,000 blue-winged teal. The combined population index of other ducks, excluding scaup, was 246,000 ducks, which was 82% higher than last year's estimate and 25% above the 10-year average and 39% above the long-term average of 177,000 other ducks. Population estimates of wood duck (72,000), ring-necked duck (60,000), northern shoveler (27,000), and gadwall (24,000) accounted for most (75%) of the total population of other ducks.

The estimate of total duck abundance (683,000), which excludes scaup, was 46% higher than last year's estimate of 469,000 ducks and was 8% above the 10-year average and 10% above the long-term average of 620,000 ducks. The estimated number of Canada geese was 209,000 and 32% higher than last year and 18% above the 10-year average. Very few goose broods were observed this year during the survey due to the late spring and late and likely reduced nesting effort by Canada geese this year.

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.

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 (N805NR). Wetlands were counted on only the observer's side of the plane (0.125 mile wide transect); a correction factor obtained in 1989 (123,000/203,000 = 0.606) was used to adjust previous estimates (1968-88) of wetland abundance (Type II-V) that were obtained when the observer counted wetlands on both sides of the plane (0.25 mile wide transect). All wetland and waterfowl data were recorded on digital voice recorders by the pilot and observer and transcribed by the observer from the digital files. On some transects with low waterfowl abundance, the observer recorded all observations so transcription would be easier.

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 2012 and 2013 were compared using two-tailed Z-tests.

SURVEY CHRONOLOGY:

The 2013 aerial survey began on 12 May in southern Minnesota and concluded in northern Minnesota on 27 May. The start date was 2 weeks later than last year and delayed due to the late spring. Transects were flown on 10 days, May 12-13, May 15-17, and May 23-27. Flights began no earlier than 7 AM and were completed by 12:30 PM each day. The median date for survey completion was May 23, which was 10 days later than last year and one of the latest surveys on record.

WEATHER AND HABITAT CONDITIONS:

For the majority of Minnesota lakes, ice out was the latest or almost latest on record. Temperatures in March averaged 7°F below normal and precipitation was 0.3 inches above normal statewide. Temperatures in April averaged 9°F below normal, was the 5th coldest April on record statewide. April precipitation was 1.05 inches above normal statewide and ranged from 0.1 inches below normal in west central Minnesota to 2.6 inches above

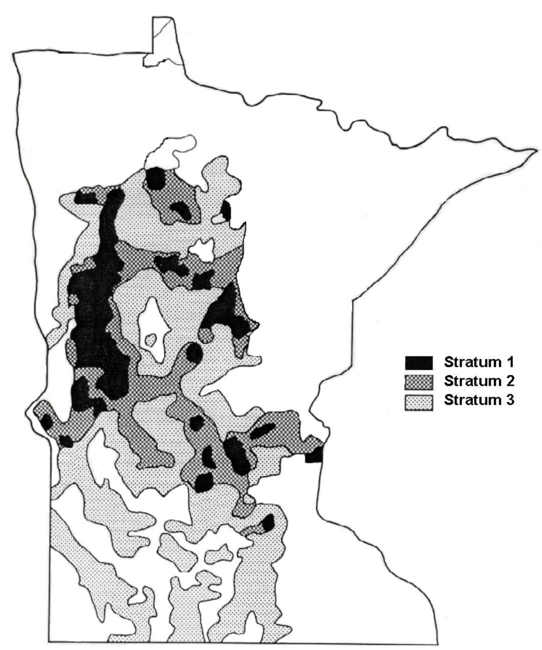

Figure 1. Location of waterfowl breeding population survey strata in Minnesota.

normal in south east Minnesota. May temperatures averaged 1.9°F below normal statewide. May precipitation was 1.5 inches above normal statewide and ranged from 0.3 inches above normal in northwest Minnesota to 4.9 inches above normal in south east Minnesota (http://climate.umn.edu). Additional temperature and precipitation data are provided in Appendix A.

Wetland conditions in the state were extremely dry in early April but improved dramatically by the end of May. In early May, 40% of the state was abnormally dry, 45% moderate to severe drought and 15% of the state was under no drought designation. By late May, 20% of the state was abnormally dry, 20% moderate to severe drought, and 60% of the state was under no drought designation. In late April 2013, statewide topsoil moisture indices were rated as 17% very short or short, 64% adequate and 19% surplus moisture. By late May, topsoil moisture indices were rated as 4% very short or short and 70% adequate and 26% surplus moisture. (http://droughtmonitor.unl.edu).

Planting dates for row crops were extremely late in 2013. By May 14, only 18% of the corn acres had been planted statewide compared to 86% in 2012 and 68% for the previous 5-year average. By June 2, only 2% of alfalfa hay had been cut compared to 58% in 2012 and a 5-year average of 32% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, (http://www.nass.usda.gov/mn/).

Due to the late spring, leaf-out dates and wetland vegetation growth was 3-4 weeks later than average and visibility was excellent during the survey.

Wetland numbers (Type II-V) increased 13% from 2012 and were 3% below the 10-year average and 2% above the long-term average (Table 2; Figure 2). The number of temporary (Type 1) sheet water wetlands was 85% below the long-term average. In general, wetland conditions improved dramatically in mid to late May, particularly in the east and southeastern portions of the survey region.

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. Table 7 and Table 8 provide the unadjusted population index (Unad. PI), which is multiplied by the visibility correction factor (VCF) to obtain the population index (PI) for ducks and Canada geese. The standard error (SE) of the estimate is also provided for mallard and blue-winged teal estimates.

The 2013 breeding population estimate of mallards was 293,239 (SE = 58,463), which was 30% above the 2012 estimate of 224,965 mallards, but statistically unchanged (Z = 0.93, P = 0.36) (Table 7, Figure 3). Mallard numbers were 14% above the 10-year average and 30% above the long-term average of 226,000 mallards. In 2013, the mallard population was comprised of 58% lone males, 32% pairs, and 10% flocked mallards. The 5-year average is 75% lone males, 18% pairs, and 7% flocked mallards. The higher number of pairs this year and lower number of lone males this year likely reflects a later nesting effort due to the extremely late spring.

The estimated blue-winged teal population was 143,927 (SE = 46,635), which was 33% above the 2012 estimate of 108,607 blue-winged teal, but statistically unchanged (Z = 0.63, P = 0.53). Blue-winged teal numbers were 19% below the 10-year average and 33% below the long-term average (Table 7, Figure 4). The blue-winged teal population was comprised of 16% lone males, 37% pairs, and 48% flocks. The 5-year average is 17% lone males, 50% pairs, and 33% flocks. The lower number of pairs this and higher number of flocks likely reflects a later nesting effort due to the extremely late spring.

The combined population estimate of other ducks (excluding scaup) was 245,729 which was 82% above last year's estimate of 135,000 other ducks and 25% above the 10-year average and 39% above the long-term average (Table 7, Figure 5). Population estimates of wood duck (72,000), ring-necked duck (60,000), northern shoveler (27,000), and gadwall (24,000) accounted for most (75%) of the total population of other ducks. Scaup numbers (43,000) were 41% above the 10-year average and 32% below the long-term average.

The total duck population index, excluding scaup, was 683,000 ducks and was 46% higher than last year's index of 469,000 ducks and 8% above the 10-year average and 10% above the long-term average (Table 8, Figure 6).

The population index for total ducks was 726,000 ducks, which was 9% above the 10-year average and 6% above the long-term average.

Visibility Correction Factors (VCFs) for mallards, blue-winged teal, and other ducks were all higher in 2013 than 2012 and above the long-term average (Table 7). The mallard VCF (2.64) was 2% below the 10-year average and 19% above the long-term average. The blue-winged teal VCF (5.29) was 40% above the 10-year average and 37% above the long-term average. The VCF for other ducks (3.57) was 25% above the 10-year average and 39% above the long-term average.

Canada goose numbers (uncorrected for visibility) increased 8% compared to 2012 and remained 105% above the long-term average (Table 8). The VCF for Canada geese was 2.22 and 2% below the 10-year average of 2.26. The population estimate of Canada geese (adjusted for visibility) was 209,000, which was 18% above the 10-year average of 177,000 geese (Table 8, Figure 7). Only 5 Canada goose broods were observed, compared to 70 in 2012, even though the survey start date was 2+ weeks later than last year, which reflects how late the spring was this year.

The estimated coot population, uncorrected for visibility, was 40,500 compared to 26,000 in 2012.

The estimated number of swans (likely trumpeters) was 11,500 swans and considerably higher than last year's estimate of 6,600. This estimate is expanded for area but not visibility and lone swans are not doubled. Trumpeter swans continue to expand their range and dramatically increase in number.

SUMMARY:

Wetland conditions were dry throughout most of the state in early spring but improved in mid to late May with rainfall events. Overall, wetland numbers were 13% higher than last year and near both the 10-year (-3%) and long-term (+2%) averages. Mallard abundance in 2013 was 293,000 mallards, which was 30% higher than last year and 14% above the 10-year average and 30% above the long-term average of 226,000 mallards. Blue-winged teal abundance (144,000) was 33% higher than 2012 but 33% below the long-term average of 216,000 blue-winged teal. The combined population index of other ducks (246,000) was 82% higher than 2012 and 39% above the long-term average of 177,000 other ducks. Total duck abundance (683,000), excluding scaup, was 46% higher than 2012 (469,000) and was 10% above the long-term average. Canada goose numbers, adjusted for visibility bias, increased 32% from 2012.

ACKNOWLEDGMENTS: Thanks to the ground crews and the pilot for all of their efforts.

<u>DATA SUPPLIED BY:</u> Minnesota Department of Natural Resources (MNDNR) and U.S. Fish and Wildlife Service (USFWS)

<u>Air Crew:</u> Pilot/Observer: Tom Buker, Conservation Officer Pilot, MNDNR, Division of Enforcement; Observer: Steve Cordts, Waterfowl Staff Specialist, MNDNR, Division of Wildlife

<u>Ground Crew Leaders</u>: Sean Kelly, Deputy Chief, Migratory Birds, USFWS, Region III, Twin Cities; Wayne Brininger, USFWS, Tamarac National Wildlife Refuge; Dan Hertel and Fred Oslund , USFWS, HAPET, Fergus Falls; Paul Richert, Tom Cooper, and Jim Kelley, USFWS, Region III, Twin Cities; Kim Bousquet, USFWS, Big Stone National Wildlife Refuge; Greg Dehmer and Sally Zodrow, USFWS, Sherburne National Wildlife Refuge

Ground Crew Assistants: Brad Nylin, Minnesota Waterfowl Association; K. Fritz and J. Berens, USFWS, Big Stone National Wildlife Refuge; Lowell Deede, Gina Kemper, and C. Okeson , USFWS, Tamarac National Wildlife Refuge, Paul Soler and Tony Hewitt, USFWS, Sherburne National Wildlife Refuge, M. Oehler and Tyler Zimmerman, USFWS, HAPET, Fergus Falls; A. Forbes, USFWS, Region III, Twin Cities

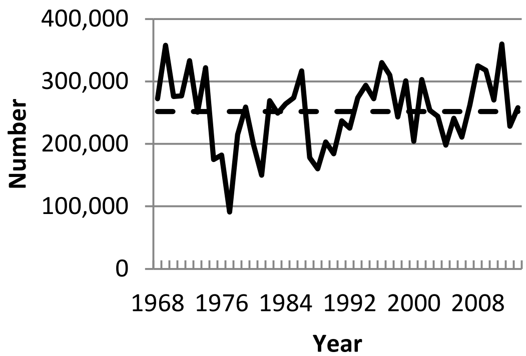

Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2013.

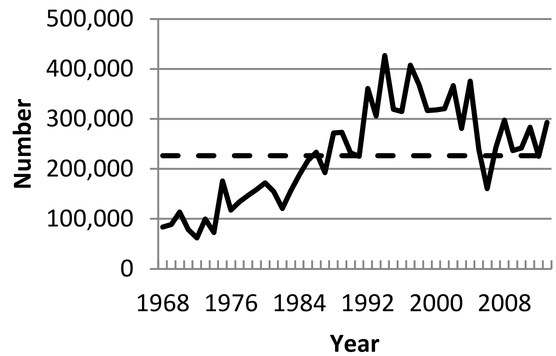

Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2013.

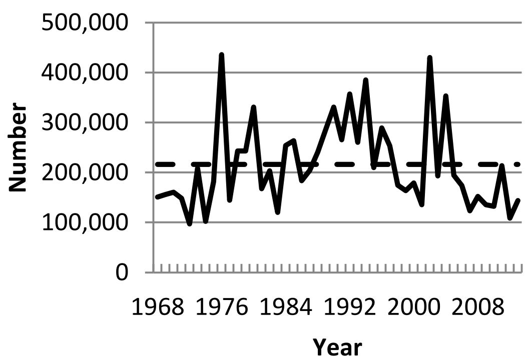

Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2013.

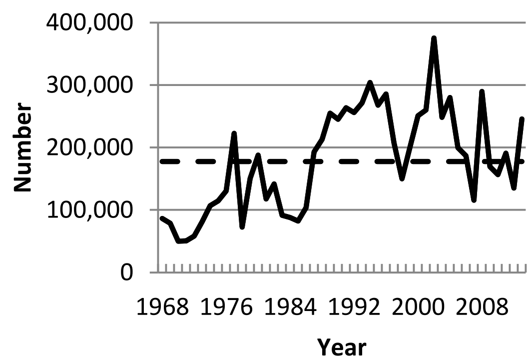

Figure 5. Other duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2013

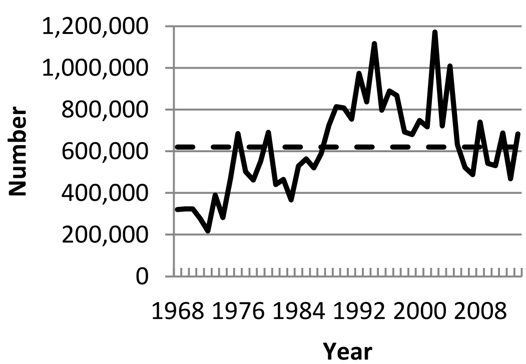

Figure 6. Total duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2013

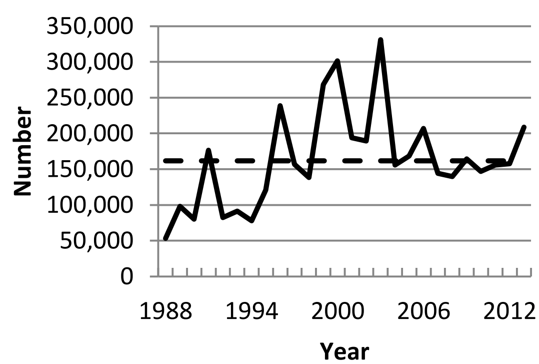

Figure 7. Canada goose population (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1988-2013.

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Table 1. Survey design for Minnesota, May 2013.[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), 1968-2013.

	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
	2012	30,910	228,000
	2013	9,813	258,000
Averages:	10-year	41,930	266,000
	Long-term	65,022	252,000
% change from:	2012	-68%	13%
	10-year	-77%	-3%
	Long-term	-85%	2%

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1995-2013.

	Year																		
Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dabblers:																			
Mallard	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	18,911	21,161
Black Duck	0	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	333
Gadwall	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	1,389	722
American Wigeon	194	0	0	56	56	56	111	0	56	555	167	0	56	111	56	56	111	222	222
Green-winged Teal	0	278	56	333	0	278	56	278	222	444	56	56	167	278	167	56	56	56	0
Blue-winged Teal	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	5,110	4,193
Northern Shoveler	111	1,277	1,500	500	555	1,055	305	1,277	278	1,166	333	167	56	1,000	666	1,027	111	56	333
Northern Pintail	167	167	111	111	167	167	389	56	111	56	0	56	0	56	56	0	111	0	111
Wood Duck	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	4,138	3,249
Dabbler Subtotal	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	29,882	30,324
Divers:																			
Redhead	639	722	778	944	500	583	1,444	750	333	805	666	666	916	1,389	472	944	805	750	861
Canvasback	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	722	1,555
Scaup	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	1,055	1,000
Ring-necked Duck	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	2,666	3,582
Goldeneye	111	167	0	111	56	56	333	111	0	222	222	56	222	278	278	222	56	56	333
Bufflehead	56	278	0	56	111	56	111	222	111	389	167	222	56	1,611	833	389	278	56	611
Ruddy Duck	167	139	528	11,052	972	0	83	1,305	417	305	1,222	305	0	1,027	861	28	56	0	305
Hooded Merganser	278	611	555	389	722	500	722	555	333	278	333	555	111	666	944	555	500	555	333
Large Merganser	0	0	56	0	0	0	111	0	972	0	111	0	278	333	333	333	111	56	222
Diver Subtotal	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	5,916	8,802
Total Ducks	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	35,798	39,126
Other:																			
Coot	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	444	10,386
Canada Goose	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	26,437	23,771

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1995-2013.

	Year																		
Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dabblers:																			
Mallard	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	29,689	27,409
Black Duck	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	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	1,987	701
American Wigeon	0	468	351	818	0	468	0	0	0	2,513	117	0	0	351	0	351	0	117	234
Green-winged Teal	0	935	234	351	117	117	117	468	234	234	0	117	0	0	234	117	0	0	117
Blue-winged Teal	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	9,000	4,383
Northern Shoveler	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	0	351
Northern Pintail	234	117	234	468	117	117	117	0	117	0	0	0	234	0	0	0	234	0	0
Wood Duck	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	5,143	4,792
Dabbler subtotal	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	45,936	37,987
Divers:																			
Redhead	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	468	468
Canvasback	0	234	701	117	117	935	0	468	1,052	234	0	0	1,169	468	234	117	584	117	935
Scaup	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	935	2,045
Ring-necked Duck	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	1,695	6,253
Goldeneye	701	1,753	818	234	935	584	468	234	234	351	117	117	0	351	584	468	468	584	935
Bufflehead	0	117	117	0	0	0	0	1,169	117	468	351	117	117	1,403	818	643	1,403	468	0
Ruddy Duck	117	58	117	0	468	0	0	1,870	2,688	0	351	58	0	0	175	409	58	234	117
Hooded Merganser	117	234	468	117	701	935	1,403	701	701	234	234	351	234	584	701	117	2,221	1,636	701
Large Merganser	0	0	0	0	0	117	117	0	0	234	351	0	0	351	0	0	234	0	234
Diver subtotal	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	6,137	11,688
Total Ducks	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	52,073	49,675
Other:																			
Coot	526	7,013	5,026	643	234	1,110	468	4,909	1,519	8,007	584	292	409	23,961	0	117	292	292	2,571
Canada Goose	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	23,260	22,442

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1995-2013.

	Year																		
Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dabblers:																			
Mallard	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	47,848	62,638
Black Duck	0	0	0	0	0	0	0	0	0	174	0	0	174	174	0	0	0	174	174
Gadwall	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	1,566	5,220
American Wigeon	0	1,044	348	696	0	522	174	1,218	174	1,566	1,044	174	348	348	174	348	1,044	174	348
Green-winged Teal	0	957	348	174	0	1,218	1,392	522	174	0	174	522	0	0	0	0	174	348	696
Blue-winged Teal	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	35,669	18,617
Northern Shoveler	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	8,265	6,786
Northern Pintail	174	870	522	870	870	696	522	0	174	348	174	174	348	174	0	174	0	174	174
Wood Duck	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	10,962	12,180
Dabbler subtotal	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	105,180	106,833
Divers:																			
Redhead	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	3,306	1,827
Canvasback	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	1,044	696
Scaup	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	696	8,874
Ring-necked Duck	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	9,135	6,960
Goldeneye	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	0	348
Bufflehead	0	1,044	174	348	0	0	0	1,218	783	2,088	0	174	696	1,218	870	174	2,871	174	3,915
Ruddy Duck	2,349	1,740	348	0	174	0	696	18,878	87	2,262	870	696	261	87	348	0	3,828	522	522
Hooded Merganser	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	1,044	348
Large Merganser	174	0	0	0	0	0	0	522	0	0	261	957	348	348	348	348	174	174	0
Diver subtotal	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	16,095	23,490
Total Ducks	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	121,275	130,323
Other:																			
Coot	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	25,664	27,578
Canada Goose	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	37,496	48,022

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1995-2013.

	Year																		
Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dabblers:																			
Mallard	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	96,448	111,208
Black Duck	0	0	0	0	0	0	117	0	0	174	56	0	174	174	0	0	0	174	507
Gadwall	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	4,941	6,643
American Wigeon	194	1,512	699	1,570	56	1,045	285	1,218	230	4,634	1,327	174	404	810	230	754	1,155	513	804
Green-winged Teal	0	2,170	638	858	117	1,613	1,564	1,267	630	678	230	694	167	278	400	172	230	404	813
Blue-winged Teal	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	49,779	27,194
Northern Shoveler	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	8,320	7,470
Northern Pintail	575	1,154	867	1,449	1,153	979	1,028	56	402	404	174	230	582	230	56	174	345	174	285
Wood Duck	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	20,242	20,221
Dabbler subtotal	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	180,995	175,145
Divers:																			
Redhead	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	4,523	3,155
Canvasback	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	1,883	3,186
Scaup	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	2,686	11,919
Ring-necked Duck	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	13,495	16,795
Goldeneye	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	640	1,616
Bufflehead	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	697	4,526
Ruddy Duck	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	756	944
Hooded Merganser	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	3,236	1,383
Large Merganser	174	0	56	0	0	117	228	522	972	234	723	957	626	1,032	681	681	519	230	456
Diver subtotal	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	28,146	43,980
Total Ducks	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	209,141	219,125
Other:																			
Coot	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	26,401	40,535
Canada Goose	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	87,193	94,235

Table 7. Mallard, blue-winged teal, and other duck (excluding scaup) populations in Minnesota, 1968-2013.

	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		61,493	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

Table 7. Cont.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
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
2012	96,448	2.33	224,965	45,057	49,779	2.18	108,607	31,971	60,228	2.24	135,017
2013	111,208	2.64	293,239	58,463	27,194	5.29	143,927	46,635	68,804	3.57	245,729
Averages:											
10-year	96,808	2.70	258,171	36,816	52,160	3.77	177,994	41,491	61,934	3.37	197,068
Long-term	102,313	2.22	226,119	36,571	58,984	3.85	216,337	42,459	60,932	3.13	177,386
% change from											
2012	15%	13%	30%	30%	-19%	143%	33%	46%	14%	59%	82%
10-year average	15%	-2%	14%	59%	-5%	40%	-19%	12%	11%	6%	25%
Long-term average	9%	19%	30%	60%	-16%	37%	-33%	10%	13%	14%	39%

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	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	2.09	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

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
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
2012	2,686	2.24	6,021	206,455	468,589	209,141	474,610	87,193	1.81	157,706
2013	11,919	3.57	42,568	207,206	682,895	219,125	725,463	94,235	2.22	208,825
Averages:										
10-year	9,498	3.37	30,138	206,716	633,939	216,179	664,076	79,506	2.26	177,100
Long-term	21,313	3.13	62,759	221,988	620,000	243,293	682,759	45,907	2.35	161,510
% change from										
2012	344%	59%	607%	0%	46%	5%	53%	8%	23%	32%
10-year average	25%	6%	41%	0%	8%	1%	9%	19%	-2%	18%
Long-term average	-44%	14%	-32%	-7%	10%	-10%	6%	105%	-5%	29%

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 28 April - 26 May 2013 (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
		28-April		5-May		12-May		19-May		26-May							
Region	City	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	28-April	5-May	12-May	19-May	26-May	1 Apri1-May 26
NW	Crookston	38.6	-8.3	41.4	-8.5	51.8	-0.9	61.4	6.1	56.4	-1.4	0.08	0.20	0.00	1.22	0.80	-0.73
NC	Grand Rapids	41.5	-4.8	41.5	-7.6	49.0	-2.8	58.1	3.8	53.0	-3.7	0.02	0.16	0.01	0.32	1.25	-0.25
	Itasca	36.0	-7.7	38.0	-8.8	m	m	58.2	5.8	54.1	-0.9	0.28	0.54	m	0.48	2.09	1.44
WC	Alexandria	40.2	-8.0	41.4	-9.7	52.0	-1.8	65.2	8.9	54.0	-4.7	0.20	0.03	0.28	1.24	1.50	-0.03
	Fergus Falls	Missing															
	Montevideo	38.8	-10.5	43.6	-8.6	50.4	-4.6	64.7	7.0	56.4	-3.8	0.56	0.10	0.67	0.32	1.42	0.80
	Morris	37.6	-11.0	41.6	-10.0	51.0	-3.4	63.7	6.7	54.9	-4.6	0.31	0.03	0.07	0.38	1.65	-0.91
C	Becker	41.6	-9.0	50.7	-2.7	54.0	-2.1	63.6	5.1	56.3	-4.3	0.10	0.13	0.10	0.07	1.46	-1.11
	Hutchinson	41.7	-8.4	46.7	-6.2	54.0	-1.5	63.6	5.6	56.6	-3.9	0.42	0.20	0.04	2.51	0.84	2.60
	St. Cloud	44.1	-4.7	45.3	-6.2	51.4	-2.7	63.3	6.7	53.2	-5.7	0.28	0.21	0.14	2.39	1.96	2.66
	Staples	Missing															
	Willmar	38.8	-11.0	44.1	-8.7	51.0	-4.6	62.3	4.1	55.5	-5.2	0.38	0.11	0.40	0.79	1.11	-0.60
EC	Aitkin	38.2	-7.8	42.2	-6.4	47.8	-3.2	58.2	4.8	53.3	-2.5	0.12	1.00	0.02	0.52	2.09	2.79
	Cambridge	Missing															
	Msp Airport	48.7	-2.9	49.1	-5.1	56.3	-0.4	67.6	8.5	57.2	-4.3	0.94	0.63	0.22	2.89	0.96	4.52
SW	Pipestone	39.2	-10.1	45.9	-6.2	50.0	-4.8	66.4	9.0	55.8	-4.0	0.27	0.19	0.94	0.88	0.64	-1.35
	Redwood Falls	46.0	-4.9	45.7	-8.1	52.8	-3.7	67.5	8.4	55.5	-6.1	0.12	0.14	0.44	0.94	0.51	-0.69
	Worthington	40.0	-9.1	43.8	-8.2	50.2	-4.5	66.6	9.1	55.5	-4.6	0.30	1.01	1.18	0.74	0.89	1.44
SC	Faribault	Missing															
	Waseca	43.2	-7.2	47.2	-6.1	53.8	-2.3	63.7	4.9	56.8	-4.6	1.10	2.26	0.16	1.24	1.76	4.92
	Winnebago	42.7	-7.9	46.3	-7.1	54.6	-1.5	66.9	8.1	57.4	-3.9	1.13	1.23	0.04	1.04	1.77	3.30
Statewide		41.1	-6.8	44.0	-6.7	51.0	-2.4	61.3	5.5	54.8	-3.5	0.42	0.77	0.28	1.18	1.57	

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

Waterfowl information is taken from the U.S. Fish And Wildlife Service report Waterfowl Population Status, 2013 by Kathy Fleming, Pamela Garrettson, Walt Rhodes, And Nathan Zimpfer. The entire report is available on the Division Of Migratory Bird Management website (http://www.fws.gov/migratorybirds/reports/reports.html).

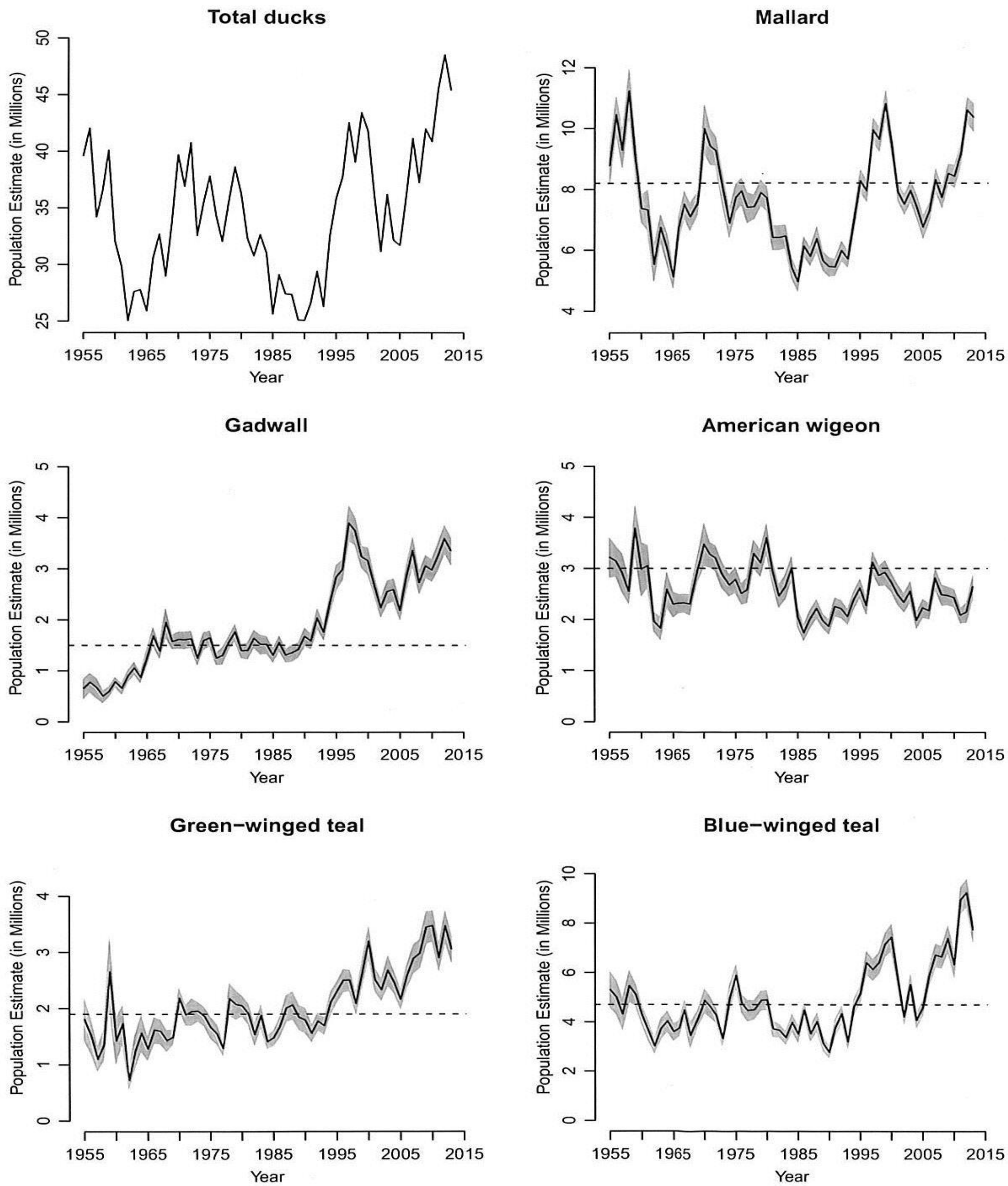

Figure 1 Estimates of North American breeding populations, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S (from: U.S. Fish and Wildlife Service 2013).

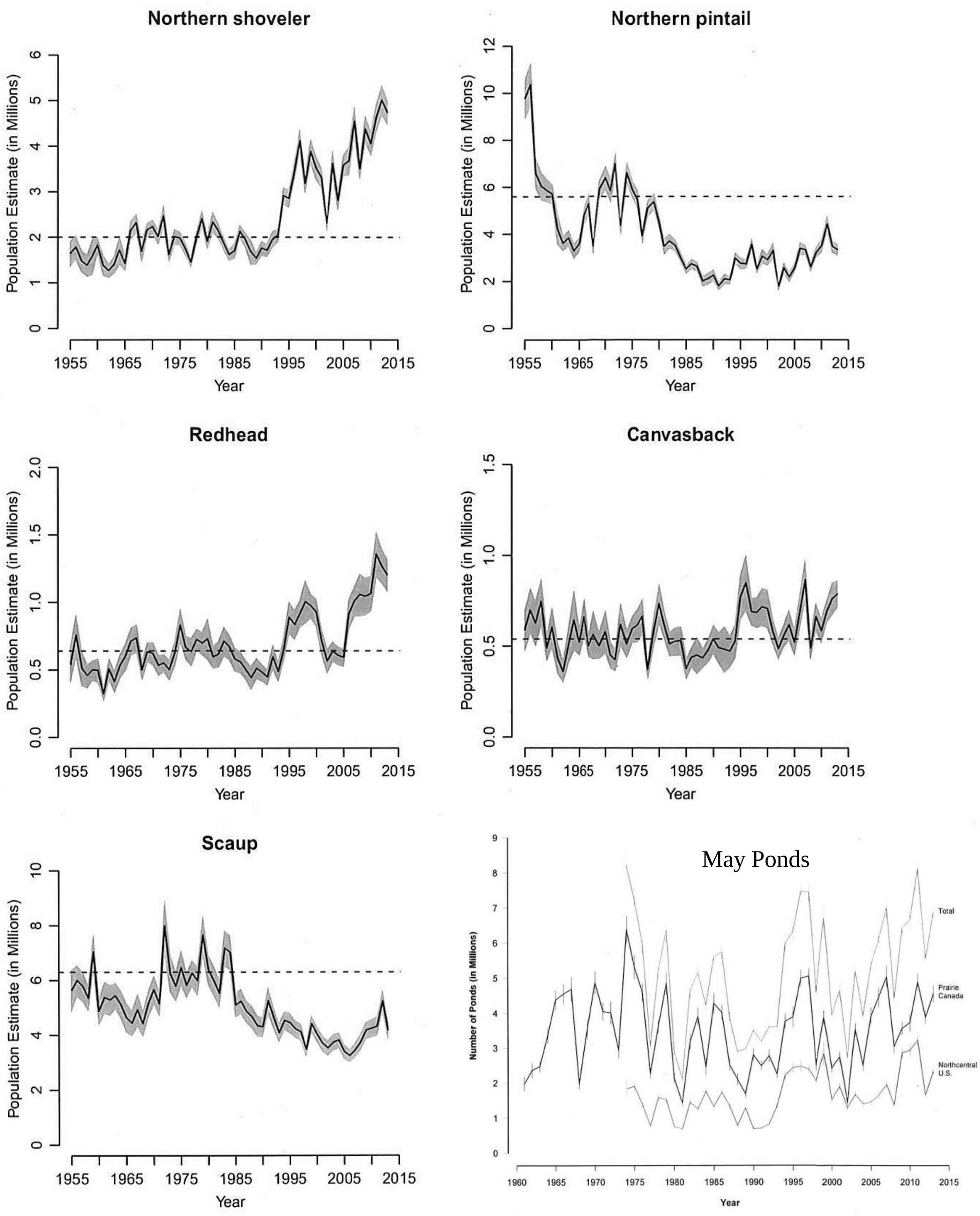

Figure 1 (continued).

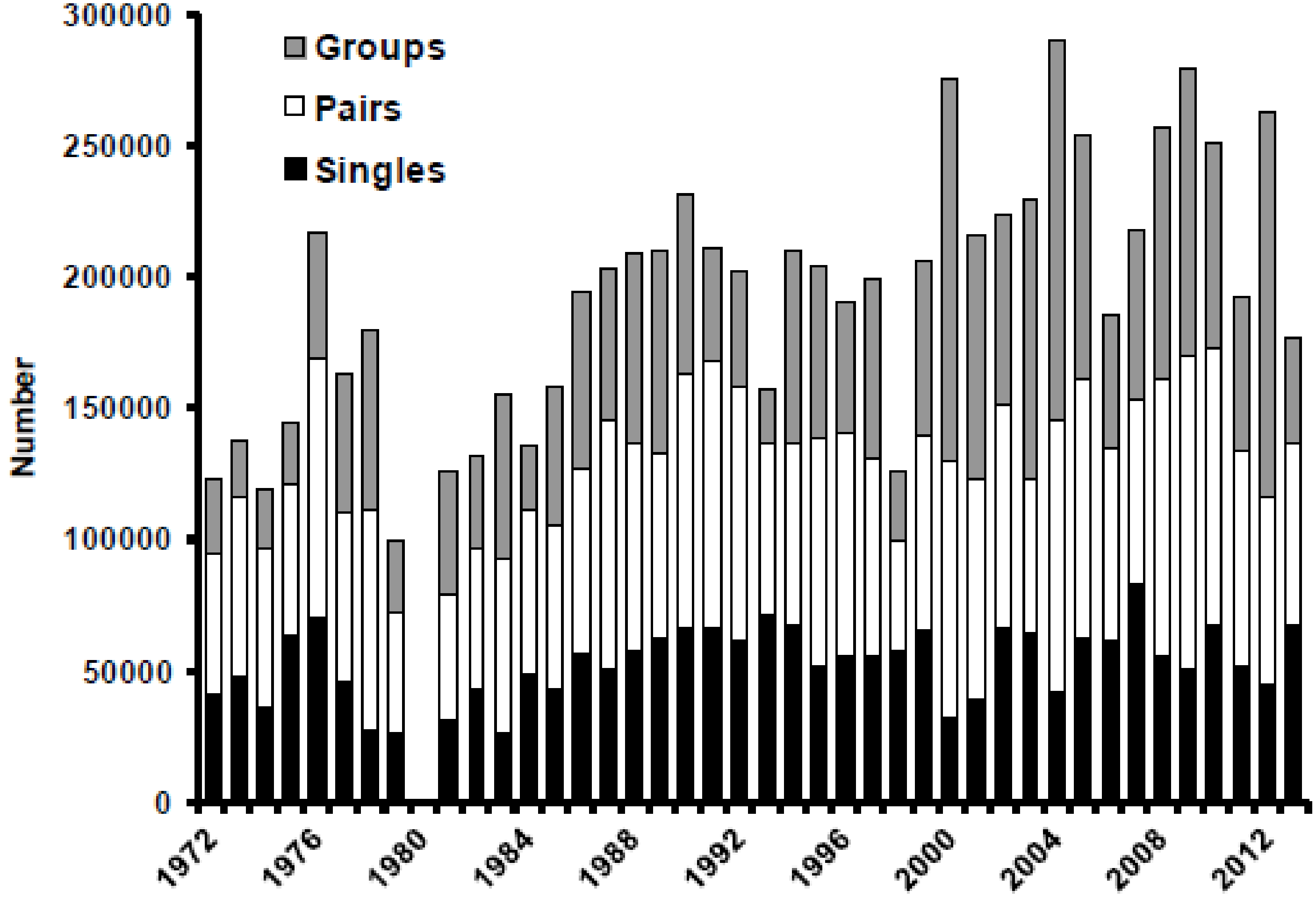

Figure 2 Breeding ground survey estimates of the Eastern Prairie Population of Canada geese, 1972-2013. (from: Baldwin, F., J. Wollenberg, and B. Lubinski. 2013. 2013 EPP Breeding Population Survey. Unpublished report prepared for the Mississippi Flyway Council Technical Section). Data not available for 1980.

2013 MINNESOTA SPRING CANADA GOOSE SURVEY

David Rave, Wetland Wildlife Populations and Research Group

INTRODUCTION

This report presents results from the thirteenth 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 2013 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.

Pilot John Heineman and I flew the survey on 6 days between 6 and 14 May, 2013. This is the latest this survey has ever started, and about 2.5 weeks later than the average start date over the past 12 years. 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 2013 was 250,600 (±73,100). Adding 17,500 for the Twin Cities metro area (Cooper 2004) yields a statewide estimate of 268,100 (Table 1). Relative error (95% CI half-width) was 29.2% of the estimate. The survey tallied 27.0% singles, 68.0% pairs, and 5% groups (Table 2). Typically, some of the pairs seen on this survey are not associated with nests and are likely non-breeders. An index to nesting effort (i.e., Productive Geese) was obtained by combining singles and pairs associated with nests. In 2013, 30.0% of the geese seen were classified as Productive Geese (Table 2).

The 2013 Canada goose breeding population estimate for the surveyed area was 40% lower than the estimate in 2012. Goose numbers were lower than 2012 in all regions (Table 1). A time-series plot suggests the goose population in the survey area has been reasonably stable over the last 13 years (Figure 2). The estimated breeding population in a proposed new hunting zone was 79,701 (±24,619), which was similar to the 2012 estimate for this zone 127,220 (±64,628)

Weather conditions in April and May of 2013 were the coldest and snowiest ever recorded during the Canada goose survey, and lake ice-out dates statewide were some of the latest ever recorded in Minnesota's history. The extreme cold and late ice-out conditions likely affected Canada goose population estimates in 2013. When the survey started, approximately 3 weeks later than normal, resident Canada geese were in various, and extremely asynchronous, stages of pairing, laying and incubation. This is very different than the norm, when there is a slight difference in stages between geese in the southern portions of the state, and the north. Late and frequent snowstorms, and temperatures well below freezing, caused birds in the southern third of the state to be anywhere from seeking nest sites to mid-incubation when the survey started. Ice, which still covered lakes in the northernmost portions of the state on the final day of the survey, may actually have prevented breeding birds from even arriving before the survey was concluded in northern portions of the state. The extremely late spring, with many late failed nests, likely influenced the number of productive geese observed this year. The late spring, low numbers of productive geese, and a low estimate of overall breeding geese all indicate that 2013 will likely not be a very good year for Canada goose production. Weather conditions throughout June and July may influence goose productivity. Regardless, the total 2013 Canada goose population estimate was 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 drier than average throughout most the state, and wetlands were frozen in much of the state well into May. Heavy rainfall in late May moderated the dry conditions, however, were likely too late to improve goose production this year. Due to the extremely cold spring weather conditions, which will lead to fewer and smaller goose broods, I expect below average Canada goose production throughout the state in 2013.

ACKNOWLEDGMENTS

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. Robert Wright provided GIS expertise. John Giudice provided statistical assistance, and analyzed the data. Christine Herwig helped with printing aerial photos. Cindy Kuettel helped with excel graphics.

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Table 1. Spring Canada goose population estimates in Minnesota, 2001-2013.

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**
2012	144,762	166,727	104,710	416,198	±132,344	17,500	**433,698**
2013	104,907	91,652	54,044	250,602	±73,122	17,500	**268,102**

*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 2008-2013 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, 2001-2013.

Year	Singles[1]	Pairs[1]	Groups	Productive Geese[2]	Dates of Survey	Number of productive geese
2001	27.0	63.9	9.1	36.4	4/14 to 5/02/2001	103,820
2002	30.7	52.0	17.2	41.5	4/26 to 5/11/2002	138,896
2003	27.9	58.2	13.9	29.3	4/22 to 5/01/2003	89,139
2004	26.5	57.5	16.0	35.5	4/22 to 5/04/2004	133,035
2005	33.0	50.2	16.8	40.7	4/20 to 5/03/2005	137,679
2006	43.5	45.9	10.6	50.3	4/24 to 5/05/2006	188,912
2007	31.0	51.5	17.5	36.2	4/23 to 4/28/2007	101,154
2008	38.4	55.4	6.2	42.6	4/23 to 5/05/2008	123,059
2009	41.8	50.7	7.5	45.2	4/21 to 5/01/2009	128,818
2010	42.5	48.2	9.3	46.6	4/15 to 4/20/2010	144,802
2011	50.3	47.2	2.6	55.7	4/21 to 4/29/2011	205,908
2012	30.0	49.6	20.4	35.1	4/16 to 4/23/2012	152,228
2013	27.0	68.0	5.0	30.0	5/06 to 5/14/2013	80,431

[1]Singles and pairs were doubled before calculating proportions.

[2]Productive geese equals Singles + Pairs with nests.

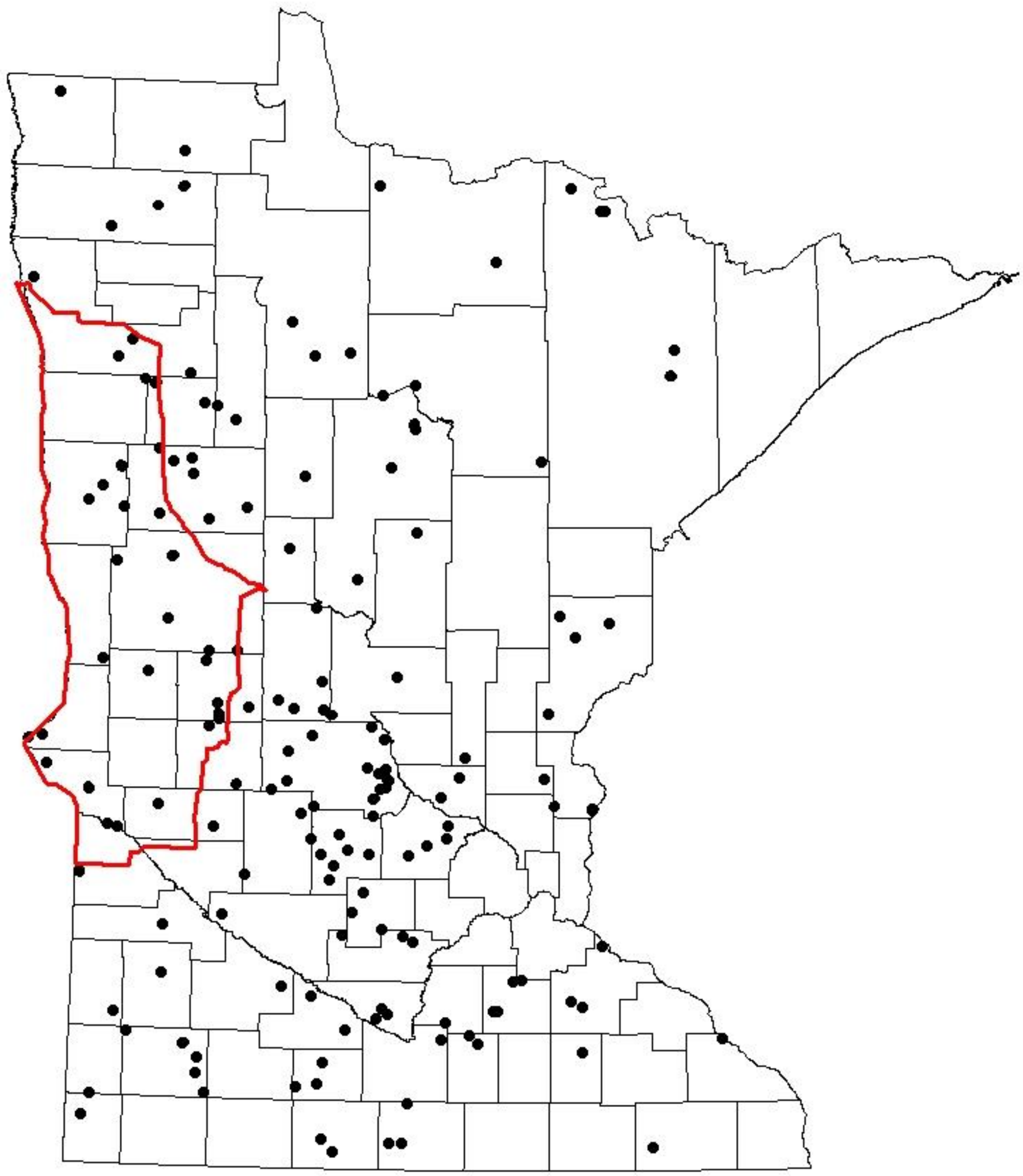

Figure 1. Location of 160 ¼ mi^2 plots surveyed for the 2013 Canada goose breeding pair survey within 3 ecoregions of Minnesota; forest, transition, and prairie. Red outlined polygon was the original location of a possible "new" Early Season Canada goose hunting zone

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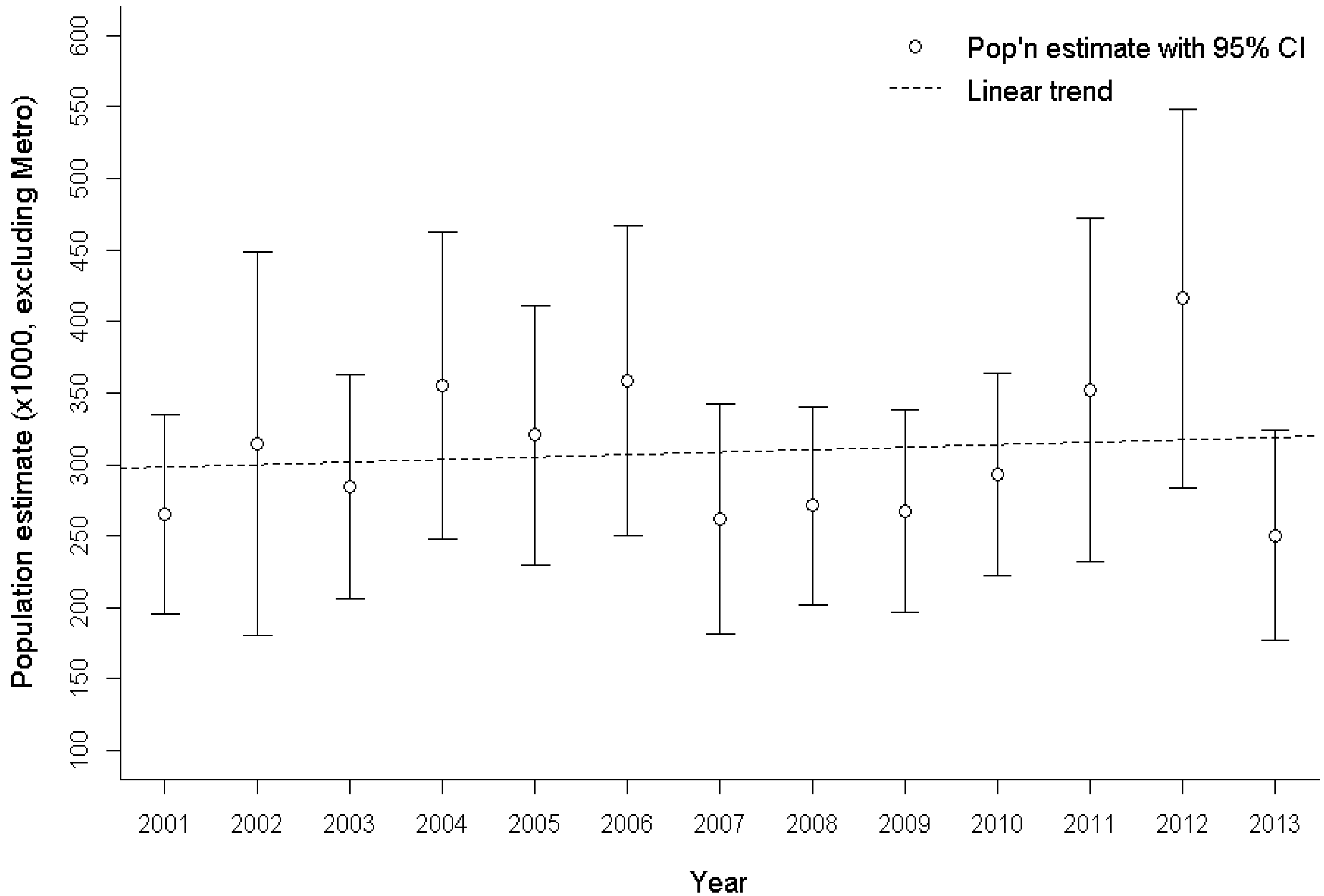

Figure 2. Spring Canada goose population estimates (±95% CI) in Minnesota, 2001-2013. (Does not include Metro area.)

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp. The entire report is available on the Division of Migratory Bird Management web site (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

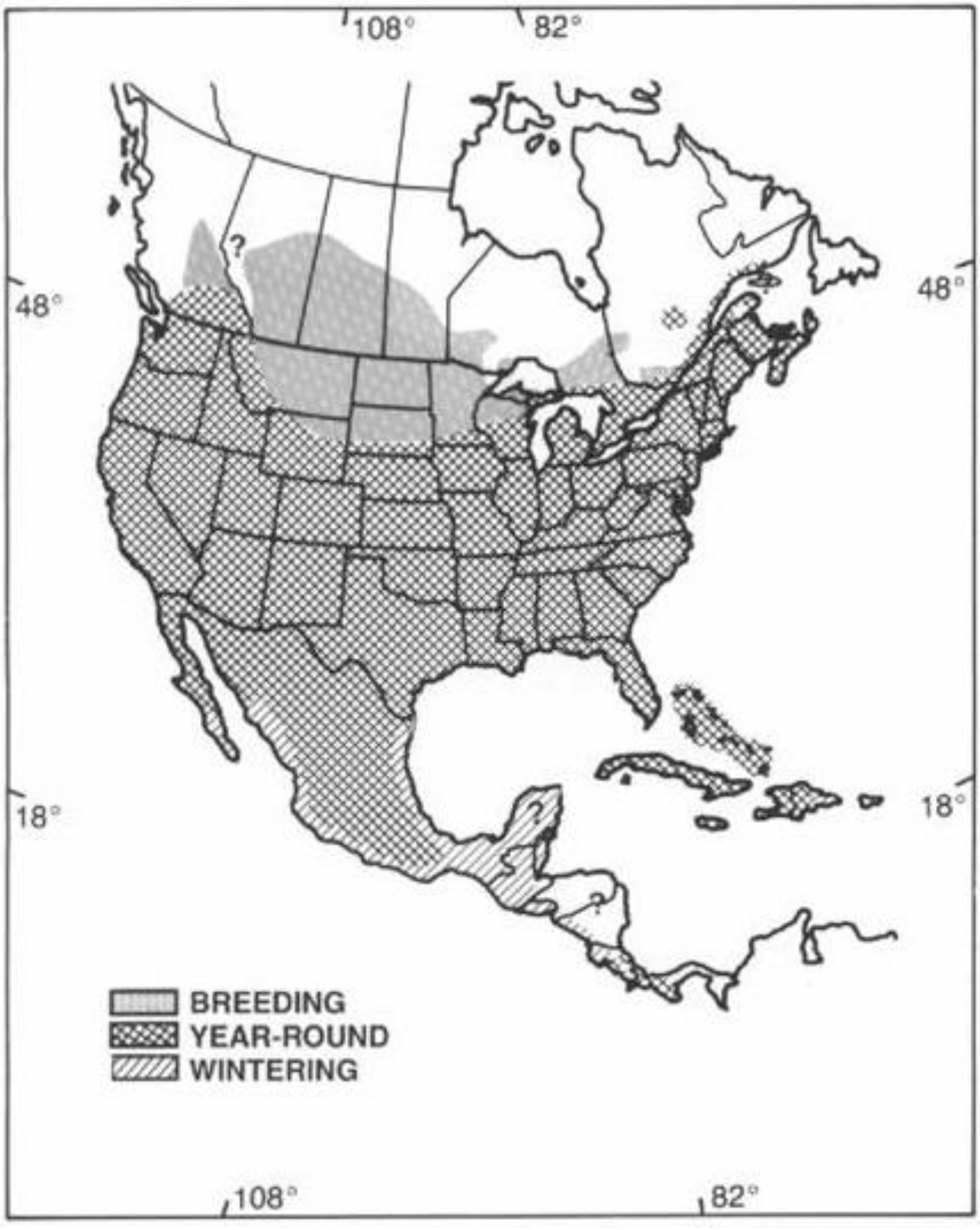

Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

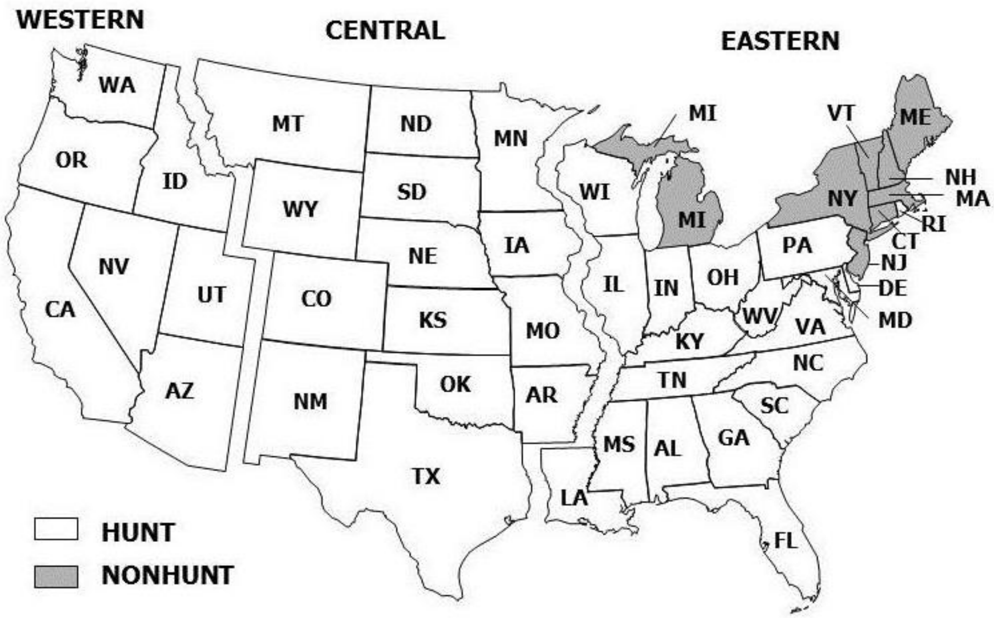

Figure 2. Mourning dove management units with 2012 hunting and non-hunting states. (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

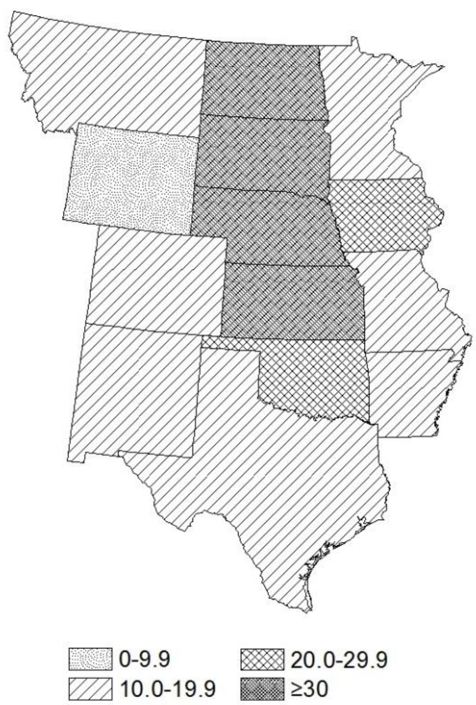

Figure 3. Mourning dove abundance in the Central Management Unit, based on the mean of the 2 CCS-heard index values from the last 2 years (2012-13). (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 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 2010, 2011 and 2012 seasons [a]. (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

Management unit / State	Active Hunters			Hunter Days Afield			Total Harvest		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
CENTRAL	406,100 †	427,700 †	338,700 †	1,362,300	1,444,800±11	1,108,700 ±11	7,194,900 ± 10	7,657,700 ±9	6,361,600 ±14
AR	23,900 ±20	25,300 ±20	21,400 ±22	63,300 ± 28	63,800 ±34	57,600 ±26	446,400 ± 28	519,300 ±43	494,200 ±30
CO	15,900 ± 14	15,300 ±14	17,000 ±18	38,400 ± 19	44,500 ±24	43,800 ±26	172,000 ± 18	178,700 ±14	204,300 ±26
IA	†[b]	5,800 ±11	†[b]	†[b]	19,000 ±17	†[b]	†[b]	56,800 ±21	†[b]
KS	28,200 ± 10	32,800 ±10	12,200 ±39	93,900 ± 13	95,800 ±15	49,100 ±52	511,200 ± 15	534,800 ±18	244,800 ±62
MN	10,000 ± 42	9,400 ±49	6,800 ±52	55,300 ± 115	25,100 ±51	21,600 ±48	98,900 ± 58	57,300 ±40	65,400 ±75
MO	29,300 ± 10	31,600 ±11	23,800 ±29	75,200 ± 14	74,600 ±14	51,400 ±50	426,000 ± 20	359,600 ±16	296,600 ±81
MT	1,600 ± 35	2,200 ±37	200 ±87	4,700 ± 44	5,900 ±47	500 ±120	17,400 ± 36	14,400 ±61	2,600 ±161
NE	15,800 ± 14	15,500 ±16	13,200 ±17	49,700 ± 21	46,900 ±28	39,000 ±17	276,400 ± 19	265,500 ±23	223,400 ±20
NM	5,900 ±20	6,700 ±39	9,000 ±11	21,000 ± 20	24,600 ±49	38,000 ±17	128,000 ± 29	76,900 ±42	160,100 ±17
ND	3,800 ± 28	3,700 ±25	4,900 ±30	11,800 ± 37	10,400 ±29	17,400 ±36	54,200 ± 38	41,800 ±31	78,900 ±37
OK	19,500 ± 14	17,100 ±15	15,700 ±14	51,300 ± 22	54,200 ±25	49,200 ±19	268,700 ± 28	379,400 ±33	349,700 ±26
SD	5,000 ± 21	6,200 ±21	4,500 ±22	14,200 ± 26	16,300 ±26	14,700 ±28	64,300 ± 23	87,200 ±26	65,500 ±28
TX	244,600 ± 10	253,200 ±11	207,200 ±13	876,500 ± 10	958,600 ±16	720,200 ±16	4,699,300 ± 14	5,061,100 ±13	4,150,800 ±20
WY	2,700 ± 26	2,700 ±30	2,700 ±32	7,100 ± 32	5,100 ±38	6,300 ±38	32,100 ± 36	25,000 ±52	25,300 ±40

[a] 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.

[b] † No estimate available.

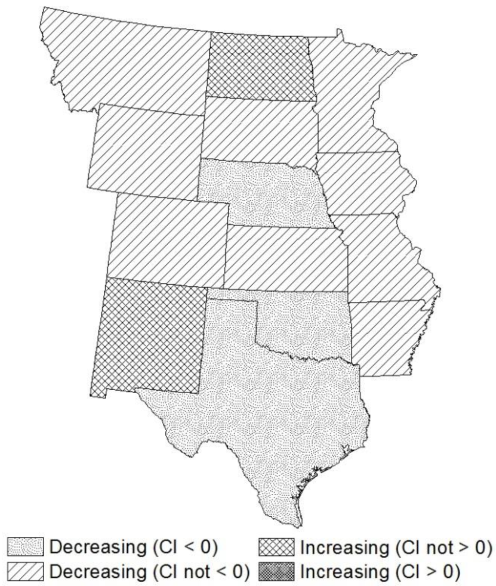

Figure 4. Trend in mourning dove abundance by state in the Central Management Unit over the last 10 years (2004-2013) based on CCS-heard data. Credible intervals (CI, 95%) that exclude zero provide evidence for an increasing or decreasing trend (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

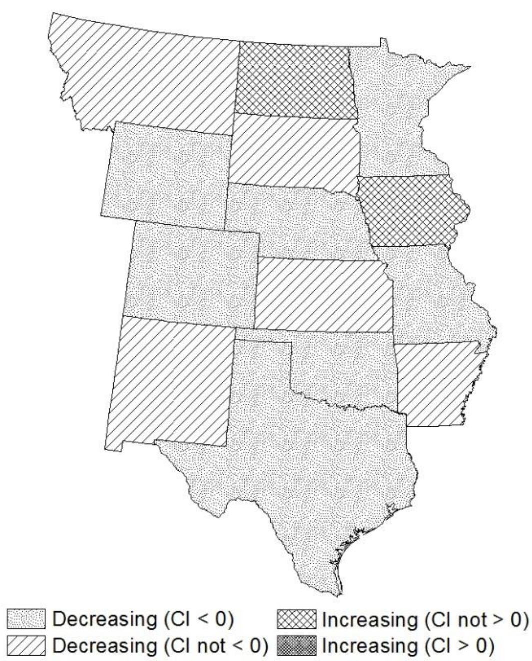

Figure 5. Trend in mourning dove abundance by state in the Central Management Unit over the last 48 years (1966-2013) based on CCS-heard data. Credible intervals (CI, 95%) that exclude zero provide evidence for an increasing or decreasing trend. (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

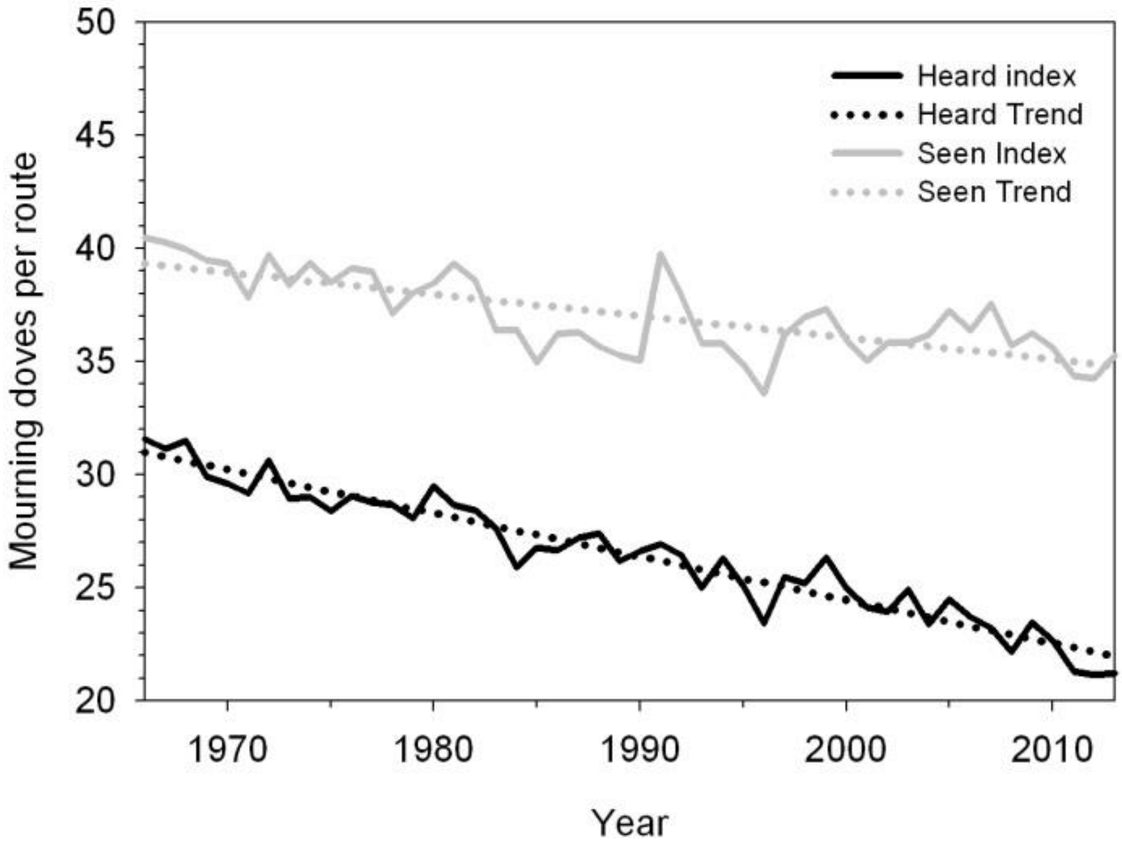

Figure 6. Mourning dove abundance indices and predicted trends in the Central Management Unit based on CCS data, 1966-2013. Trend lines are predicted values from fitting a simple linear regression line through the annual indices. (From: Seamans, M.E., R.D. Rau, and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 36 pp.)

American Woodcock information is taken from the U.S. Fish and Wildlife Service report American Woodcock Population Status, 2013. Cooper, T.R. and R.D. Rau. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.
The entire report is available on the Division of Migratory Bird Management home page (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

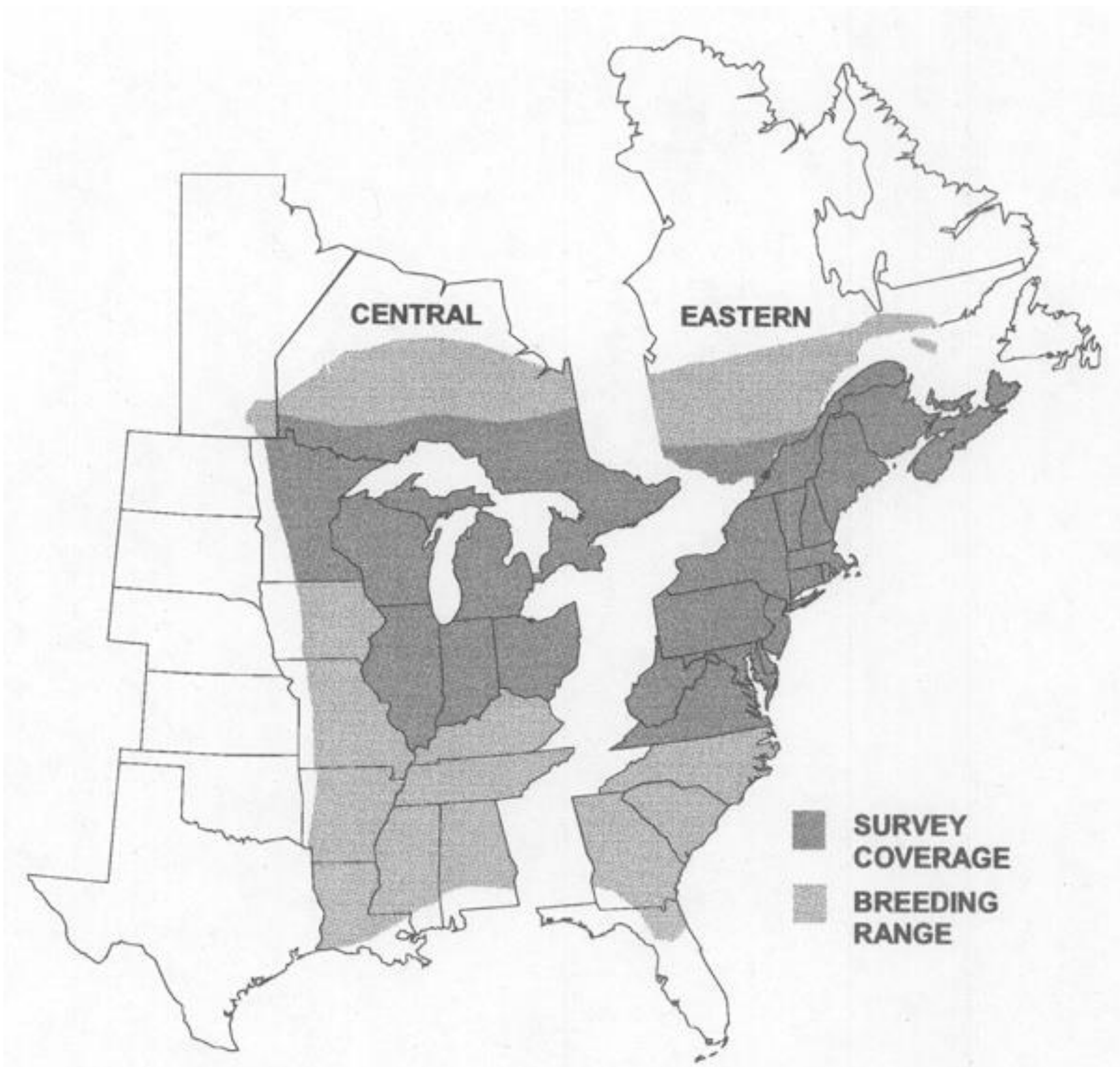

Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Cooper, T.R. and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 1. Short term (2012 – 13), 10 –year (2003-2013), and long-term (1968-2013) 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 R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit/State	Number of Routes[b]	n[c]	2012-13			2003-13			1968-13		
			% Change	95%	CI[d]	% Change	95%	CI[d]	% Change	95%	CI[d]
CENTRAL	449	722	-1.13	- 8.14	6.48	- 0.08	-0.97	0.80	- 0.80	-1.06	-0.55
IL	30	45	- 0.85	-65.62	182.06	- 15.10	-24.14	-6.46	- 1.28	*4.17	1.77
IN	18	60	- 7.26	-47.09	55.63	- 2.95	- 7.74	3.08	- 4.17	-5.56	-2.92
MB[e]	19	30	- 11.90	-39.33	24.19	- 0.10	- 3.57	3.70	- 0.45	-2.60	1.80
MI	106	151	5.73	-6.58	19.54	0.05	- 1.32	1.49	- 0.72	-1.11	-0.33
MN	75	120	- 12.89	-26.13	2.58	0.74	- 1.04	2.54	- 0.03	-0.62	0.60
OH	34	72	1.35	-20.53	31.74	- 0.12	- 2.64	3.77	- 1.55	-2.29	-0.77
ON	87	156	- 3.64	-17.59	12.68	- 0.57	- 2.50	1.47	- 0.89	-1.38	-0.40
WI	80	118	2.06	-13.36	20.32	1.96	0.10	4.03	- 0.28	-0.79	0.26

[a] Median of route trends estimated used hierarchical modeling. To estimate the total percent change over several years, use: $100(\% \text{ change}/100+1)^{y})-100$ 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 2013 for which data were received by 5 June, 2013.

[c] Number of routes with at least one year of non-zero data between 1968 and 2013.

[d] 95% credible interval, if the interval overlaps zero, the trend is considered non-significant.

[e] Manitoba began participating in the Singing-ground survey in 1992.

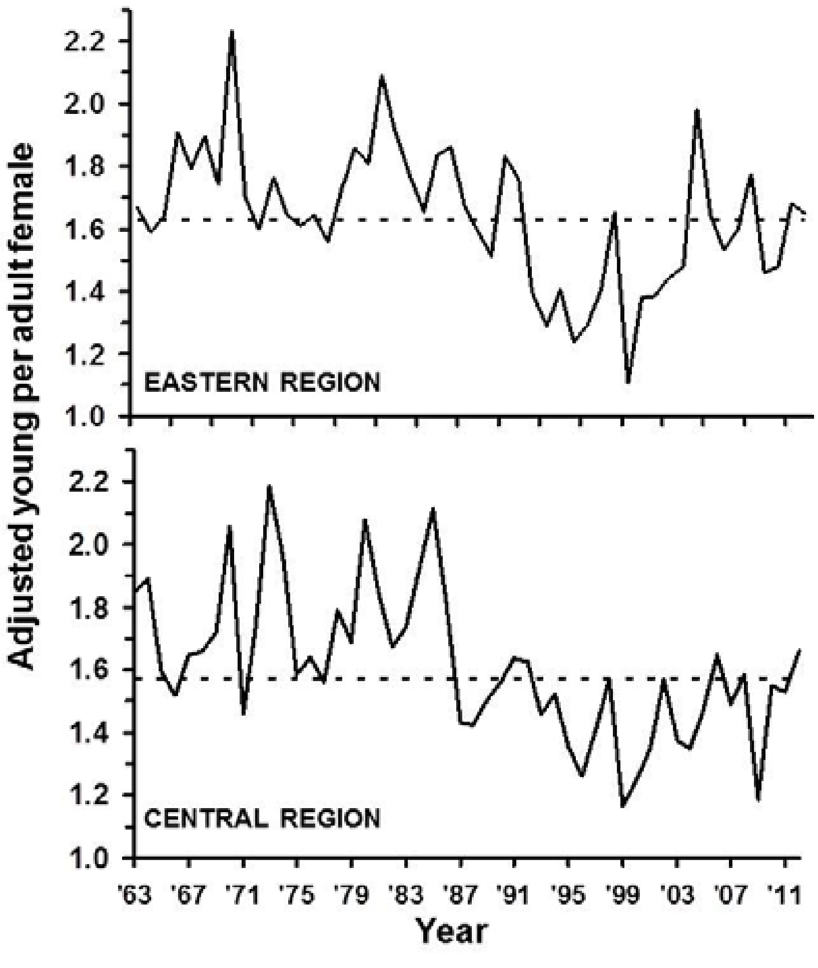

Figure 2. Weighted annual indices of American woodcock recruitment, 1963-2012. Dashed line is the 1963-2011 average. (from: Cooper, T.R. and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

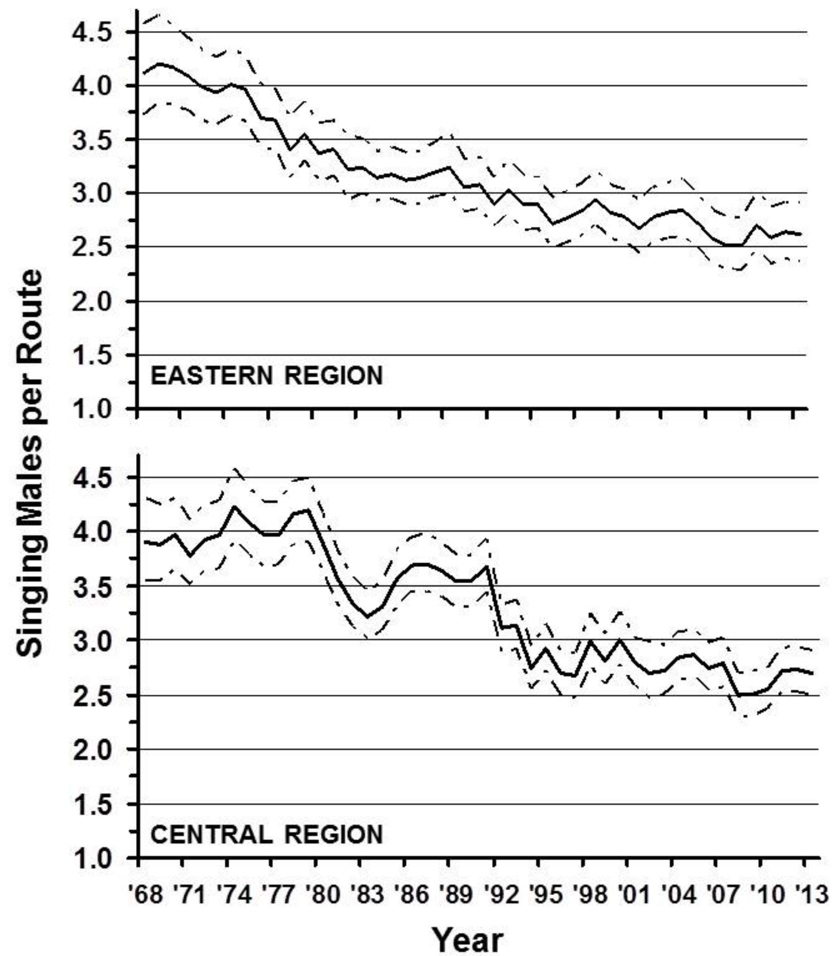

Figure 3. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2013. The dashed lines represent the 95th percentile credible interval. (from: Cooper, T.R. and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 2. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2009-10, 2010-11, 2011-12 and 2012-13 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 R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit / State	Active woodcock hunters ([a])				Days afield ([a, c])				Harvest ([a, c])			
	2009-10	2010-11	2011-12	2012-13	2009-10	2010-11	2011-12	2012-13	2009-10	2010-11	2011-12	2012-13
Central Region	n.a. [b]	n.a. [b]	n.a. [b]	n.a. [b]	322,300 ± 14	392,400 ± 20	350,500 ± 16	276,900 ± 16	175,100 ± 17	233,100 ± 20	231,700 ± 20	193,100 ± 23
IL	1,800 ± 98	800 ± 171	2,900 ± 108	900 ± 175	6,200 ± 91	1,200 ± 123	8,800 ± 131	3,500 ± 172	5,300 ± 142	900 ± 106	3,700 ± 195	1,900 ± 160
IN	1,100 ± 63	1,000 ± 66	1,100 ± 79	400 ± 119	4,000 ± 80	3,900 ± 89	4,100 ± 86	1,500 ± 122	1,700 ±79	3,000 ± 134	1,800 ± 102	600 ± 84
MI	26,400 ± 15	31,100 ± 14	28,400 ± 15	25,700 ± 17	146,200 ± 21	159,200 ± 19	144,000 ± 18	121,400 ± 22	80,900 ± 22	93,200 ± 21	106,900 ± 28	74,100 ± 28
MN	9,700 ± 37	13,900 ± 32	17,000 ± 29	11,200 ± 36	38,300 ± 44	55,400 ± 33	76,900 ± 46	40,400 ± 34	16,00 ± 48	34,800 ± 39	44,200 ± 42	31,000 ± 59
OH	1,600 ± 82	1,800 ± 98	3,100 ± 98	600 ± 115	7,200 ± 94	4,300 ± 70	10,200 ± 96	2,600 ± 83	1,200 ± 63	1,700 ± 93	2,300 ± 74	1,500 ± 80
WI	19,400 ± 22	14,600 ± 25	15,200 ±25	13,700 ± 28	77,100 ±24	65,700 ± 40	69,000 ± 30	58,000 ± 33	29,200 ± 24	42,300 ± 22	42,600 ± 31	40,400 ± 37

[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.

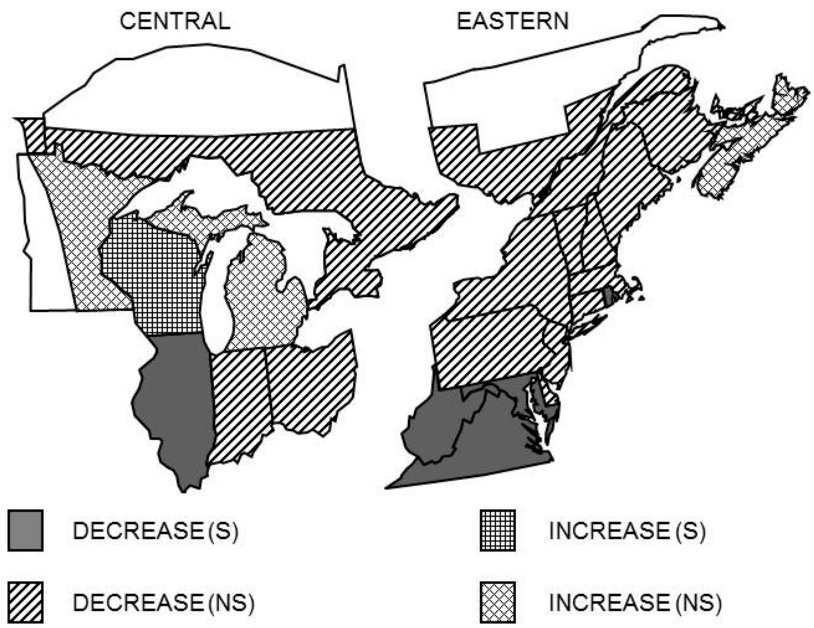

Figure 4. Ten-year trends in number of American woodcock heard on the Singing-ground Survey; 2003-13, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

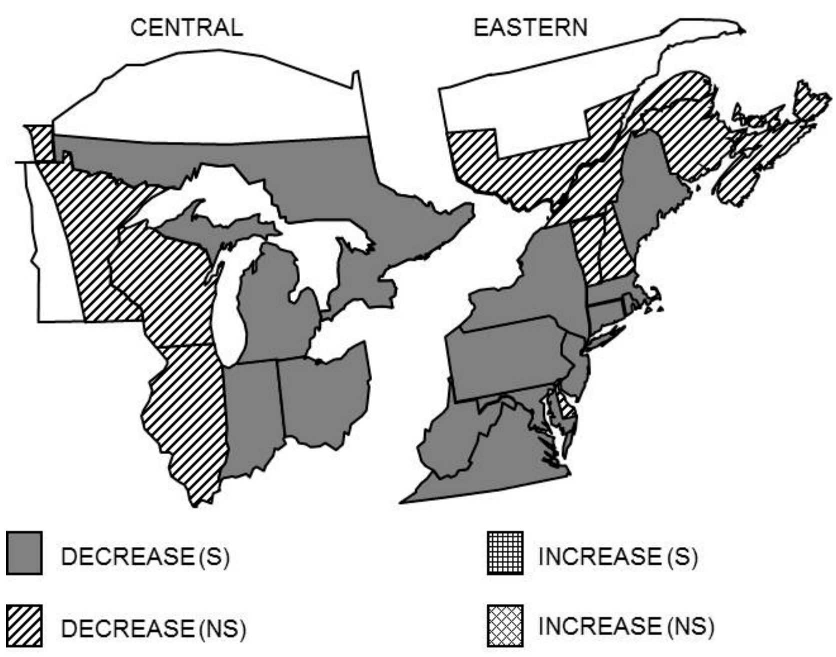

Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-2013, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

2013 RING-NECKED DUCK BREEDING PAIR SURVEY

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John H. Giudice, Wildlife Biometrics Unit

SUMMARY OF FINDINGS

Since 2006, we have used comparable methods to estimate the number of ring-necked ducks (RNDU, *Aythya collaris*) in either 3 or 6 Ecological Classification System (ECS) Sections in Minnesota. In 2006 and 2007, we estimated RNDU numbers in 6 ECS Sections that contained potential RNDU breeding habitat; but beginning in 2008, we surveyed 3 ECS sections. However, in 2013 we decided to repeat the plots flown in all 6 ECS Sections during the 2007 survey. We used helicopters to survey 195 of 200 plots that had been surveyed in 2007 and 49 resample plots. The survey was flown from 4-18 June. Survey timing was appropriate based on RNDU lone male to indicated breeding pair (IBP) ratios. There were an estimated 11,660 IBP (SE = 2,256) and 24,590 RNDU (SE = 4,660) in the survey area, which was similar to previous estimates. The majority of RNDU observations were in the Northern Minnesota Drift and Lake Plains ECS Section.

INTRODUCTION

Ring-necked ducks (RNDU) are an important breeding waterfowl species in portions of Minnesota. They are also important to Minnesota's waterfowl hunters and often rank 3rd most abundant duck in the State's annual waterfowl harvest (U.S. Fish and Wildlife Service, unpublished data). Continental populations of RNDU have increased since the 1950s (Zicus et al. 2008, U.S. Fish and Wildlife Service, unpublished data); however, a survey of 14 important RNDU breeding lakes in north central Minnesota indicated a decline in numbers since the early 1970s (Zicus et al. 2004). This apparent decline led to concern about the status of breeding RNDU in the state. To monitor the population, Minnesota Department of Natural Resources (MNDNR) initiated a survey in 2004 to estimate the number and distribution of breeding RNDU in Minnesota (Zicus et al. 2008).

The RNDU aerial breeding population survey has been conducted in Minnesota for 10 years. The survey has changed over time, as we have worked to balance budget needs and improve sampling schemes to monitor this important resource. The first 2 years were pilot years and results are not directly comparable to later years, thus results are not presented here.

The basic design developed by Zicus et al. (2008) used Public Land Survey (PLS) Sections as the primary sampling unit (plots). Plots were assigned to strata based upon the amount of RNDU habitat determined from Geographic Information Systems (GIS) land cover data (Habitat classes (HC) 1-2 = with RNDU nesting habitat and water, HC 3 = with water but no nest cover, HC 4 = with no water or potential nesting habitat) and location (ECS Section) (Fig. 1a). Survey designs included:

- 2004-2005: Pilot study with extensive sampling frame (Zicus et al. 2006, 2007, 2008).

- 2006-2007: Stratified Random Sample Design (SRSD) with 12 strata based on 6 ECS Sections (used to spatially allocate the sample) and HC 1 or 2 plots based upon relative abundance of nesting cover. There was also a separate stratum of all HC 3 and 4 plots combined that were surveyed using double-sampling (see Zicus et al. 2007, Rave et al. 2008 for details).

- 2008-2009: SRSD with 6 strata. We restricted the sampling frame to 3 ECS Sections within the RNDU range in Minnesota and only surveyed HC 1 and 2 plots (HC 3 and 4 stratum was not surveyed) (Sousa et al. 2009, 2010).

- 2010: Same sampling frame as in 2008-2009, but used a SRSD with 7 strata (3 ECS sections X 2 HC, and an additional stratum consisting of 49 of the 174 plots that were surveyed in 2009 [stratum = resample]) (Herwig 2010).

- 2011-2012: Generalized random tessellation stratified design (GRTS) with 3 strata (HC 1 and 2, plus 49 'resample' plots). Same sample frame as in 2008-2010, but used GRTS rather than ECS sections to obtain a spatially balanced sample (Herwig and Giudice 2011, Lawrence et al. 2012).

Prior to beginning the 2013 RNDU breeding population survey, we decided that we would not continue this survey every year due to budget considerations and the lack of trend in population estimates since 2006. Given that this would be the last year of the survey for a period of years, we decided to survey the same HC 1 and 2 plots that were surveyed in all 6 ECS Sections in 2007, along with 49 resample plots that have been surveyed since 2009. Our objective was to estimate breeding pair numbers and monitor population trends for RNDU in northern Minnesota. We also summarize data and correct errors from previous reports.

METHODS

Since 2006, we have used Public Land Survey (PLS) sections (~2.6-km^2 plots, range = 1.2 – 3.0 km^2) as primary sampling units (Zicus et al. 2008). The sampling frame for HC 1-2 plots had been defined as PLS sections that contained any potential RNDU nesting cover, which Zicus et al. (2008) defined as Minnesota Gap Analysis Project (MNGAP) level 4 land cover data that was either:

- Class 10 = lowlands with <10% tree crown cover and >33% cover of low-growing deciduous woody plants such as alders and willows,
- Class 14 = wetlands with <10% tree crown cover that is dominated by emergent herbaceous vegetation such as fine-leaf sedges, or
- Class 15 = wetlands with <10% tree crown cover that is dominated by emergent herbaceous vegetation such as broad-leaf sedges and/or cattails,
- That were within 250 m of and adjacent to:
    - Class 12 = lakes, streams, and open-water wetlands, or
    - Class 13 = water bodies whose surface is covered by floating vegetation.

MNGAP class 10, 14, and 15 cover associated with lakes having a General or Recreational Development classification under the Minnesota Shoreland Zoning ordinance was excluded, because pilot surveys indicated that breeding RNDU seldom used this habitat. Plots that met the criteria were assigned to HC 1 if they contained ≥ median amount of this cover; otherwise they were HC 2 (Figure 1A).

Rave et al. (2008) noted "However, the habitat layer that we used in 2006 and 2007 included some MNGAP class 10, 14, and/or 15 cover that was **within** 250 m **but not** necessarily **adjacent** to that patch of MNGAP class 12 and/or 13 cover." They recommended either correcting this problem with GIS work to reclassify sample plots or changing the definition of RNDU nesting cover used in this survey. There is no record that this change was made for the 2008-2012 surveys; thus, the definition of potential RNDU nesting cover in the years 2006-2012 (Zicus et al. 2007, Rave et al. 2008, Sousa et al. 2009, 2010, Herwig 2010, Herwig and Giudice 2011, Lawrence et al. 2012) should be modified from above to be:

- That were within 250 m of ~~and adjacent to~~:
    - Class 12 = lakes, streams, and open-water wetlands, or
    - Class 13 = water bodies whose surface is covered by floating vegetation.

In 2013, we planned to survey the same HC 1 and 2 plots that were surveyed in 2007 (Figure 1B). This included plots in 3 ECS Sections (Southern/Western Superior Uplands [combined and considered 1 ECS Section for these surveys], Northern Superior Uplands, and Northern Minnesota and Ontario Peatlands) that had not been surveyed since 2007. As in 2007, the Boundary Waters Canoe Area was excluded from the survey area. We did not survey the 50 HC 3 and 4 PLS sections (expected to have low densities or no breeding RNDU) that had been surveyed in 2007. Few ducks were seen on those plots in 2007 (1 pair, 1 lone male, 4 flocked males, group of 3). Instead, we invested that survey effort to resurvey 49 plots we surveyed annually since 2009. These resample plots were randomly selected in 2010 from the 174 plots sampled in 2009 and represented a range of RNDU counts and IBP (Herwig 2010). The 49 plots have been consistently surveyed since 2009 and were treated as a third stratum (sampling rate = 1). Our sample in 2013 should have included 249 plots (102-HC 1, 98-HC 2, and 49 resample plots); however, 1 plot was both a HC 1 and a resample plot. Thus, only 248 plots were selected to be surveyed. The 3 ECS Sections that have been consistently surveyed since 2006 were considered the 'core' survey area. The 3 ECS Sections that were only surveyed in 2006, 2007, and 2013 were considered the 'exterior' survey area. All 49 resample plots were in the core survey area.

We surveyed plots from a MNDNR Division of Enforcement helicopter (Bell OH-58 [Jet Ranger]) flying ~30–45 meters above ground level and ~75–130 km/h. A 2-person survey crew (pilot + 1 observer) recorded RNDU observations by sex and social status (Zicus et al. 2008). We considered pairs, lone males, and flocked males (2–5) to indicate breeding pairs (Zicus et al. 2008). The breeding population in the survey area was considered to be twice the Indicated Breeding Pairs (IBP) plus the number of birds in groups. Originally, lone and flocked females were included in the breeding population estimate calculated for this survey; but, we chose to exclude these females and recalculated previous year's estimates to reflect this change. We made this change because neither the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1987) nor MNDNR include lone females in their spring aerial breeding waterfowl population surveys. Lone or flocked females were not included because they are represented by the lone or flocked males that are doubled to account for hens sitting on the nest. The number of lone females ranged from 0-11 observed/year and only 4 groups of flocked females (size = 2, 2, 3, 4) were recorded from 2006-2013.

From 2007 through 2011, observations were recorded on aerial photos and transcribed to data sheets following the survey. In 2012 and 2013, observations were recorded in digital voice files, each associated with a UTM location, on a tablet computer using the DNRSurvey software program developed by MNDNR Wildlife and GIS staff (Wright et al. 2011). Data were transcribed and proofed following the survey. 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.

RESULTS

We completed the survey in 8 days flight time. MNDNR pilot John Heineman flew the entire survey. There were 4 observers: John Giudice (4, 11 June), Brian Lueth (6, 7 June), Jeff Lawrence (8, 12, 18 June), and Steve Cordts (13 June). We were unable to survey 5 plots from the 2007 sample. These included:

1. 2 plots on Agassiz National Wildlife Refuge that we were not allowed to survey because of nesting Franklin's gulls (*Leucophaeus pipixcan*),
2. 1 plot on Camp Ripley that was in the active firing range,
3. 1 plot near Detroit Lakes that had an active mink farm,
4. 1 plot near Grand Portage (far NE MN) that was too far from helicopter fuel.

In addition, one of the Northern Minnesota Drift and Lake Plains HC 1 plots was also a resample plot and we included it as part of the 49 resample plots; thus, there were 6 total 2007 plots that were not included to estimate the population in the 2013 sample.

The survey was conducted from 4-18 June 2013 (Figure 2). Survey start dates have ranged from 4-9 June and end dates ranged from 11-18 June (6-16 June 2006, 5-13 June 2007, 9–17 June 2008, 5–12 June 2009, 7–16 June 2010, 6–11 June 2011, and 4-8 June 2012). The surveys have varied in duration due to number of plots, size of the survey area, weather, availability of a second helicopter and crew, and scheduling conflicts.

We surveyed approximately 1% of the survey plots in each of the ECS Sections (Table 1). The survey plots from 2007 were well distributed throughout the survey area (Figure 1B). There were only 6 random survey plots flown in the Lake Agassiz, Aspen Parklands section, but 10 of the 49 resample plots were in this section.

A total of 242 RNDU (excluding 7 lone females) was detected on 55 (23%) of the 243 sample plots (Table 2). The habitat class stratification implemented by Zicus et al. (2008) continues to be effective as ring-necked ducks in the core survey area were present on twice as many HC 1 as HC 2 plots (Figure 3). This relationship was not as strong in the exterior area (Figure 3). Plot occupancy was also higher in the core survey area (Table 2). RNDU occupied 27% of the plots in the core area compared to 15% of the plots in the exterior area. The proportion of pairs was approximately 50% of all IBP (Figure 4).

We estimated 11,660 IBP (SE = 2,256) and 24,590 RNDU (SE = 4,660) in the entire survey area (Table 3, Figures 5 and 6). In the core area, the RNDU breeding population was an estimated 18,300 birds, which was not statistically different than previous years and similar to the 17,860 estimated in 2007. The IBP estimate in the core area was also similar to 2007. While the point estimates for the exterior were lower than the 2007 survey, they were not statistically different. The number of birds observed on the 49 resample plots was similar to previous years (Figures 5, 6).

We were unable to fly 5 of the 2007 plots, 3 that had above average numbers of RNDU in 2007 (1 in Northern Superior Uplands that had 9 IBP, 2 in Lake Agassiz, Aspen Parklands that had 7 and 8 IBP). When we exclude these plots from the 2007 data and compare the number of RNDU seen on the same plots in 2007 and 2013, we observed more IBP during the 2013 survey in the Northern Minnesota Drift and Lake Plains and Northern Superior Uplands, and similar or fewer numbers in the other ECS Sections (Table 4). The 5 missed plots were important and accounted for 15% of the IBP counted in the core survey area and 25% of the IBP counted in the exterior area in 2007 (Table 2). Few birds were observed in the Western and Southern Superior Uplands in 2007, but no birds were recorded there in 2013.

As in previous years, the majority of the birds were located in the Northern Minnesota Drift and Lake Plains ECS Section (Figures 7, 8) and few birds were reported in the southern portion of the survey area. In 2009, several RNDU were incorrectly reported in the southern portion of the survey area (Sousa et al. 2010). We found an error in the GIS file and provide annual depiction of survey plots and distribution of RNDU, including a corrected 2009 map (Figure 7). The 2009 distribution was similar to other years.

DISCUSSION

We have used the same habitat classification to select survey plots since 2006, but we reduced the scope of the survey in 2008 (Sousa et al. 2009). The population of RNDU breeding in areas we surveyed all years has shown no definitive trend the past 8 years. There was a low population estimate in 2010. However, based on the full time series, the extremely low count in 2010 was probably due in part to sampling error (i.e., the true population decline probably was not as great as depicted by the 2010 estimate) (Herwig and Giudice 2011). When we resurveyed the exterior survey area in 2013, it accounted for 26% of the breeding RNDU this year vs. 31-33% of the population estimate in 2006 and 2007. The change in numbers was not significant, but warrants monitoring in future surveys. We did not resurvey HC 3 and 4, which accounted for 9% of the population estimate in 2006 and 2007.

The timing of the 2013 survey was appropriate because the proportion of pairs was approximately 50% of all IBP (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1987). Spring phenology was very late in 2013, especially compared to 2012 (http://climate.umn.edu/doc/whatsnew.htm, accessed 29 Oct 2013), but by June 2013 conditions were closer to normal.

Given that we planned to suspend the annual survey effort beginning in 2014, it made sense to survey the original area (all 6 ECS Sections) and repeat much of the 2007 survey this year. The original survey design was developed to achieve a balance between determining spatial distribution and abundance of RNDU (Zicus et al. 2008). Our objective this year was to detect any change in the population between 2007, when we last surveyed all 6 ECS Sections, and 2013. Periodically surveying the same plots provides the best method to determine population trend (Zicus et al. 2008). It is unfortunate that in 2013 we were unable to survey 5 of the 2007 HC 1-2 plots. Three of these plots contained several RNDU in 2007 and contributed to the 2007 population estimate. It would have improved the comparison between years if we had flown these plots; but, we do not have a good method to adjust for this after the 2013 survey.

We changed survey design several times over the 8-year period of this survey, but the estimates for the same survey areas are comparable among years. In 2011 and 2012, we used a generalized random tessellation stratified (GRTS) design to obtain a spatially balanced sample of plots (Stevens and Olsen 2004) instead of stratifying based upon ECS Section. The GRTS design ensures that sampling units are dispersed across the sampling frame. The changes were implemented in order to increase the relative precision of the estimates (Herwig and Giudice 2011). While the GRTS design has inherent benefits for this type of survey, we recommend resurveying a previous set of plots (e.g. repeat the 2007 and 2013 plots) when the survey is conducted again in 3-5 years. While this is not ideal for estimating the size or distribution of the population, we have gained insight on both of these population characteristics during the past surveys. Resurveying plots will provide better information on population change among years, thus will be most informative for conducting an occasional survey (e.g. every 3-5 years) in the future.

The Northern Minnesota Drift and Lake Plains ECS Section had the highest number or breeding RNDU in Minnesota. This area contains large amounts of potential RNDU breeding habitat (Figure 1A) and breeding RNDU are well distributed throughout this ECS Section (Figure 8). In contrast, while the Minnesota and Northeast Iowa Morainal section has substantial potential breeding habitat (Figure 1A), breeding RNDU mostly occur in the northern portion of this ECS Section (Figure 7). Also, few RNDU were recorded in the Western and Southern Superior Uplands ECS Sections. The Lake Agassiz, Aspen Parklands ECS Section has limited potential breeding habitat (Figure 1A), but RNDU are relatively abundant in the limited habitat. Much of the habitat is located on large tracts of public land, such as Agassiz National Wildlife Refuge and Thief Lake and Roseau River wildlife management areas. In the exterior area, the Northern Superior Uplands was the most important RNDU breeding area (Rave et al. 2008, this survey), and both this area and the N. Minnesota & Ontario Peatlands had numerically more RNDU than the Lake Agassiz, Aspen Parklands. We selected the Lake Agassiz, Aspen Parklands as part of the core survey area in 2008 because it had higher densities of ducks on the available RNDU habitat. Also, in their review of the survey, Zicus et al. (2008) stated "In this survey, plots in northeastern Minnesota could be eliminated because they are remote, proved to be expensive to survey, and had few breeding pairs."

Resample plots may provide more reliable information on population trends because the same plots are surveyed each year (i.e., sampling variation is minimized). For example, RNDU counts on resample plots have not demonstrated a changing trend during 2009-2013, whereas the population estimate (based on all plots) for 2010 was substantially lower than previous and subsequent estimates (Figure 6). This suggests that the 2010 population estimate may have been partially an artifact of the random sample.

This survey has increased our understanding or RNDU breeding population size and distribution in Minnesota. The RNDU is the 4th most abundant breeding duck in Minnesota, following mallards (*Anas platyrhynchos*), blue-winged teal (*A. discors*), and wood ducks (*Aix sponsa*) (Cordts 2013, this survey). When we began the pilot survey in 2004, we discussed whether population size, trend or distribution was the most important parameter to monitor the population. The original design allowed us to determine population size, thus trend, and the stratification into 6 ECS sections ensured that plots were distributed across the landscape. While it is possible the breeding RNDU population was larger in Minnesota during the 1970s and 1980s as indicated by the 14-lake survey (Zicus et al. 2008), the helicopter survey indicates that breeding populations do not show a strong changing trend in Minnesota. The 14 lakes RNDU survey has also not indicated a positive or negative trend since 2006 (Figure 11) (Lawrence 2011, MNDNR unpublished data).

We recommend that 2013 be the last year this survey is flown until 2016-2018. The decision on which year to reinstitute the survey will depend on results from the 14 lake survey and perhaps other anecdotal information. We should consider flying the survey 2 years in a row (e.g. 2016 and 2017) to reduce the influence of annual variability in the counts. We also recommend resurveying the 2013 plots, because the resample design will be more informative for estimating trends from a periodic survey. If the survey crew can obtain permission or deal with the other issues that were problems in 2013, we recommend that the 5 plots from 2007 that not flown in 2013 be surveyed in future surveys. We recognize that conducting this survey on an annual basis would yield the best population status information; but, balancing costs and the lack of trend in the population, we believe a periodic survey is a reasonable compromise. While we have not detected trend in this population during the past 8 years, we think that periodic breeding pair surveys of Minnesota's RNDUs will be essential to monitor status and ensure maintenance of this resource.

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Table 1. Number of plots surveyed (*n*) and sampling rate (%) by Ecological Classification System (ECS) Section and habitat class for Minnesota's ring-necked duck breeding-pair survey, 2006–2013.

			Survey Year														
	Habitat		2006-07		2008		2009		2010		2011[d]		2012[d]		2013	
ECS Section	class[a]	N plots[b]	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
W. & S. Superior Uplands	1	1118	10	0.9	0		0		0		0		0		10	0.9
	2	1100	10	0.9	0		0		0		0		0		10	0.9
N. Superior Uplands	1	1810	14	0.8	0		0		0		0		0		13	0.7
	2	2399	19	0.8	0		0		0		0		0		19	0.8
N. MN & Ontario Peatlands	1	1321	17	1.3	0		0		0		0		0		17	1.3
	2	1068	13	1.2	0		0		0		0		0		13	1.2
N. MN Drift & Lake Plains	1	3828	41	1.1	83	2.2	56	1.5	55	1.5	64	1.7	63	1.6	39	1.0
	2	3317	36	1.1	25	0.8	47	1.4	47	1.4	52	1.6	56	1.7	36	1.1
MN & NE Iowa Morainal	1	1638	15	0.9	31	1.9	24	1.5	24	1.5	24	1.5	29	1.8	14	0.9
	2	1923	17	0.9	22	1.1	27	1.4	27	1.4	31	1.6	32	1.7	17	0.9
Lake Aggasiz, Aspen Parklands	1	216	5	2.3	9	4.2	10	4.6	10	4.9	3	1.4	4	1.9	3	1.4
	2	124	3	2.4	4	3.2	10	8.1	10	8.8	2	1.6	1	0.8	3	2.5
All	3/4	26369	50	0.2	0		0		0		0		0		0	
Resample 2009 plots[c]	1/2	49	0		0		0		49	100.0	49	100.0	49	100.0	49	100.0
Total			250		174		174		222		225		234		243	

[a]-Habitat class 1 and 2 contain likely RNDU nesting cover, Habitat 3 and 4 are unlikely RNDU nesting habitat. See methods for details.

[b]-Number of Public Land Survey sections by ECS section and habitat class.

[c]-Resample plots include 12 Habitat Class (HC) 1 plots and 12 HC 2 plots in N. MN Drift & Lake Plains; 8 HC 1 and 7 HC 2 plots in MN & NE Iowa Morainal; and 5 HC 1 and 5 HC 2 plots in Lake Agassiz, Aspen Parklands.

[d]-Plots in 2011 and 2012 were selected using a GRTS analysis (Lawrence et al. 2012) and are assigned to the ECS section using a domain analysis.

Table 2. Plot occupancy, number, and density of indicated breeding pairs (IBP) and total birds observed on Habitat Class 1 and 2 plots during the ring-necked duck breeding pair survey in Minnesota, 2006-2013.

			Plots with birds		IBP[d]			Birds[e]		
Strata	Year	No. of plots surveyed	*n*	%	Total	Per plot[f]	Per occupied plot[f]	Total	Per plot[f]	Per occupied plot[f]
Core[a]	2006	117	27	23	120	1.03	4.44	198	1.69	7.33
	2007	117	33	28	101	0.86	3.06	164	1.40	4.97
	w/o 2013 skipped plots	113	31	27	86	0.76	2.77	134	1.19	4.32
	2008	174	57	33	173	0.99	3.04	287	1.65	5.04
	2009	174	56	32	173	0.99	3.09	269	1.55	4.80
	2010	173	38	22	105	0.61	2.76	156	0.90	4.11
	2011	176	56	32	166	0.94	2.96	245	1.39	4.38
	2012	185	53	29	196	1.06	3.70	303	1.64	5.72
	2013	113	30	27	87	0.77	2.90	143	1.27	4.77
Exterior[b]	2006	83	21	25	47	0.57	2.24	77	0.93	3.67
	2007	83	14	17	36	0.43	2.57	59	0.71	4.21
	w/o 2013 skipped plots	82	13	16	27	0.33	2.08	43	0.52	3.31
	2013	82	12	15	29	0.35	2.42	40	0.49	3.33
Resurvey[c]	2009	49	13	27	44	0.90	3.38	67	1.37	5.15
	2010	49	14	29	42	0.86	3.00	64	1.31	4.57
	2011	49	13	27	54	1.10	4.15	79	1.61	6.08
	2012	49	15	31	33	0.67	2.20	67	1.37	4.47
	2013	49	13	27	39	0.80	3.00	59	1.20	4.54

[a]Core includes N MN Drift and Lake Plains, MN & NE Iowa Morainal, and Lake Aggasiz, Aspen Parklands

[b]Exterior includes W/S Superior Uplands, N Superior Uplands, and N MN & Ontario Peatlands.

[c]49 resurvey plots, 2009 resample plots are also included in the core numbers for 2009.

[d]The number of indicated breeding pairs (IBP) is the sum of the pairs, lone males, and males in flocks of 2–5 birds.

[e]Total number of ring-necked ducks counted during the survey (excluding lone and flocked females).

[f]These naïve calculations of density (*n* /plots) are not directly comparable with the weighted density estimates presented in Table 3.

Table 3. Breeding population (BPOP) and indicated breeding pair (IBP) estimates for ring-necked ducks on habitat class 1 and 2 areas in portions of Minnesota, 2006-2013.

		Plots		Indicated Breeding Pairs (IBP)				Breeding Population (BPOP)			
Area	Year	N	n	IBP/plot	SE	IBP	SE	BPOP/plot	SE	BPOP	SE
Core[a]	2006	11,046	117	0.892	0.213	9,850	2,348	1.978	0.456	21,850	5,040
	2007	11,046	117	0.788	0.157	8,700	1,729	1.617	0.316	17,860	3,487
	2008	11,046	174	0.855	0.143	9,440	1,582	1.764	0.293	19,490	3,240
	2009	11,046	174	0.991	0.141	10,950	1,562	2.069	0.310	22,850	3,422
	2010	11,046	222	0.483	0.098	5,340	1,082	1.020	0.220	11,270	2,433
	2011	11,046	225	0.942	0.120	10,410	1,325	1.997	0.250	22,060	2,764
	2012	11,046	234	1.052	0.166	11,620	1,833	2.137	0.332	23,610	3,664
	2013	11,046	161	0.771	0.172	8,510	1,898	1.656	0.360	18,300	3,971
Exterior[b]	2006	8,816	83	0.558	0.128	4,920	1,127	1.222	0.297	10,770	2,620
	2007	8,816	83	0.463	0.165	4,080	1,457	0.926	0.331	8,160	2,915
	2013	8,816	82	0.357	0.138	3,150	1,219	0.714	0.276	6,300	2,438
All	2006	19,862	200	0.744	0.131	14,770	2,604	1.642	0.286	32,620	5,680
	2007	19,862	200	0.644	0.114	12,790	2,261	1.310	0.229	26,030	4,545
	2013	19,862	243	0.587	0.114	11,660	2,256	1.238	0.235	24,590	4,660
Resample[c]	2009	174	49	0.898	0.267	44	-	1.796	0.534	88	-
	2010	49	49	0.857	0.302	42	-	1.714	0.604	84	-
	2011	49	49	1.102	0.382	54	-	2.204	0.764	108	-
	2012	49	49	0.673	0.201	33	-	1.633	0.611	80	-
	2013	49	49	0.796	0.272	39	-	1.592	0.543	78	-

[a]Core includes N MN Drift and Lake Plains, MN & NE Iowa Morainal, and Lake Aggasiz, Aspen Parklands

[b]Exterior includes W/S Superior Uplands, N Superior Uplands, and N MN & Ontario Peatlands.

[c]49 resurvey plots, 2009 resample plots are also included in the core numbers for 2009.

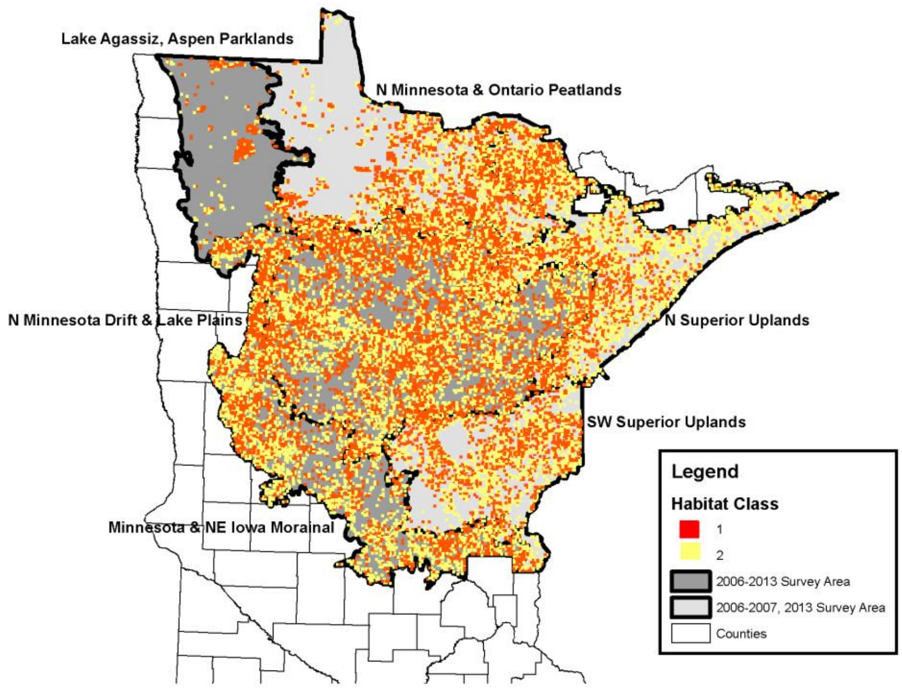
Table 4. Number of ring-necked duck indicated breeding pairs (IBP) and breeding population (BPOP) counts on plots surveyed during both 2007 and 2013 ring-necked duck breeding pair surveys.

	N observed by year			
	IBP[a]		BPOP[b]	
ECS Section	2007	2013	2007	2013
Lake Agassiz, Aspen Parklands	6	4	12	8
Minnesota & NE Iowa Morainal	19	11	38	22
N. Minnesota & Ontario Peatlands	9	11	18	22
N. Minnesota Drift & Lake Plains	61	73	125	159
Northern Superior Uplands	12	18	24	36
Western (& S.) Superior Uplands	6	0	12	0
Total	113	117	229	247

[a]Indicated breeding pairs (IBP) is the sum of the pairs, lone males, and males in flocks of 2–5 birds.

[b]Breeding population is IBP * 2 + ducks in groups.

A



B

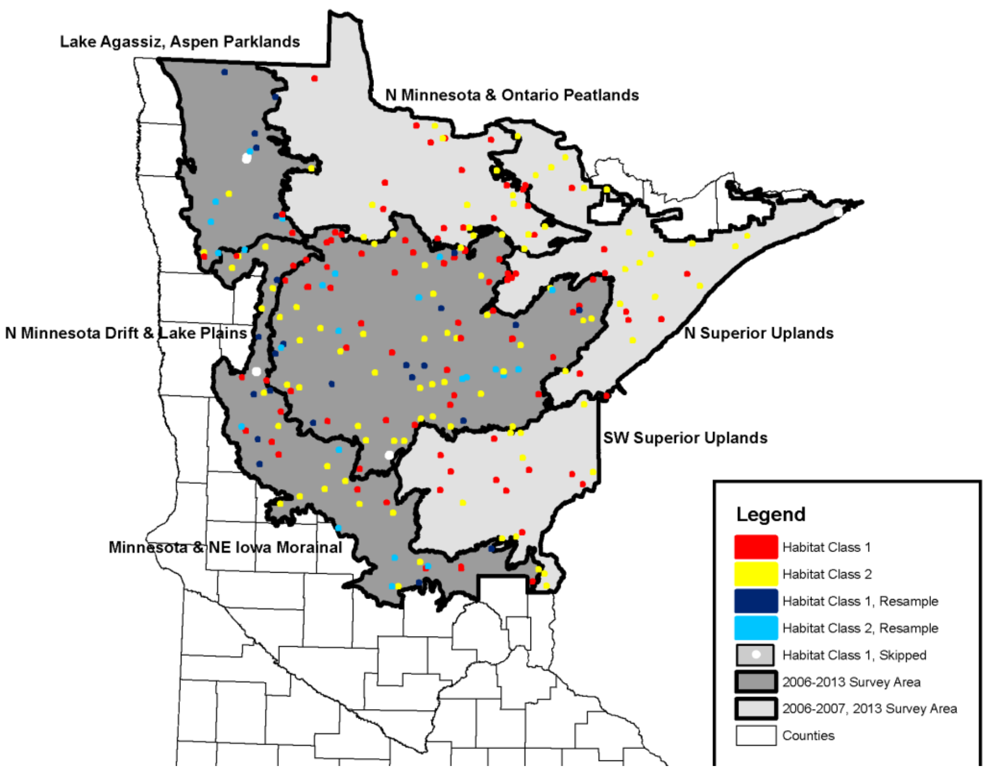


Figure 1. (A) Sampling frame showing Habitat Class 1 and 2 Public Land Survey plots for the ring-necked duck breeding pair survey, 2006-2013, and (B) random, resample, and skipped plots surveyed in 2013 (enlarged for visibility) by Habitat Class.

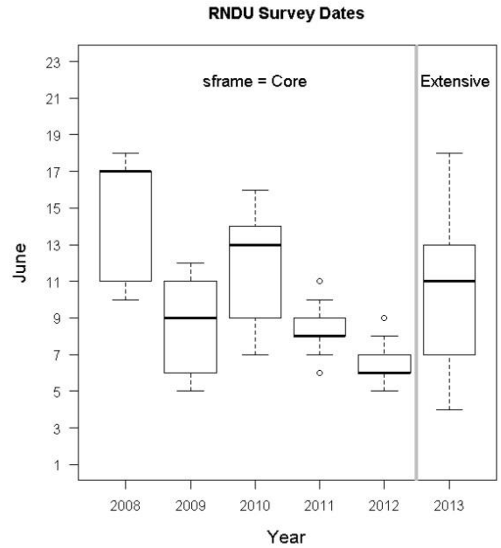


Figure 2. Box plot showing dates ring-necked duck breeding pair survey plots were completed, 2008-2013. Note that in 2013 both the core and exterior survey areas was flown, but included a similar number of survey plots.

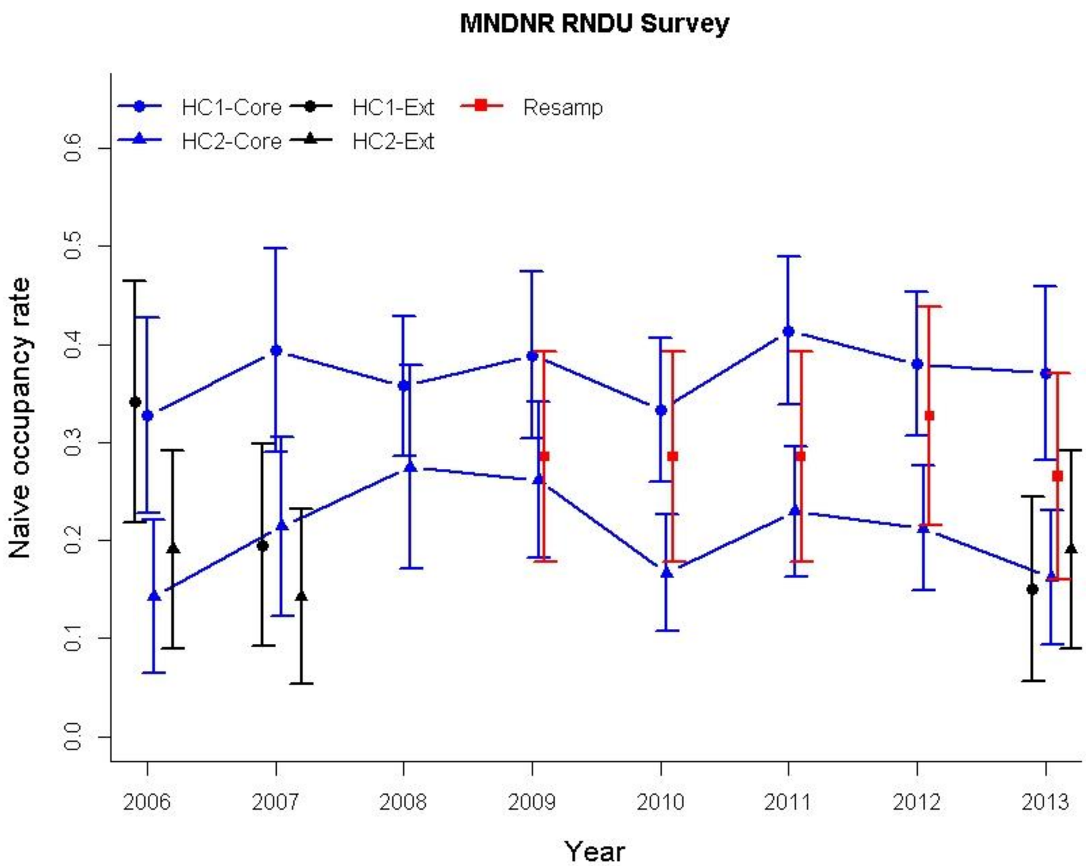


Figure 3. Proportion of occupied plots (naïve occupancy rate is unweighted number of occupied plots/total plots surveyed) by Habitat Class during the 2006-2013 ring-necked duck breeding pair surveys for the Core, Exterior (Ext), and resample survey plots.

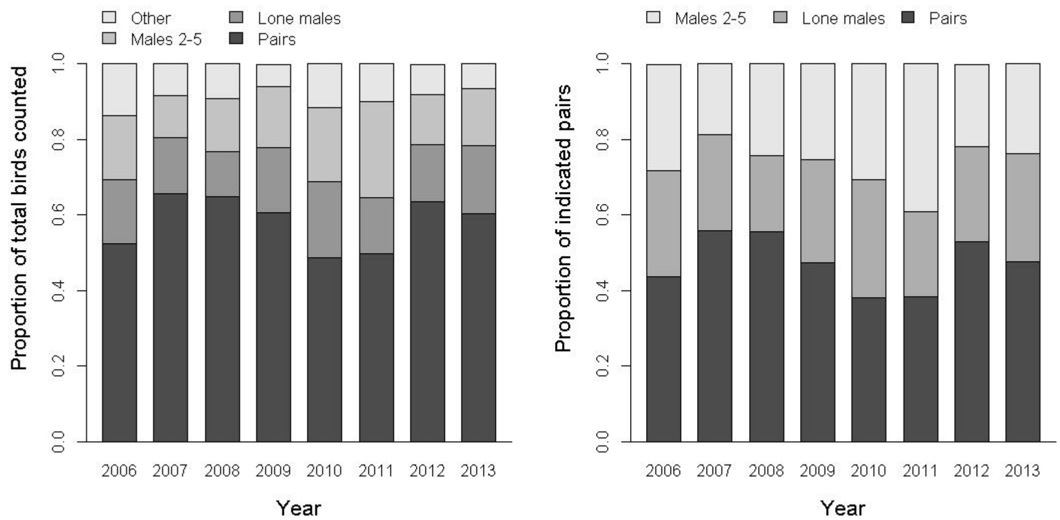


Figure 4. Social grouping of ring-necked ducks counted on 2006-2013 ring-necked duck breeding pair surveys for all ducks counted (left panel) and indicated breeding pairs (right panel).

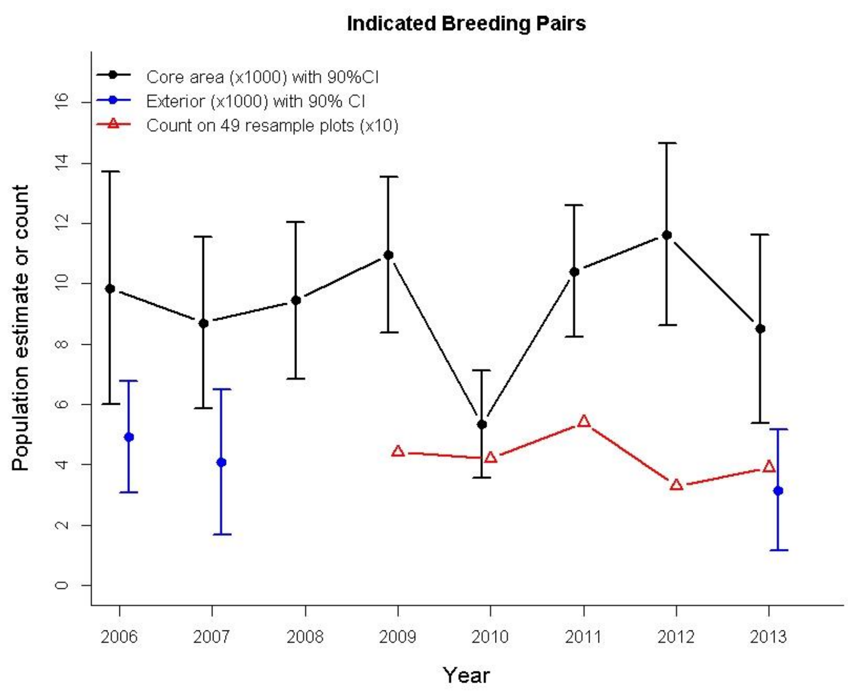


Figure 5. Estimated indicated breeding pairs with 90% Confidence Intervals for the for the core and exterior survey areas (x1000) during the Minnesota ring-necked duck breeding pair survey, 2006–2013. Counts for the 49 resample plots (x10) are also shown.

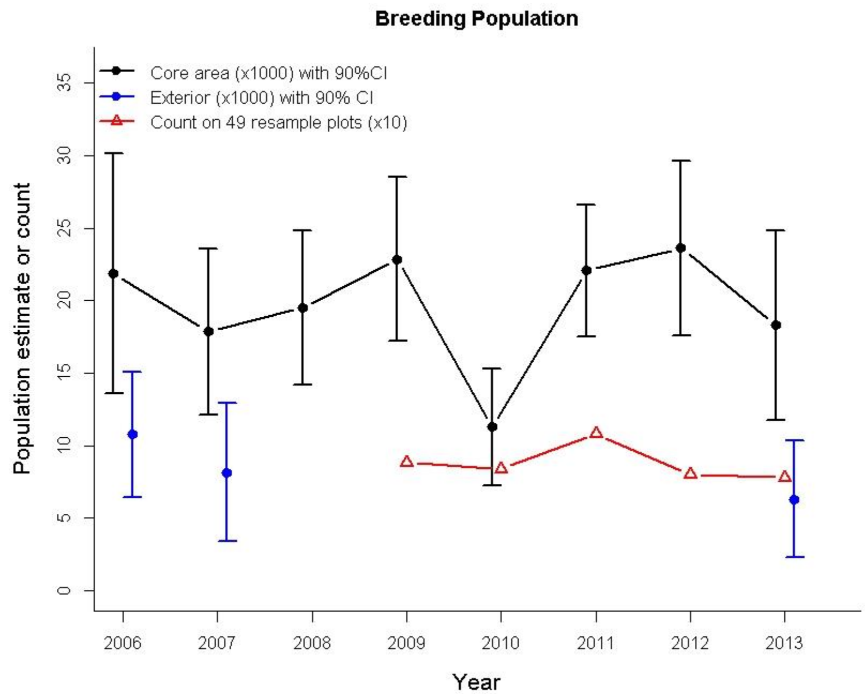


Figure 6. Estimated breeding population with 90% confidence intervals for the for the core and exterior survey areas (X1000) during the Minnesota ring-necked duck breeding pair survey, 2006–2013. Counts for the 49 resample plots (x10) are also shown.

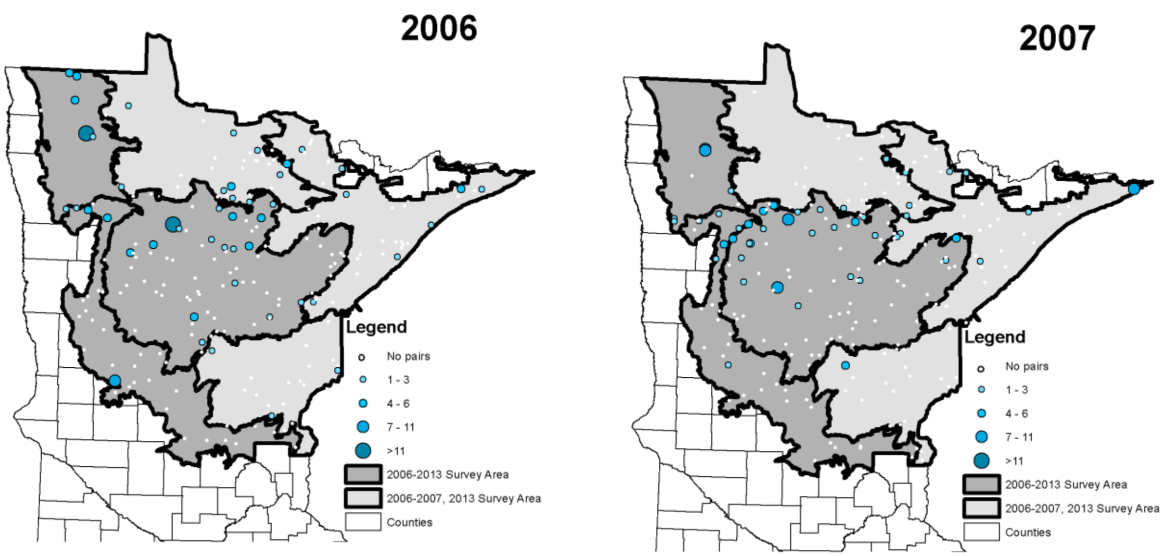


Figure 7. Ring-necked duck survey plots in Habitat Classes 1 and 2 and number of indicated breeding pairs/plot during annual ring-necked ducks breeding pair surveys in northern Minnesota, 2006-2013.

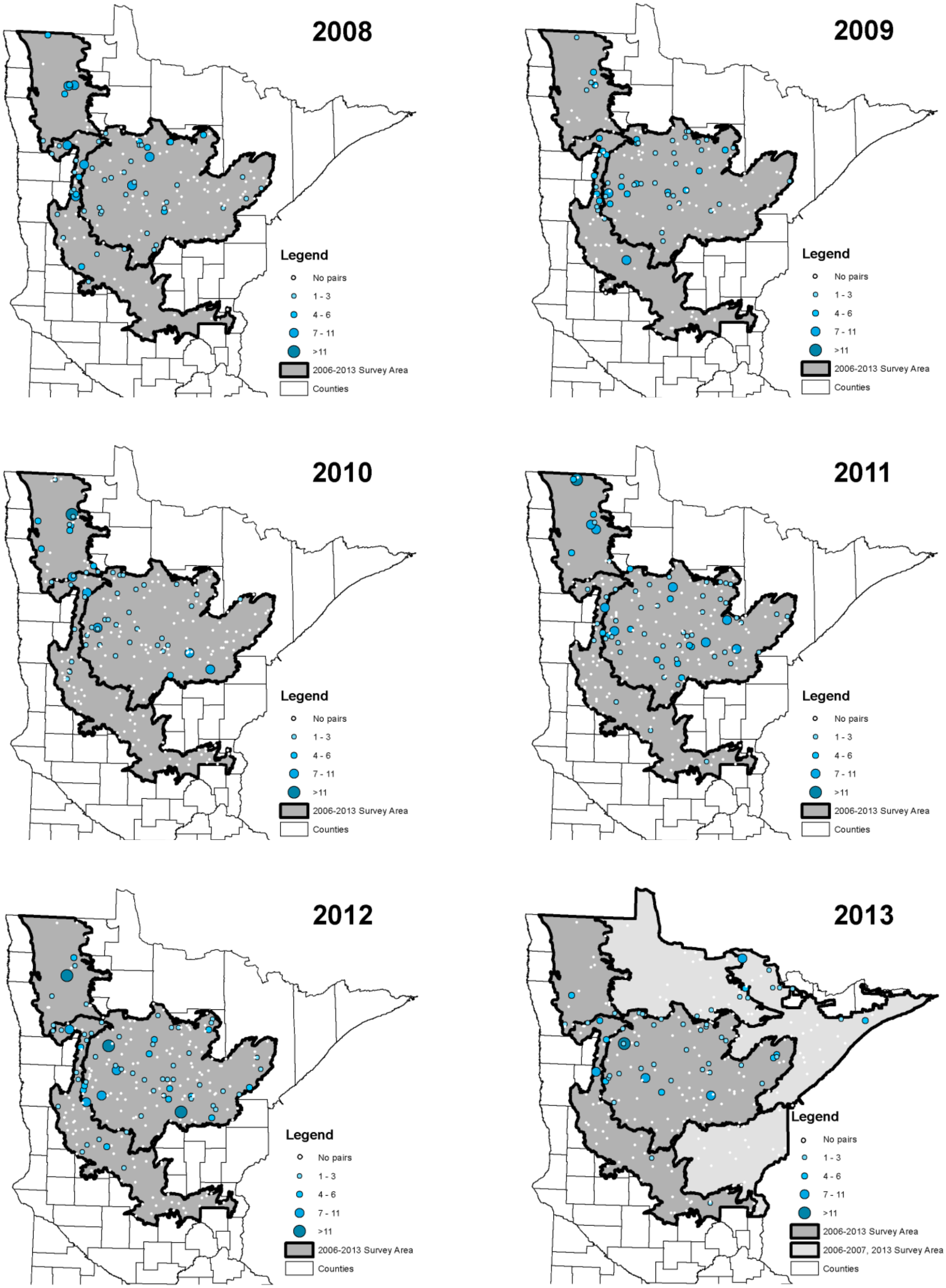


Figure 7 (continued).

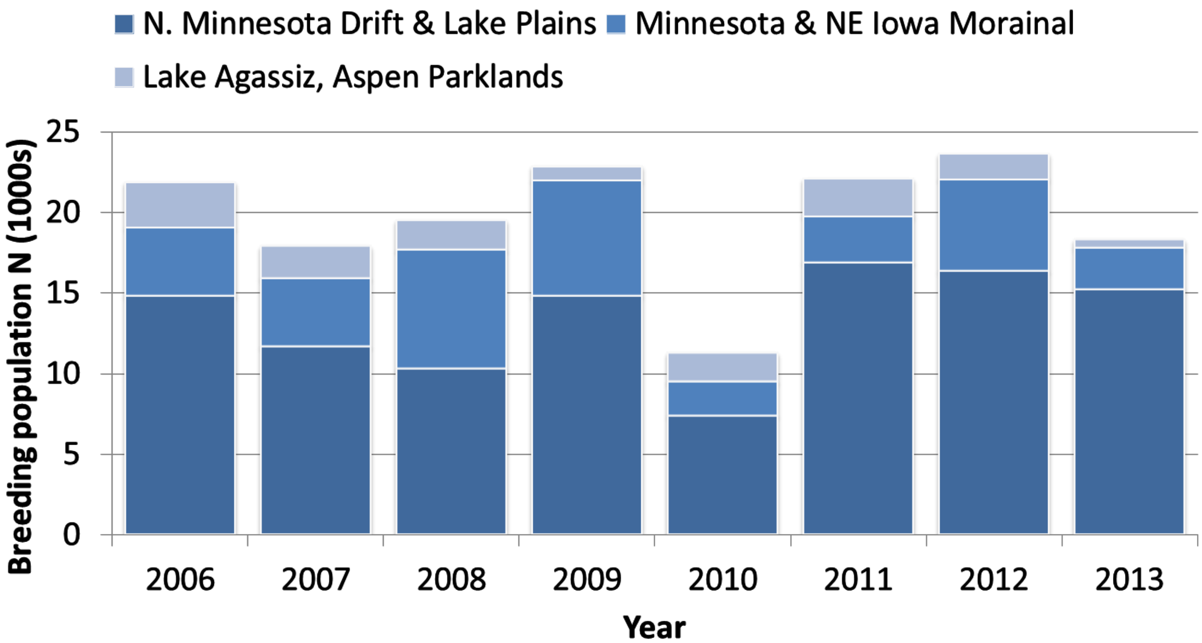


Figure 8. Estimated ring-necked duck breeding population in 3 Ecological Classification System Sections, Habitat Classes 1 and 2, during annual June ring-necked ducks breeding pair surveys in northern Minnesota, 2006-2013.

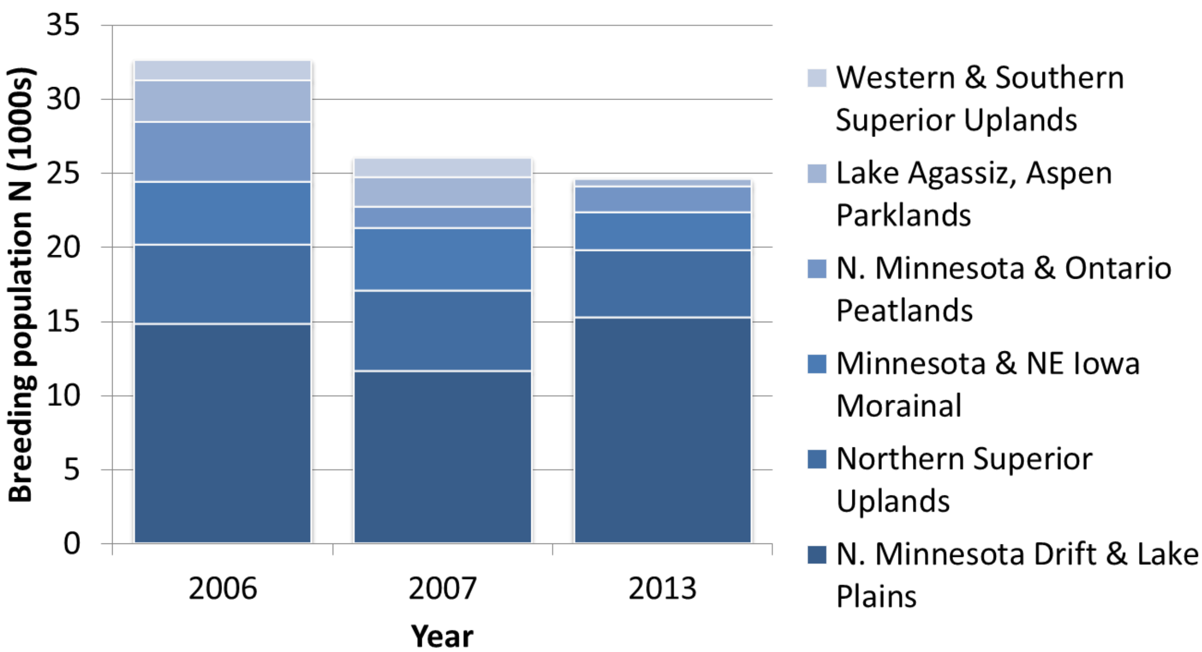


Figure 9. Estimated ring-necked duck breeding population in 6 Ecological Classification System Sections, Habitat Classes 1 and 2, during annual June ring-necked ducks breeding pair surveys in northern Minnesota, 2006, 2007, and 2013.

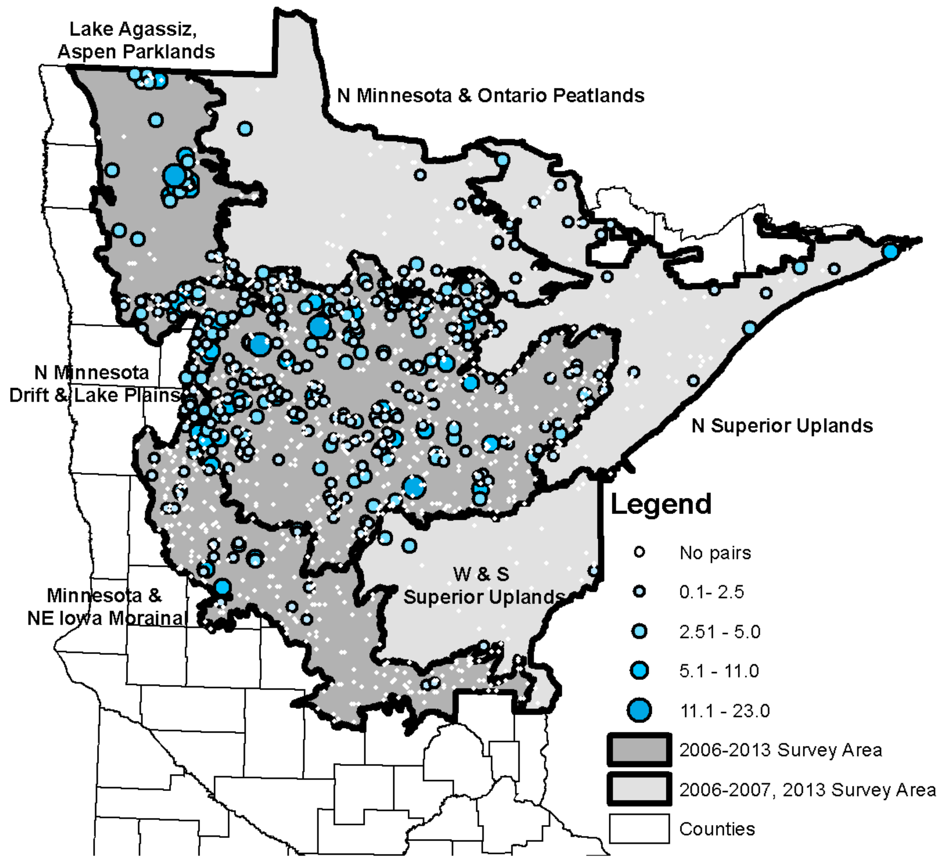


Figure 10. Sample plot locations and number of indicated breeding pairs observed/plot on the Minnesota ring-necked duck breeding pair survey, June 2006-2013. Value is average number of IBP per year for plots surveyed > 1 year. White circles indicate plots where no indicated pairs were seen.

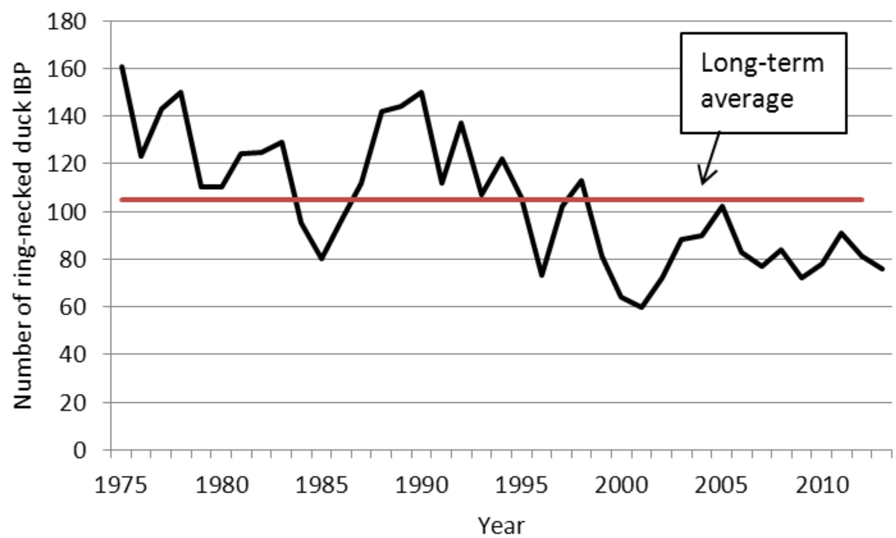


Figure 11. Number of ring-necked duck Indicated Breeding Pairs (IBP) observed on 14 lakes in north central Minnesota, 1975-2013 (Lawrence 2011, MNDNR unpublished data).

ESTIMATING NUMBERS OF BREEDING SANDHILL CRANES IN NORTHWEST MINNESOTA - 2013

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SUMMARY

In 2013, we conducted the 2nd year of a sandhill crane (*Grus canadensis*) breeding population survey in northwest Minnesota. Based upon results from the 2012 survey, we excluded the portion of the Red River Prairie Ecological Classification System (ECS) Subsection that was within the Northwest Goose and Sandhill Crane Hunting Zone (NWGCZ). We then used the same sampling frame of 4-km^2 plots that was created by GIS in 2012. We did not survey plots with no potential crane breeding habitat. We used a generalized random-tessellation stratified (GRTS) design to select a spatially balanced sample of 115 plots. We surveyed each sample plot once during 17-23 May 2013 using a Bell OH-58 helicopter with a 2-person crew. We counted and classified all crane observations in each plot based on their social status (individuals, pairs, groups) and evidence of breeding status (e.g., nest, colts, territorial behavior).

We estimated there were 5,550 sandhill cranes (SACR) in the Aspen Parkland and some adjacent areas within the NWGCZ compared to 7,710 SACR in the same survey area in 2012. In 2013, there were an estimated 950 breeding birds, 2,310 birds in groups, and 2,290 cranes whose breeding status was unknown (i.e., singles or pairs observed without a nest or young and not exhibiting territorial or defense behavior). We will use data obtained in 2012 and 2013 to improve survey stratification and design in 2014.

INTRODUCTION

SACR in northwest Minnesota are part of the mid-continent population, which is hunted in Canada and several Central Flyway states (Central Flyway Webless Migratory Bird Technical Committee 2006). In 2010, Minnesota began a hunting season on SACR in the NWGCZ (Figure 1). The majority of midcontinent SACR harvest in other states and provinces occurs on migration, staging, and wintering areas (Krapu et al. 2011), yet in northwestern Minnesota, harvest was comprised of local breeding cranes and likely migrant cranes from elsewhere. We previously reviewed the history and status of SACR and the hunting season (Lawrence et al. 2012). There were some indications that harvest on Minnesota-breeding SACR was greater than expected (Lawrence et al. 2011); thus, in 2012, we conducted a pilot survey of breeding SACR in northwestern Minnesota.

When we began the survey, there was no template for a large-scale, aerial survey specifically designed for breeding SACRs. Thus, we proposed conducting a pilot survey for three years to provide sufficient information for making intelligent survey-design choices, including developing and evaluating a stratification scheme (e.g., Zicus et al. 2008), answering questions about bias-precision-cost tradeoffs (e.g., Giudice et al. 2010), and identifying important sources of variation in estimates of abundance and population trends (Thompson et al. 1998:149).

In 2012, we stratified 4 km^2 plots in the NWGCZ and adjoining Aspen Parkland Habitat based upon amount of expected crane nesting habitat in each plot (Lawrence et al. 2012), and surveyed 60 plots in more likely crane nesting habitat (mostly associated with the Aspen Parkland (Figure 2) and 30 plots in less likely habitat, which was mostly associated with the Red River Valley. We also surveyed one 100-km^2 plot in an area with previous records of nesting cranes. We did not survey plots that were not expected to have any cranes. We estimated there were 7,210 cranes in the survey area and that 96% of the cranes were associated with plots that contained potential nesting habitat (Figure 3). However, there was not a strong relationship between the amount of crane nesting habitat and the number of cranes/plot.

For the second year of this pilot survey, we used results from 2012 to modify the survey area and focus on parkland habitat where most of the breeding cranes were located. The survey was designed to provide an estimate of the number of breeding cranes in northwest Minnesota that was within ±25% of the true population size with 90% certainty (i.e., if we could replicate the sample survey many times, 90% of the population estimates will be within ±25% of the true population size).

The breeding population size estimates obtained from this survey, combined with data on crane harvest, harvest derivation, and other parameters will allow us to better manage hunting of cranes in northwest Minnesota and may provide insights to hunting cranes in other portions of their breeding range. The survey design will also provide the potential to monitor breeding crane populations in other areas, e.g. east-central Minnesota.

Here, we describe modifications to the survey sampling scheme in 2013, present population estimates, and discuss plans for the 2014 survey.

STUDY AREA

In 2012, we selected the NWGCZ and portions of the Aspen Parklands ecological subsection that extended beyond the NWGCZ as our primary sampling frame (Figure 2). This included the Aspen Parklands ecological subsection, northwestern portions of the Red River Prairie Subsection, and a small portion of the Agassiz Lowlands subsection.

In 2013, we reduced the size of the survey area to only include plots in the Aspen Parkland ECS subsection and the small area of Agassiz Lowland subsection that was contained in the NWGCZ. We did not survey any plots in the Red River Prairie ECS Subsection. While there are a few Stratum 2 plots (some nesting cover) and several Stratum 3 plots (no nesting cover, but other possible habitat) in this subsection, based on the plots flown in 2012, we believe the likelihood of finding nesting cranes in this area was low (only 2 SACR observations in 2012).

METHODS

Sampling frame

We used ArcGIS 10.1 (Environmental Systems Research Institute, Redlands, CA) to develop an overlay grid of 4-km^2 plots for the northwestern Minnesota study area (Figure 2). The grid was rotated approximately 2.5 degrees east to orient it with Public Land Survey (PLS)-based features such as roads and property boundaries. We treated 4-km^2 plots as the primary sampling unit (PSU) and excluded any PSUs not located entirely within the boundary of the SACR survey area (Figure 2).

Sampling design

We used descriptions of crane nesting habitat in northwest Minnesota (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008) and 2006 National Land Cover Data (NLCD) (Fry et al. 2011) to identify potential nesting cover. We defined potential nesting cover as NLCD cover type 95 (emergent herbaceous wetland).

We used NLCD to quantify the amount (m^2) of potential SACR habitat in each 4-km^2 plot. NLCD is a Landsat-based, 30-meter resolution, land cover database created by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of Federal agencies led by the U.S. Geological Survey (USGS National Land Cover Database). We used the same definition of SACR habitat in 2012 and 2013. We defined "SACR nesting habitat" as NLCD cover class 95 (emergent herbaceous wetland) and "other SACR habitat" as NLCD cover classes 11 (open water) and 90 (woody wetlands). We then classified each 4-km^2 plot into 4 categories:

NLCD-1: $\geq$ median amount of nesting habitat,

NLCD-2: 0 < m^2 of nesting habitat < median,

NLCD-3: nesting habitat = 0 but other SACR habitat > 0,

NLCD-4: no SACR habitat.

In 2012, the NLCD plot classifications were strongly correlated with ecological subsections (Figure 2). Therefore, we stratified the sampling frame (4-km^2 plots) into 3 strata:

1. NLCD12 plots – Stratum 1 and 2 plots; 71% of sampling frame; mostly associated with Aspen Parklands and Agassiz Lowlands.
2. NLCD3 plots – 11% of sampling frame; mostly associated with Red River Prairie.
3. NLCD4 plots – 18% of sampling frame; mostly associated with Red River Prairie.

We assumed that SACR density in the NLCD4 stratum was very low (approaching zero) and did not sample stratum NLCD4. Likewise, we expected SACR density to be low (but > 0) in the NLCD3 stratum. For NLCD12 and NLCD3 strata in 2012, we drew a spatially-balanced, Generalized Random-Tessellation Stratified (GRTS) sample (Stevens and Olsen 2004) with n = 60 (sampling rate = 2.2%) and 30 (sampling rate = 7.3%), respectively. We sampled the NLCD3 stratum at a higher rate to ensure we had a sufficient sample size to evaluate the feasibility of estimating SACR numbers in this low-density stratum. We also surveyed a 100-km^2 block (n = 25 4-km^2 plots) to better examine distribution of cranes within a specific area. Thus, the total sample size in 2012 was 115 4-km^2 plots (Table 2, Figure 3).

The 2012 results indicated that few cranes used habitats in the Red River Prairie in May (Figure 3); thus, we chose to exclude this area from the 2013 survey. We decided to include the 95 Stratum 3 plots in the reduced survey area in the sample of plots, but not survey the 74 Stratum 4 plots in this area. In 2013, we used the GRTS design to select 115 plots from within all the Aspen Parkland ECS subsection and parts of the Agassiz Lowlands subsection within the NWGCZ. We surveyed plots within Stratum 1, 2, and 3 combined, without further stratification. We also recalculated the 2012 estimates based upon the 2013 sample frame.

Target population(s)

In 2013, we chose to not survey the Red River Prairie, thus we did not have an estimate of cranes for the entire NWGCZ and adjacent parkland habitats. However, 2012 results suggest that the area we surveyed in 2013 provides a good approximation of the total number of cranes in the zone. As in 2012, separating breeding and non-breeding components of the population was problematic. We recorded crane observations as singles, pairs, and groups. Groups of SACR likely contain mostly non-breeders (subadults, non-territorial adult birds, and, possibly, failed breeders), whereas the breeding status of singles and pairs is more difficult to determine (Hayes and Barzen 2006). Therefore, for the purposes of this survey, we classified crane observations as follows:

1. *Breeding birds* = singles or pairs that were observed with a nest or young, or birds that were suspected of having a nest or young (but it was not detected) based on their behavior (reluctance to fly or leave the area, broken-wing displays, etc.).
2. *Groups* = flocks of $\geq$3 cranes.
3. *Status unknown* = singles or pairs whose breeding status could not be determined (e.g., nest or young was not detected, and did not exhibit any territorial or defense behavior).

For population estimates, we considered doubling observations of single 'breeding' birds (e.g., similar to indicated pairs in waterfowl surveys), but this could result in a positive bias for the estimate of breeding birds. For example, if single breeding birds were truly paired and their mate was missed (not detected) because it was located off the survey plot, then the missed mate is accounted for when we expand the counts for sampling (i.e., it is not necessary to double the observed count). Conversely, if the mate was on the plot but was not detected, then doubling the observed count is equivalent to applying a sightability correction factor = 2 for single crane observations. In reality, both cases likely occurred and we could not distinguish between them. Therefore, we used a conservative approach when estimating population size by taking observations of single birds at their face value (i.e., count = 1) regardless of their breeding status.

Survey Procedures

The survey was conducted during mid-May, which is the peak incubation period for cranes in northwest Minnesota (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008). All plots were surveyed using Bell OH-58 [Jet Ranger] containing a pilot and one observer. Surveys were flown at 5-45 meters above ground level and from 10-100 km/hr, depending upon the cover. Observations were recorded in digital voice files, each associated with a UTM location, on a tablet computer using the DNRSurvey software program developed by Minnesota DNR Wildlife and GIS staff (Wright et al. 2011).

RESULTS

Survey effort

The survey was conducted over 3 days (17, 22, 23 May), averaging 38 plots/day (range: 27-47). The survey team (DNR pilot John Heineman and observer Jeff Lawrence) conducted surveys (plots, transit, and refuel time included) an average of 10 hr/day (range: 7.3-11.6 hr) and spent an average of 7 min surveying a plot (range: 2-14 min) (Table 1). Total transit time averaged 5 min/plot. Refueling time averaged 40 min/stop (including an estimate of 30 minutes for end-of-day refueling) with typically 3 stops required for a full day of surveys. Average total time (survey + transit + refueling) per plot was 15.6 min. Forty-three percent of total survey effort (total minutes; all activities) in 2013 was associated with surveying plots, 34% with transit time, and 23% with refueling stops.

Sampling statistics

We detected SACR on 49 (43%) of the 115 sample plots (Table 2). The average count per occupied plot was 4.4 birds (SE=1.1, range: 1 to 46). We counted 216 SACR on sample plots, of which 43% were pairs, 16% were singles, and 42% were groups (Table 3). We observed 8 groups, which ranged in size from 3 to 43 birds. Twenty-nine percent of observed pairs and singles exhibited some evidence of being breeding birds (30% of pairs and 26% of singles; Table 3). We detected 20 nests, and eggs were observed at 17 nests (the status of the other 3 nests could not be determined). Crane observations were distributed throughout the survey area (Figure 4).

Population estimates

The estimated total number of cranes in the survey area was 5,550 (90% CI: 3,580–7,510) compared to 7,710 (90% CI: 4,520–10,900) in 2012 (Table 4). This is a minimum estimate because we did not adjust for detection probabilities (which are likely <1, at least for singles and pairs in dense cover). If our sample of singles and pairs exhibiting breeding behavior was representative of the relative abundance of breeding birds in the target population, then we estimated there were a minimum of 950 (90% CI: 690-1,210) breeding birds in the survey area, and another 2,290 (90% CI: 1,760-2,810) singles and pairs whose breeding status was uncertain (Table 4).

As in 2012, the bound on the estimated total (all strata) was greater (CV = 22% and relative bound = 35%) than the usual target level for a Minnesota Department of Natural Resources (MNDNR) wildlife survey (i.e., CV = 15% and relative bound = 25%), which partly reflects the influence of 1 extremely large plot count (46 birds) on the estimated population variance. The estimated CV for breeding birds and status-unknown birds was reasonably good (≤17%; Table 4).

Habitat associations

We did not stratify the plots by amount of potential crane habitat in 2013 because we saw little benefit to this during the 2012 survey (Lawrence et al. 2012). In 2013, there were only weak relationships between plot counts (total birds or breeding birds) and amount of potential nesting cover as defined by NLCD and GAP cover data (Figure 5). We used the same definitions for GAP cover as we used in 2012 (Lawrence et al. 2012).

DISCUSSION

Survey Effort and Design Considerations

We completed the survey in only 3 days compared to 7 days in 2012. This was in part due to the reduced survey area, but was also due to flying longer each day due to other scheduling conflicts. We determined the number of plots to survey in 2013 based upon time to survey plots in 2012 and estimated we would fly the plots in 35 hours. However, we actually flew all 115 plots in 28 total hours of helicopter time compared to 37 hours in 2012.

We began the survey on 17 May 2013, later than the 15 May survey completion date in 2012. 2013 was characterized by a late spring and near record late ice out on Minnesota lakes (2013 Ice-out summary). This was in contrast to the near record early spring in 2012 (Record Warm Spring: 2012). In 2012, we observed some colts even though we began the survey 1 week earlier than scheduled and 10 calendar days earlier than in 2013. We did not observe any colts in 2013 and believe our survey timing was good and likely near mid-incubation.

We flew one day (17 May) and then rainfall (~7.4 cm in Thief River Falls) caused us to delay the survey until 22 May. The landscape changed dramatically during this period, with standing water in many fields, flooded rivers, and likely increased water levels in many wetlands when we resumed the survey (Figure 6). We suspect some nests were flooded. Conditions were wetter than the extremely dry conditions observed during the 2012 survey.

Population Estimate

The number of cranes was not different between 2012 and 2013 although the point estimate declined by 28% (95% CI =-62% to +38%). Generally, precision of our aerial breeding population surveys (e.g. May waterfowl, Canada goose) is not adequate to determine annual changes to populations, but the surveys provide guidance on long-term population trends. For the SACR survey, we would need approximately a 50% change in the breeding population or a 40% change in the breeding pair estimate to detect a difference between years. This was only the second year of the crane survey, thus we do not know how much annual variability in population estimates we will observe. The late spring chronology may have influenced the estimate too. The 2013 Minnesota Canada goose population estimate was 250,600, 40% less than the 2012 estimate (416,200); yet, this decline may have been due to survey conditions during the late spring rather than an actual decline in the population (Rave 2013). It is possible the decline in the point estimates observed in crane population size was also partially due to spring phenology. Future surveys will provide insights on changes in estimates of population size and whether there is a trend.

We reduced the size of the survey area to what we believe, and the 2012 survey supported, was the core SACR breeding habitat in the Northwest Crane Zone. While there were a few nesting birds in the Red River Prairie Subsection in 2012, they accounted for 290 of the 7,200 birds estimated last year (Lawrence et al. 2012). We do not know how strong the affinity is for nonbreeding birds to be associated with SACR nesting habitat that we used to select the survey plots. We did not record any flocks in the Red River Prairie in 2012, but it is possible that nonbreeders may use these agricultural habitats. We suspect there may have been a reduced nesting effort in 2013 due to the delayed spring, and a larger proportion of the population may have been nonbreeders. This was evident in Minnesota's Canada goose breeding population (Rave 2013); however, the timing of goose nesting is earlier than SACR nesting. We note that in 2012, we questioned if some birds had foregone nesting due to the extremely dry conditions.

Even though we reduced the size of the area surveyed, our estimate of SACR for 2012 in the new area was 7,710 compared to 7,210 for the larger area we presented in 2012 (Lawrence et al. 2012). This was because we expand counts by area surveyed and in the Red River Prairie we had many plots with few birds. When we excluded this area, our estimates actually increased, although the area was reduced. The stratified mean increased from 2.3 birds/plot in the estimate previously reported (Lawrence et al. 2012) to 2.6 birds/plot in the reduced sample frame reported here.

Our estimates of breeding and status unknown birds was reasonably precise (CV% $\leq$ 17%). Much of the variability in the population estimates is due to the groups that tend to use agricultural fields, thus their distribution on the landscape is difficult to predict relative to nesting cranes. As in 2012, we had one plot with a large count of cranes (n=43) that accounted for 48% of all birds observed in groups. We also had a plot with 28 birds in groups (flock of 11 and 17); but only 5% of all the plots had groups present. In 2012, one plot contained 42% of the cranes in groups. As noted in 2012, if the sample does not include a plot(s) with a large group, the number of birds in groups would probably decline (Lawrence et al. 2012). We may consider using breeding and status unknown birds (singles and pairs) to provide a better index of the status of population trends in the future.

As in 2012, we suspected most of the unknown-status pairs were likely nonbreeders, although some may have been failed nesters. Some nests were likely flooded with the increase in water levels following the rainfall during the 2013 survey. A portion of the unknown-status singles likely had a mate on an undetected nest. All 9 singles recorded as breeders were observed on a nest and it is likely that these birds had an undetected mate in the vicinity, although some may have been off plot. There were no other singles on any of these plots that could have been mates.

Evaluation of sampling design

Similar to the previous year, post-hoc stratification analyses of plot counts suggested that NLCD was not a very effective stratification variable, although there was a weak positive correlation (Figure 5). Additional cover attributes may be needed to increase stratification effectiveness. For example, many crane observations were in or adjacent to agricultural fields (e.g., feeding sites). Thus, developing an effective stratification scheme for the SACR survey may require a more sophisticated suite of habitat metrics.

We have UTM coordinates of crane nests and approximate locations of crane observations, which will allow us to examine NLCD habitat associations at finer scales (e.g., 1-km^2 subplot) and explore the utility of using other land-cover data sources to stratify the sampling frame. Our efforts to stratify were based upon potential nesting cover, which may not reflect the distribution of nonbreeding cranes. Many of these birds were observed in agricultural habitats.

We will further evaluate the habitat associated with crane observations and consider other options for improving the survey prior to next year. We plan to fly the survey again in May 2014.

ACKNOWLEDGEMENTS

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Table 1. Summary of survey effort (minutes) by activity for an aerial survey of sandhill cranes in Minnesota, May 2012 and 2013.

		Survey time			Transit time				Refueling stops				Total time[a]	
Year	Stratum	Total minutes	Plots	Min/ plot	Total minutes	Number transits	Min/ transit	Min/ plot	Total minutes	Number stops	Min/ stop	Min /plot	Total minutes	Min/plot
2012	NLCD-123	822	90	9.1	663	104	6.4	7.4	482	13	37.1	5.4	1,967	21.9
	EspTwp	310	25	12.4	16	6	2.7	0.6	97	3	32.3	3.9	423	16.9
	All	1,132	115	9.8	679	110	6.2	5.9	579	16	36.2	5.0	2,390	20.8
2013	All	766	115	6.7	620	125	5.0	5.4	405	10	40.5	3.5	1,791	15.6

[a]excludes visibility surveys conducted in 2012.

Table 2. Sampling statistics [a] for an aerial survey of sandhill cranes in northwestern Minnesota, May 2012 and 2013.

								Counts/occupied plot				
Year	*n* strata	Sampling allocation	nh	Nh	srate	n.occ	p.occ	min	max	med	mean	SD
2012	3	~Optimal	89	2,953	0.030	47	0.529	1	43	2	4.94	0.940
2013	1	SRS	115	2,953	0.039	49	0.426	1	46	2	4.41	1.062

[a]nh = sample size (4-km^2 plots), Nh = stratum size, srate = sampling rate, n.occ = number of “occupied” plots (>1 sandhill crane detected), p.occ = proportion of plots with >1 crane detected, and count statistics for “occupied” plots.

Table 3. Social and breeding classification of sandhill crane observations, 2012 and 2013.

	2012[b]			2013		
Social class[a]	Count	Percent of total	Percent of pairs or singles	Count	Percent of total	Percent of pairs or singles
Pairs (x2)	110	46.6		92	42.6	
Breeding birds	46	19.5	41.8	28	13	30.4
Status unknown	64	27.1	58.2	64	29.6	69.6
Singles	37	15.7		34	15.7	
Breeding birds	8	3.4	21.6	9	4.2	26.5
Status unknown	29	12.3	78.4	25	11.6	73.5
Groups	89	37.7		90	41.7	
Total	236	100		216	100	

[a]- Breeding birds = singles or pairs that were observed with a nest or young, or birds that were suspected of having a nest or young (but it was not detected) based on their behavior (reluctance to fly or leave the area, broken-wing displays, etc.); Groups = flocks of >3 cranes; or status unknown = singles or pairs whose breeding status could not be determined (e.g., nest or young was not detected, and did not exhibit any territorial or defense behavior).

[b]-2012 data adjusted to reflect 2013 sampling frame.

Table 4. Population estimates (N) by indicated breeding status for sandhill cranes in northwestern Minnesota, May 2012 and 2013.

Year	Status	Plots surveyed	Total plots	n plots with cranes	Minimum cranes/plot	Maximum cranes/plot	Avg. birds/plot	SE birds/plot	$\hat{N}$	SE	LCB (90%)	UCB (90%)	CV%
2012[a]	Breeding birds[b]	89	2,953	26	1	4	0.5	0.10	1,500	281	1,040	1,960	19
	Groups	89	2,953	9	3	37	1.1	0.56	3,240	1,650	530	5,960	51
	Status unknown[c]	89	2,953	40	1	6	1.0	0.15	2,970	441	2,240	3,690	15
	Total	89	2,953	49	1	43	2.6	0.66	7,710	1,939	4,520	10,900	25
2013	Breeding birds[b]	115	2,953	22	1	2	0.3	0.05	950	158	690	1,210	17
	Groups	115	2,953	6	3	43	0.8	0.38	2,310	1,122	470	4,160	49
	Status unknown[c]	115	2,953	36	1	6	0.8	0.11	2,290	317	1,760	2,810	14
	Total	115	2,953	49	1	46	1.9	0.40	5,550	1,195	3,580	7,510	22

[a] 2012 data adjusted to reflect 2013 sampling frame.

[b] Singles and pairs (x2) with a nest or young, or exhibiting some type of breeding or territorial behavior.

[c] Singles and pairs (x2) without a nest or young, and no behavioral evidence that they were breeding birds.

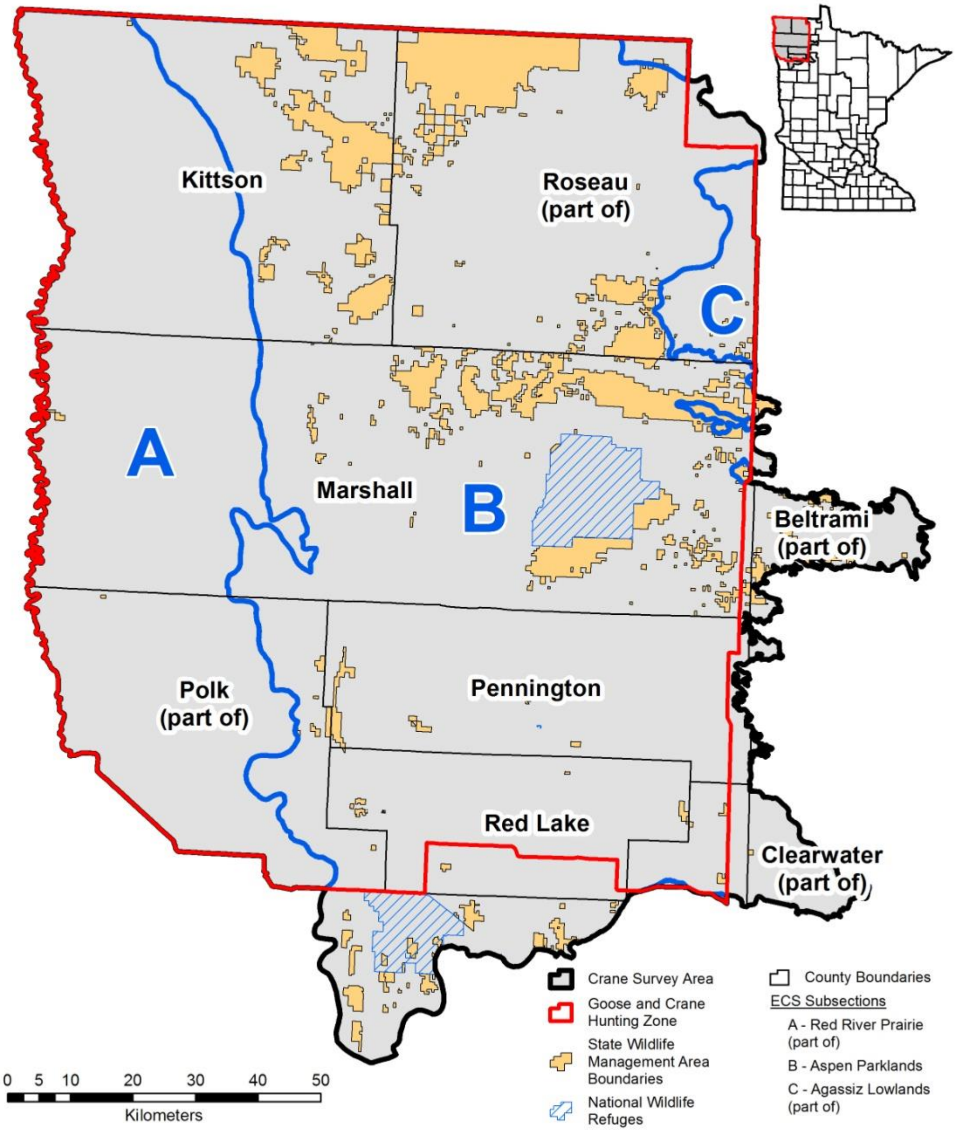

Figure 1 Location of the Northwest Goose and Sandhill Crane Hunting Zone in Minnesota and the sandhill crane survey area. Ecological Classification Area A (Red River Prairie) was not surveyed in 2013.

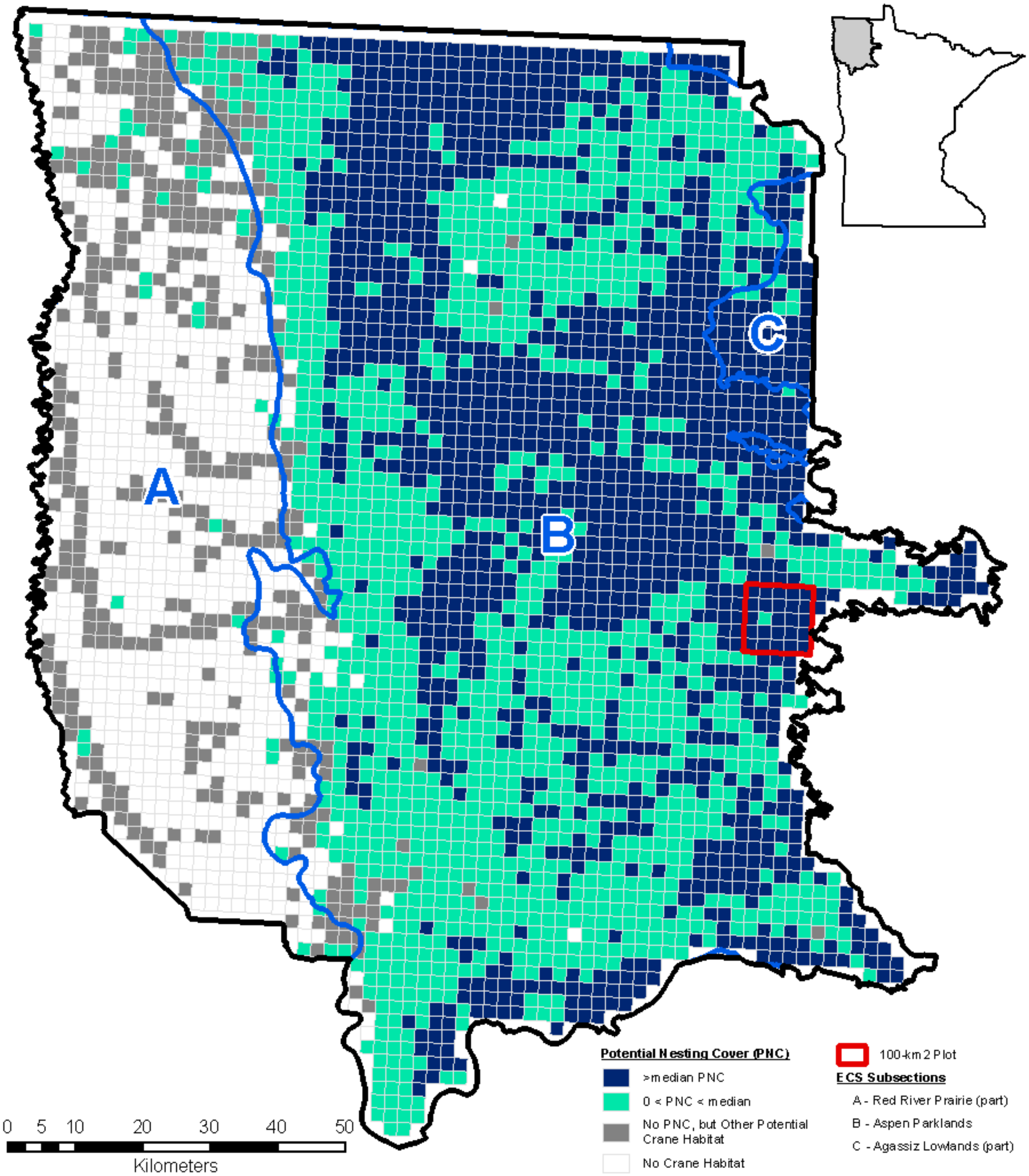

Figure 2. Sampling frame for the spring aerial survey of sandhill cranes, northwestern Minnesota. The primary sampling unit was 4-km^2 plots. Colored squares denote plots by strata as defined by National Land Cover Data: dark blue = NLCD-1 (>median amount of potential crane nesting cover), turquoise = NLCD-2 (0 < potential nesting cover < median), gray = NLCD-3 (no nesting cover but other potential crane cover), white = NLCD-4 (no crane habitat). Black lines denote the boundaries of the survey area and blue lines note boundaries of ecological subsections. In 2012, we selected plots from strata 1-3 in the 3 subsections above (see text). In 2013, we excluded plots in the Red River Prairie ECS Subsection (A above) and did not survey the 100-km^2 plot.

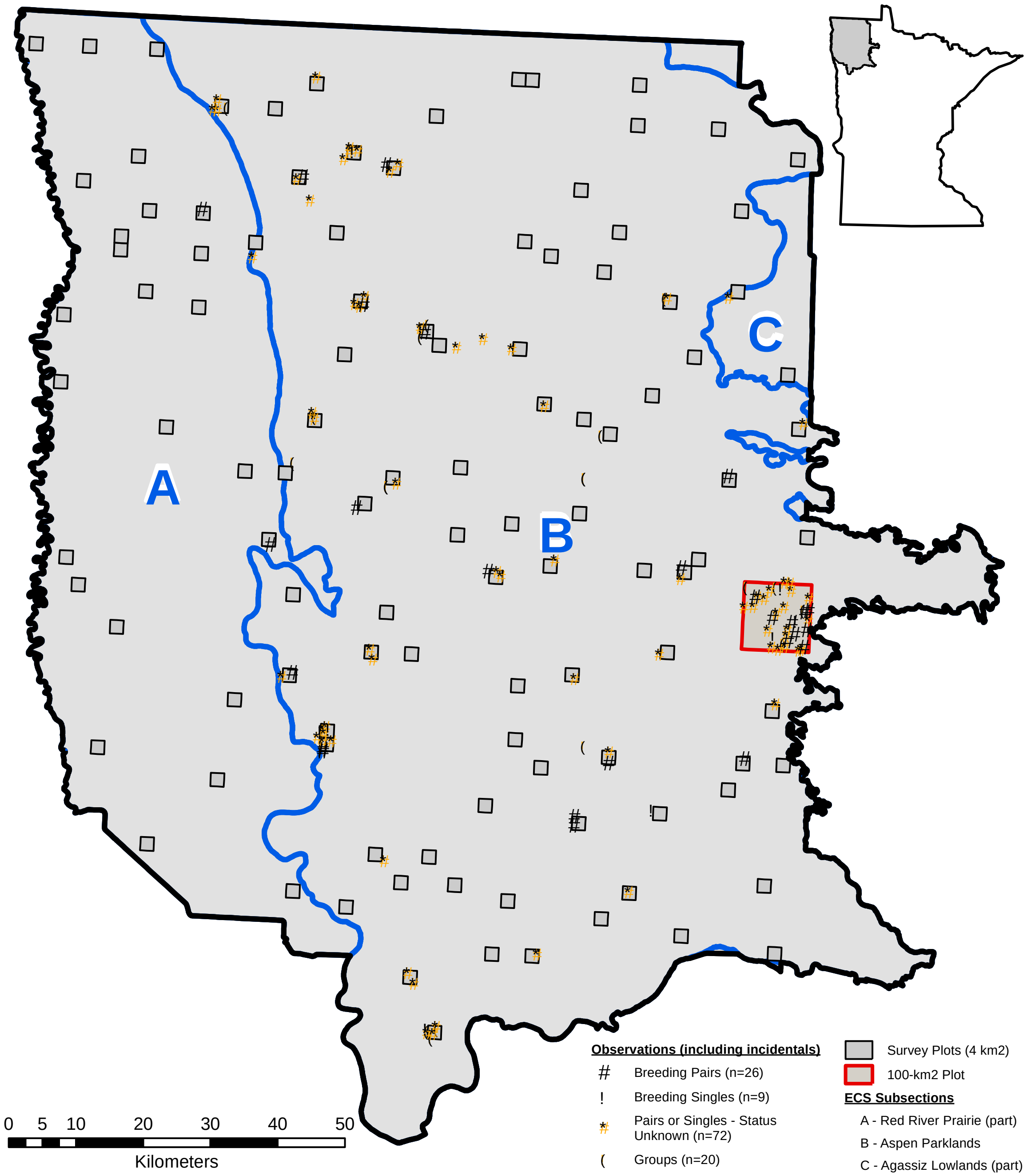

Figure 3. Distribution of sample plots (n = 115) and sandhill crane observations by type (including incidental sightings) in the 2012 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 16,350 km^2.

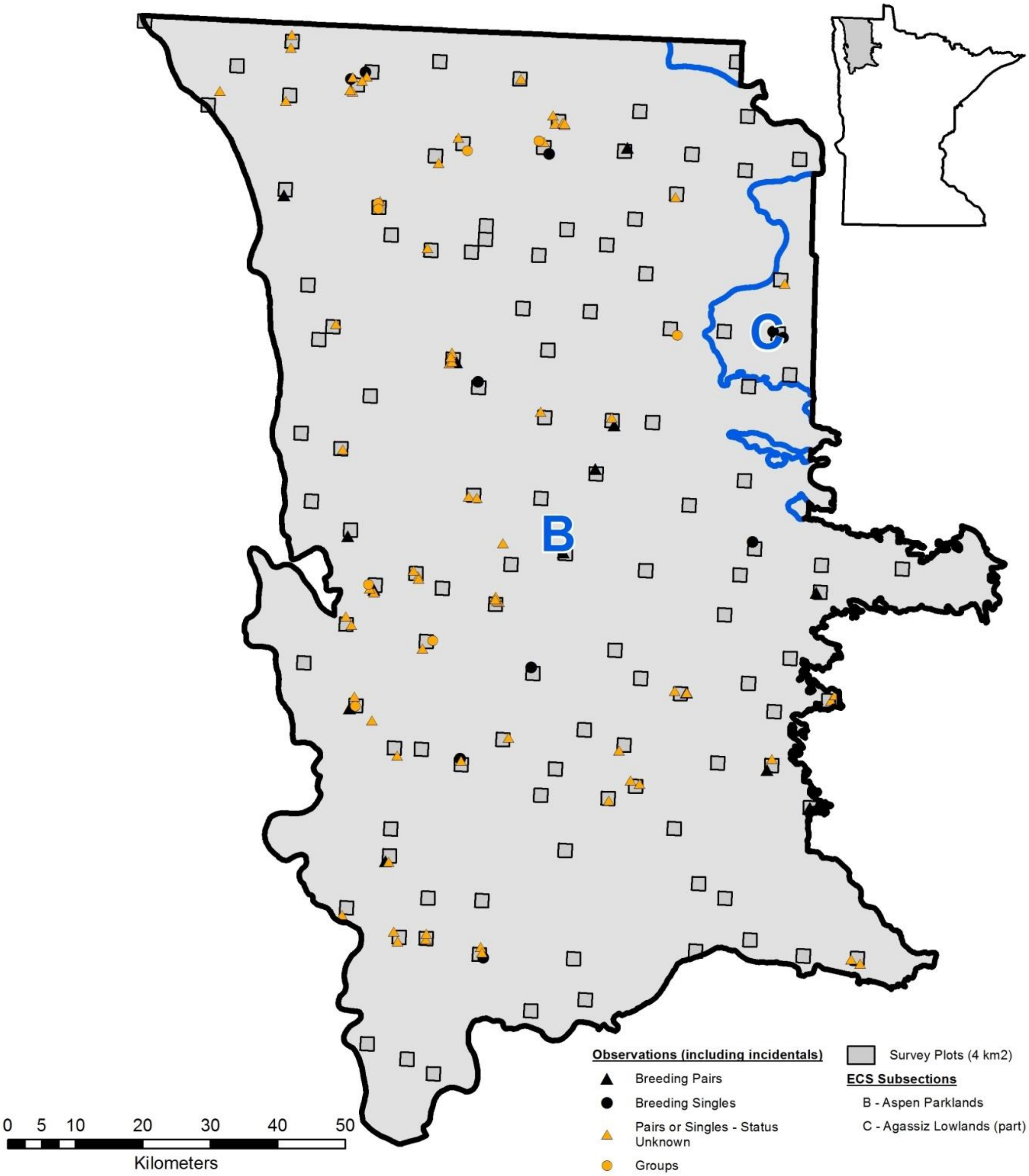

Figure 4. Distribution of sample plots (n = 115) and sandhill crane observations by type (including incidental sightings) in the 2013 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 11,812 km^2.

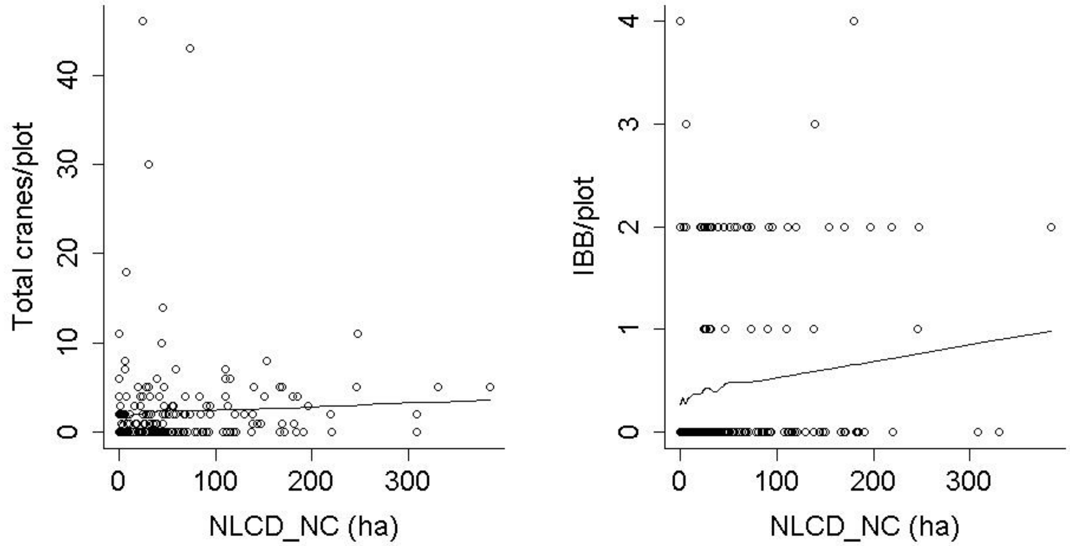

Figure 5. Relationship between sandhill crane observations (total SACR and Indicated Breeding Pairs [IBB]) and habitat abundance (as defined by NLCD classification schemes) based on 114 4-km^2 plots surveyed in May 2013, northwest Minnesota.

Figure 6. Field sheet water observed during the SACR breeding population survey, 22 May 2013.

HUNTING HARVEST STATISTICS

Division of Fish and Wildlife
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2012 SMALL GAME HUNTER MAIL SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources (DNR), 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

A postcard survey (Figure 1) was mailed in early March and respondents who returned it within three weeks were eliminated from follow-up mailings. In past years there were up to 4 mailings (initial and up to 3 follow-up mailings to non-respondents). After examination of mailing responses over the years it was determined that the majority of responses were received during the first two mailings. Therefore, the number of mailings was reduced to one initial and one follow-up to non-respondents this year. The size of the initial mailing was increased to maintain overall sample size.

The sampling frame consisted of individuals who purchased a small game hunting license (any type) for the 2012 small game hunting season (N= 294,837). A stratified random sample, allocated proportionally by license type (n= 7,000; 2.3%) was drawn from the Minnesota DNR electronic database. License type was used as strata and included the following small game license types: Resident Senior Citizen, Resident Youth, Resident Adult, Resident Individual Sport, Resident Combination Sport, Resident Lifetime, Resident Lifetime Sport, Nonresident Youth, and Nonresident Adult. For analysis, license types were pooled into "Resident" (N= 288,712) and "Nonresident" (N= 6,456) (Figure 2).

Recipients were asked if they hunted small game during the 2012-13 season and if not, they were instructed to return the survey. Respondents who hunted were asked, (1) if they used a Walk-In Access area, (2) the total number of days they hunted small game, (3) the number bagged by species, (4) the number of days hunted by species and (5) the county in which they hunted most for each species listed (Figure 1).

Returned surveys were checked for completeness, consistency, and biological practicability. Dual key-entry and quality control checks were used to minimize transcription errors. Data was tabulated using Viking Data Entry VDE+ software and analyzed using R programming language (ver. 2.9.2; R Development Core Team [RDCT] 2009).

RESULTS

Of the 7,000 mailed surveys, 109 were undeliverable; 3,520 were returned for an adjusted response rate of 51%. This mail survey was initiated in 1976 as a means to gather small game harvest information. The response rate was initially very high (average 87% in first 5 years) but has been in a long term decline since the mid-1980s. That trend has been especially apparent since 2004 and this year's survey marks the lowest response rate ever recorded (Figure 3). This may have been due to the reduced number of mailings (two instead of 4) although typically 80% of returns come during the first two mailings. Response rate is highest among license holders 50 to 70 years old and non-response is highest among the 18-35 year olds (Figure 3). However, the number of license holders who reported they actually hunted has remained steady (Table 1).

Estimated number of hunters showed a mild to moderate increase for ducks, woodcock, ring-necked pheasants, mourning doves and coyotes (Table 2). Success rates for all species were fairly similar to last year as was estimated take per hunter (Tables 3 and 4). License sales increased from the previous year as did pheasant stamp sales and duck stamp sales (Figure 2, Table 5). Total estimated harvest for the top-four small game species in Minnesota is presented in Figure 4. Total estimated harvest for all small game species is presented in Table 5. Duck harvest appears to be the highest since 2003-04 and coyote harvest was the highest ever recorded. Survey results for selected species taken by Non-resident hunters are presented in Table 6.

The Walk-In Access (WIA) program started in 2011 as a 2-year pilot program funded by the U.S. Department of Agriculture Voluntary Public Access Program. The goal of WIA is to provide new hunting opportunities on private land that is already enrolled in existing conservation programs or lands with high quality wildlife cover. In order to estimate use of WIA areas, respondents were asked if they hunted a Minnesota WIA area. Twenty five percent of respondents indicated they used Walk-In Access areas (Figure 5), which when expanded indicates that an estimated 62,500 small game hunters took advantage of Walk-In Access areas

Note that all estimates were based on a survey of approximately 2% of all small game license holders.

2012 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2012 - Feb 2013)? ☐No ☐Yes (Please check box)
2. Did you hunt a Minnesota Walk-In Access area? ☐No ☐Yes
3. Indicate the **total number of days** spent hunting small game of all species listed below, in Minnesota. ________
4. 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 2012-2013 small game hunting season **(March 2012-February 2013)**. We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2012 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.

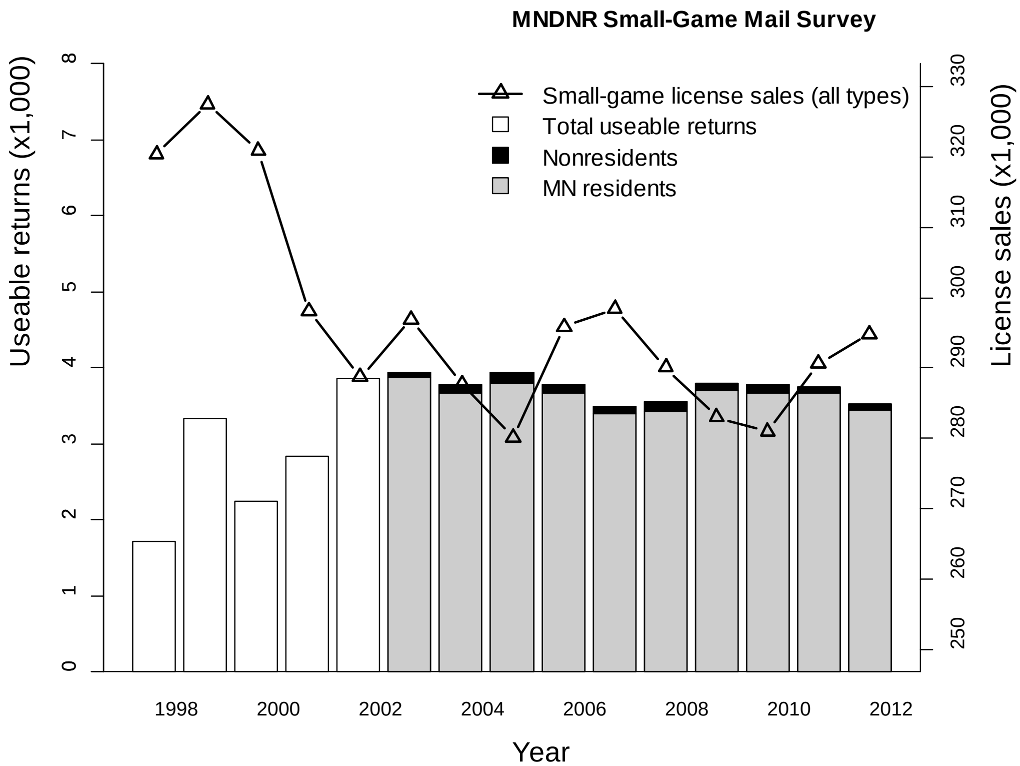
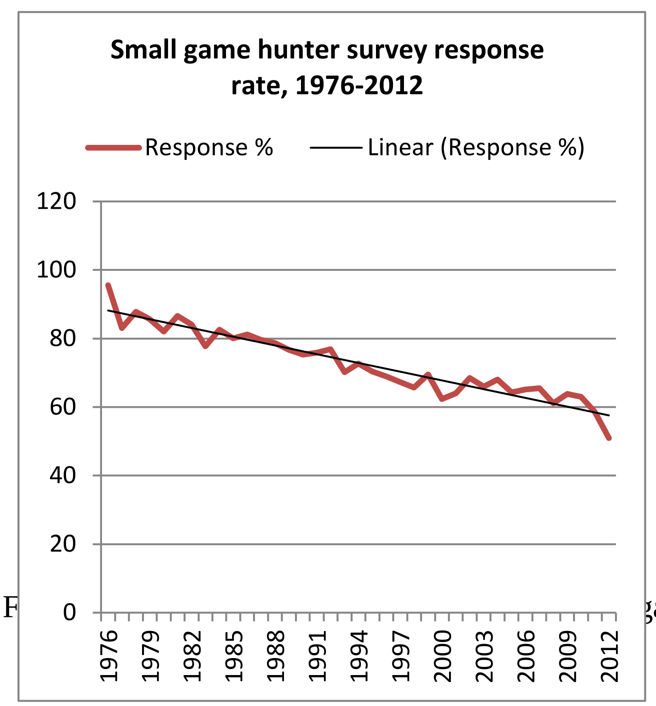
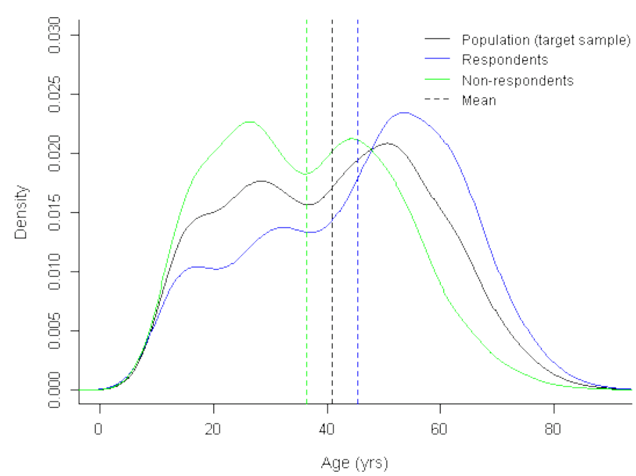


Figure 2. Number of Minnesota small game license sold and usable returned surveys, 1998-2012. Includes resident and non-resident licenses, and excludes duplicate licenses





F … game survey 2012.

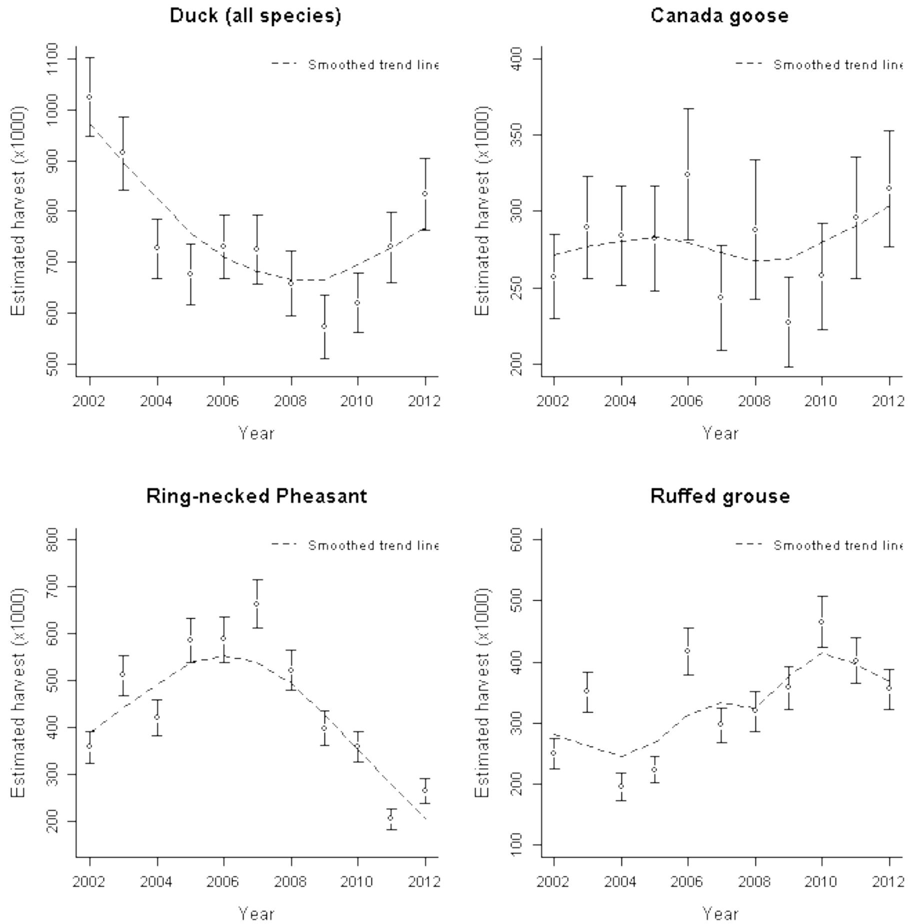


Figure 4. Summary of top four small game species harvested in Minnesota 2002-2012.

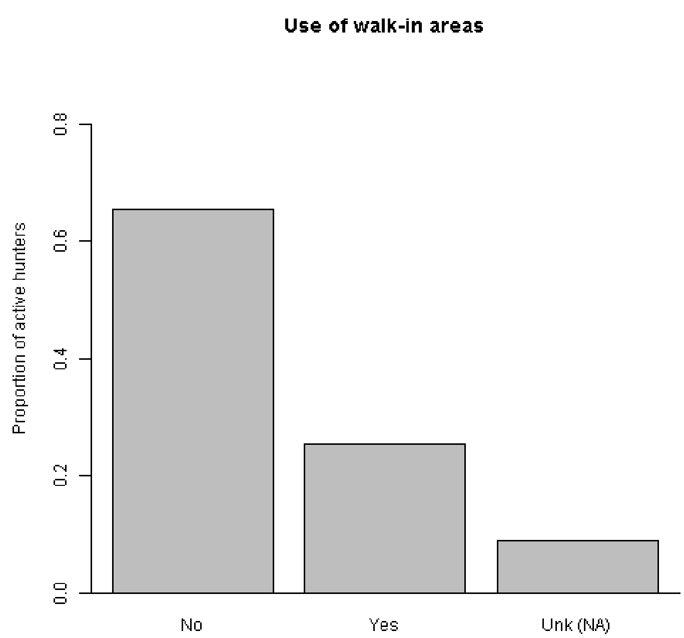


Figure 5. Propoı ıs in Minnesota, 2012.

Table 1. Percent of respondents who hunted small game, 2003-04 through 2012-2013 [a].

		Returns from mail survey	Projections from license sales
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
2011-12	Hunted	2,761 (73.7%)	214,137
	Did not hunt	987 (26.3%)	76,549
		3,748 (100.0%)	290,686
2012-13	Hunted	2,669 (76%)	223,808
	Did not hunt	851 (24%)	71,360
		3,520 (100%)	295,168

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

Table 2. Estimated number of statewide hunters by species, 2000-01 through 2012-13.

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Ducks	109,008	109,241	111,619	101,487	104,634	92,634	87,075	87,468	81,358	77,705	72,772	83,450	90,400
Canada goose	76,518	76,322	78,574	74,855	74,728	69,416	66,224	62,649	59,222	55,599	53,426	61,190	64,990
Other geese	6,834	6,502	5,981	7,373	5,327	4,628	4,529	3,695	4,411	3,275	3,647	3,020	4,110
American coot	3,809	3,901	4,411	3,912	5,099	4,129	4,529	3,454	4,166	4,094	4,614	4,580	4,700
Common snipe	2,241	1,382	2,243	1,429	1,902	1,210	2,187	1,928	1,797	1,340	1,340	1,240	1,260
Rails / gallinules	336	406	673	150	228	0	547	482	408	372	224	230	590
Crow *	14,004	11,542	12,859	12,263	12,404	11,890	10,777	8,514	10,047	10,643	9,376	11,170	12,660
American woodcock	15,909	11,542	11,962	12,789	12,023	11,035	13,510	10,843	12,171	11,834	10,790	10,080	14,000
Mourning dove $^{\gamma}$					15,524	11,107	12,886	13,172	11,599	10,495	10,641	10,000	10,730
Ring-necked pheasant	100,045	84,694	91,284	105,023	104,406	110,852	118,703	118,311	106,763	99,811	89,142	77,640	84,270
Ruffed grouse	120,547	101,194	90,686	93,513	79,141	76,037	91,682	90,600	86,505	87,530	92,490	93,840	97,190
Spruce grouse	9,411	8,778	7,327	8,727	7,305	7,048	9,840	10,602	8,332	9,825	8,855	10,860	8,300
Sharp-tailed grouse	9,747	8,372	6,355	6,921	6,164	4,913	6,560	6,827	6,616	5,582	7,144	6,590	7,300
Gray partridge	7,842	6,828	6,579	7,975	5,327	6,265	6,013	6,667	4,411	4,243	3,721	2,480	3,270
Gray squirrel	26,664	26,010	25,494	29,190	23,438	24,563	25,459	25,863	22,382	22,255	23,737	26,680	29,350
Fox squirrel	16,693	15,281	14,878	19,936	15,372	15,094	15,619	14,779	13,233	13,174	15,626	13,810	16,770
Eastern cottontail	19,830	17,150	15,700	21,441	18,644	20,148	20,070	19,598	17,644	16,300	15,031	13,730	18,620
White-tailed jackrabbit	2,465	3,251	2,467	3,009	3,044	2,065	2,577	2,891	2,451	1,786	2,233	2,640	2,520
Snowshoe hare	5,154	6,502	5,682	5,567	4,338	3,346	5,545	4,257	4,574	3,498	3,795	3,650	5,450
Raccoon (Sept - Feb)	6,498	6,340	5,981	5,868	6,316	4,841	8,747	9,558	7,433	7,294	8,260	8,920	9,730
Raccoon‡ (March -Aug)	4,593	4,145	3,589	4,589	3,348	2,705							
Red fox (Sept -Feb)	10,083	5,608	7,476	7,222	5,783	5,980	6,248	5,783	5,800	7,815	7,218	6,130	6,460
Red fox‡ (March -Aug)	1,905	2,682	2,243	2,182	1,370	1,282							
Gray fox	1,344	1,544	1,271	1,505	1,674	997	2,030	1,928	1,879	1,786	1,637	1,400	2,010
Coyote	15,797	10,648	12,261	15,122	16,133	18,653	17,024	16,064	19,278	19,426	19,421	19,240	22,470
Badger	672	406	748	451	533	783	859	482	490	372	596	390	340

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

Table 3. Estimated harvest per hunter, for respondents reporting that they hunted a particular species, 2000-01 through 2012-13.

	Estimated take per hunter												
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Ducks	8.9	9.1	9.2	9.0	6.9	7.3	8.4	8.1	8.1	7.4	8.5	8.8	9.2
Canada geese	3.9	4.0	3.3	3.9	3.8	4.1	4.9	3.9	4.9	4.1	4.8	4.8	4.9
Other geese	2.2	1.2	1.9	1.7	1.5	1.9	1.5	2.1	3.2	1.9	1.1	2.2	2.2
American coot	2.7	4.5	4.6	2.8	4.0	3.9	5.6	4.6	5.7	3.6	5.7	3.2	3.8
Common snipe	1.3	1.3	1.5	1.8	1.1	4.4	1.9	2.0	1.2	1.1	1.4	1.2	1.1
Rails/gallinules	3.7	0.6	2.6	0.5	0.3	0	2.4	5.3	0.4	0.8	0.3	1.7	0.3
Crow *	6.9	7.7	5.6	6.7	5.8	7.8	6.4	6.4	5.2	5.3	6.1	7.4	7.5
American woodcock	2.8	2.3	2.4	2.4	3.5	2.5	3.2	2.6	2.4	3.0	2.8	2.6	2.3
Mourning dove $^{\gamma}$					6.2	7	6.7	7.7	11.4	10.5	9.4	7.8	9.0
Ring-necked pheasant	3.7	3.2	3.9	4.9	4.0	5.3	4.9	5.5	4.9	4.0	4.0	2.6	3.1
Ruffed grouse	5.1	3.3	2.8	3.8	2.5	2.9	4.5	3.2	3.7	4.1	5.0	4.3	3.7
Spruce grouse	2.5	1.1	1.6	2.1	1.3	1.4	2.7	1.7	2.0	1.9	1.7	1.8	1.5
Sharp-tailed grouse	1.6	1.2	1.3	1.7	1.7	1.3	1.8	2.0	2.1	1.7	2.4	1.8	1.6
Gray partridge	2.1	1.5	1.7	2.8	2.4	2.6	1.9	1.6	2.2	1.9	2.5	1.7	1.8
Gray squirrel	5.3	5.6	5.2	6.0	5.7	5.0	5.5	5.2	5.4	4.9	5.9	4.9	4.7
Fox squirrel	3.9	4.1	4.5	4.2	4.1	4.1	4.2	3.2	3.9	4.1	3.9	3.7	3.4
Eastern cottontail	3.9	3.6	3.3	4.3	4.6	4.5	3.9	4.0	4.5	3.5	3.6	2.8	3.6
White-tailed jackrabbit	2.8	2.6	1.6	2.4	2.3	2.7	1.6	3.3	2.6	1.5	3.2	2.1	1.1
Snowshoe hare	5.2	3.3	1.9	2.2	1.8	3.1	3.0	1.4	2.5	1.5	1.8	2.7	3.2
Raccoon (Sept - Feb)	7.6	9.4	10.0	8.5	9.0	6.0	7.2	4.9	9.7	9.1	9.4	6.0	5.3
Raccoon‡ (March -Aug)	7.8	4.4	5.4	4.7	6.1	2.7							
Red fox (Sept -Feb)	1.9	1.2	1.5	1.8	1.1	1.7	1.3	1.1	0.8	1.3	1.2	1.2	1.3
Red fox‡ (March -Aug)	0.9	1.5	1.7	0.6	0.6	0.9							
Gray fox	0.7	0.4	0.4	0.4	1.1	0.9	1.8	0.3	1.3	1.0	1.5	0.8	0.2
Coyote	1.8	1.1	1.2	1.3	1.1	2.1	1.2	2.1	2.4	2.4	2.3	1.8	2.4
Badger	0.8	0.6	1.7	0.7	1.0	1.2	1.3	0.3	1.0	2.0	1.0	0.8	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 4. Mean harvest for successful hunters and hunter success rates (%), 2002-03 through 2012-13.

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Ducks	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)	10.3 (84.6)	10.6 (87)
Canada geese	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)	6.3 (77.3)	6.3 (77)
Other geese	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)	4.3 (51.3)	4.2 (53)
American coot	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)	4.3 (74.6)	4.8 (80)
Common snipe	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)	1.6 (75.0)	2.1 (53)
Rails / gallinules	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)	5.0 (33.3)	1.0 (29)
Crow	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)	8.6 (86.1)	8.4 (90)
American woodcock	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)	3.6 (71.5)	3.3 (68)
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)	10.0 (77.5)	11.6 (77)
Ring-necked pheasant	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)	4.3 (61.8)	4.8 (66)
Ruffed grouse	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)	5.8 (73.6)	5.2 (70)
Spruce grouse	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)	2.9 (62.9)	2.8 (54)
Sharp-tailed grouse	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)	3.0 (60.0)	3.3 (49)
Gray partridge	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)	3.1 (53.1)	3.4 (54)
Gray squirrel	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)	6.3 (77.6)	6.0 (77)
Fox squirrel	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)	4.9 (75.8)	4.3 (79)
Eastern cottontail	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)	4.1 (69.5)	5.2 (69)
White-tailed jackrabbit	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)	3.3 (61.8)	1.9 (60)
Snowshoe hare	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)	3.7 (72.3)	4.7 (68)
Raccoon (Sept -Feb)	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)	6.7 (89.6)	5.8 (92)
Raccoon‡ (March -Aug)	5.9 (91.7)	5.6 (85.2)	6.7 (90.9)	3.1 (86.8)							
Red fox (Sept -Feb)	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)	2.4 (48.1)	2.6 (51)
Red fox‡ (March -Aug)	3.6 (46.7)	1.1 (51.7)	1.4 (44.4)	1.6 (55.6)							
Gray fox	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)	2.5 (33.3)	1.0 (21)
Coyote	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)	3.9 (44.8)	4.9 (49)
Badger	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)	1.3 (60.0)	1.0 (100)

‡ 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 5. Statewide (resident and non-resident) small game hunting license sales and estimated hunter harvest, 2001-02 through 2012-13.

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Small game license sales [a]	298,055	288,729	296,939	287,725	280,156	295,898	298,467	290,064	282,983	300,624	290,686	295,168
State duck stamp sales	118,590	119,677	118,757	114,003	102,143	101,792	100,134	95,675	89,942	88,069	89,681	90,052
Pheasant stamp sales	97,665	102,097	121,456	114,653	117,301	129,546	129,315	123,270	110,456	104,286	86,868	90,541
Estimated harvest [b]												
Ducks	989,723	1,024,662	914,398	727,206	676,741	730,559	708,491	658,186	576,571	619,604	730,370	834,950
Canada geese	308,341	256,937	289,689	284,714	281,829	324,498	243,705	288,411	229,068	257,532	296,040	315,380
Other geese	7,867	11,125	12,755	8,150	9,025	6,658	7,723	13,895	6,255	3,945	6,750	9,060
American coot	17,554	20,114	10,993	20,345	15,938	24,909	16,061	23,871	14,820	26,345	14,740	18,030
Common snipe	1,783	3,432	2,558	2,130	5,336	4,221	3,933	2,210	1,487	1,936	1,470	1,430
Rails / gallinules	244	1,723	75	75	0	1,329	2,569	163	298	75	390	170
Crow	84,412	71,753	82,285	71,943	92,742	69,188	54,319	51,742	56,301	57,298	82,990	95,430
American woodcock	26,662	28,230	30,438	41,479	27,919	39,907	27,866	29,210	35,384	29,766	25,980	31,610
Mourning dove [d]				96,559	77,749	85,950	101,161	132,577	109,988	100,234	77,790	96,520
Ring-necked pheasant	266,786	357,833	511,462	419,712	585,299	587,580	655,443	522,071	400,242	359,396	204,440	264,310
Ruffed grouse	331,916	249,386	350,674	194,687	224,309	417,153	293,544	318,338	357,998	465,576	401,280	355,130
Spruce grouse	9,480	11,943	18,327	9,204	10,079	26,568	17,705	16,997	19,159	14,957	19,470	12,240
Sharp-tailed grouse	9,795	8,516	11,835	10,417	6,387	11,939	13,790	13,695	9,545	16,819	12,020	11,820
Gray partridge	10,174	10,921	22,250	12,572	16,289	11,545	11,000	9,660	8,019	9,154	4,110	6,040
Gray squirrel	145,916	133,589	174,848	132,659	122,078	140,788	133,194	121,534	109,717	138,925	129,600	137,280
Fox squirrel	62,958	67,100	84,529	62,410	62,187	66,068	47,736	51,079	54,013	61,686	51,580	56,850
Eastern cottontail	62,426	51,967	93,054	86,508	90,062	77,872	78,588	79,927	57,702	53,874	38,780	67,000
White-tailed jack rabbit	8,453	4,046	7,161	6,940	5,493	4,149	9,482	6,446	2,608	7,221	5,430	2,850
Snowshoe hare	21,717	10,909	11,969	7,895	10,406	16,801	5,789	11,343	5,352	6,772	9,700	17,280
Raccoon (Sept -Feb)	59,279	60,049	49,878	56,970	29,191	62,891	46,739	72,026	66,667	77,689	53,910	51,660
Raccoon [c] (Mar –Aug)	18,362	19,524	21,752	20,456	7,331							
Red fox (Sept –Feb)	6,842	11,438	13,000	6,072	10,166	7,872	6,188	4,408	10,238	8,781	7,140	8,470
Red fox [c] (Mar –Aug)	4,077	3,746	1,287	836	1,141							
Gray fox	571	521	602	1,758	927	3,593	559	2,443	1,857	2,382	1,160	420
Coyote	12,032	14,223	19,961	18,230	38,612	20,769	34,377	45,689	46,234	44,051	33,820	53,750
Badger	244	1,272	302	533	924	1,091	159	490	744	596	310	340

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 6. Mail survey results of nonresident small game hunters, 2001-02 through 2012-13.

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Nonresident licenses issued [a]	5,843	5,852	6,291	6,385	5,897	7,356	7,858	7,114	6,934	6,695	6,312	6,456
Questionnaires:												
Number mailed	124	130	123	182	210	185	185	226	196	163	169	166
Number not delivered	9	9	17	13	10	11	11	15	10	6	11	11
Number (percent) returned	77 (67)	75 (66)	68 (64)	114 (67)	134 (67)	115 (62)	101 (58)	89 (42)	105 (54)	107 (66)	91 (54)	71 (43)
Estimated nonresidents and (percent) of all licensed nonresidents hunting:												
Ducks	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)	2,430 (38.5)	2,360 (36.6)
Canada goose	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)	1,620 (25.6)	1,360 (21.1)
Ruffed grouse	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)	1,460 (23.1)	2,820 (43.7)
Ring-necked pheasant	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)	1,780 (28.2)	1,910 (29.6)
Raccoon	0 (0)	0 (0)	0 (0)	0 (0)	44 (0.7)	0 (0)	78 (1.0)	0 (0)	0 (0)	63 (0.9)	0 (0)	0 (0)
Estimated nonresident take:												
Ducks	42,225	17,556	17,855	19,269	12,149	12,173	22,718	15,463	11,755	17,055	13,840	20,380
Canada goose	13,400	5,852	5,736	6,214	3,946	3,580	3,501	5,762	3,698	6,334	4,050	2,270
Ruffed grouse	6,622	9,207	9,437	7,924	6,429	11,522	7,236	6,938	8,651	12,600	8,980	10,090
Ring-necked pheasant	3,740	7,647	9,344	11,174	13,656	16,079	17,661	10,642	6,274	8,076	4,860	6,820
Raccoon [b]	0	0	0	0	887	0	3,268	0	0	593	0	0

[a] Excludes duplicate licenses and nonresident shooting preserve licenses.
[b] In 2001, 2002, 2003, 2004, 2006, 2008, 2009, 2011 and 2012 no non-residents reported hunting/harvesting raccoons.

Raccoon take per hunter			
Year	Resident	Non-resident	Number of Non-resident raccoon licenses
2000	8	13	51
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
2011[b]	6.7	0	34
2012[b]	5.8	0	52

The following information has been excerpted from: U.S. Fish and Wildlife Service. Migratory bird hunting activity and harvest during the 2011 and 2012 and 2012-13 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, 2011 and 2012. (from: Raftovich, R.V., K.A. Wilkins. 2013. Migratory Bird Hunting activity and harvest during the 2011-12 and 2012-13 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2013. 64 pp).

	Minnesota Harvest					**Mississippi Flyway Harvest**		
Species	2011	% of Harvest	2012	% of Harvest	Percent change in Harvest 11-12	2011	2012	Percent change Harvest 11-12
Mallard	180,515	29.07	197,316	26.33	9	2,240,248	1,882,553	-19
Domestic mallard	0	0	0	0	0	3,398	647	-425
American black duck	491	0.08	587	0.08	16	21,992	20,688	-6
Black x mallard	491	0.08	587	0.08	16	5,068	2,074	-144
Gadwall	8,339	1.34	18,792	2.51	56	1,474,405	1,240,234	-19
American wigeon	5,396	0.87	9,983	1.33	46	136,779	137,133	0
Green-winged teal	36,790	5.92	56,376	7.52	35	1,001,902	932,461	-7
Blue-winged /cinnamon teal	89,767	14.45	123,322	16.46	27	704,647	932,096	+24
Northern shoveler	15,697	2.53	15,856	2.12	1	375,918	391,133	+4
Northern pintail	7,848	1.26	5,285	0.71	-48	212,499	156,593	-36
Wood duck	150,593	24.25	184,396	24.61	18	928,178	780,024	-19
Redhead	18,640	3.00	22,315	2.98	16	155,227	99,179	-57
Canvasback	9,811	1.58	4,111	0.55	-66	68,358	52,081	-31
Greater scaup	1,962	0.32	2,936	0.39	33	33,680	40,968	+18
Lesser scaup	5,396	0.87	17,617	2.35	69	114,903	307,579	+63
Ring-necked duck	63,278	10.19	75,755	10.11	16	260,061	324,658	+20
Goldeneye	9,320	1.50	4,111	0.55	-127	39,306	26,055	-51
Bufflehead	7,358	1.18	3,523	0.47	-109	78,145	67,418	-16
Ruddy duck	1,962	0.32	2,349	0.31	16	21,717	20,443	-6
Scoters	0	0	0	0	0	6,014	3,989	-51
Hooded merganser	6,377	1.03	4,111	0.55	-55	53,766	45,886	-17
Other mergansers	981	0.16	0	0	0	13,368	7,214	-85
Total Duck Harvest (retrieved kill)	621,000 ±11%		749,300 ±13%		+ 17	8,000,100 ±6%	7,522,700 ±5%	-6

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

Table 2. Top 10 states in number of **adult duck hunters**, 2012, and number of hunter-days and retrieved duck kill, . (from: Raftovich, R.V., K.A. Wilkins. 2013. Migratory Bird Hunting activity and harvest during the 2011-12 and 2012-13 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2013. 64 pp).

State	Number of active duck hunters	Duck hunter days afield	Total duck harvest	Seasonal duck harvest per hunter
Louisiana	103,600 ± 5%	916,300 ± 8%	2,762,700 ± 8%	26.7 ± 10%
Minnesota	77,700 ± 9%	503,200 ± 12%	749,300 ± 13%	9.6 ± 16%
Texas	74,700 ± 21%	513,800 ± 41%	1,491,600± 46%	20.0 ± 51%
Arkansas	57,300 ± 9%	472,000 ± 11%	1,328,700 ± 13%	23.2 ± 16%
California	51,900 ± 10%	554,000 ± 17%	1,587,500 ± 21%	30.6 ± 23%
Wisconsin	47,800 ± 12%	309,800 ± 15%	350,700 ± 11%	7.3 ± 17%
North Carolina	39,400 ± 15%	227,800 ± 21%	394,400 ± 18%	10.0 ± 24%
Michigan	37,200 ± 11%	229,900 ± 16%	320,200 ± 15%	8.6 ± 18%
Missouri	35,400 ± 13%	213,600 ± 19%	445,000 ± 24%	12.6 ± 27%
North Dakota	31,400 ± 6%	160,200 ± 9%	459,300 ± 9%	14.6 ± 11%
Mississippi Flyway		3,637,200 ± 5%	8,000,100 ± 6%	
United States		7,073,700 ± 4%	15,931,200 ± 6%	

Table 3. Top 10 states in number of **adult goose hunters**, 2012, and number of hunter-days and retrieved goose kill, in . (from: Raftovich, R.V., K.A. Wilkins. 2013. Migratory Bird Hunting activity and harvest during the 2011-12 and 2012-13 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2013. 64 pp).

State	**Number of active goose hunters**	**Goose hunter days afield**	**Total goose harvest**	**Seasonal goose harvest per hunter**
Minnesota	58,900 ± 10%	355,400 ± 14%	236,700 ± 16%	4.0 ± 19%
Wisconsin	36,700 ± 13%	240,300 ± 19%	83,800 ± 17%	2.3 ± 21%
California	32,100 ± 12%	263,300 ± 19%	151,000 ± 18%	4.7 ± 21%
Michigan	31,900 ± 11%	183,300 ± 15%	144,700 ± 18%	4.5 ± 21%
Texas	31,300 ± 25%	83,900 ± 42%	208,400 ± 65%	6.7 ± 70%
Maryland	26,300 ± 7%	166,900 ± 11%	191,400 ± 14%	7.2 ± 16%
Pennsylvania	26,300 ± 16%	119,500 ± 17%	115,700 ± 19%	4.4 ± 25%
North Dakota	25,200 ± 7%	113,200 ± 9%	184,900 ± 16%	7.3 ± 18%
Arkansas	20,300 ± 15%	116,100 ± 20%	116,000 ± 25%	5.7 ± 29%
Illinois	19,600 ± 13%	179,000 ± 21%	100,300 ± 28%	5.1 ± 31%
Mississippi Flyway		1,520,900 ± 7%	1,020,700 ± 7%	
United States [b]		3,458,000 ± 4%	3,191,200 ± 6%	

[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 2012 CANADA GOOSE HUNT IN MINNESOTA

David P. Rave, Wetland Wildlife Populations and Research
Margaret H. Dexter, Wildlife Policy and Research Unit
John Giudice, Biometrics Unit

The September Canada goose season in Minnesota was 1 - 21 September, 2012 (21 days). Beginning in 2007 and continuing through 2009, a 7-day (16 - 22 Sep) experimental season was added in the Northwest Goose Zone (Fig. 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). This season extension is now 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 2012 September goose hunter mail questionnaire survey (Appendix A).

METHODS

Permittees were randomly selected to receive a post-season hunter survey. Questionnaires were sent to 3,100 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 data-entry errors.

The questionnaire asked hunters the number of days hunted, and, 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 a series of questions to gauge their satisfaction with the September Canada goose hunting season, and to determine their willingness to participate in, and regulations preferences for, an August Canada goose season in Minnesota.

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

RESULTS AND DISCUSSION

The DNR License Bureau reported that 34,311 Special Canada Goose Season permits were sold prior to 22 September, 2012. Response rate to the survey was 51%. Among those respondents, 75% indicated that they hunted during the September season. Active hunters were afield an average of 4.1 days and retrieved 4.2 geese per hunter. Overall, the success rate for active hunters was 67% (Table 1). The number and percentage of hunters that hunted in each county in Minnesota is presented in Appendix B.

The survey estimates that 25,900 active hunters shot and retrieved 108,300 Canada geese during the 2012 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 2012 retrieved harvest of 91,800 geese.

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 was overwater. The survey indicates that 26% (SE = 0.19) of the geese harvested in the early season (23,600 total geese) were harvested by hunters overwater.

We asked hunters about whether or not they had harvested a limit of 5 geese, or had harvested zero geese, during the September goose season. Fourteen percent of September goose hunters reported bagging a limit of geese $\geq$1 time during the September season. Seventy-four percent of hunters reported a zero harvest on at least one day during the September season.

Thirty-eight percent of all geese in the September season were harvested in the first week of the season, followed by 36% in the second week, and 26% harvested the third.

We asked hunters how satisfied they were (1=very low ,…, 7=very high) relative to overall hunting experience, number of geese bagged, number of geese seen, and regulations. Mean satisfaction was: overall experience 5.1, geese bagged 3.9, number of geese seen 4.4, and regulations 5.1.

Landowners and managers in the west central portion of Minnesota are still reporting numerous goose depredation issues. To determine support for, and obtain input concerning possible regulations , we asked a series of questions about an August portion of the early season that is proposed for 2013. Sixty-nine percent of respondents indicated that they would hunt during an August season if one is offered, while 15% indicated they would not hunt. We then asked hunters their preference for an opening date, and 40% preferred to open August 17th, versus 31% that favored an August 3rd opener, and 31% that had no preference.

Twenty-six percent of hunters favored a 5 day split between the end of an August season and the start of the September season, while 31% favored no split, and 43% had no preference.

Thirty-nine percent of hunters preferred that the bag limit during an August season remain at 5, while 16% favored an 8 bird bag, 14% a 10 bird bag, and 8% favored a 15 bird bag. Twenty-four percent of hunters had no preference as to daily bag limit during the August season.

Most hunters indicated that they would not hunt in the August season if it was not held in their local area. The mean distance that hunters indicated that they would be willing to travel to hunt geese in August was 36 miles. However, some respondents indicated they would be willing to travel as far as 250 miles to hunt August geese.

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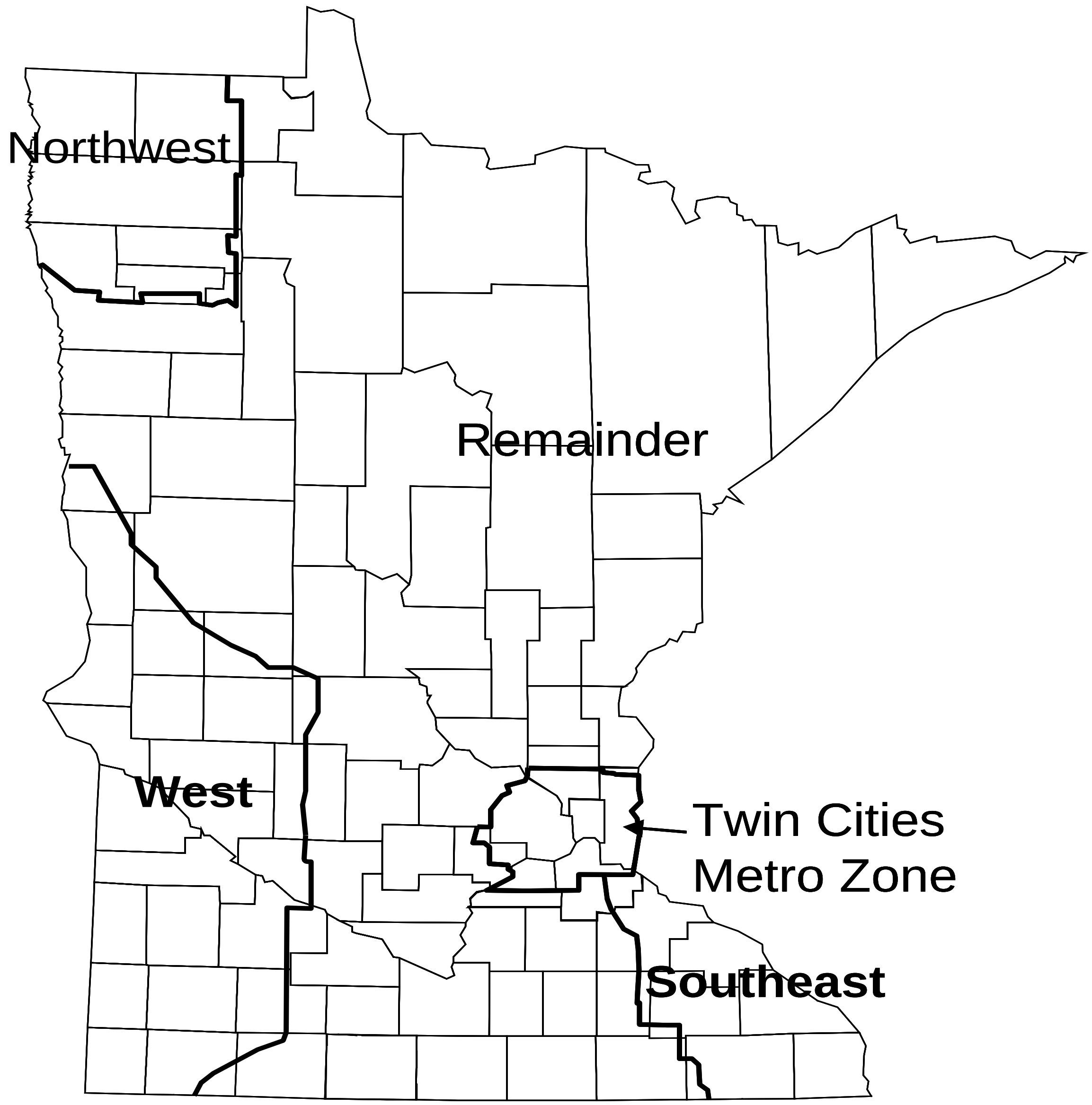


Figure 1. Traditional September season Goose Zones in Minnesota. The West, Twin Cities Metro and Southeast zones are now included in the Remainder zone during the September season.

Table 1. Permit sales, hunter activity, and harvest[a] during the September Canada Goose season (1 – 21 September) in Minnesota, 2012.

Parameter	Total
Total permits sold	34,311
Questionnaires delivered	3,100
Useable questionnaires returned	1,563
% responding	51.2
Active hunters	1,179
% active hunters	75.0
% hunters that were successful	67.0
Days hunted per active hunter	4.1
Geese shot and retrieved per active hunter	4.2
Unretrieved harvest per active hunter	0.47
% unretrieved harvest	0.099
EXPANDED:	
Active hunters	25,900
Hunter days	106,900
Retrieved harvest	**108,300**
Est. unretrieved harvest	12,200
Total harvest	122,900

[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, 2010-2012.

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
2011						**123,700**	26,000	1.21	4.80
2012						**108,300**	25,900	0.98	4.20

Appendix A. Questions asked on the 2012 September Special Canada Goose Season Hunter Survey.

1. Did you hunt during the September 1-21, 2012 September Canada goose season?
__ Yes __ No (Please check one.)

If NO, please proceed to Question 7.

2. Please indicate the number of days hunted, total harvest of geese, and the County you hunted most during the 2012 September Canada goose season.
_________________ Number of days you hunted
_________________ Total geese personally shot and retrieved
_________________ Total geese personally knocked down but not retrieved
_________________ County hunted most

3. Did you personally hunt geese overwater (for example with decoys floating in or along the shore of a wetland or pass shooting next to a wetland) during the September 2012 Canada goose season?
______Yes
______No (If No, please proceed to Question 4.)

If Yes:
How many days did you personally hunt overwater? ____________
How many geese did you personally shoot while hunting overwater? ____________

4. During the 2012 September Canada goose season, about how many days that you hunted geese….
…..did you shoot your daily bag limit of five geese? _____________
…..did you shoot 0 geese? _____________

5. During the 2012 September Canada goose season, how many geese did you personally harvest during each of the following periods:

First week (Saturday, Sept. 1 – Friday, Sept. 7)? ___________
Second week (Saturday, Sept. 8 – Friday, Sept. 14)? ___________
Last week (Saturday, Sept. 15 – Friday, Sept. 21)? ___________

6. During the 2012 September Canada goose season, how satisfied or dissatisfied were you with the following? (*Please circle one response for each.*)

	Very dissatisfied	**Moderately dissatisfied**	**Slightly Dissatisfied**	**Neither**	**Slightly Satisfied**	**Moderately satisfied**	**Very satisfied**
Goose hunting experience	1	2	3	4	5	6	7
Goose hunting harvest	1	2	3	4	5	6	7
Goose hunting regulations	1	2	3	4	5	6	7
Number of geese seen	1	2	3	4	5	6	7

Proposed August Canada Goose Season

In 2013, the DNR may offer an August Canada goose season in all or portions of the State. This season would be in addition to our current September Canada goose season.

7. Would you hunt Canada geese in August if the season were open? (Please check one):

Yes _______ No ________ Don't know ________

If you checked yes, what season dates would you prefer (Please check one):

1) Saturday, August 3 to late August _________
2) Saturday, August 17 to late August _________

8. If an August Canada goose season is offered, would you prefer a 5 day split between the end of the August season and the opening of the September Canada goose season?

___Yes ___No ___No preference (Please check one.)

9. In 2013, the bag limit in early goose seasons (proposed August and September) will likely increase. Which bag limit would you prefer?

___8 birds/day ___10 birds/day ___15 birds/day ___No preference (Please check one.)

10. If the August Canada goose season was <u>not</u> opened in your area, how far would you travel to hunt Canada Geese in August?

_____ would only hunt in local area.

_____ up to 50 miles

_____ up to 100 miles

_____ more than 100 miles

If you have general comments you may write them here (continue on back if necessary). If you have questions and desire a specific response, please contact your local DNR Wildlife Office or the DNR Information Center (Minnesota DNR, 500 Lafayette Road, St. Paul, MN 55155-4020, 1-888-646-6367). Thank you.

Comments:

Appendix B. Number and percent of September Canada goose hunters in the survey in each county in Minnesota, 2012.

	Hunters			Hunters			Hunters	
County	N	%	County	N	%	County	N	%
AITKIN	10	0.009	LOW	10	0.009	TODD	28	0.025
ANOKA	33	0.029	LE SUEUR	27	0.024	TRAVERSE	4	0.004
BECKER	19	0.017	LINCOLN	7	0.006	WABASHA	7	0.006
BELTRAMI	23	0.02	LYON	4	0.004	WADENA	3	0.003
BENTON	11	0.01	MAHNOMEN	4	0.004	WASECA	13	0.011
BIG STONE	15	0.013	MARSHALL	13	0.011	WASHINGTON	26	0.023
BLUE EARTH	12	0.011	MARTIN	7	0.006	WATONWAN	1	0.001
BROWN	14	0.012	McLEOD	25	0.022	WILKIN	2	0.002
CARLTON	7	0.006	MEEKER	25	0.022	WINONA	4	0.004
CARVER	18	0.016	MILLE LACS	7	0.006	WRIGHT	56	0.049
CASS	18	0.016	MORRISON	29	0.025	YELLOW MEDICINE	1	0.001
CHIPPEWA	4	0.004	MOWER	7	0.006			
CHISAGO	18	0.016	MURRAY	6	0.005			
CLAY	5	0.004	NICOLLET	12	0.011			
CLEARWATER	7	0.006	NOBLES	4	0.004			
COOK	0	0	NORMAN	3	0.003			
COTTONWOOD	10	0.009	OLMSTEAD	4	0.004			
CROW WING	15	0.013	OTTERTAIL	59	0.052			
DAKOTA	25	0.022	PENNINGTON	7	0.006			
DODGE	3	0.003	PINE	20	0.018			
DOUGLAS	37	0.032	PIPESTONE	2	0.002			
FARIBAULT	8	0.007	POLK	12	0.011			
FILLMORE	1	0.001	POPE	37	0.032			
FREEBORN	10	0.009	RAMSEY	2	0.002			
GOODHUE	3	0.003	RED LAKE	3	0.003			
GRANT	6	0.005	REDWOOD	3	0.003			
HENNEPIN	22	0.019	RENVILLE	8	0.007			
HOUSTON	2	0.002	RICE	33	0.029			
HUBBARD	4	0.004	ROCK	3	0.003			
ISANTI	19	0.017	ROSEAU	5	0.004			
ITASCA	19	0.017	SCOTT	32	0.028			
JACKSON	10	0.009	SHERBURNE	17	0.015			
KANABEC	13	0.011	SIBLEY	9	0.008			
KANDIYOHI	36	0.032	ST. LOUIS	18	0.016			
KITTSON	2	0.002	STEARNS	45	0.039			
KOOCHICHING	3	0.003	STEELE	6	0.005			
LAC QUI PARLE	6	0.005	STEVENS	9	0.008			
LAKE	1	0.001	SWIFT	4	0.004			

2013 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 2013 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 1 March - 30 April 2013. 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 1,405 permits was issued and 810 responses (58 %) to the questionnaire were obtained (Table 1). In calculating harvest estimates, we assumed that the 595 non-respondents participated in the conservation action and took light geese in the same manner as respondents (i.e., tallies were expanded by 1.55). Harvest was again concentrated in the southwest portion of the state with some also being taken in west-central Minnesota. Seven hundred seventy people attempted to take light geese during the 61-day conservation order period. Active participants pursued light geese for 3,070 days and 2,430 light geese were shot and retrieved. This was an average retrieved take of 3.2 geese per active participant. Another 370 light geese were estimated wounded and not retrieved.

Unplugged shotguns were used by 380 (49.4 %) individuals to take 1,670 (68.7%) geese, of which 620 (25.5%) were taken with the 4th, 5th, or 6th shell. Electronic calls were used by 190 (24.5%) participants to take 1,020 (41.9%) light geese. During the 1/2 hour after sunset period, 260 (10.7%) geese were harvested by 260 (33.7%) active hunters.

The method used for hunting white geese was 32.6% over decoys, 38.6% pass shooting, and 28.9 % sneaking geese.

ACKNOWLEDGMENTS

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

MINNESOTA 2013 LIGHT GOOSE HARVEST SURVEY

For the Period of March 1 - April 30, 2013 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, 2013. 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 2013 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, 2013? 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, 2013? ___________
3. In what county did you hunt light geese most often during March 1 - April 30, 2013? ___________
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

Figure 1. Light Goose Conservation Order hunter mail questionnaire, 2013.

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2002 - 2013

	Year											
Statistic	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total permits sold	1,997	1,438	1,424	1,383	1,363	1,292	1,406	1,670	952	994	1,048	1,405
Useable returns	1,375	1,071	1,095	998	955	921	910	1,057	671	659	675	810
Response rate (%)	69.0	74.0	77.0	72.0	70.0	71.0	65.0	63.0	72.3	67.1	65.3	58.3
Active hunters (%)	60.5	38.5	48.5	44.7	37.3	39.8	54.9	66.0	40.8	45.7	56.9	54.9
Estimated total hunters	1,209	553	690	618	516	514	773	1,103	389	455	600	770
Estimated hunter days	5,517	2,600	3,372	2,643	2,665	2,302	3,404	4,647	1,475	1,830	2,270	3,070
Mean days/hunter	4.6	4.7	4.9	4.3	5.2	4.5	4.4	4.2	3.8	4.0	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	2,620	2,430
Mean harvest/hunter	2.9	3.6	4.0	2.3	2.6	3.5	3.1	4.0	1.4	3.4	4.4	3.2
Estimated crippling losses	637	253	315	150	163	172	302	640	70	145	210	370
Percent using unplugged guns	46.4	50.6	48.2	44.0	42.3	43.6	46.7	46.8	44.9	44.2	43.0	49.4
Est. number hunters using uplugged guns	560	280	333	272	215	224	361	516	175	201	260	380
Est. number geese **shot** with unplugged guns	2,137	996	1,385	777	689	1,032	1,275	2,413	348	742	1,510	1,670
Est. harvest with shell 4-5-6	615	401	491	269	287	277	339	822	131	311	460	620
Percent using electronic calls	11.8	15.7	19.3	17.8	14.4	17.1	19.1	23.5	25.9	21.3	22.2	24.5
Est. number hunters using e-calls	142	87	133	110	73	88	148	260	101	97	130	190
Est. harvest while using e-calls	512	474	326	268	280	329	566	1,171	192	531	460	620
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	42.4	33.4
Est. number hunting after 1/2-hr sunset	550	228	265	264	223	197	326	475	154	180	250	260
Est. harvest 1/2-hr after sunset	841	267	311	242	246	209	511	713	87	238	240	260

MINNESOTA'S WILD TURKEY HARVEST - 2013

Marrett Grund, Farmland Wildlife Populations and Research Group

Minnesota offers fall and spring turkey hunting seasons. The fall turkey season was 30 days in length (October 1-30) and allowed for an unlimited number of hunters to take one wild turkey of either sex. Although there were an unlimited number of hunters, each hunter needed to select and could only hunt in 1 of the 12 permit areas (PAs; Figure 1). The spring turkey season regulated harvest and distributed hunting pressure by allocating permits across the 12 PAs and 8 time periods using a quota system for the first 4 time periods. During spring, adult hunters interested in pursuing turkeys for the first 4 time periods were required to apply for a permit through a lottery system but youth hunters were able purchase a permit over-the-counter during these time periods. Preference for this lottery system was determined by the number of years a valid but unsuccessful application had been submitted since last receiving a permit. Hunters could apply individually or in a group of up to 4 hunters. Successful applicants were notified through U.S. Mail and unsuccessful applicants were awarded a preference point. Hunters could simply purchase a permit over-the-counter for the last 4 seasons. The goal of this system was to provide quality turkey hunting opportunities by minimizing hunter interference rates while allowing hunters to take the harvestable surplus of turkeys.

Fall 2012 Turkey Season – This was the first year that a quota system was not used to restrict hunter numbers during the fall season. Consequently, the number of permits issued to hunters doubled from 5,382 permits in 2011 to 10,779 permits in 2012 (Table 1, Figure 2). There were 1,753 turkeys harvested during Fall 2012, which was about 400 more turkeys than the record harvest in 2010. Hunter success rates ranged from 10-19% at the permit area level (Table 2) and averaged 16% at the statewide level, which was slightly below the 5-year average (22%). These lower hunter success rates may be related to hunters interested in harvesting a turkey opportunistically while pursuing other species and therefore were expending less effort; and/or allowing more casual turkey hunters who may not have as much experience with turkey hunting during the fall season. It is unlikely these reduced hunter success rates are related to fewer turkeys in the pre-hunt population because turkey population growth rates have been stable to slightly increasing throughout Minnesota (Giudice et al. 2011) and the 2011-12 winter was relatively mild, which would suggest above average survival and reproduction rates should have occurred the previous year. Weather conditions were favorable throughout the season and most crops were harvested in early- to mid-October.

Spring 2013 Turkey Season – There were 38,831 permits issued during the spring season, including 19,113 general/landowner permits, 5,539 youth permits, 4,550 archery permits, and 9,629 surplus permits (Table 2). Hunters registered 10,390 turkeys (Table 3), which was about 12% below the 5-year average (Figure 3). Hunter success rates averaged 30% at the statewide level, which was comparable to the 5-year average of 30% (Table 3). The winter of 2012-13 was relatively mild through February, but then measurable snow was on the ground through much of April in most of the range where turkeys were abundant in Minnesota. The impact of the delayed but extended winter weather on turkey populations is unknown, but it is reasonable to believe that the winter-like weather affected hunter effort and turkey movement patterns. This likely explains much of the reduced harvest success rates and hunter participation rates, particularly during the first few hunting time periods. Wisconsin and Iowa both reported similar trends in spring 2013 wild turkey harvests as well.

LITERATURE CITED

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

Table 1. Permits available and issued, applicants, registered harvest, and hunter success rates for fall wild turkey seasons 1990 – 2012, 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
2011	10,430	3,538	5,382	953	18
2012	Unlimited	N/A	10,779	1,753	16

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

Table 2. Permits issued, registered harvest, and hunter success during the Fall 2012 and Spring 2013 Minnesota wild turkey seasons.

	Fall 2012			Spring 2013		
Permit Area	Permits Issued	Harvest	Success (%)[a]	Permits Issued[b]	Harvest	Success (%)[a]
501	1,750	316	18	9,050	2,639	29
502	175	24	14	610	169	28
503	1,717	282	16	3,961	1,255	32
504	401	39	10	930	278	30
505	788	126	16	3,150	908	29
506	466	75	16	1,334	317	24
507	2,690	515	19	8,107	2,628	32
508	1,425	197	14	3,868	1,170	30
509	128	19	15	246	102	41
510	1,144	147	13	2,788	886	32
511	71	10	14	133	27	20
512	24	3	13	38	11	29

[a] Success rates were not adjusted for non-participation.
[b] Permits issued for the Camp Ripley disabled veterans hunt and archery permits were not included.

Table 3. Permits available, permits issued, and registered harvest from 1978 – 2013 for all spring wild turkey hunting seasons in Minnesota.

	Permits				
Year	Available	Issued	Issued (%)	Registered harvest	Success (%)[a]
1978	420	411	97.9	94	23
1979	840	827	98.5	116	14
1980	1,200	1,191	99.3	98	8
1981	1,500	1,437	95.8	113	8
1982	2,000	1,992	99.6	106	5
1983	2,100	2,079	99.0	116	6
1984	3,000	2,837	94.6	178	6
1985	2,750	2,449	89.1	323	13
1986	2,500	2,251	90.0	333	15
1987	2,700	2,520	93.3	520	21
1988	3,000	2,994	99.8	674	23
1989	4,000	3,821	95.5	930	24
1990	6,600	6,126	92.8	1,709	28
1991	9,170	8,607	93.9	1,724	20
1992	9,310	9,051	97.2	1,691	19
1993	9,625	9,265	96.3	2,082	23
1994	9,940	9,479	95.4	1,975	21
1995	9,975	9,550	95.7	2,339	25
1996	12,131	10,983	90.5	2,841	26
1997	12,530	11,610	92.7	3,302	28
1998	14,035	13,229	94.3	4,361	33
1999	18,360	16,387	89.3	5,132	31
2000	20,160	18,661	92.6	6,154	33
2001	22,936	21,404	93.3	6,383	30
2002	24,136	22,607	93.7	6,516	29
2003	25,016	22,770	91.0	7,666	34
2004	27,600	25,261	91.5	8,434	33
2005	31,748	27,638	87.1	7,800	28
2006	32,624	27,876	85.4	8,241	30
2007[b]	33,976	28,320	83.4	9,412	33
2008[b]	37,992	31,942	84.1	10,994	34
2009[b]	42,328	36,193	85.5	12,210	34
2010[b]	55,982	46,548[c]	83.0	13,467	29
2011[b]	Unlimited	43,521[c]	N/A	10,055	23
2012[b]	Unlimited	38,906[c]	N/A	11,325	29
2013[b]	Unlimited	34,281[c]	N/A	10,390	30

[a] Success rates not adjusted for non-participation
[b] Youth hunt data included
[c] Permits issued to archery hunters were not included. There were 2,462, 3,911, and 4,550 permits issued to archers in 2011, 2012, and 2013, respectively

Table 4. Permits available and issued by license type (resident and non-resident) and time period for the spring 2013 wild turkey season, Minnesota.

		Permits issued			
Time period	Permits available	General lottery	Landowner	Surplus	Youth[b]
A	5,705	4,807	628	1	1,284
B	5,705	4,707	271	90	221
C	5,705	5,091	236	0	1,682
D	5,705	3,307	57	1,960	958
E	Unlimited	5	0	4,844	377
F	Unlimited	0	0	856	168
G	Unlimited	4	0	1,490	499
H	Unlimited	0	0	388	350
Total[a]	Unlimited	17,921	1,192	9,629	5,539

[a] Excludes archery permit sales.
[b] Total excludes youth archery permits.

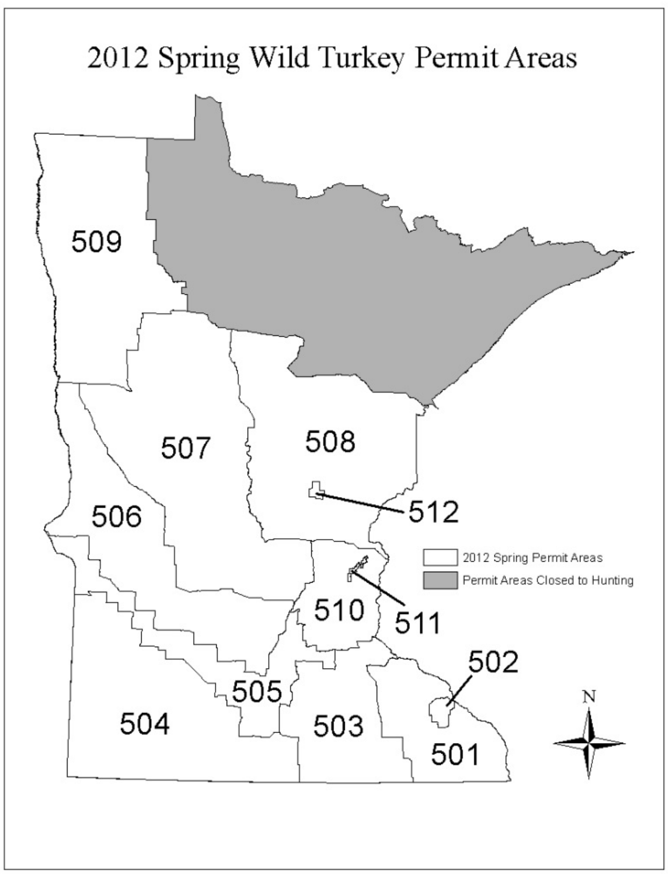


Figure 1. Permit areas open for hunting during the 2013 spring turkey hunting season, Minnesota.

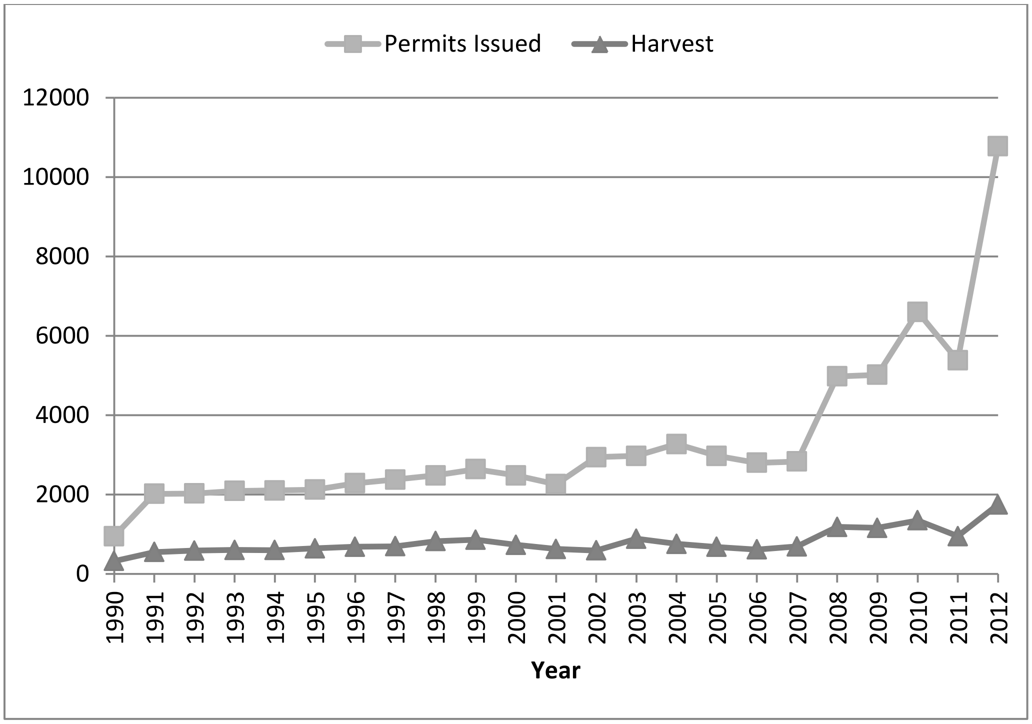


Figure 2. Permits issued and registered harvest for fall wild turkey seasons, 1990-2012, Minnesota.

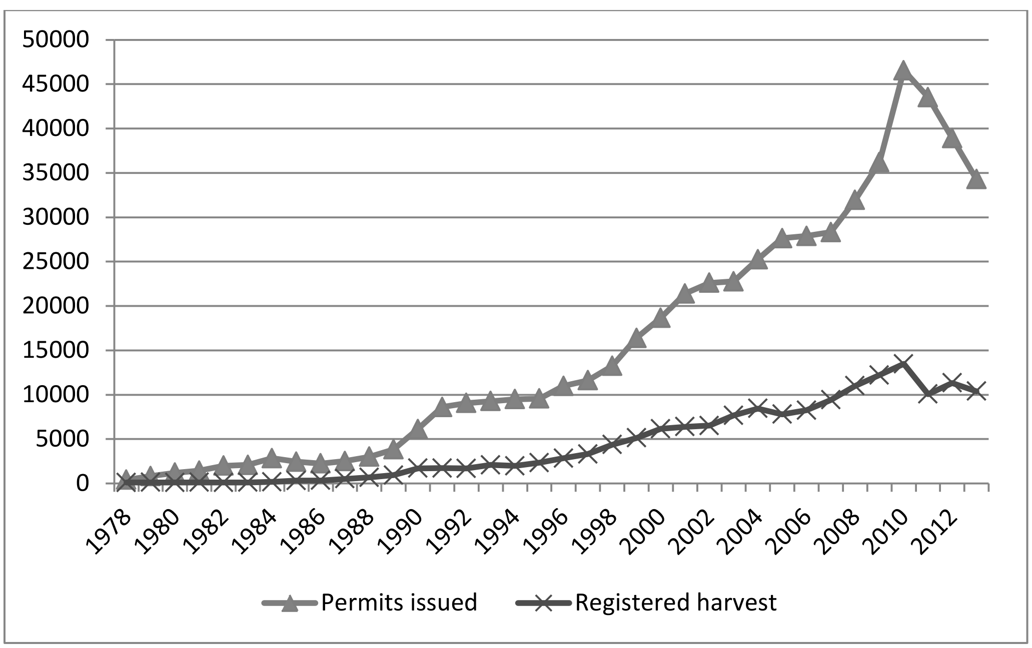


Figure 3. Permits issued and registered harvest for spring wild turkey seasons, 1978-2013, Minnesota.

PRAIRIE-CHICKEN HARVEST IN MINNESOTA DURING 2012

Michael A. Larson, Forest Wildlife Populations and Research Group

INTRODUCTION

Hunting seasons for greater 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), increasing the quota of hunters in some permit areas, and selling surplus licenses after the lottery beginning in 2011.

Only residents of the state are eligible to hunt prairie-chickens in Minnesota. Residents who are an owner or tenant of ≥40 acres of grassland within a permit area may apply to the lottery as a "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 available 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 of the state 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. Inadvertently, however, I failed to send postcard surveys to people who purchased surplus permits for permit areas in which there were fewer lottery applicants than permits available. 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. To ensure that responses from people who replied to the first mailing were similar to responses from people who replied to the second mailing I compared averages visually but not with a statistical test. 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. I calculated all estimates by permit area and summed across permit areas to estimate totals for the entire prairie-chicken range.

RESULTS & DISCUSSION

One hundred eighty-six prairie-chicken hunting permits were available during 2012. There were 179 lottery winners (Table 1), and 6 of them were landowners. There were fewer applicants than there were permits available in 3 of the 11 permit areas. One hundred fifty-one lottery winners purchased permits, and 11 others purchased surplus permits. Although there were 162 permit purchasers in 2012, inadvertently I did not send surveys to the purchasers of surplus permits. One hundred twenty-five purchasers who were surveyed (83%) responded to the first mailing of the survey, and 18 (12%) responded to the second mailing, so the response rate among those surveyed was 95% (i.e., 143 of 151).

Four purchasers who responded to the survey reported that they did not hunt (3%), and 139 respondents reported hunting. Given that 162 people purchased permits, there were an estimated 158 hunters (i.e., purchasers who went afield; Table 2). Hunters hunted an average of 2.4 days during the 5-day season (20–24 October 2012). Surveyed hunters reported harvesting 79 prairie-chickens, and the estimated total harvest was 86 prairie-chickens (Table 2). I estimated that 62 of the 158 hunters bagged at least 1 prairie-chicken (39%, Table 2). The average rating for hunter satisfaction on a 1–5 scale was 3.4 (median = 4), and 78% of the 140 respondents to this question reported a satisfaction level of 3 or greater.

The prairie-chicken harvest and hunter success rate during 2012 were less than during 2011 and 18–26% less than averages from sets of previous years (e.g., the modern hunting era = 2003–2011, years with >180 permits = 2006–2011; Table 3). This is consistent with a declining trend in spring survey counts since 2007. As I have reported in previous prairie-chicken harvest reports, there was a moderate degree of correlation between the total number of males observed in survey blocks during spring and total harvest during the fall (Kendall's $\tau = 0.6$, $n = 5$ years [2006–2010]). 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 23 sharp-tailed grouse while hunting prairie-chickens during 2012, and the estimated total harvest of sharp-tailed grouse by prairie-chicken hunters was 25. The reported sharp-tailed grouse were harvested from permit areas 802A through 808A, with the most (i.e., 6 or 7) coming from 803A, 805A, and 806A and none coming from 807A (Figure 1).

ACKNOWLEDGEMENTS

I appreciated the help of Laura Gilbert in preparing and mailing the survey and in data entry, and comments from Charlotte Roy helped me improve the report. This survey was funded in part under the Federal Aid in Wildlife Restoration Act, Minnesota project W-69-S-12.

Table 1. Results of the lottery for prairie-chicken hunting permits in Minnesota during 2012.

Permit area	Permits available	No. of applicants	Lottery winners No.[b]	Lottery winners Proportion	Permit purchasers[a] No.	Permit purchasers[a] Proportion	Surplus purchasers[c]
801A	10	8	8	1.00	7	0.88	0
802A	10	13	11	0.85	10	0.91	0
803A	10	9	9	1.00	8	0.89	1
804A	17	7	7	1.00	7	1.00	10
805A	20	54	20	0.37	19	0.95	0
806A	17	24	19	0.79	17	0.89	0
807A	25	53	25	0.47	25	1.00	0
808A	20	35	20	0.57	19	0.95	0
809A	20	33	22	0.67	12	0.55	0
810A	27	47	27	0.57	21	0.78	0
811A	10	15	11	0.73	6	0.55	0
All	186	298	179	0.60	151	0.84	11

[a] Number and proportion of lottery winners who purchased a permit.
[b] More permits than were available may be awarded in a permit area when the last applicant selected in the lottery applied as a member of a hunting party.
[c] Number of people who purchased a surplus permit after the lottery because there were fewer applicants than there were permits available.

Table 2. Hunter harvest of prairie-chickens in Minnesota during 2012.

Permit area	No. of hunters[a] Self-reported	No. of hunters[a] Estimated	Birds harvested Self-reported	Birds harvested Estimated	Birds per harvester[b]	Success rate[c]
801A	7	7	1	1	1.0	0.14
802A	10	10	4	4	1.3	0.30
803A	8	9[d]	3	3	1.5	0.22
804A	7	17[d]	0	0	NA	0.00
805A	18	19	10	11	1.4	0.42
806A	16	17	12	13	1.3	0.59
807A	21	22	13	14	1.8	0.36
808A	16	18	14	16	1.3	0.67
809A	11	12	11	12	1.5	0.67
810A	19	21	9	10	1.1	0.43
811A	6	6	2	2	2.0	0.17
All	139	158	79	86	1.4	0.39

[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] Purchasers of surplus permits in permit areas 803A (n = 1) and 804A (n = 10) were inadvertently not surveyed.

Table 3. Annual summary of prairie-chicken hunting results in Minnesota during 2003–2012.

Year	Permits available	Applicants	Hunters[a]	Birds harvested	Success rate[b]	Hunter satisfaction[c]
2003	100	853	92	130	0.75	4.4
2004	101	759	87	58	0.45	3.6
2005	110	500	86	94	0.63	4.0
2006	182	512	149	109	0.49	3.6
2007[d]	187	519		122	0.53	
2008	186	535	137	133	0.58	3.9
2009	186	512	143	118	0.52	3.4
2010	186	421	136	78[e]	0.32	3.0
2011	186	264	138	103	0.45	3.4
2012	186	298	158	86	0.39	3.4

[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, which had 150 permit purchasers.

[e] One hunter reported harvesting 10 prairie-chickens during 2010.

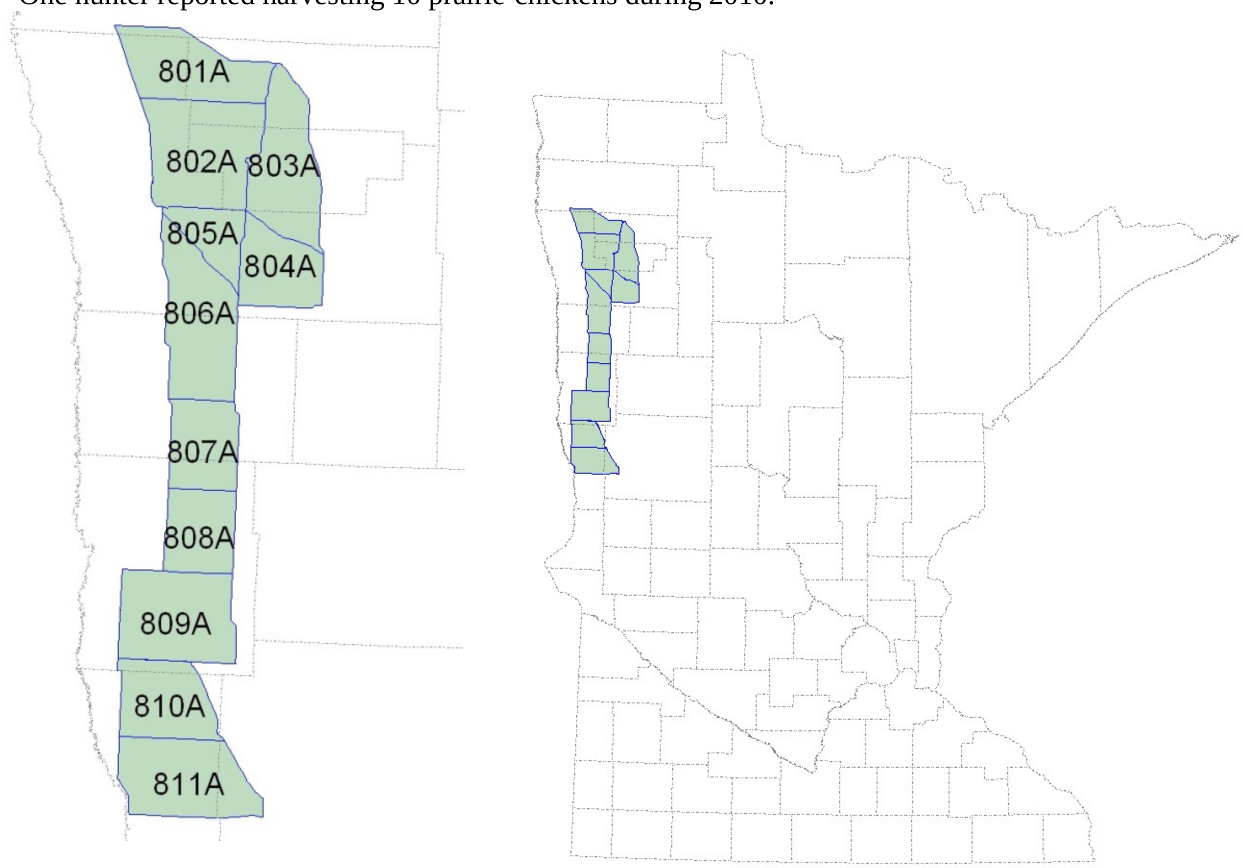


Figure 1. Map of permit areas for prairie-chicken hunting in Minnesota (left) and their location relative to counties within the state (right).

STATUS OF MINNESOTA BLACK BEARS

Final Report to Bear Committee
February 19, 2013

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

All data contained herein are subject to revision, due to updated information, improved analysis techniques, and/or regrouping of data for analysis.

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, and thus harvest age structure. We used harvest age structure accumulated since 1980 to reconstruct minimum population size (Downing population reconstruction) and thereby assess population trend.

RESULTS

Permit applications for bear licenses seem to have stabilized at a higher level during 2010-2012 than before, when permit availability was higher (Table 1, Figure 2). The reduced permit availability seems to have driven up sales of no-quota licenses, which were the highest on record in 2012. The estimated number of hunters in the field (8,600) was the lowest since 1993. However, the total harvest (2,604) was substantially higher than last year because success rate (30%) was up. Success rate may have increased in part due to reduced numbers of hunters (i.e., competition), and in part due to poorer fall foods.

This was the second year of a system whereby all available licenses for the quota area were sold (those not purchased by permittees selected in the lottery were purchased later as surplus). Number of available permits was reduced 15% from 2011 to 2012 (Tables 2 and 3). All BMUs except 22 were reduced. BMU 22 was the only BMU undersubscribed (Figure 1). As permit allocations were significantly reduced in all BMUs over the past 5 years, the percentage of 1st-year applicants drawn in the lottery diminished(Table 4). In 2008 and 2009, some 1st-year applicants (preference level 1) were drawn in all BMUs. By 2012, 1st – year applicants were not drawn in most BMUs. Less than 50% of 2nd -year applicants were drawn in 3 BMUs (26, 44, 45).

Despite 5% fewer hunters statewide compared to 2011, the total harvest was 22% higher (Table 5). Most of the increased harvest occurred in the southern BMUs: 45, 51, and 52. BMU 52 had a record harvest, likely due both to a high number of hunters and poor natural foods. Northern BMUs 13 and 25 had especially low harvests (lowest since 1996).

Hunting success was the highest since 1995 in the quota area as a whole (Table 6), and notably high in BMUs 24, 26, 31, 51, and 45; it was a record high in BMU 45 (33%, versus previous high of 24% in 1995). The bear population in this BMU appears to be recovering. Also, hunter density was quite low in BMU 45 due to severely reduced permits over the past few years.

During years of normal fall food abundance, about 70% of the harvest occurs during the 1st week of the bear season, and ~83% occurs by the end of the 2nd week. 2012 was normal in that respect, even though the season opened on a Saturday (Table 7).

The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was higher than in the past few years (Table 8), possibly because complaints were higher than normal. An unusually high number of complaints were registered shortly after bears emerged from dens in April, and remained high through the year (120-180 each month, May–August). The total number of complaints received in 2012 was the highest since 1999 (following a record low in 2011). However, only 16 nuisance bears were killed by private parties (excluding hunters) or DNR personnel, and for the first time, no bears were caught and moved. The number hit by cars was more than double that of 2011, but still half that of the 1990s (Table 9).

Wild fruit crops were, overall, the worst documented since the catastrophic food failure of 1995; composite bear food index was well below average in 4 of 5 regions (Table 10). Summer and fall berries produced poorly, due to erratic weather during May–July (Table 11). An early warm spring encouraged early and prolific flowering, so early species (e.g., Juneberry and sarsaparilla) produced some fruit, but they dried up early due to heat and lack of moisture in mid-summer. Species flowering slightly later (e.g. cherries, plums) were likely damaged by cool temperatures, wind, and rain during peak flowering that froze flowers and/or prevented effective insect pollination. Blueberries were almost non- existent across the state, except in the far northeast, where snow cover during winter 2011–2012 was adequate to protect buds. Only red oak acorns were abundant across most of the bear range, resulting in near-average fall food indices. Hazel nuts and dogwood berries, also important fall foods, did not produce well (Table 12, Figure 3).

Year-to-year variability in the abundance of wild bear foods was much greater during 1984–1996 than in the ensuing 15 years (Figure 4). This year, 2012, was an outlier in that regard. Food abundance was not only low, but was outside the normal range of year-to-year variation since 1997. The reason for lower fruit crop variability in recent years is unknown, but may be related to generally warmer winter and summer temperatures. A combination of two key factors, fall food abundance and number of hunters, accounts for 84% of the yearly variation in the bear harvest since 1984 (Figure 5). Predictions of the number of bears killed by hunters, based solely on these 2 factors, have been particularly accurate since 2000 ($R^2 = 0.95$). Since then, actual bear harvest has only once differed from predicted harvest by >10%.

Sex ratios of harvested bears (Figure 6) reflect both the sex ratio of the living population (which varies with harvest pressure) as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions). In 2011, record high harvest sex ratios (%M) occurred in BMUs 12 & 45. In 2012 BMU 12 continued to have the highest %M in the state (typical of this BMU), whereas BMU 45 had a near equal sex ratio.

Statewide, ages of harvested females (Figures 8, 9) declined dramatically during the past 3 decades, as evidenced by a declining median age and increasing proportion of the harvest composed of 1–2 year-olds. Median age of harvested females was 2.9 years old in 2012, closer to the age of harvested males (2.2 years) than in the past. This declining age structure coincided with both a period of population increase, and then a decline (Figure 10). Variation in median age within individual BMUs is too great to discern short- term trends (Figure 7). The greatest variation is in the northern BMUs. The southern no-quota area (BMU 52), which likely has the highest harvest pressure, has the most consistent female age structure; ages of harvested females in this area are equivalent to BMU 44 and older than BMU 45.

DISCUSSION

Ages of harvested bears (Figures 10, 11) accumulated over 33 years were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting). This was scaled upwards (to include bears that died of other causes), using tetracycline mark–recapture estimates as a guide. Whereas both the tetracycline and reconstructed populations showed an increase during the 1990s, followed by a decline during the 2000s, the shapes of the 2 trajectories differed somewhat. Therefore, it was not possible to exactly match the curve from the reconstruction to all 4 tetracycline-based estimates, so several curves were scaled to differing degrees to intersect different sets of tetracycline-estimates. Both the tetracycline and age- reconstructed estimates showed a population decline of ~30% from 2001 to 2008. A light harvest in 2008 enabled the population to grow slightly, but it declined again after a heavier harvest in 2009. Reconstructed populations rely on several years of age data, so population estimates for 2011 and 2012 are not yet available.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1992–2012.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Permit applications	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]	19184[a]	18103
Permits available	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050[b]	6000
Licenses purchased (total)	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986
Quota area [c]	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951
Quota surplus/military [c]										235	209	2554	1356	1591	1561	526	233	77	83	1385	1070
No-quota area [c]	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965[h]
% Licenses bought																					
Of permits available [d]	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	100	100
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	80.7	82.7
Estimated no. hunters [e]	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9100	8600
Harvest	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604
Harvest sex ratio (%M) [f]	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59	61	59
Success rate (%)																					
Total harvest/hunters [g]	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29	23	30
Quota harvest/licenses	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30	24	33

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907).

[b] Permits reduced because of a new procedure in 2011 that ensures that all available licenses are purchased (see Table 2).

[c] 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. In 2011, surplus licenses offered for all lottery licenses not purchased by July 31. Free licenses for 10 and 11 year-olds were available beginning 2009 (2009 = 45; 2010 = 86; 2011 = 72 [including surplus youth; 2012 = 67]). Youth licenses included here with surplus and military licenses. Total licenses = quota + quota surplus + no-quota + military (no permit needed) + youth.

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued. 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. In 2011-12, all unpurchased licenses were put up for sale, and all were bought.

[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%). The estimated no. of hunters in 2011-12 may be under-estimated because a large no. of people bought surplus licenses 1 month before the season, so they were more apt to hunt.

[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 2001–2012 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. In 2012, 55 hunters took >1 bear (52 took 2 bears on NQ license, 2 hunters took 1 bear on NQ + 1 on quota license, 1 took 2 bears on NQ and 1 on quota license): thus, the 2604 bears were taken by 2548 different hunters, so success = 2548/8600 = 30%.

[h] Record high number of no-quota area licenses purchased (cannot distinguish where they hunted: BMUs 11, 11b, 52).

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.

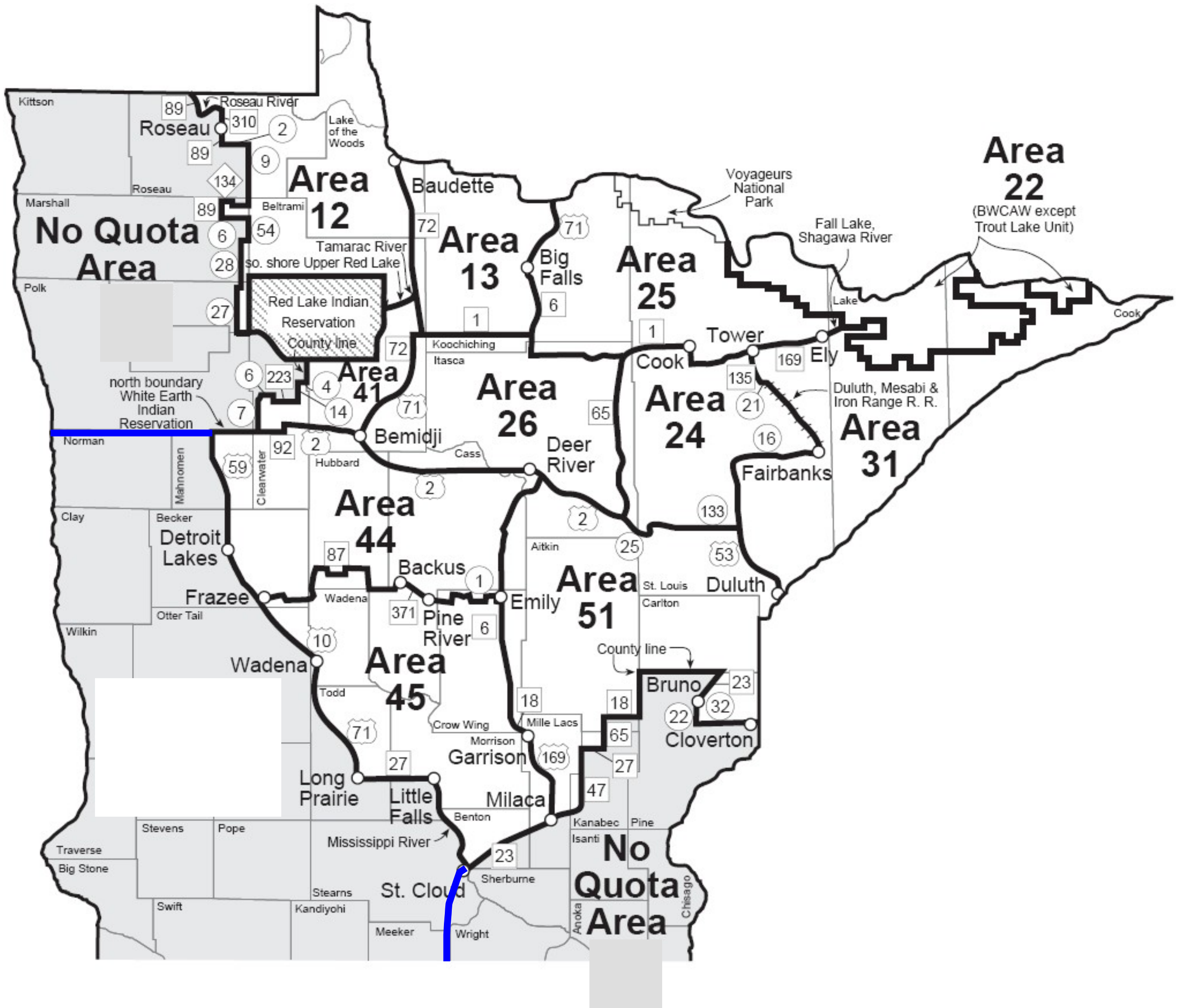


Figure 2. Relationship between licenses sold and hunting success (note inverted scale) in quota zone, 1987–2012 (non-quota zone first partitioned out in 1987). Number of licenses explains 31% of variation in hunting success during this period (P = 0.003). Large variation in hunting success is also attributable to food conditions.

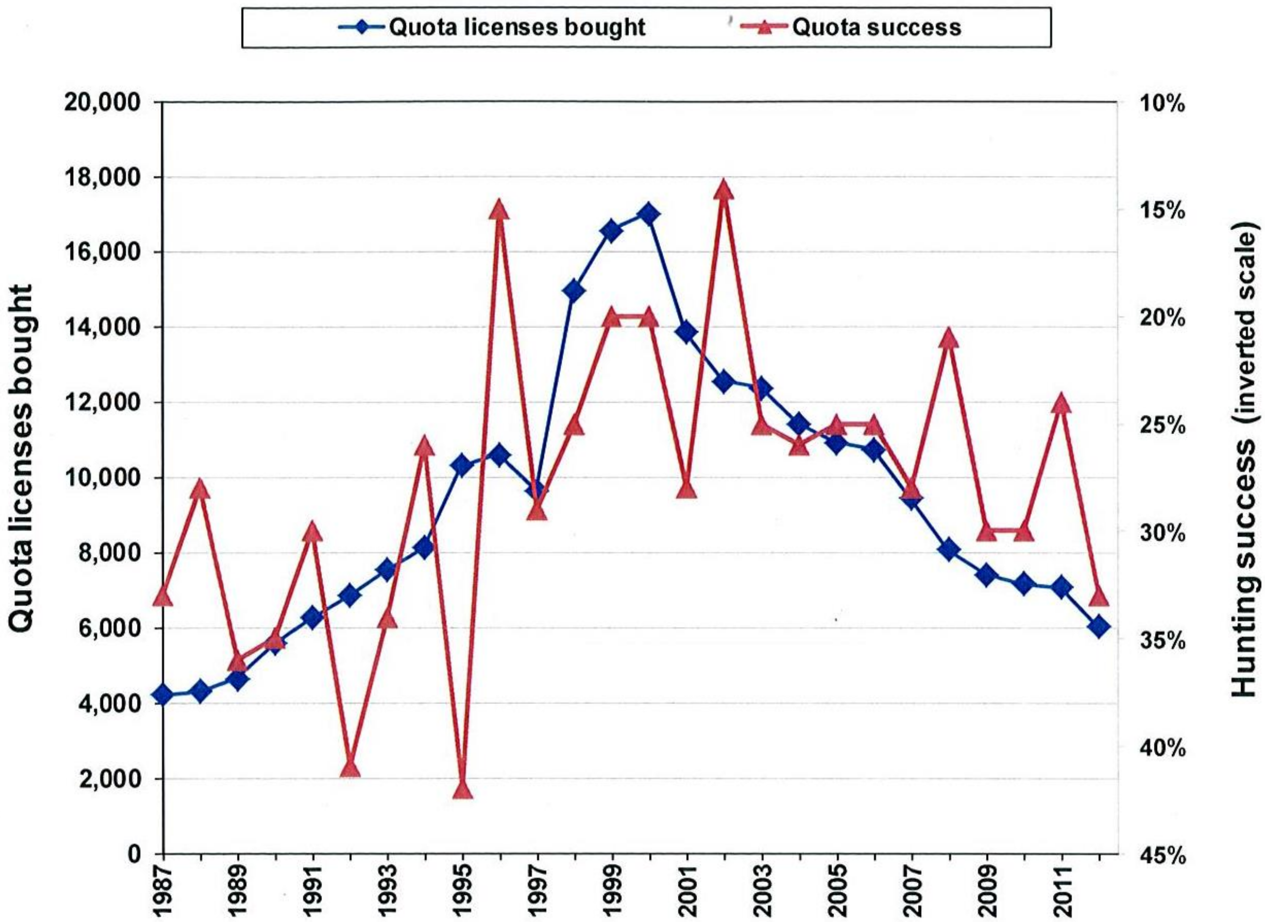


Table 2. Number of bear hunting quota area permits available, 2008–2012 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2012	2011 After reduct.[a]	2011 Before reduct	2010	2009	2008
12	300	350	450	4500	450	450
13	400	450	600	600	600	650
22	100	100	125	100	150	150
24	300	350	500	550	650	750
25	850	900	1200	1200	1250	1550
26	550	950	900	900	1000	1150
31	900	1000	1300	1300	1300	1700
41	250	300	400	400	400	400
44	700	850	1100	1100	1100	1350
45	200	250	400	400	600	1000
51	1450	1850	2500	2500	2500	2700
Total[e]	6000	7050	9475	9500	10000	11850

[a] In 2011, under a new procedure, all licenses not purchased by permittees were sold (Table 3). In order not to increase the number of hunters, 2011 permit allocations were reduced by the mean percentage of licenses that were purchased in each BMU in 2009-2010. The table shows the permit allocation before and ater this reduction. In 2012, permits were allocated based on what had been offered in 2011.

Table 3. Number of bear hunting permit applicants and surplus licenses bought, 2008–2012[a]. Shaded values indicate undersubscribed areas (applications < permits available).

BMU	2012 Apps	2012 Bought license	2012 Surplus bought	2011[b] Apps	2011[b] Bought license	2011[b] Surplus bought	2010 Apps	2010 Surplus	2009 Apps	2009 Surplus	2008 Apps	2008 Surplus
12	813	244	60	834	267	84	903	5[c]	876		857	
13	719	325	76	751	366	84	753		700		709	
22	83	56	43	90	71	31	114		91	0[d]	85	50
24	888	253	47	918	294	56	971		843		825	
25	1625	713	137	1763	712	190	1811	5[c]	1694		1793	4[c]
26	1666	458	92	1894	512	139	1959		1874		1999	2[c]
31	2406	758	146	2505	826	174	2414		2423		2388	3[c]
41	592	208	42	688	253	47	718		685		656	
44	2619	612	88	3010	697	154	2923		2787		2821	
45	1135	170	30	1019	208	42	937		941		873	128
51	3650	1154	296	4086	1478	372	3950	1[c]	3822		3828	
Total[e]	16196	4951	1057	17558	5684	1373	17453		16736		16834	178

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.

[b] In 2011-12, all licenses not purchased by permittees were sold as "surplus". Surplus = Permits available (Table 2) minus Bought license (±4 to account for groups applying together).

[c] Courtesy licenses issued by Commissioner, not actual surplus.

[d] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.

[e] Beginning in 2008, applicants could apply for area 99 in order to increase future 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 applicants) who were drawn for a bear permit, 2008–2012. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn, in which case the success of preference level 2 lottery applicants is also shown.

BMU	**2012**		**2011**		**2010**		**2009**	**2008**
	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 1
12	0	80	2		23		29	37
13	33		51		77		84	92
22	100		100		88		100	100
24	0	75	14		49		75	91
25	28		35		60		72	86
26	0	49	0	77	15		32	43
31	0	84	11		35		43	68
41	0	86	6		31		37	47
44	0	28	0	55	0	90	3	26
45	0	29	0	67	24		61	100
51	1		25		52		58	67

Table 5. Minnesota bear harvest tally[a] for 2012 by Bear Management Unit (BMU) and sex compared to harvests during 2007–2011 and record high harvests.

BMU	2012 M	(%M)	F	U	Total	2011	2010	2009	2008	2007	5 year mean	Record high harvest (yr)
Quota												
12	58	(71)	24	0	82	106	95	140	101	124	113	263 (01)
13	68	(61)	44	0	112[f]	119	155	149	129	163	143	258 (95)
22	3	(38)	5	0	8	11	9	7	7	15	10	41 (89)
24	57	(53)	51	0	108	122	124	151	100	134	126	288 (95)
25	133	(52)	121	0	254[f]	317	307	344	298	369	327	584 (01)
26	148	(62)	90	0	238	167	232	228	137	315	216	513 (95)
31	220	(61)	143	0	363	358	363	384	248	398	350	697 (01)
41	42	(60)	28	0	70	54	71	104	77	104	82	201 (01)
44	102	(54)	86	0	188	130[d]	248	255	196	333	232	643 (95)
45	33	(49)	34	0	67	32[d]	58	42	72	113	63	178 (01)
51	284	(60)	187	0	471	288[e]	501	416	344	557	421	895 (01)
Total	1148	(59)	813	0	1961	1704[f]	2163	2220	1709	2625	2084	4288 (01)
11	155	(69)	69	0	224	219	178	315	172	324	242	351[h] (05)
11b	9	(64)	5	0	14	3	11	9	3	4	6	
52	218	(54)	187	0	405[c]	205[g]	347	257	251	219	256	400 (06)
Total	382	(59)	261	0	643	427	536	581	426	547	503	678 (95)
State	1530	(59)	1074	0	2604	2131	2699	2801	2135	3172	2588	4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes sometimes differs from the registered sex (2011: 1450 [97%] unchanged; 12 $M_{(reg)} \rightarrow F_{(tooth)}$; 38 F→M; 2012: 1821 [98%] unchanged; 15 $M_{(reg)} \rightarrow F_{(tooth)}$; 28 F→M). Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2011: 1535 of 2131 = 72%; 2012: 1897 of 2604 = 73%). Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally. The number of missing registrations was greatly reduced in 2011 and 2012.

Year	Quota area	No-quota area
2007	27	9
2008	23	4
2009	19	14
2010	20	8
2011	11	2
2012	6	1

[b] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted (*n* = 27 in 2007, 14 in 2008, 3 in 2009, 14 in 2010, 14 in 2011, 8 in 2012). 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.

[c] Record high harvest.

[d] Lowest harvest since BMU was established in 1994.
[e] Lowest harvest since 1991.
[f] Lowest harvest since 1996.
[g] Lowest harvest since 2002.

[h] Estimated registered harvest, including those in which registration data were lost and no tooth envelope was received.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2007–2012.

BMU	Max success (yr) (excl 2012)	Mean success 2007-2011	2012	2011	2010	2009	2008	2007
12	49 (95)	33	27	30	30	39	32	36
13	59 (95)	30	28	26	34[c]	32	28	31
22	21 (92)	13	8	11	14	16[c]	8	14
24	45 (92)	27	36[e]	35[e]	29	31[d]	20	20
25	47 (92)	33	30	35	34	36	28[f]	31
26	59 (95)	29	43[d]	26	34	31	17[f]	36
31	55 (92)	32	40[d]	36	36	38[c]	21[f]	28
41	50 (95)	28	28	18	25	34	27	35
44	43 (95)	25	27	15[f]	28	30	21	30
45	24 (95)	14	33[b]	13	21[d]	11[f]	11[f]	14
51	37 (95)	22	32[d]	16[f]	27	23	19	27
Quota	42 (95)	27	33[d]	24	30	30	21	28
No Quota[g]	35 (95)	19	20	15[f]	20	22	17[f]	19
Statewide	40 (95)	25	28	22	27	28[c]	20	26

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the proportion of license-holders that hunted are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

[b] Highest success since establishment of this BMU in 1994
[c] Highest success since 1997 (until this year).
[d] Highest success since 1995 (until this year).
[e] Highest success since 1992 (until this year)
[f] Lowest success since 2002 (until this year).

[g] 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, 1992–2012.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
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
2011	Thu		65	78	93
2012	Sat		68	83	96

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

Table 8. Number of people participating in nuisance bear survey, 1992–2012.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1992	74	79	81	85	83	74	62
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28
2010	36	40	33	27	28	23	16
2011	30	34	29	31	29	27	21
2012	56	52	47	40	38	32	23

[a] Electronic submission of monthly complaint tally beginning in 2001.

Table 9. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1992–2012, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of personnel participating in survey [a]	85	88	88	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51	40	34	56
Complaints examined on site	1562	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65	70	37 [h]	113
Complaints handled by phone [b]					959	2196	743	987	618	660	550	424	507	451	426	380	452	535	514	396 [h]	722 [i]
Total complaints received					1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600	584	433 [h]	835
% Handled by phone					74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%	91%	86%
Bears killed by:																					
Private party or DNR	187	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23	22	9 [h]	16
Hunter before season [c]																					
– from nuisance survey	38	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4	3	3	11
– from registration file	52	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15	10	5	12
Hunter during/after season [d]	19	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0	0	0	0
Permittee [e]	28	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	3	5	0	0 [j]
Bears translocated	342	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2	2	2	0
% bears translocated [f]	22	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3	3	5	0
Bears killed by cars [g]	90	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18	28	15 [h]	33

Table 9 footnotes:

[a] Maximum number of people turning in a nuisance bear report each month (from Table 7). Monthly reports were required beginning in 1984.

[b] Tallies of complaints handled by phone were made only during the indicated years.

[c] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data. Similarity between the two values does not necessarily mean the same bears were reported.

[d] Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

[e] A permit for non-landowners to take a nuisance bear before the bear season was officially implemented in 1992, but some COs individually implemented this program in 1991. Data are based on records from the nuisance survey, not directly from permit receipts.

[f] Percent of on-site investigations resulting in a bear being captured and translocated.

[g] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2011 are either from the forms or from the confiscation records, whichever was greater (they differed very little).

[h] Lowest since record-keeping began (1981 for on-site complaints, nuisance bears killed and car-kills). However, participation in this survey may have affected the results. In 2011, 2 known nuisance kills of radio-collared bears, which were handled by COs, were not tallied here because these 2 COs did not participate in this survey.

[i] 120-180 calls in each month, May–Aug.

[j] 12 permits issued, but no bears killed.

Table 10. Bear food index values for five survey areas (see map in lower right) in northern Minnesota's bear range, 1984–2012. Shaded boxes denote particularly low (<45; pink) and high (≥70; green) fruit abundance.

Year	Survey Area					Entire Range[a]
	NW	NC	NE	WC	EC	
1984	32.3	66.8	48.9	51.4	45.4	51.8
1985	43.0	37.5	35.3	43.5	55.5	42.7
1986	83.9	66.0	54.7	74.7	61.1	67.7
1987	62.7	57.3	46.8	67.4	69.0	61.8
1988	51.2	61.1	62.7	54.4	47.3	56.0
1989	55.4	58.8	48.1	47.8	52.9	51.6
1990	29.1	39.4	55.4	44.0	47.9	44.1
1991	59.7	71.2	64.8	72.1	78.9	68.4
1992	52.3	59.9	48.6	48.1	63.3	58.2
1993	59.8	87.8	75.0	73.9	76.8	74.3
1994	68.6	82.3	61.3	81.5	68.2	72.3
1995	33.8	46.5	43.9	42.0	50.9	44.4
1996	89.5	93.2	88.4	92.2	82.1	87.6
1997	58.2	55.5	58.8	62.0	70.1	63.9
1998	56.9	72.8	66.4	72.3	84.5	71.1
1999	63.7	59.9	61.1	63.2	60.6	62.0
2000	57.7	68.0	54.7	69.2	67.4	62.3
2001	40.6	48.7	55.6	62.2	66.0	55.8
2002	53.1	63.4	60.4	68.6	68.3	66.8
2003	59.1	57.5	55.2	58.6	49.7	58.8
2004	57.0	60.5	61.1	70.3	67.9	64.4
2005	53.4	65.9	61.4	59.9	72.6	62.3
2006	51.0	64.9	53.4	51.0	52.1	56.9
2007	68.4	79.0	67.3	67.6	70.0	69.4
2008	58.6	74.1	64.7	66.6	71.4	65.4
2009	59.9	67.8	63.2	69.2	69.5	66.5
2010	70.0	71.3	79.0	60.8	57.3	68.0
2011	61.4	59.6	57.9	66.7	63.5	62.5
2012	49.1	50.3	59.4	50.5	41.5	50.7

[a] Values represent the sums of mean statewide index values for 14 species surveyed. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Figure 1. Boundaries of Minnesota's 5 bear food areas.

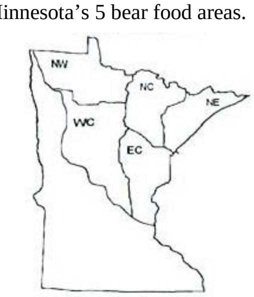


Table 11. Index values of bear food abundance[a] in 2012 compared to the previous 28-year mean (1985–2011) in 5 survey areas across Minnesota's bear range. Shaded values indicate particularly low (pink) and high (green) fruit abundance (≥1 point difference for individual foods; ≥5 points difference for composite scores).

	NW		NC		NE		WC		EC		Entire Range	
FRUIT	28yr mean	2012 n = 20[b]	28yr mean	2012 n = 15	28yr mean	2012 n = 8	28yr mean	2012 n = 14	28yr mean	2012 n = 9	28yr mean	2012 n = 45[b]
SUMMER												
Sarsaparilla	4.5	4.8	5.9	5.6	5.4	5.4	4.7	4.5	5.7	2.4	5.1	4.2
Pincherry	3.2	2.5	4.4	2.3	4.1	3.2	3.9	3.1	3.8	2.4	3.9	2.7
Chokecherry	5.5	4.2	5.3	3.1	4.4	3.5	5.5	3.3	4.7	2.9	5.2	3.7
Juneberry	4.9	4.6	4.7	6.0	4.8	7.0	3.8	3.8	4.0	2.6	4.4	4.3
Elderberry	1.4	1.2	3.2	1.5	3.6	4.5	3.2	1.4	3.4	0.8	3.0	2.1
Blueberry	5.0	1.2	5.4	1.7	4.9	2.6	3.7	1.8	3.7	2.3	4.4	1.8
Raspberry	6.6	6.4	8.1	7.1	8.0	6.0	7.1	5.4	7.1	5.0	7.3	5.9
Blackberry	1.3	1.5	2.3	2.5	1.0	1.3	3.5	3.1	4.3	4.0	2.9	2.9
FALL												
Wild Plum	2.1	2.0	1.8	1.3	1.0	1.0	2.6	1.8	2.4	2.3	2.1	1.7
HB Cranberry	5.2	3.0	4.4	2.6	3.6	4.6	3.7	2.7	3.6	2.2	4.0	2.9
Dogwood	6.0	3.3	5.8	3.6	5.0	5.2	5.8	3.9	6.0	1.3	5.7	3.5
Oak	3.4	6.4	2.9	5.0	1.6	3.0	5.8	7.1	5.8	6.7	4.3	6.2
Mountain Ash	1.5	1.4	2.6	1.1	4.6	4.7	1.8	1.2	2.2	1.6	2.6	2.1
Hazel	6.3	6.7	7.7	6.9	7.3	7.5	8.1	7.5	7.9	5.0	7.4	6.7
TOTAL	56.9	49.1	64.7	50.3	59.1	59.4	63.1	50.5	64.5	41.5	62.2	50.7

b n = Number of surveys used to calculate each area-specific mean index value for 2011.

C Sample size for the entire bear range does not equal the sum of the sample sizes of the 5 areas because some surveys were conducted on the border of 2 or more areas and were included in tabulations for each area.

Table 12. Regional productivity indices (summed) for oak, hazel, and dogwood, 1984– 2012. Shaded blocks indicate particularly low (≤5.0, yellow) or high (≥8.0, tan) fall food productivity.

	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range [a]
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8	4.2	4.7	5.3	4.4
1986	7.2	5.0	4.0	7.0	6.2	6.2
1987	8.0	7.8	7.3	7.6	8.0	7.7
1988	5.5	7.2	7.3	6.8	6.1	6.7
1989	6.0	5.3	4.1	5.7	6.4	5.8
1990	3.3	4.2	6.4	5.7	6.4	5.2
1991	6.2	6.2	5.4	7.2	7.7	6.7
1992	4.7	5.0	4.4	4.4	6.8	5.1
1993	5.3	7.1	6.7	6.2	7.7	6.5
1994	7.1	7.8	5.8	7.8	7.1	7.2
1995	4.8	4.8	5.1	4.6	5.3	4.9
1996	8.7	8.6	8.1	9.2	8.5	8.6
1997	5.8	5.4	5.1	6.8	6.5	6.2
1998	5.8	6.0	6.3	7.1	7.8	6.7
1999	6.4	5.1	5.9	6.6	6.0	6.2
2000	5.8	7.7	7.2	7.5	8.5	7.0
2001	3.4	4.1	5.7	6.0	6.5	5.2
2002	8.7	7.1	6.6	8.8	8.2	8.1
2003	6.3	6.0	5.5	6.2	6.0	6.1
2004	6.1	5.4	5.4	6.4	6.1	6.0
2005	5.8	5.8	6.1	6.4	7.0	6.2
2006	6.7	6.1	6.0	6.7	5.8	6.3
2007	6.0	5.8	5.7	6.6	6.4	6.2
2008	6.6	7.3	6.2	7.0	8.9	7.1
2009	5.1	6.2	5.3	6.3	6.5	6.0
2010	7.7	6.4	6.5	6.2	5.4	6.6
2011	5.8	6.5	6.2	7.0	7.4	6.5
2012	6.2	6.3	6.3	6.5	4.8	6.1

[a] This value represents the sum of mean statewide productivity index values for hazel, oak, and dogwood. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.

Figure 3. Productivity of key fall bear foods in Minnesota's bear range, 2012.

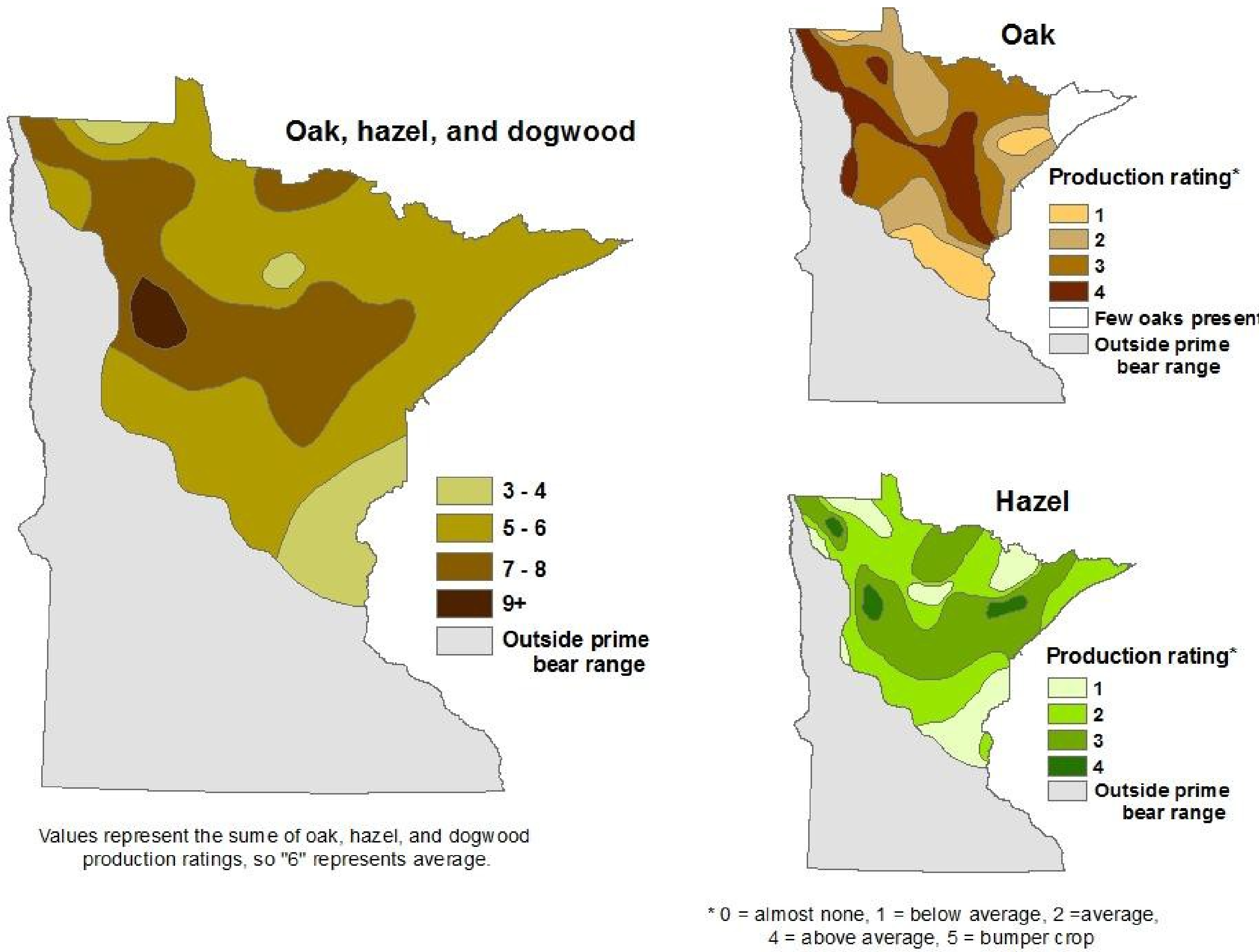


Figure 4. Summed bear food index (from Table 10) across Minnesota's bear range, comparing range of year-to-year variability during 1984–1996 versus 1997–2011, and 2012.

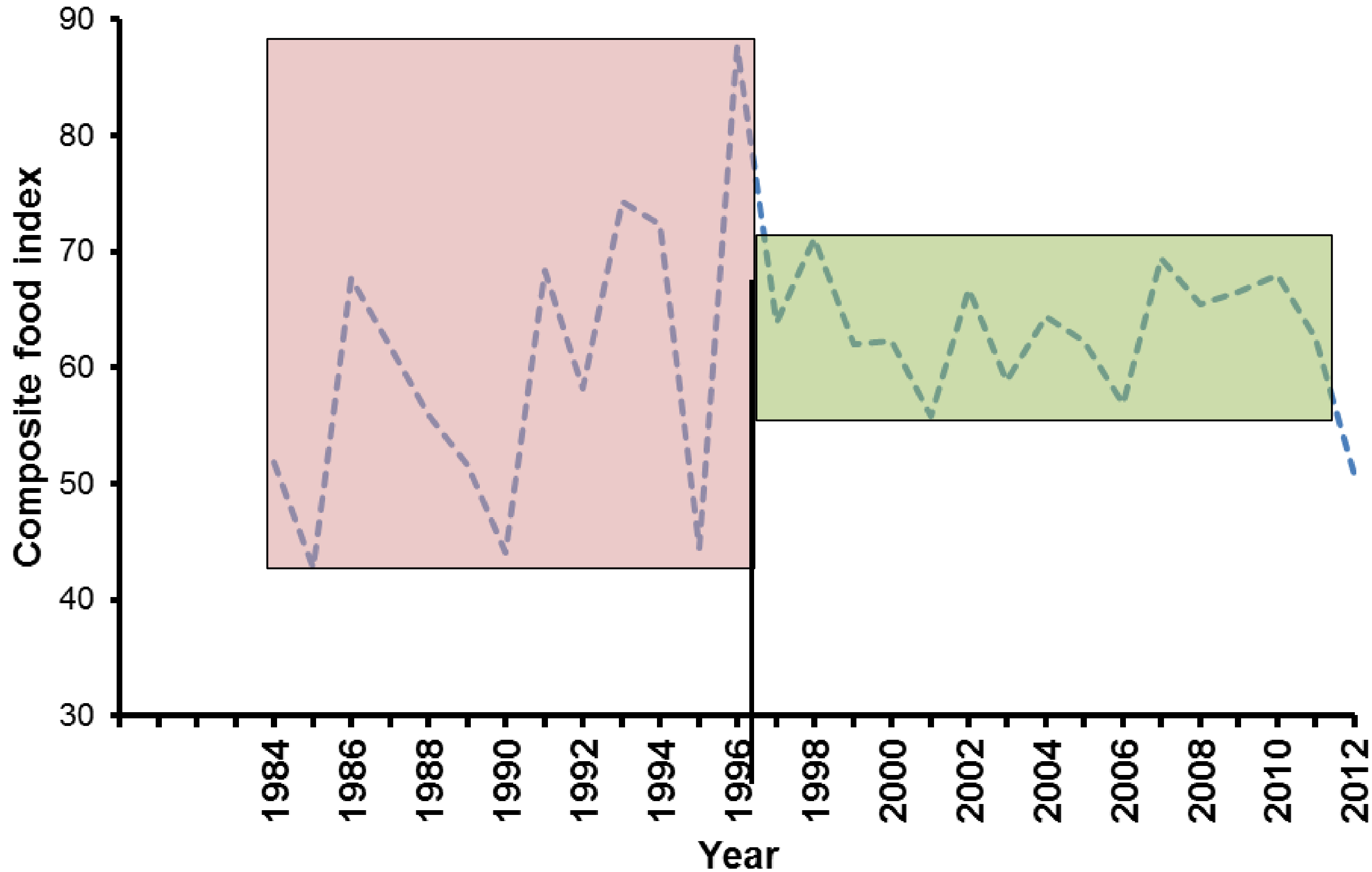
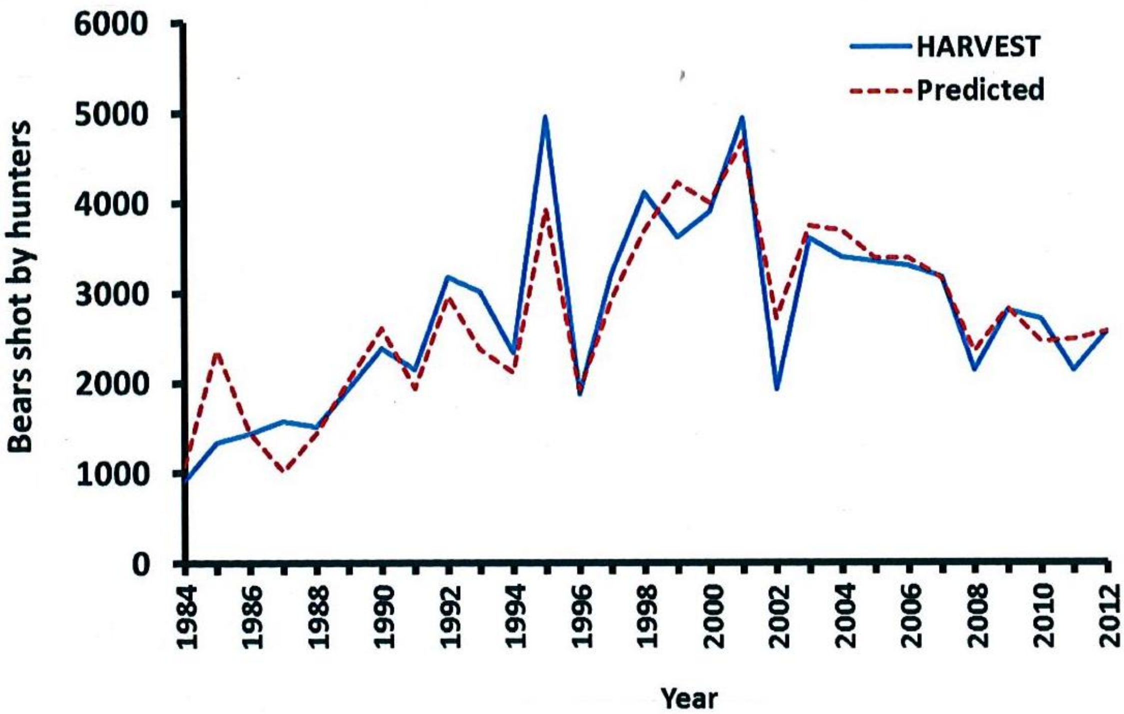


Figure 5. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: (top graph) 1984-2012 (R^2=0.84); (bottom graph) 2000-2012 (R^2=0.95).



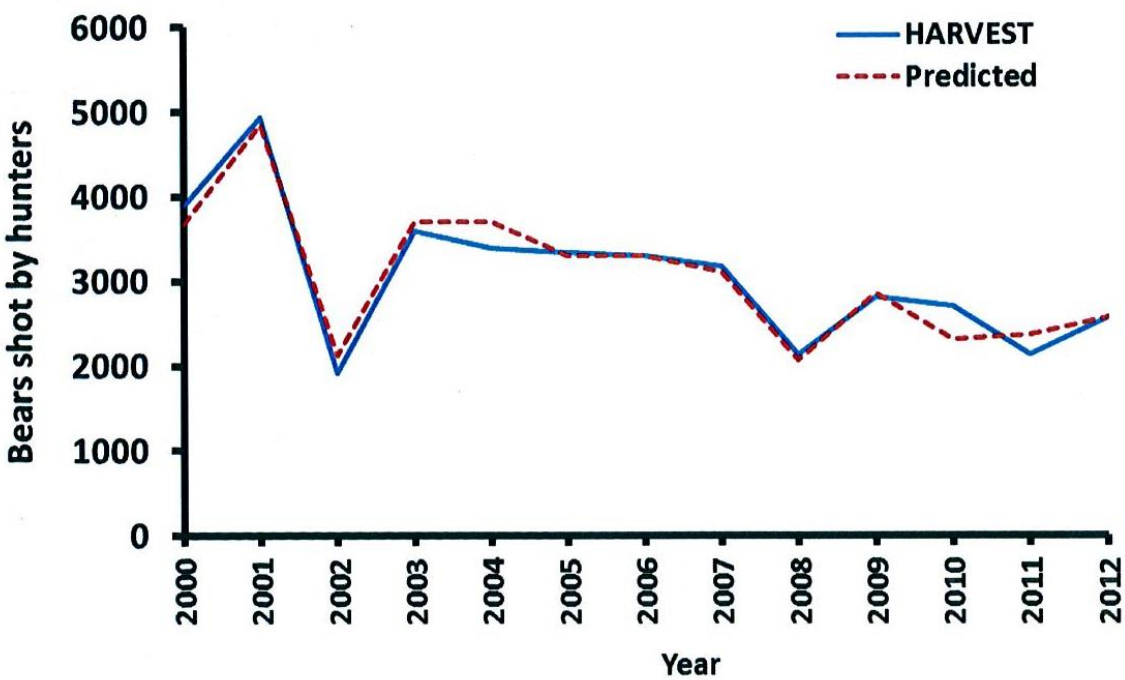


Figure 6. Sex ratios of harvested bears by BMU, 2006–2012.

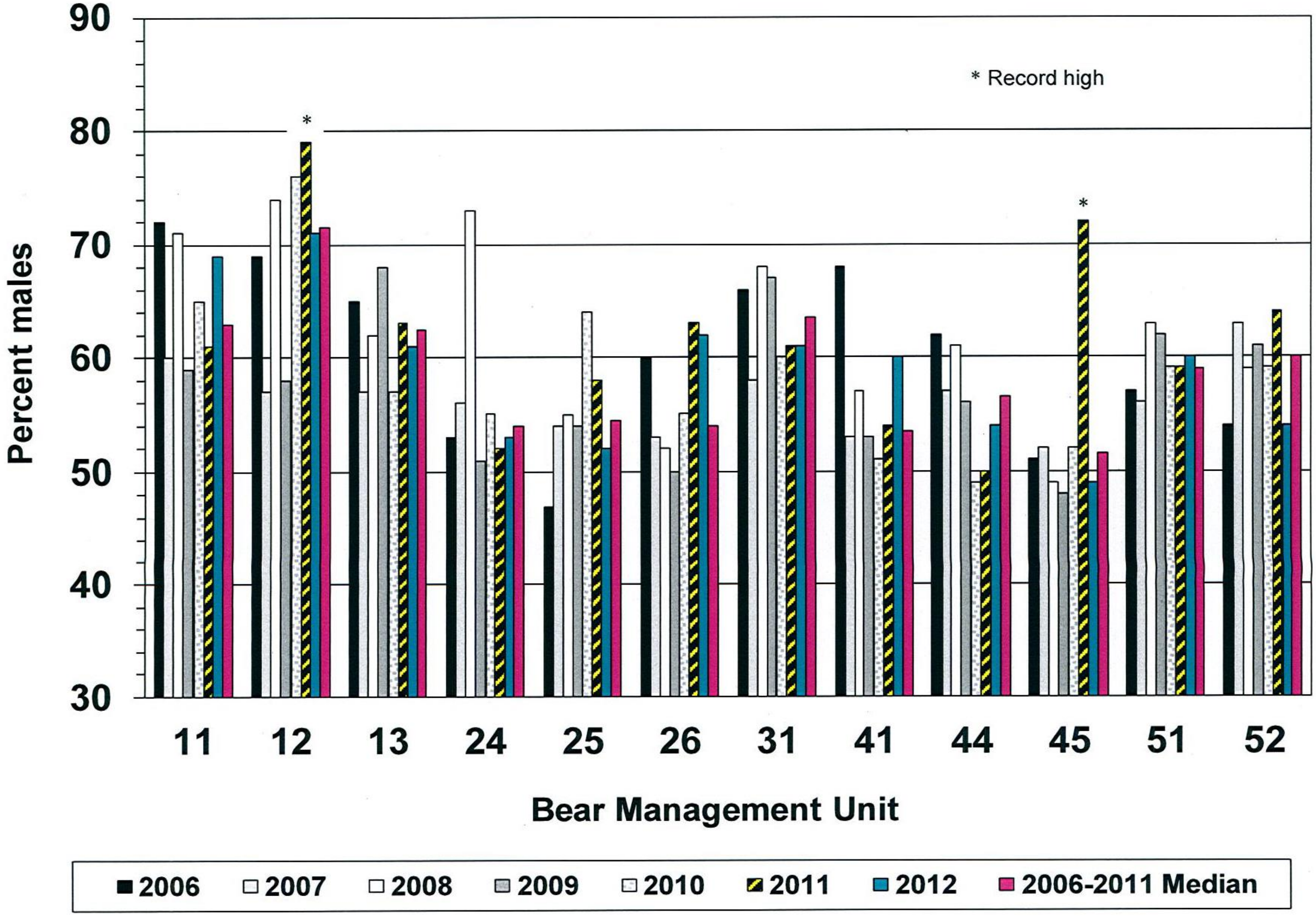


Figure 7. Median ages of harvested bears by BMU, 2006–2012.

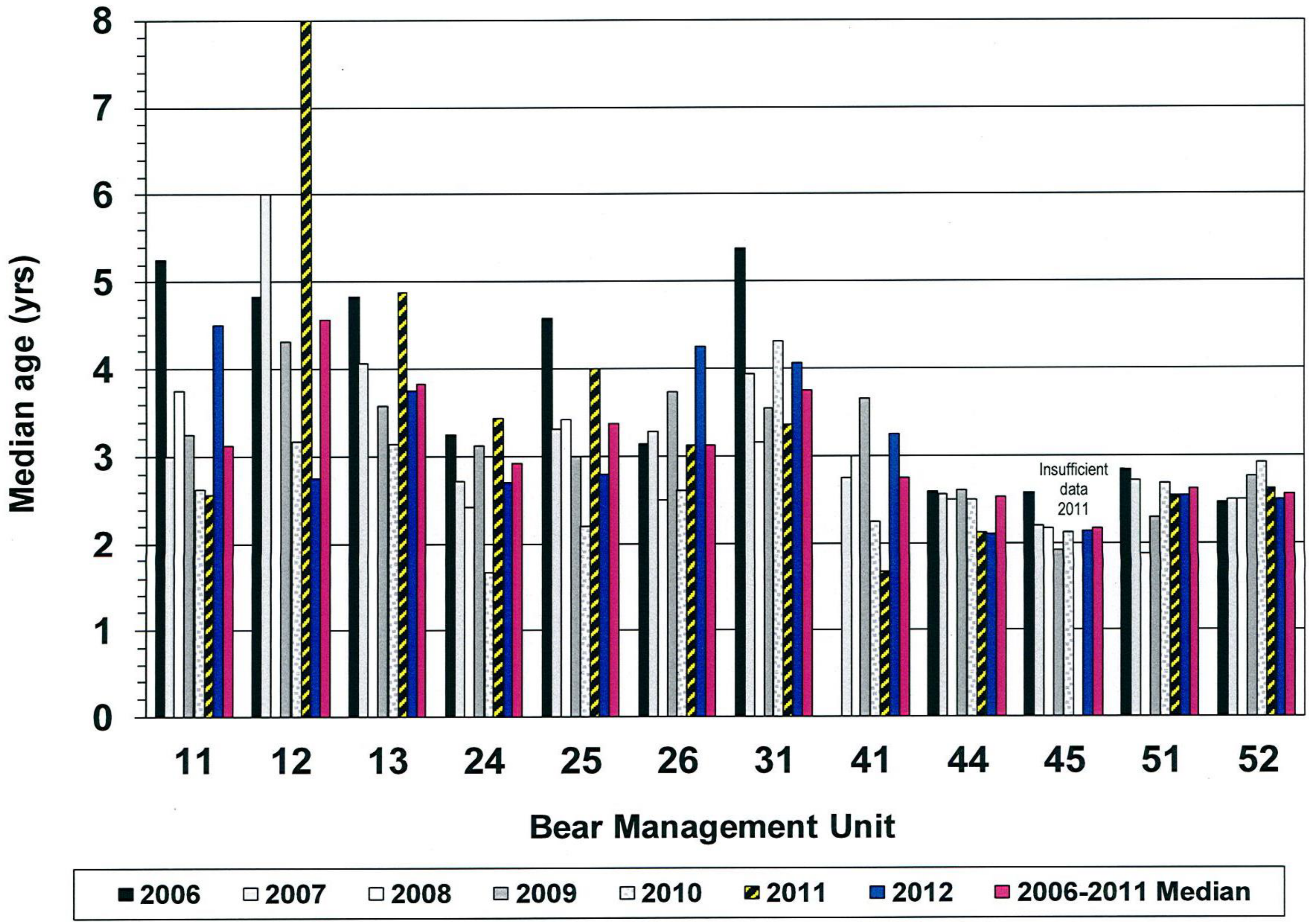


Figure 8. Statewide harvest structure: median ages (years) by sex, 1982–2012.

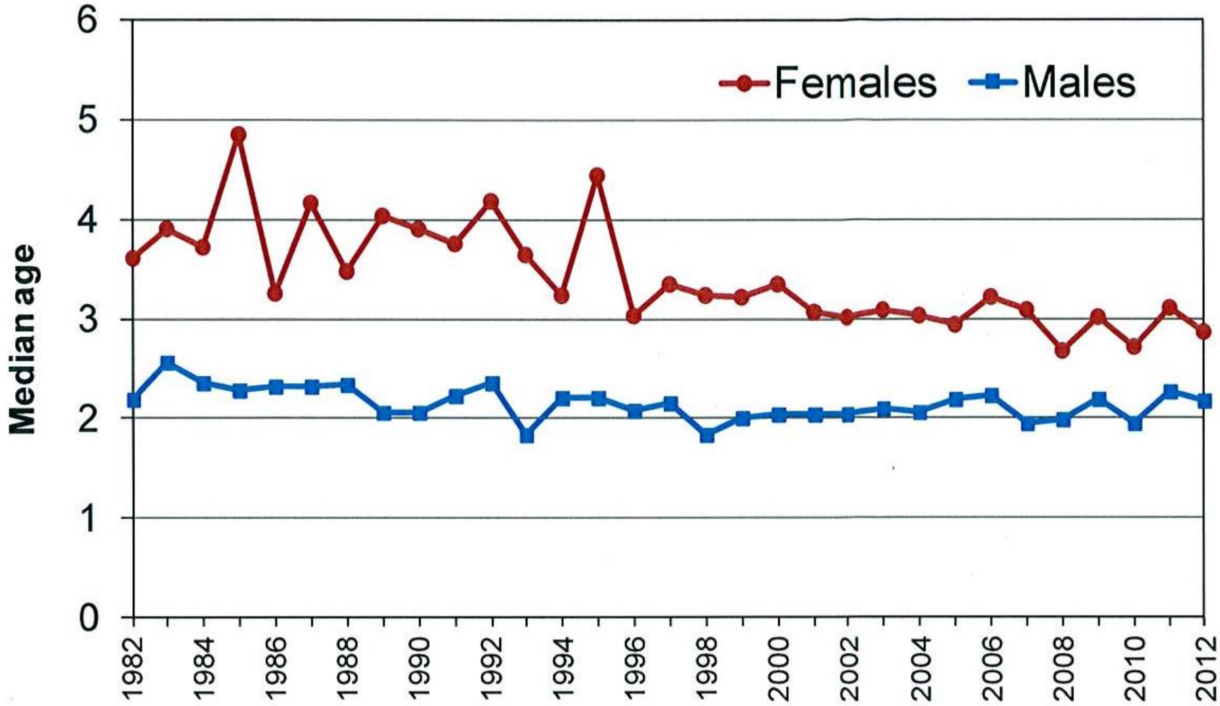


Figure 9. Statewide harvest structure: proportion of each sex in age category, 1982–2012. Trend lines are significant.

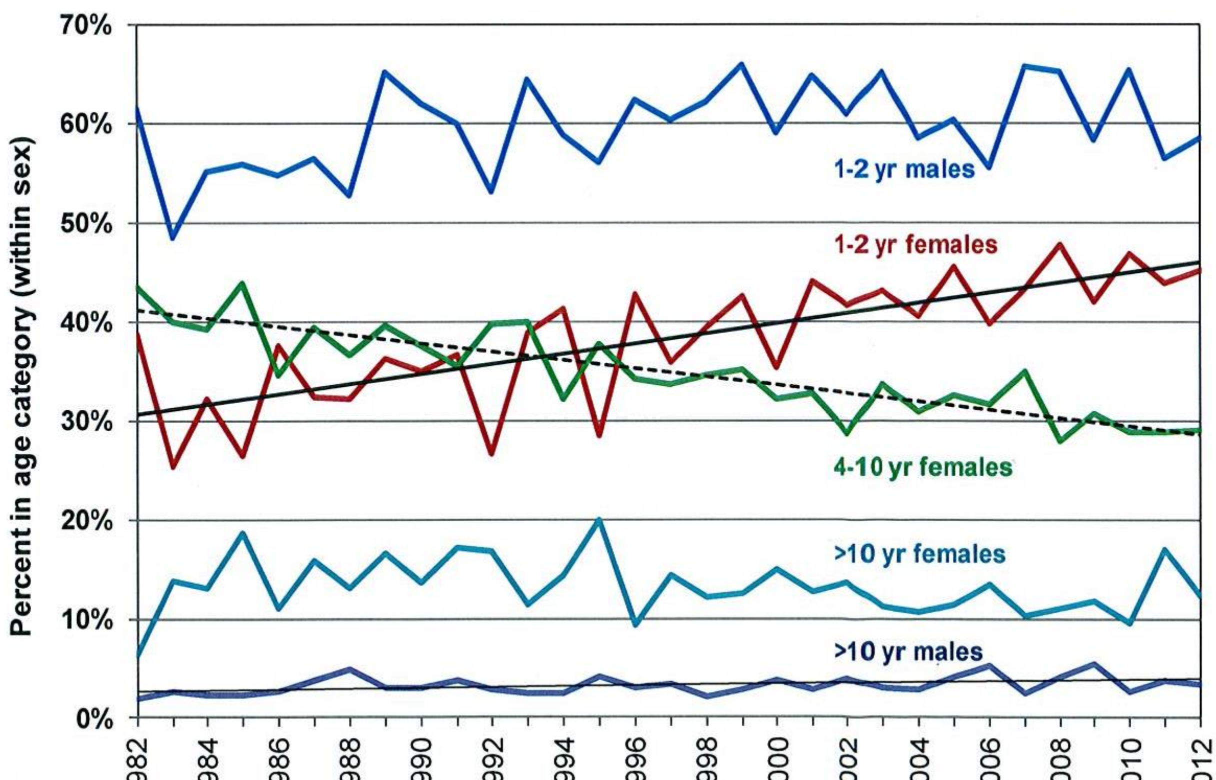


Figure 10. Statewide population trend derived from Downing reconstruction using the harvest age structures from 1980−2012. Curves were scaled (elevated) to various degrees to match the tetracycline-based mark–recapture estimates.

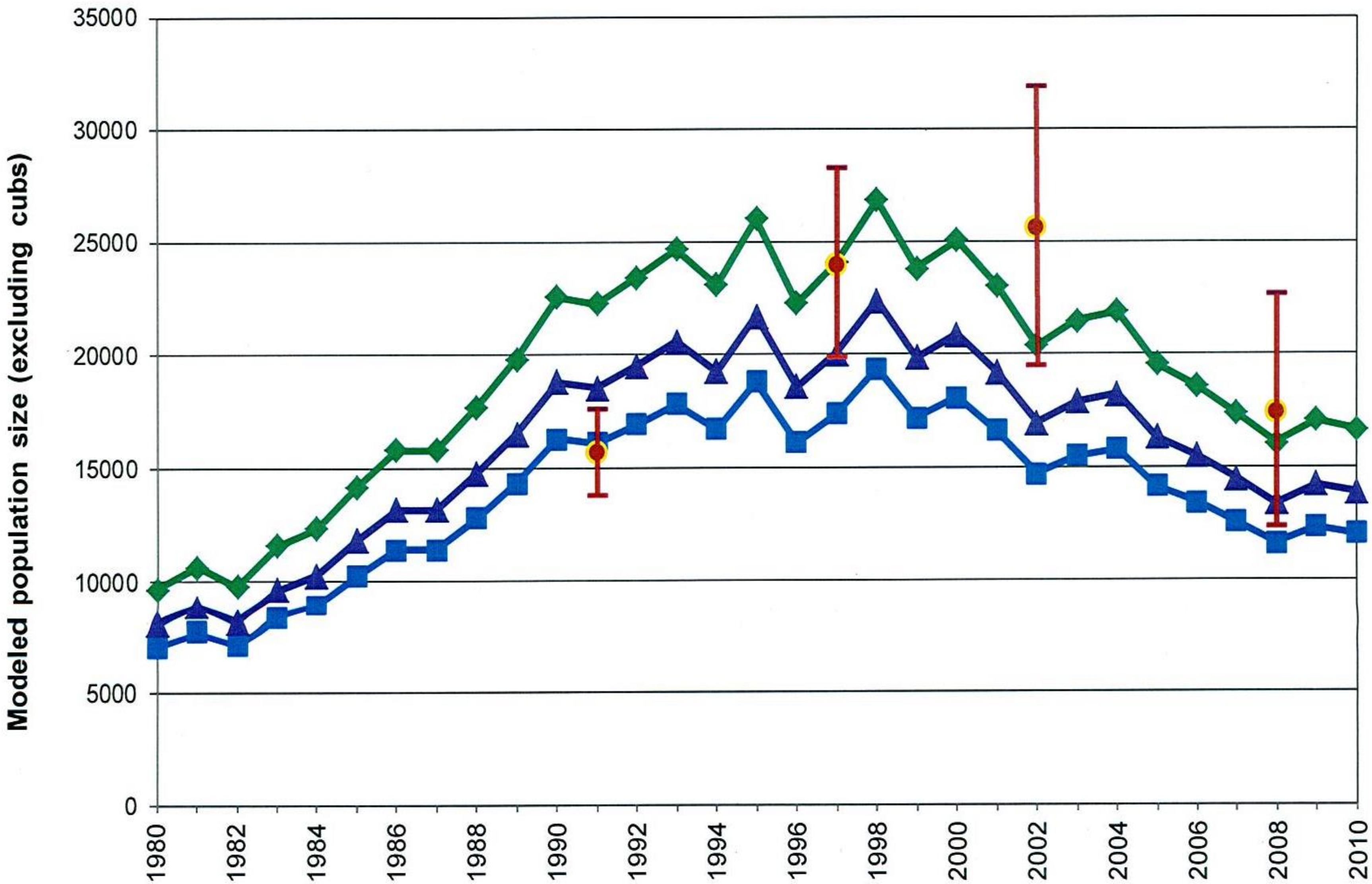
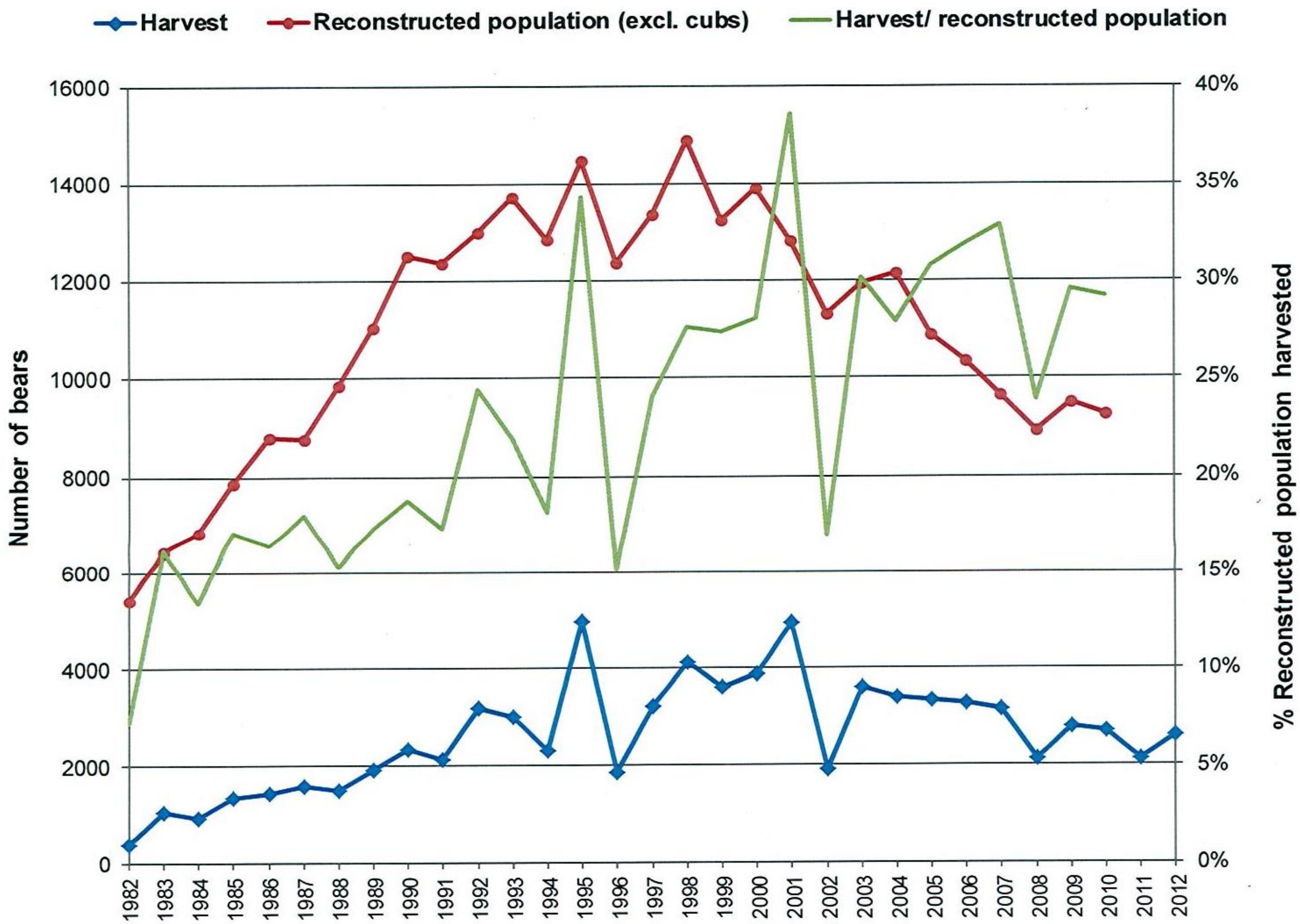


Figure 11. Statewide population trend derived from Downing reconstruction versus total harvest and harvest as a percent of reconstructed population size. The reconstructed population consists only of bears eventually harvested, not bears that died of other causes. Thus, the actual population size is larger than the reconstructed population.



2012 MINNESOTA DEER HARVEST REPORT

Leslie McInenly, Big Game Program Leader, Division of Fish and Wildlife

INTRODUCTION

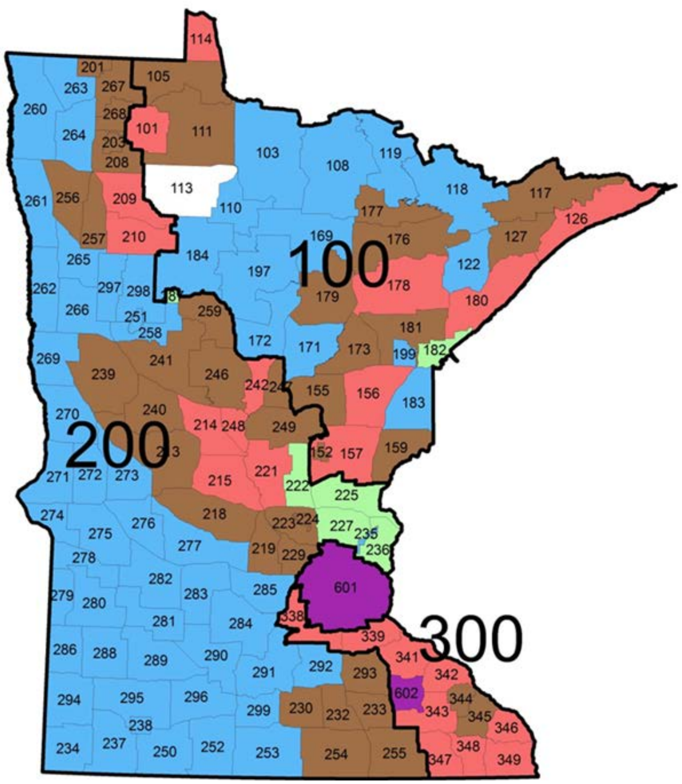
The white-tailed deer may be considered Minnesota's most popular wildlife species. Each year 500,000 hunters harvest close to 200,000 deer. In 2012, hunters registered 186,634 deer

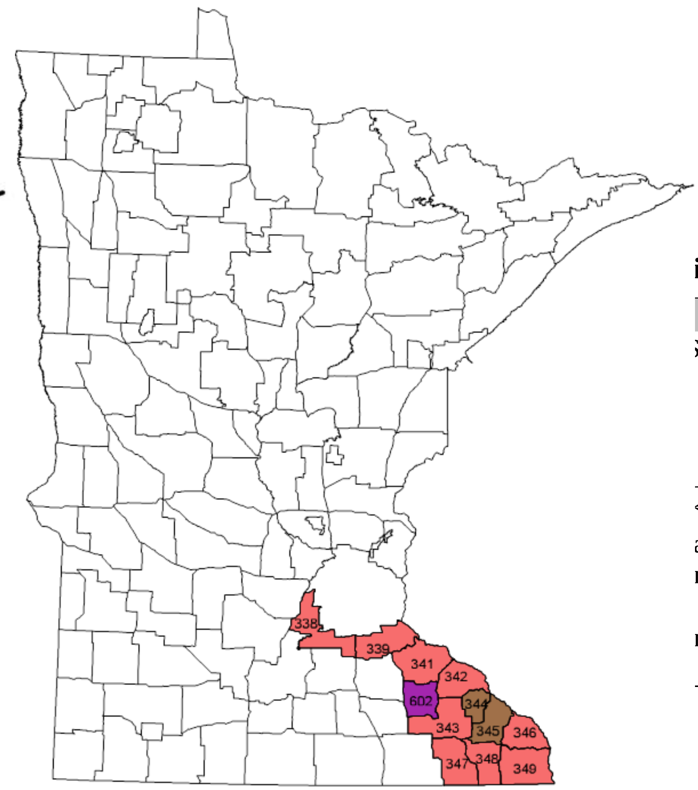
METHODS

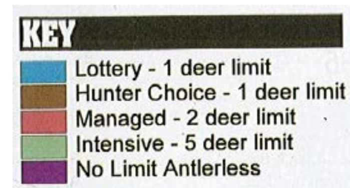
Every deer taken by hunting in Minnesota must be registered. In 2012, hunters were required to register deer within 24 hours of the close of the season under which the deer was taken. Deer may be registered at any of the 825 to nearly 900 “Big Game Registration” stations available throughout the state. Starting in 2011, deer could also be registered using the interest and telephone except in areas under Disease Management tag restrictions (PA 602) and in the 300-series areas while antler point restrictions were being tested (2010,2011,2012). 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

Outcomes of the 2012 deer harvest are presented in the following tables.







innesota Firearms Deer Seasons

	DATES
;tatewide (A)*	
	Nov. 3-18
	Nov. 3-11
	Nov. 3-11
.ate Southeast (B)**	Nov. 17-25
:*	Nov. 24-Dec. 9
agement Area (601)***	
ms or muzzleloader.)	Nov. 3-25
Disease Area (602)***	
ms or muzzleloader.)	Nov. 3-25
	Oct. 18-21

Figure 1. 2012 Firearms and Archery Deer Seasons.

2012 Minnesota Archery Deer Season Dates: September 15-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, 2001-2012.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
REGULAR FIREARMS												
Resident License Sales	401,005	367,964	344,875	309,698	291,298	299,774	285,286	376,006	377,077	379,866	382,668	391,822
Non-Resident License Sales	10,972	10,835	11,334	12,036	12,523	12,520	12,520	11,883	11,759	11,908	11,955	12,483
Bonus Permit Sales	59,013	105,699	194,201	183,186	184,566	167,343	145,522	190,156	140,920	143,763	142,049	89,750
Multi-Zone Buck License Sales	41,921	35,658	32,929	32,359	28,233	15,984	15,051	N/A	N/A	N/A	N/A	N/A
Youth License Sales	4,011	2,884	34,463	51,347	50,501	49,599	49,242	50,397	56,678	59,726	60,943	62,949
All Season Deer License Sales	3,986	22,125	30,998	46,008	59,090	75,511	76,385	N/A	N/A	N/A	N/A	N/A
Total License Sales	519,601	545,165	648,800	634,634	626,211	620,731	584,006	628,442	586,434	595,263	597,615	557,004
Registered Buck Harvest[1]	98,894	101,333	110,440	116,612	95,594	95,695	97,528	85,646	83,820	88,027	76,003	84,729
Antlerless Permits Offered	286,540	365,667	31,625	30,760	28,830	18,925	18,830	32,325	60,100	60,083	15,252	33,340
Antlerless Permits Issued	196,603	192,907	25,386	24,111	25,656	18,925	18,830	32,325	60,100	60,083	60,083	33,340
Antlerless Permits App.	225,341	202,086	30,253	28,454	31,403	31,403	31,403	31,403	90,882	86,783	86,783	72,236
Registered AL Harvest[1]	98,169	102,280	147,420	123,278	119,363	135,981	118,860	98,147	78,525	78,525	88,197	71,140
Registered Total Harvest[1]	197,063	203,613	257,860	239,890	214,957	231,676	216,388	183,793	162,345	174,104	164,200	155,869
Registered % Successful[2]	37.9	37.3	39.7	37.8	34.3	37.3	37.1	35.1	32.1	35.6	32.9	32.0
ARCHERY												
Resident License Sales	69,608	57,532	59,339	50,601	50,293	49,595	52,780	87,872	88,707	91,156	90,252	95,259
Non-Resident License Sales	1,288	1,275	1,428	1,144	1,207	1,286	1,509	1,509	1,610	1,638	1,718	1,814
Youth Archery Sales	N/A	N/A	3,748	7,261	7,489	7,688	7,663	9,005	9,157	9,577	10,306	11,276
Mgmt Permit License Sales	22,141	18,126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total License Sales	93,037	76,933	60,767	59,006	58,989	58,569	61,952	99,033	99,474	102,371	102,276	108,349
Total Harvest - All-Season License			2,356	3,489	4,563	8,284	6,900	N/A	N/A	N/A	N/A	N/A
Total Archery Harvest	15,884	14,744	21,691	20,726	23,538	25,360	24,161	22,632	20,629	22,057	20,444	21,605
Registered % Successful[2]	17.1	19.2	22.3	29.2	24.6	24.8	24.3	18.5	17.5	17.8	17.0	18.8
MUZZLELOADER												
Total Muzzleloader License Sales	13,043	11,764	9,142	10,512	9,226	10,781	9,867	64,673	63,282	55,640	59,384	58,363
Estimated All-Season Hunters	--	--	12,020	14,168	23,293	23,293	26,813	N/A	N/A	N/A	N/A	N/A
Total Muzzleloader Harvest	4,494	3,505	9,466	9,289	15,421	13,507	12,138	9,572	7,929	9,023	7,416	7,779
Registered % Successful[2]	34.5	29.8	44.7	37.6	47.4	39.6	28.2	13.4	11.3	16.2	12.4	12.4
Antlerless Permits Offered										5,792	1,997	1,635
Antlerless Permits App.										7,260	2,615	4,629
TOTAL Registered Harvest	217,452	222,050	290,525	260,604	255,736	270,778	260,434	221,837	194,186	207,313	192,331	186,634

[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, 2012.

Firearms/Zone	Hunters	Harvest			Overall Success
		Bucks	Antlerless	Total	
1	181,143	33,124	25,823	58,947	30.9%
2	238,964	44,345	35,611	79,956	31.8%
3A	25,210	4,578	4,235	8,813	31.2%
3B	13,099	1,256	3,566	4,822	32.4%
CWD	1,911	498	731	1,229	46.0%
Free Landowner[1]	4,773	0	1,499	1,499	31.5%
Muzzleloader[2]	59,384	3,251	4,528	7,779	12.4%
Archery[3]	102,276	8,663	12,942	21,605	18.8%
TOTAL[4]	**514,020**	**97,136**	**89,498**	**186,634**	**33.7%**

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

[2] Total number of people who bought only a muzzleloader license was 6,989.

[3] Includes Camp Ripley. Total number of people who bought only an archery license was 32,495.

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

Table 3. Firearms Harvest and Harvest per Square Mile by Permit Area, 2012. Includes all firearm licenses.

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	238	53	167	43	501	496	0.48	0.53	1.01
103	1A	774	36	123	17	950	1,824	0.42	0.10	0.52
105	1A	743	110	438	86	1,377	932	0.80	0.68	1.48
108	1A	1086	27	168	38	1,319	1,701	0.64	0.14	0.78
110	1A	956	103	447	91	1,597	530	1.80	1.21	3.01
111	1A	434	64	236	42	776	1,440	0.30	0.24	0.54
114	1A	44	4	31	5	84	412	0.11	0.10	0.20
117	1A	48	4	8	4	64	1,129	0.04	0.01	0.06
118	1A	617	10	61	9	697	1,445	0.43	0.06	0.48
119	1A	753	13	81	12	859	946	0.80	0.11	0.91
122	1A	381	27	100	20	528	622	0.61	0.24	0.85
126	1A	404	38	192	26	660	979	0.41	0.26	0.67
127	1A	97	9	36	2	144	587	0.17	0.08	0.25
152	1A	98	17	65	10	190	62	1.59	1.49	3.08
155	1A	1582	305	1021	176	3,084	639	2.48	2.35	4.83
156	1A	1725	457	1485	322	3,989	834	2.07	2.71	4.78
157	1A	2504	614	1757	385	5,260	904	2.77	3.05	5.82
159	1A	1121	172	703	98	2,094	575	1.95	1.69	3.64
169	1A	1477	152	605	106	2,340	1,202	1.23	0.72	1.95
171	1A	1312	135	492	83	2,022	729	1.80	0.97	2.77
172	1A	1911	173	647	135	2,866	786	2.43	1.21	3.64
173	1A	809	174	651	117	1,751	617	1.31	1.53	2.84
176	1A	1576	196	865	159	2,796	1,150	1.37	1.06	2.43
177	1A	734	140	487	90	1,451	553	1.33	1.30	2.63
178	1A	2004	510	1783	352	4,649	1,325	1.51	2.00	3.51
179	1A	1726	332	1165	225	3,448	939	1.84	1.83	3.67
180	1A	1070	154	649	173	2,046	999	1.07	0.98	2.05
181	1A	1150	197	670	144	2,161	746	1.54	1.36	2.90
182	1A	441	95	393	93	1,022	280	1.58	2.08	3.65
183	1A	1304	147	537	70	2,058	675	1.93	1.12	3.05
184	1A	2888	302	1098	241	4,529	1,318	2.19	1.24	3.44
197	1A	1010	74	336	65	1,485	1,343	0.75	0.35	1.11
199	1A	107	2	38	3	150	152	0.70	0.28	0.98
201	2A	72	13	61	12	158	169	0.43	0.51	0.93
203	2A	74	5	25	7	111	132	0.56	0.28	0.84
208	2A	229	30	122	20	401	379	0.60	0.45	1.06
209	2A	516	105	398	115	1,134	641	0.80	0.96	1.77
210	2A	926	196	744	205	2,071	635	1.46	1.80	3.26
213	2A	1594	316	819	242	2,971	1,161	1.37	1.19	2.56
214	2A	1458	433	996	376	3,263	566	2.58	3.19	5.77
215	2A	1096	302	764	225	2,387	730	1.50	1.77	3.27
218	2A	883	189	520	132	1,724	912	0.97	0.92	1.89
219	2A	514	107	291	66	978	427	1.20	1.09	2.29
221	2A	959	320	667	263	2,209	647	1.48	1.93	3.41
222	2A	859	268	654	242	2,023	413	2.08	2.82	4.90
223	2A	505	95	224	76	900	385	1.31	1.03	2.34
224	2A	104	15	45	13	177	49	2.12	1.49	3.61
225	2A	1239	278	791	237	2,545	635	1.95	2.06	4.01
227	2A	793	230	469	156	1,648	491	1.61	1.74	3.35

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	196	28	107	22	353	313	0.63	0.50	1.13
230	2A	261	56	150	35	502	464	0.56	0.52	1.08
232	2A	247	51	117	15	430	380	0.65	0.48	1.13
233	2A	209	24	98	16	347	386	0.54	0.36	0.90
234	2A	202	8	87	15	312	637	0.32	0.17	0.49
235	2A	43	6	12	4	65	37	1.17	0.60	1.77
236	2A	628	150	382	90	1,250	404	1.56	1.54	3.10
237	2A	278	15	88	9	390	737	0.38	0.15	0.53
238	2A	88	11	25	1	125	98	0.90	0.38	1.28
239	2A	1374	316	827	206	2,723	1,110	1.24	1.22	2.45
240	2A	1579	277	829	207	2,892	694	2.28	1.89	4.17
241	2A	2901	664	1695	515	5,775	1,047	2.77	2.75	5.52
242	2A	501	167	481	132	1,281	307	1.63	2.54	4.17
246	2A	2142	480	1352	388	4,362	860	2.49	2.58	5.07
247	2A	642	166	466	120	1,394	263	2.44	2.86	5.29
248	2A	387	80	286	94	847	229	1.69	2.01	3.71
249	2A	1116	264	647	207	2,234	729	1.53	1.53	3.06
250	2A	335	18	91	10	454	730	0.46	0.16	0.62
251	2A	87	11	34	14	146	68	1.28	0.87	2.14
252	2A	318	22	88	12	440	735	0.43	0.17	0.60
253	2A	435	18	113	15	581	987	0.44	0.15	0.59
254	2A	494	72	237	29	832	946	0.52	0.36	0.88
255	2A	452	61	171	43	727	774	0.58	0.36	0.94
256	2A	391	60	260	53	764	654	0.60	0.57	1.17
257	2A	392	47	186	33	658	426	0.92	0.62	1.54
258	2A	888	134	375	120	1,517	381	2.33	1.65	3.98
259	2A	1615	344	971	241	3,171	546	2.96	2.85	5.81
260	2A	327	15	72	9	423	1,252	0.26	0.08	0.34
261	2A	160	6	35	3	204	796	0.20	0.06	0.26
262	2A	177	24	70	18	289	677	0.26	0.17	0.43
263	2A	345	21	80	17	463	513	0.67	0.23	0.90
264	2A	679	35	165	30	909	672	1.01	0.34	1.35
265	2A	420	45	180	27	672	495	0.85	0.51	1.36
266	2A	326	34	121	20	501	625	0.52	0.28	0.80
267	2A	169	28	95	12	304	472	0.36	0.29	0.64
268	2A	212	32	128	25	397	239	0.89	0.77	1.66
269	2A	194	14	77	21	306	652	0.30	0.17	0.47
270	2A	182	9	36	4	231	758	0.24	0.06	0.30
271	2A	242	15	77	9	343	646	0.37	0.16	0.53
272	2A	209	10	54	8	281	544	0.38	0.13	0.52
273	2A	446	62	170	37	715	634	0.70	0.42	1.13
274	2A	214	12	45	6	277	381	0.56	0.17	0.73
275	2A	400	13	106	16	535	777	0.52	0.17	0.69
276	2A	521	41	140	27	729	575	0.91	0.36	1.27
277	2A	1105	72	348	59	1,584	876	1.26	0.55	1.81
278	2A	389	25	123	13	550	422	0.92	0.38	1.30
279	2A	235	15	95	12	357	346	0.68	0.35	1.03

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
280	2A	256	13	98	9	376	676	0.38	0.18	0.56
281	2A	427	25	113	18	583	579	0.74	0.27	1.01
282	2A	137	7	21	3	168	780	0.18	0.04	0.22
283	2A	315	14	64	9	402	640	0.49	0.14	0.63
284	2A	359	20	73	13	465	853	0.42	0.12	0.54
285	2A	370	36	130	28	564	580	0.64	0.33	0.97
286	2A	377	14	78	14	483	458	0.82	0.23	1.05
287	2A	117	51	174	45	387	51	2.31	5.33	7.64
288	2A	427	26	92	12	557	630	0.68	0.21	0.88
289	2A	224	15	33	5	277	820	0.27	0.06	0.34
290	2A	445	32	147	15	639	666	0.67	0.29	0.96
291	2A	657	79	221	33	990	832	0.79	0.40	1.19
292	2A	420	65	136	43	664	517	0.81	0.47	1.28
293	2A	546	75	253	45	919	512	1.07	0.73	1.79
294	2A	327	19	121	10	477	689	0.47	0.22	0.69
295	2A	479	20	125	17	641	855	0.56	0.19	0.75
296	2A	305	12	84	5	406	675	0.45	0.15	0.60
297	2A	176	8	37	11	232	449	0.39	0.12	0.52
298	2A	739	43	155	28	965	677	1.09	0.33	1.43
299	2A	268	25	113	13	419	389	0.69	0.39	1.08
338	3A	170	45	131	32	378	472	0.36	0.44	0.80
338	3B	41	24	67	19	151	472	0.09	0.23	0.32
339	3A	186	31	116	35	368	406	0.46	0.45	0.91
339	3B	47	16	72	20	155	406	0.12	0.27	0.38
341	3A	493	100	287	66	946	483	1.02	0.94	1.96
341	3B	152	71	236	66	525	483	0.31	0.77	1.09
342	3A	460	80	326	80	946	374	1.23	1.30	2.53
342	3B	121	83	266	78	548	374	0.32	1.14	1.47
343	3A	345	62	241	56	704	486	0.71	0.74	1.45
343	3B	104	45	143	33	325	486	0.21	0.45	0.67
344	3A	337	32	243	42	654	190	1.78	1.67	3.45
344	3B	53	25	160	28	266	190	0.28	1.12	1.40
345	3A	342	31	131	29	533	335	1.02	0.57	1.59
345	3B	114	51	211	30	406	335	0.34	0.87	1.21
346	3A	605	108	353	104	1,170	328	1.85	1.72	3.57
346	3B	176	90	344	75	685	328	0.54	1.55	2.09
347	3A	345	43	195	40	623	434	0.80	0.64	1.44
347	3B	93	53	186	39	371	434	0.21	0.64	0.86
348	3A	510	90	404	56	1,060	332	1.53	1.65	3.19
348	3B	93	60	229	41	423	332	0.28	0.99	1.27
349	3A	785	113	449	84	1,431	499	1.57	1.29	2.87
349	3B	262	108	493	104	967	499	0.53	1.41	1.94

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	659	143	412	78	1,292	1,756	0.38	0.36	0.74
602	CWD	498	180	424	127	1,229	304	1.64	2.40	4.04
901	Park	3	0	3	0	6				
902	Park	74	22	73	17	186				
903	Park	6	1	1	0	8				
904	Park	6	2	3	2	13				
905	Park	4	0	3	0	7				
906	Park	7	2	8	2	19				
907	Park	3	0	3	0	6				
908	Park	4	0	1	0	5				
909	Park	0	3	4	0	7				
910	Park	0	5	4	3	12				
911	Park	0	0	1	0	1				
913	Park	0	3	4	2	9				
914	Park	12	2	13	1	28				
915	Park	5	2	5	0	12				
916	Park	26	4	15	2	47				
917	Park	3	0	0	0	3				
918	Park	2	0	4	0	6				
919	Park	0	3	4	3	10				
920	Park	0	2	2	2	6				
921	Park	29	18	67	12	126				
922	Park	5	3	9	3	20				
923	Park	0	1	1	0	2				
924	Park	0	4	24	1	29				
925	Park	7	1	1	0	9				
926	Park	4	5	14	3	26				
927	Park	37	4	24	6	71				
928	Park	10	10	16	7	43				
929	Park	9	7	18	3	37				
930	Park	13	5	32	6	56				
Total		**84,729**	**14,218**	**46,261**	**10,661**	**155,869**	**83,265**	**1.02**	**0.85**	**1.87**

Table 4. Firearm Harvest using Bonus and Disease Management Permits, 2012.
Managed Permit Areas.

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
101	1A	39	113	31	183
114	1A	0	19	1	20
126	1A	22	116	17	155
156	1A	225	799	178	1,202
157	1A	316	955	208	1,479
178	1A	265	1,008	188	1,461
180	1A	84	331	99	514
209	2A	60	257	73	390
210	2A	109	461	129	699
214	2A	210	495	180	885
215	2A	127	375	114	616
221	2A	163	371	147	681
242	2A	93	240	73	406
248	2A	37	122	47	206
338	3A	22	79	16	117
338	3B	11	25	8	44
339	3A	22	82	27	131
339	3B	8	38	15	61
341	3A	61	203	46	310
341	3B	36	114	30	180
342	3A	45	223	61	329
342	3B	42	145	46	233
343	3A	44	172	37	253
343	3B	21	70	12	103
346	3A	61	238	70	369
346	3B	42	158	46	246
347	3A	29	128	24	181
347	3B	19	87	17	123
348	3A	55	267	40	362
348	3B	27	106	29	162
349	3A	72	294	56	422
349	3B	47	263	66	376
Total		**2,414**	**8,354**	**2,131**	**12,899**

Intensive Permit Areas

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
182	1A	59	255	69	383
222	2A	171	401	182	754
225	2A	179	491	162	832
227	2A	155	317	103	575
236	2A	96	253	60	409
287	2A	35	131	39	205
601	Metro	103	306	64	473
602	CWD	146	374	113	633
Total		**944**	**2,528**	**792**	**4,264**

Table 5. Summary of Firearms Special Hunts, 2012. Includes regular, youth, and bonus permits.

			Harvest				
Area	**Dates**	**Permits Issued**	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
900 - Cascade River State Park[1]	11/3-11/18	NA*	0	0	0	0	0
901 - Rice Lake Nat. Wildlife Refuge	11/10-11/18	40#	5	0	4	0	9
902 - St. Croix State Park[1]	11/9-11/12	400*	74	22	73	17	186
903 - Savanna Portage State Park	11/10-11/12	20*	6	1	1	0	8
904 - Gooseberry Falls State Park[1]	11/3-11/18	40*	6	2	3	2	13
905 - Split Rock Lighthouse State Park[1]	11/3-11/18	30*	4	0	3	0	7
906 - Tettegouche State Park[1]	11/3-11/18	125*	7	2	8	2	19
907 - Scenic State Park[1]	11/3-11/18	30*	3	0	3	0	6
908 - Hayes Lake State Park	11/3-11/18	75*	4	0	1	0	5
909 - Lake Bemidji State Park[1]	11/3-11/6	30**	0	3	4	0	7
910 - Zippel Bay State Park[1]	11/3-11/18	55**	0	5	4	3	12
911 - Judge CR Magney SP[1]	11/3-11/18	N/A*	0	0	1	0	1
912 - Schoolcraft State Park	11/3-11/18	N/A*	0	0	0	0	0
913 - Lake Carlos State Park	11/3-11/6	20**	0	3	4	2	9
914 - William O'Brien State Park[1]	11/10-11/11	60*	12	2	13	1	28
915 - Lake Bronson State Park	11/3-11/11	30*	5	2	5	0	12
916 - Maplewood State Park	11/3-11/6	100*	26	4	15	2	47
917 - Old Mill State Park	11/3-11/6	10*	3	0	0	0	3
918 - Lake Alexander SNA[1]	11/3-11/11	40*	2	0	4	0	6
919 - Glacial Lakes State Park	11/8-11/11	30**	0	3	4	3	10
920 - Zumbro Falls Woods SNA - A[1]	11/3-11/11	12**	0	2	2	2	6
921 - Forestville/Mystery Cave State Park[1]	11/3-11/5	130#	29	18	67	12	126
922 - Lake Louise State Park[1]	11/10-11/11	25***	5	3	9	3	20
923 - Zumbro Falls Woods SNA -B[1]	11/17-11/25	12***	0	1	1	0	2
924 - Whitewater State Game Refuge	11/17-11/25	75**	0	4	24	1	29
925 - Vermillion Highlands WMA[1]	11/3-11/16	25*	7	1	1	0	9
926 - Baker Park Reserve[1]	11/24-11/25	70*	4	5	14	3	26
927 - Elm Creek Park Reserve[1]	11/17-11/18	155*	37	4	24	6	71
928 - Wild River State Park[1]	11/3-11/5	75***	10	10	16	7	43
929 - Frontenac State Park - B[1]	11/17-11/19	60#	9	7	18	3	37
930 - Mille Lacs Kathio State Park[1]	11/9-11/11	40***	13	5	32	6	56
Total			**271**	**109**	**358**	**75**	**813**

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

#Antler Point Restriction

Table 6. Free Landowner Firearms Harvest by Permit Area, 2012.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	0	3	1	4
105	5	13	2	20
111	2	3	0	5
155	1	3	1	5
156	5	12	0	17
157	5	38	8	51
159	1	6	1	8
173	1	3	0	4
176	1	5	2	8
177	5	11	0	16
178	4	7	1	12
179	2	8	4	14
180	1	2	1	4
181	2	5	1	8
182	0	1	0	1
201	1	1	0	2
208	1	6	0	7
209	2	11	3	16
210	5	18	6	29
213	15	43	11	69
214	25	68	25	118
215	16	18	4	38
218	0	6	3	9
219	1	2	0	3
221	1	20	5	26
222	0	12	0	12
223	1	1	1	3
225	4	10	6	20
227	2	3	1	6
229	0	5	0	5
230	0	2	0	2
232	0	2	0	2
233	3	0	0	3
236	5	6	2	13
239	10	32	10	52
240	20	53	11	84
241	25	94	27	146
246	3	25	5	33
247	0	2	0	2
248	1	4	0	5
249	3	33	13	49
254	0	4	1	5
255	0	6	3	9
256	1	8	1	10
257	3	19	2	24
259	3	7	1	11
267	2	5	0	7
268	3	6	1	10
293	2	7	0	9
338	0	5	1	6
339	0	3	0	3
341	4	17	8	29
342	4	25	4	33
343	3	8	4	15
344	3	11	1	15
345	4	24	3	31
346	4	38	9	51
347	0	8	2	10
348	1	17	2	20
349	6	47	11	64
602	2	2	1	5
Total	**183**	**644**	**157**	**1,295**

Table 7. Archery Harvest by Permit Area, 2012.
Includes Regular, Youth, and Bonus Permits.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	5	2	8	3	18
103	7	0	13	0	20
105	11	5	10	0	26
108	24	4	33	5	66
110	17	2	21	3	43
111	8	0	8	2	18
114	6	0	3	0	9
117	1	0	0	0	1
118	12	1	20	0	33
119	7	1	8	0	16
122	10	0	6	0	16
126	14	4	25	4	47
127	2	1	1	0	4
152	3	4	2	1	10
155	71	6	52	2	131
156	82	24	191	27	324
157	122	38	198	32	390
159	67	5	48	2	122
169	33	1	50	2	86
171	35	6	36	3	80
172	81	19	64	3	167
173	19	7	26	3	55
176	48	3	37	4	92
177	15	3	24	0	42
178	95	22	228	25	370
179	93	17	89	9	208
180	81	30	138	20	269
181	78	5	52	7	142
182	259	138	649	131	1,177
183	38	6	41	3	88
184	138	15	89	10	252
197	28	6	26	3	63
199	5	0	2	0	7
201	5	0	2	0	7
208	6	0	2	1	9
209	28	11	64	9	112
210	48	9	87	12	156
213	188	13	92	7	300
214	101	26	196	27	350
215	151	35	249	39	474
218	156	21	74	18	269
219	124	9	69	8	210
221	101	32	150	31	314
222	88	59	269	53	469
223	146	18	97	15	276
224	20	3	10	3	36
225	144	70	277	48	539

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
236	203	80	309	71	663
237	38	5	14	2	59
238	17	2	5	0	24
239	87	11	47	5	150
240	85	10	50	4	149
241	150	21	128	15	314
242	115	53	233	36	437
246	81	8	65	12	166
247	76	11	65	7	159
248	51	16	91	13	171
249	68	15	39	6	128
250	59	0	33	2	94
251	1	0	2	1	4
252	57	6	39	1	103
253	66	10	52	8	136
254	99	10	44	5	158
255	89	10	65	7	171
256	23	2	16	3	44
257	11	4	15	1	31
258	35	2	23	4	64
259	83	8	68	8	167
260	16	0	5	1	22
261	14	2	5	1	22
262	23	1	16	2	42
263	15	0	3	0	18
264	21	0	11	0	32
265	25	0	11	0	36
266	22	1	17	1	41
267	4	0	2	0	6
268	5	0	2	0	7
269	26	0	7	1	34
270	28	3	6	5	42
271	34	0	11	2	47
272	21	0	2	4	27
273	48	4	27	0	79
274	19	0	12	3	34
275	38	6	29	2	75
276	53	3	41	4	101
277	170	14	146	10	340
278	50	4	41	4	99
279	16	6	18	2	42
280	28	1	25	1	55
281	60	7	52	1	120
282	20	0	16	2	38
283	41	4	27	1	73
284	62	5	28	4	99
285	89	7	38	3	137

Table 7. (Continued)

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
227	205	97	450	76	828
229	67	9	43	6	125
230	55	7	30	1	93
232	37	7	29	0	73
233	67	4	27	3	101
234	32	2	16	0	50
235	18	5	12	3	38
289	44	0	23	1	68
290	54	12	50	6	122
291	127	16	92	7	242
292	84	10	63	2	159
293	130	8	57	7	202
294	33	1	14	3	51
295	61	11	58	8	138
296	36	1	11	3	51
297	6	1	1	0	8
298	15	2	5	1	23
299	68	12	43	2	125

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
286	37	1	19	1	58
287	2	0	4	0	6
288	63	9	59	6	137
338	67	10	70	12	159
339	61	8	74	11	154
341	130	18	160	21	329
342	101	21	122	18	262
343	180	26	252	26	484
344	40	5	31	9	85
345	71	4	30	5	110
346	160	23	180	26	389
347	74	11	93	12	190
348	99	10	114	13	236
349	178	13	150	16	357
601	812	322	1226	248	2,608
602	83	37	143	37	300
970*	75	33	81	18	207
971**	95	17	86	25	223
Total	**8,663**	**1,796**	**9,685**	**1,461**	**21,605**

*Camp Ripley First Hunt
**Camp Ripley Second Hunt

Table 8. Archery Harvest using Bonus and Disease Management Permits by Permit Area, 2012.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	2	7	2	11
105	0	1	0	1
111	0	1	0	1
114	0	2	0	2
126	2	13	4	19
152	3	1	1	5
155	1	4	0	5
156	13	139	18	170
157	24	141	23	188
159	1	10	0	11
173	0	1	0	1
176	1	4	0	5
177	0	1	0	1
178	14	142	13	169
179	0	2	0	2
180	19	102	13	134
181	4	25	6	35
182	130	580	121	831
201	0	1	0	1
209	8	49	7	64
210	8	66	9	83
213	0	3	0	3
214	18	154	24	196
215	25	197	28	250
218	0	2	4	6
219	2	0	0	2
221	24	116	24	164
222	49	247	47	343
223	0	10	2	12
224	0	2	1	3
225	58	239	43	340
227	86	397	69	552
229	0	3	2	5

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
230	1	1	1	3
232	0	1	0	1
236	66	270	68	404
239	0	1	0	1
240	1	1	0	2
241	2	3	1	6
242	36	181	25	242
246	3	3	2	8
247	1	6	0	7
248	12	70	10	92
249	0	2	0	2
254	0	2	0	2
255	1	1	2	4
256	1	2	1	4
257	1	1	0	2
259	0	3	0	3
287	0	4	0	4
293	1	8	1	10
338	8	55	10	73
339	8	63	10	81
341	14	135	21	170
342	18	105	18	141
343	21	223	24	268
344	0	3	0	3
345	2	5	2	9
346	19	150	21	190
347	10	77	11	98
348	9	96	8	113
349	10	119	13	142
601	287	1098	232	1617
602	34	130	35	199
TOTAL	**1,058**	**5,481**	**977**	**7,516**

Table 9. Summary of Archery Special Hunts, 2012. Includes Regular, Youth, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
970 - Camp Ripley	10/20 - 10/21	2,500	75	81	33	18	207
971 - Camp Ripley	10/29 - 10/30	2,500	95	86	17	25	223
972 - Crow-Hassan Park Reserve	11/11- 11/13	130	0	1	0	0	1
973 - Murphy-Hanrehan Park Reserve	11/11- 11/13	180	1	0	0	0	1
974 - Cleary Lake Regional Park	11/11 - 11/13	55	0	0	0	0	0
975 - Vermillion Highlands WMA	9/17-10/30	60	1	3	2	1	7
976 - City of New Ulm	10/15 - 12/31	50	0	7	2	4	13
977 - City of Red Wing	9/17 - 12/31	Unl.	10	24	4	10	48
978 - City of Sandstone	9/17 - 12/31	Unl.	0	0	0	0	0
980 - City of Taylors Falls	9/17 - 12/31	Unl.	0	0	0	0	0
981 - City of Mankato	10/15 - 12/31	40	0	0	0	0	0
982 - City of Granite Falls	9/17 - 12/31	10	0	0	0	0	0
983 - City of Ortonville	9/17 - 12/31	30	0	11	4	0	15
984 - City of Canby	9/17 - 12/31	20	0	2	1	0	3
985 - City of Bemidji	9/17 - 12/31	40	1	11	2	2	16
987 - Greenleaf State SRA	9/17 - 12/31	Unl.	0	0	0	0	0
988 - Kellogg Weaver Dunes SNA	9/17 - 12/31	10	0	0	0	0	0
989 - Cedar Mountain SNA	9/17 - 12/31	Unl.	0	0	0	0	0
990 - City of Warroad	9/17 - 12/30	9	0	0	0	0	0
991 - East Minnesota River Refuge	9/17 - 12/31	10	0	3	1	1	5
Total			**183**	**229**	**66**	**61**	**539**

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

Table 10. Free Landowner Archery Harvest by Permit Area, 2012.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total		Permit Area	Fawn Male	Adult Female	Fawn Female	Total
155	0	1	0	1		247	0	1	0	1
156	0	1	0	1		248	0	2	0	2
157	2	1	0	3		249	1	1	0	2
159	0	1	0	1		257	0	1	0	1
173	0	1	0	1		259	0	1	0	1
177	0	1	0	1		341	0	1	0	1
178	0	1	0	1		342	0	2	0	2
179	1	0	0	1		343	1	2	0	3
213	1	5	1	7		344	0	1	0	1
214	1	2	0	3		345	0	3	1	4
215	0	4	0	4		346	0	1	2	3
218	1	0	0	1		347	0	1	0	1
221	0	3	1	4		348	1	0	0	1
239	4	2	0	6		349	0	3	0	3
240	0	2	0	2		601	0	1	0	1
241	1	11	0	12		**Total**	**14**	**57**	**5**	**76**

Table 11. Muzzleloader Harvest by Permit Area, 2012.
Includes Regular, Muzzleloader, Youth, and Bonus permits. Does not include Park hunts.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	7	0	12	2	21
103	8	1	3	4	16
105	23	0	12	1	36
108	13	0	3	0	16
110	12	1	13	1	27
111	6	0	10	2	18
114	1	0	1	0	2
118	26	0	2	1	29
119	10	0	1	0	11
122	10	2	3	3	18
126	14	3	27	2	46
127	1	0	2	0	3
152	2	0	0	0	2
155	10	6	38	2	56
156	23	7	42	4	76
157	17	8	57	7	89
159	11	6	16	1	34
169	12	3	13	1	29
171	6	0	5	0	11
172	18	0	5	1	24
173	7	3	14	3	27
176	14	7	29	6	56
177	4	3	16	2	25
178	32	11	74	13	130
179	25	6	16	4	51
180	17	5	36	6	64
181	17	3	23	4	47
182	11	6	27	3	47
183	14	2	12	2	30
184	47	4	48	5	104
197	8	0	6	0	14
199	3	0	0	0	3
201	7	0	10	0	17
203	6	0	3	0	9
208	17	2	13	1	33
209	28	4	37	4	73
210	30	8	48	5	91
213	85	22	75	9	191
214	35	15	82	15	147
215	64	27	82	21	194
218	64	16	65	10	155
219	49	10	48	12	119
221	28	27	63	12	130
222	20	25	67	15	127

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
229	24	5	10	2	41
230	21	9	16	1	47
232	29	9	21	3	62
233	36	9	33	3	81
234	25	0	6	0	31
235	4	0	0	0	4
236	30	16	60	10	116
237	33	0	5	0	38
238	5	0	3	1	9
239	58	18	55	5	136
240	34	14	60	10	118
241	60	23	130	15	228
242	18	10	48	15	91
246	50	14	64	11	139
247	22	6	25	6	59
248	16	3	31	3	53
249	27	6	26	5	64
250	39	0	11	0	50
251	3	0	0	0	3
252	32	1	15	2	50
253	37	1	20	2	60
254	48	14	53	8	123
255	36	12	34	2	84
256	21	3	16	4	44
257	12	1	8	1	22
258	21	4	17	3	45
259	42	20	43	14	119
260	25	0	3	0	28
261	11	0	1	0	12
262	13	3	3	0	19
263	24	0	7	2	33
264	35	1	5	2	43
265	28	1	10	3	42
266	48	1	10	1	60
267	13	5	3	1	22
268	13	0	14	3	30
269	29	2	7	0	38
270	23	0	1	0	24
271	31	0	9	0	40
272	15	1	6	0	22
273	34	6	14	2	56
274	32	2	14	2	50
275	34	1	15	0	50
276	65	2	23	2	92

Table 11. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
223	39	1	23	2	65	277	98	2	33	10	143
225	29	19	83	19	150	278	31	0	14	3	48
227	53	23	69	16	161	279	16	0	11	0	27
280	19	2	4	0	25	297	2	0	0	0	2
281	37	2	13	0	52	298	20	0	2	1	23
282	10	0	3	0	13	299	19	1	10	1	31
283	30	1	4	1	36	338	11	6	27	4	48
284	46	2	11	2	61	339	15	2	16	0	33
285	26	1	15	0	42	341	21	16	46	16	99
286	36	0	4	0	40	342	32	16	82	14	144
287	1	2	9	5	17	343	21	12	36	8	77
288	50	3	5	1	59	344	19	4	33	5	61
289	23	1	3	1	28	345	15	5	16	7	43
290	48	3	20	2	73	346	31	13	78	12	134
291	60	3	36	4	103	347	13	14	53	9	89
292	41	10	18	4	73	348	14	8	58	8	88
293	22	4	37	5	68	349	32	12	99	15	158
294	33	4	10	3	50	601	20	10	48	10	88
295	66	5	21	3	95	602	4	17	23	13	57
296	30	0	9	1	40	**TOTAL**	**3,251**	**690**	**3,196**	**533**	**7,670**

Table 12. Muzzleloader Harvest using Bonus and Disease Management Permits by Permit Area, 2012.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	0	7	2	9
114	0	1	0	1
126	1	17	2	20
156	3	19	3	25
157	4	29	5	38
176	1	1	0	2
178	9	29	6	44
180	2	20	6	28
181	0	1	0	1
182	4	22	1	27
208	1	1	0	2
209	3	23	2	28
210	5	31	2	38
213	0	1	0	1
214	9	41	8	58
215	15	46	15	76
218	0	0	1	1
221	20	30	5	55
222	16	42	12	70
225	11	50	10	71
227	17	41	14	72
232	0	1	0	1
236	11	41	7	59
242	6	23	6	35
246	0	1	0	1
248	1	19	2	22
255	0	0	1	1
256	0	0	1	1
287	2	8	5	15
293	0	1	1	2
338	2	7	0	9
339	1	11	0	12
341	10	23	7	40
342	9	57	10	76
343	8	21	6	35
344	0	1	0	1
345	0	1	1	2
346	6	46	10	62
347	9	29	4	42
348	5	32	5	42
349	5	63	8	76
601	9	26	9	44
602	10	19	13	42
TOTAL	**215**	**882**	**190**	**1,287**

Table 13. Summary of Muzzleloader Special Hunts, 2012.
Includes Regular, Youth, All-Season, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
936 - Crow Wing SP[1]	12/7-12/9	40***	0	2	4	1	7
937 - Soudan SP[1]	11/24-12/9	20*	1	0	0	0	1
938 - City of Tower[1]	11/24-12/9	20*	2	0	0	0	2
939 - Lake Shetek SP[1]	12/1-12/2	15**	0	1	0	1	2
940 -Rice Lake SP[1]	12/1-12/2	20**	0	5	7	4	16
942 - Sibley SP[1]	11/24-11/25	50**	0	12	9	0	21
943 - Big Stone Lake[1]	12/1-12/2	10**	0	0	0	0	0
944 - Vermillion Highlands WMA[1]	11/24-12/9	25*	0	0	0	0	0
945 -Camp Ripley[1]	11/26-11/28	100*	16	13	26	5	60
TOTAL			**19**	**33**	**46**	**11**	**109**

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

Table 14. Free Landowner Muzzleloader Harvest by Permit Area, 2012.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
157	0	3	0	3
179	0	1	0	1
208	0	2	0	2
210	0	1	0	1
213	2	8	1	11
214	2	3	0	5
215	1	4	0	5
218	0	2	0	2
221	0	1	1	2
222	1	1	0	2
225	0	1	0	1
232	1	0	0	1
239	1	2	0	3
240	1	8	0	9
241	1	14	2	17
246	0	7	0	7

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
249	1	1	0	2
254	2	2	0	4
256	1	2	0	3
268	0	2	0	2
293	0	1	0	1
338	0	2	1	3
339	0	1	0	1
341	1	1	1	3
342	0	2	0	2
343	1	1	0	2
344	0	3	0	3
345	2	1	1	4
346	0	8	1	9
347	1	2	0	3
348	1	3	0	4
349	1	8	1	10
Total	**21**	**98**	**9**	**128**

Table 15. Summary of Youth Hunts and Youth Season, 2012.

Area	Dates	Permits Issued	Harvest Adult Male	Adult Female	Fawn Male	Fawn Female	Total
950 - Camp Ripley Archery	10/5-10/7	175	5	3	1	1	10
951 - Afton SP	11/3-11/4	15	4	5	1	2	12
952 - Sibley SP	10/27-10/28	10	3	1	0	0	4
954 - Lake Bemidji SP	10/13-10/14	20	0	3	1	0	4
956 - St. Croix SP	10/27-10/28	100	8	6	1	1	16
957 - Rydell NWR	10/20-10/21	20	0	0	1	0	1
958 - Savanna Portage SP	10/27-10/28	20	6	6	2	0	14
959 - Buffalo River SP	11/3-11/4	14	0	0	2	0	2
961 - Itasca SP	10/13-10/14	75	2	4	0	1	7
962 - Great River SP	10/27-10/28	25	0	0	0	1	1
965 - Banning SP	10/27-10/28	6	1	1	0	0	2
Total		**480**	**29**	**29**	**9**	**6**	**73**

Youth Deer Season - October 18 - 21, unlimited permits

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	5	16	1	2	24
105	21	18	7	4	50
111	12	6	2	3	23
114	1	4	0	0	5
201	4	0	0	1	5
203	0	1	0	0	1
208	7	5	0	0	12
209	13	15	3	5	36
225	0	1	0	0	1
256	23	12	5	2	42
257	10	9	3	0	22
260	13	15	3	2	33
263	18	15	3	4	40
264	27	32	2	3	64
267	11	9	0	1	21
268	6	10	2	1	19
338	8	6	1	0	15
339	6	6	1	1	14
341	20	18	9	3	50
342	25	12	4	5	46
343	17	10	5	4	36
344	15	11	3	6	35
345	19	12	4	3	38
346	20	15	10	11	56
347	12	12	3	5	32
348	11	9	5	4	29
349	20	20	5	7	52
601	10	7	6	2	25
602	8	19	7	8	42
Total	**362**	**325**	**94**	**87**	**868**

Table 16. Total Deer Harvest by Permit Area, 2012.
Includes all license types, permits, and special hunts.

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	255	203	56	50	564
103	789	139	37	21	986
105	798	478	122	91	1,489
108	1123	204	31	43	1,401
110	985	481	106	95	1,667
111	460	260	66	49	835
114	52	39	4	5	100
117	49	8	4	4	65
118	655	83	11	10	759
119	770	90	14	12	886
122	401	109	29	23	562
126	432	244	45	32	753
127	100	39	10	2	151
152	103	67	21	11	202
155	1663	1111	317	180	3,271
156	1830	1718	488	353	4,389
157	2643	2012	660	424	5,739
159	1199	767	183	101	2,250
169	1522	668	156	109	2,455
171	1353	533	141	86	2,113
172	2010	716	192	139	3,057
173	835	691	184	123	1,833
176	1638	931	206	169	2,944
177	753	527	146	92	1,518
178	2131	2085	543	390	5,149
179	1844	1270	355	238	3,707
180	1168	823	189	199	2,379
181	1245	745	205	155	2,350
182	711	1069	239	227	2,246
183	1356	590	155	75	2,176
184	3073	1235	321	256	4,885
197	1046	368	80	68	1,562
199	115	40	2	3	160
201	88	73	13	13	187
203	80	29	5	7	121
208	259	142	32	22	455
209	585	514	123	133	1,355
210	1004	879	213	222	2,318
213	1867	986	351	258	3,462
214	1594	1274	474	418	3,760
215	1311	1095	364	285	3,055
218	1103	659	226	160	2,148
219	687	408	126	86	1,307
221	1088	880	379	306	2,653
222	967	990	352	310	2,619
223	690	344	114	93	1,241
224	124	55	18	16	213
225	1412	1152	367	304	3,235
227	1051	988	350	248	2,637
278	470	178	29	20	697
279	267	124	21	14	426
280	303	127	16	10	456
281	524	178	34	19	755
282	167	40	7	5	219
283	386	95	19	11	511
284	467	112	27	19	625
285	485	183	44	31	743
286	450	101	15	15	581
287	120	187	53	50	410
288	540	156	38	19	753
289	291	59	16	7	373
290	547	217	47	23	834
291	844	349	98	44	1,335
292	545	217	85	49	896
293	698	347	87	57	1,189
294	393	145	24	16	578
295	606	204	36	28	874
296	371	104	13	9	497
297	184	38	9	11	242
298	774	162	45	30	1,011
299	355	166	38	16	575
338	297	301	86	67	751
339	315	284	58	67	724
341	816	747	214	172	1,949
342	739	808	204	195	1,946
343	667	682	150	127	1,626
344	464	478	69	90	1,101
345	561	400	95	74	1,130
346	992	1025	267	253	2,537
347	537	539	124	105	1,305
348	727	814	173	122	1,836
349	1277	1263	252	237	3,029
601	1502	1694	481	338	4,015
602	593	609	241	185	1,628
901	5	4	0	0	9
902	74	73	22	17	186
903	6	1	1	0	8
904	6	3	2	2	13
905	4	3	0	0	7
906	7	8	2	2	19
907	3	3	0	0	6
908	4	1	0	0	5
909	0	4	3	0	7
910	0	4	5	3	12
911	0	1	0	0	1
913	0	4	3	2	9
914	12	13	2	1	28
915	5	5	2	0	12

Table 16. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
229	287	160	42	30	519
230	337	196	72	37	642
232	313	167	67	18	565
233	312	158	37	22	529
234	259	109	10	15	393
235	65	24	11	7	107
236	861	751	246	171	2,029
237	349	107	20	11	487
238	110	33	13	2	158
239	1519	929	345	216	3,009
240	1698	939	301	221	3,159
241	3111	1953	708	545	6,317
242	634	762	230	183	1,809
246	2273	1481	502	411	4,667
247	740	556	183	133	1,612
248	454	408	99	110	1,071
249	1211	712	285	218	2,426
250	433	135	18	12	598
251	91	36	11	15	153
252	407	142	29	15	593
253	538	185	29	25	777
254	641	334	96	42	1,113
255	577	270	83	52	982
256	458	304	70	62	894
257	425	218	55	35	733
258	944	415	140	127	1,626
259	1740	1082	372	263	3,457
260	381	95	18	12	506
261	185	41	8	4	238
262	213	89	28	20	350
263	402	105	24	23	554
264	762	213	38	35	1,048
265	473	201	46	30	750
266	396	148	36	22	602
267	197	109	33	14	353
268	236	154	34	29	453
269	249	91	16	22	378
270	233	43	12	9	297
271	307	97	15	11	430
272	245	62	11	12	330
273	528	211	72	39	850
274	265	71	14	11	361
275	472	150	20	18	660
276	639	204	46	33	922
277	1373	527	88	79	2,067

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
916	26	15	4	2	47
917	3	0	0	0	3
918	2	4	0	0	6
919	0	4	3	3	10
920	0	2	2	2	6
921	29	67	18	12	126
922	5	9	3	3	20
923	0	1	1	0	2
924	0	24	4	1	29
925	7	1	1	0	9
926	4	14	5	3	26
927	37	24	4	6	71
928	10	16	10	7	43
929	9	18	7	3	37
930	13	32	5	6	56
936	0	4	2	1	7
937	1	0	0	0	1
938	2	0	0	0	2
939	0	0	1	1	2
940	0	7	5	4	16
942	0	9	12	0	21
945	16	26	13	5	60
950	5	3	1	1	10
951	4	5	1	2	12
952	3	1	0	0	4
954	0	3	1	0	4
956	8	6	1	1	16
957	0	0	1	0	1
958	6	6	2	0	14
959	0	0	2	0	2
961	2	4	0	1	7
962	0	0	0	1	1
965	1	1	0	0	2
970	170	167	50	43	430
972	0	1	0	0	1
973	1	0	0	0	1
975	1	3	2	1	7
976	0	7	2	4	13
977	10	24	4	10	48
983	0	11	4	0	15
984	0	2	1	0	3
985	1	11	2	2	16
991	0	3	1	1	5
TOTAL	**97,136**	**59,783**	**16,890**	**12,825**	**186,634**

Table 17. Estimated firearm hunter numbers, density, and harvest by Permit Area, 2012.

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ $mile^2$	Harvest/ $mile^2$
101	1,954	496	3.9	1.0
103	3,328	1,824	1.8	0.5
105	3,848	932	4.1	1.5
108	5,132	1,701	3.0	0.8
110	4,403	530	8.3	3.0
111	3,093	1,440	2.1	0.5
114	269	412	0.7	0.2
117	218	1,129	0.2	0.06
118	3,554	1,445	2.5	0.5
119	3,750	946	4.0	0.9
122	2,083	622	3.3	0.8
126	2,058	979	2.1	0.7
127	644	587	1.1	0.2
152	948	62	15.4	3.1
155	7,781	639	12.2	4.8
156	9,498	834	11.4	4.8
157	13,588	904	15.0	5.8
159	7,184	575	12.5	3.6
169	9,357	1,202	7.8	1.9
171	6,888	729	9.4	2.8
172	10,679	786	13.6	3.6
173	4,677	617	7.6	2.8
176	8,222	1,150	7.2	2.4
177	3,845	553	7.0	2.6
178	10,670	1,325	8.1	3.5
179	9,823	939	10.5	3.7
180	6,573	999	6.6	2.0
181	6,343	746	8.5	2.9
182	2,460	280	8.8	3.7
183	7,649	675	11.3	3.0
184	14,244	1,318	10.8	3.4
197	5,824	1,343	4.3	1.1
199	556	152	3.7	1.0
201	545	169	3.2	0.9
203	317	132	2.4	0.8
208	1,219	379	3.2	1.1
209	2,695	641	4.2	1.8
210	4,578	635	7.2	3.3
213	8,523	1,161	7.3	2.6
214	7,748	566	13.7	5.8
215	6,620	730	9.1	3.3
218	5,434	912	6.0	1.9
219	3,420	427	8.0	2.3
221	4,934	647	7.6	3.4
222	5,103	413	12.4	4.9
223	3,141	385	8.2	2.3
224	702	49	14.3	3.6
225	6,806	635	10.7	4.0
227	4,949	491	10.1	3.4
229	1,551	313	4.9	1.1
230	1,561	464	3.4	1.1
232	1,195	380	3.1	1.1
233	1,164	386	3.0	0.9
234	864	637	1.4	0.5
235	308	37	8.4	1.8
236	3,118	404	7.7	3.1
237	1,131	737	1.5	0.5
238	314	98	3.2	1.3
239	7,814	1,110	7.0	2.5
240	7,602	694	11.0	4.2
241	13,745	1,047	13.1	5.5
242	2,873	307	9.4	4.2
246	11,789	860	13.7	5.1
247	3,687	263	14.0	5.3
248	2,303	229	10.1	3.7
249	5,831	729	8.0	3.1
250	1,569	730	2.1	0.6
251	568	68	8.3	2.1
252	1,566	735	2.1	0.6
253	2,139	987	2.2	0.6
254	2,731	946	2.9	0.9
255	1,795	774	2.3	0.9
256	2,412	654	3.7	1.2
257	1,848	426	4.3	1.5
258	4,646	381	12.2	4.0
259	8,292	546	15.2	5.8
260	1,723	1,252	1.4	0.3
261	792	796	1.0	0.3
262	1,011	677	1.5	0.4
263	1,866	513	3.6	0.9
264	3,577	672	5.3	1.4
265	2,003	495	4.0	1.4
266	2,282	625	3.7	0.8
267	1,044	472	2.2	0.6
268	1,360	239	5.7	1.7
269	1,333	652	2.0	0.5

Table 17. (Continued).

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
270	941	758	1.2	0.3
271	1,047	646	1.6	0.5
272	1,194	544	2.2	0.5
273	2,883	634	4.6	1.1
274	1,031	381	2.7	0.7
275	2,141	777	2.8	0.7
276	3,269	575	5.7	1.3
277	6,151	876	7.0	1.8
278	2,149	422	5.1	1.3
279	1,186	346	3.4	1.0
280	1,577	676	2.3	0.6
281	2,471	579	4.3	1.0
282	783	780	1.0	0.2
283	1,541	640	2.4	0.6
284	1,662	853	1.9	0.5
285	2,516	580	4.3	1.0
286	1,389	458	3.0	1.1
287	675	51	13.3	7.6
288	1,859	630	3.0	0.9
289	1,044	820	1.3	0.3
290	2,407	666	3.6	1.0
291	3,706	832	4.5	1.2
292	2,818	517	5.4	1.3
293	2,692	512	5.3	1.8
294	1,262	689	1.8	0.7
295	2,220	855	2.6	0.7
296	1,694	675	2.5	0.6
297	1,155	449	2.6	0.5
298	3,769	677	5.6	1.4
299	1,591	389	4.1	1.1
338	2,083	472	4.4	1.1
339	1,870	406	4.6	1.3
341	4,407	483	9.1	3.0
342	3,964	374	10.6	4.0
343	3,160	486	6.5	2.1
344	3,182	190	16.8	4.8
345	3,014	335	9.0	2.8
346	4,133	328	12.6	5.7
347	3,094	434	7.1	2.3
348	3,746	332	11.3	4.5
349	5,656	499	11.3	4.8
601	2,864	1,756	1.6	0.7
602	1,911	304	6.3	4.0
Total	**463,191**	**83,265**	**5.6**	**1.9**

Table 18. Deer harvest per square mile by season, 2012.

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	0.04	1.01	0.04		1.09
103	1,824	0.01	0.52	0.01		0.54
105	932	0.03	1.48	0.04		1.54
108	1,701	0.04	0.78	0.01		0.82
110	530	0.08	3.01	0.05		3.14
111	1,440	0.01	0.54	0.01		0.56
114	412	0.02	0.20	0.00		0.23
117	1,129	0.00	0.06	0.00		0.06
118	1,445	0.02	0.48	0.02		0.53
119	946	0.02	0.91	0.01		0.94
122	622	0.03	0.85	0.03		0.90
126	979	0.05	0.67	0.05		0.77
127	587	0.01	0.25	0.01		0.26
152	62	0.16	3.08	0.03		3.28
155	639	0.21	4.83	0.09		5.12
156	834	0.39	4.78	0.09		5.26
157	904	0.43	5.82	0.10		6.35
159	575	0.21	3.64	0.06		3.91
169	1,202	0.07	1.95	0.02		2.04
171	729	0.11	2.77	0.02		2.90
172	786	0.21	3.64	0.03		3.89
173	617	0.09	2.84	0.04		2.97
176	1,150	0.08	2.43	0.05		2.56
177	553	0.08	2.63	0.05		2.75
178	1,325	0.28	3.51	0.10		3.89
179	939	0.22	3.67	0.05		3.95
180	999	0.27	2.05	0.06		2.38
181	746	0.19	2.90	0.06		3.15
182	280	4.20	3.65	0.17		8.02
183	675	0.13	3.05	0.04		3.22
184	1,318	0.19	3.44	0.08		3.71
197	1,343	0.05	1.11	0.01		1.16
199	152	0.05	0.98	0.02		1.05
201	169	0.04	0.93	0.10		1.08
203	132	0.00	0.84	0.07		0.91
208	379	0.02	1.06	0.09		1.17
209	641	0.17	1.77	0.11		2.06
210	635	0.25	3.26	0.14		3.65
213	1,161	0.26	2.56	0.16		2.98
214	566	0.62	5.77	0.26		6.64
215	730	0.65	3.27	0.27		4.18
218	912	0.30	1.89	0.17		2.36
219	427	0.49	2.29	0.28		3.06
221	647	0.49	3.41	0.20		4.10
222	413	1.14	4.90	0.31		6.35
223	385	0.72	2.34	0.17		3.22
224	49	0.73	3.61	0.00		4.34
225	635	0.85	4.01	0.24		5.09
227	491	1.68	3.35	0.33		5.37

Table 18. (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
229	313	0.40	1.13	0.13		1.66
230	464	0.20	1.08	0.10		1.38
232	380	0.19	1.13	0.16		1.49
233	386	0.26	0.90	0.21		1.37
234	637	0.08	0.49	0.05		0.62
235	37	1.03	1.77	0.11		2.91
236	404	1.64	3.10	0.29		5.03
237	737	0.08	0.53	0.05		0.66
238	98	0.25	1.28	0.09		1.62
239	1,110	0.14	2.45	0.12		2.71
240	694	0.21	4.17	0.17		4.55
241	1,047	0.30	5.52	0.22		6.03
242	307	1.42	4.17	0.30		5.89
246	860	0.19	5.07	0.16		5.43
247	263	0.60	5.29	0.22		6.12
248	229	0.75	3.71	0.23		4.69
249	729	0.18	3.06	0.09		3.33
250	730	0.13	0.62	0.07		0.82
251	68	0.06	2.14	0.04		2.25
252	735	0.14	0.60	0.07		0.81
253	987	0.14	0.59	0.06		0.79
254	946	0.17	0.88	0.13		1.18
255	774	0.22	0.94	0.11		1.27
256	654	0.07	1.17	0.07		1.30
257	426	0.07	1.54	0.05		1.67
258	381	0.17	3.98	0.12		4.27
259	546	0.31	5.81	0.22		6.33
260	1,252	0.02	0.34	0.02		0.38
261	796	0.03	0.26	0.02		0.30
262	677	0.06	0.43	0.03		0.52
263	513	0.04	0.90	0.06		1.00
264	672	0.05	1.35	0.06		1.46
265	495	0.07	1.36	0.08		1.52
266	625	0.07	0.80	0.10		0.96
267	472	0.01	0.64	0.05		0.70
268	239	0.03	1.66	0.13		1.81
269	652	0.05	0.47	0.06		0.58
270	758	0.06	0.30	0.03		0.39
271	646	0.07	0.53	0.06		0.67
272	544	0.05	0.52	0.04		0.61
273	634	0.12	1.13	0.09		1.34
274	381	0.09	0.73	0.13		0.95
275	777	0.10	0.69	0.06		0.85
276	575	0.18	1.27	0.16		1.60
277	876	0.39	1.81	0.16		2.36
278	422	0.23	1.30	0.11		1.65
279	346	0.12	1.03	0.08		1.23

Table 18. (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
280	676	0.08	0.56	0.04		0.67
281	579	0.21	1.01	0.09		1.30
282	780	0.05	0.22	0.02		0.28
283	640	0.11	0.63	0.06		0.80
284	853	0.12	0.54	0.07		0.73
285	580	0.24	0.97	0.07		1.28
286	458	0.13	1.05	0.09		1.27
287	51	0.12	7.64	0.34		8.09
288	630	0.22	0.88	0.09		1.20
289	820	0.08	0.34	0.03		0.45
290	666	0.18	0.96	0.11		1.25
291	832	0.29	1.19	0.12		1.61
292	517	0.31	1.28	0.14		1.73
293	512	0.39	1.79	0.13		2.32
294	689	0.07	0.69	0.07		0.84
295	855	0.16	0.75	0.11		1.02
296	675	0.08	0.60	0.06		0.74
297	449	0.02	0.52	0.00		0.54
298	677	0.03	1.43	0.03		1.49
299	389	0.32	1.08	0.08		1.48
338	472	0.34	1.12	0.10		1.56
339	406	0.38	1.29	0.08		1.75
341	483	0.68	3.05	0.20		3.93
342	374	0.70	3.99	0.38		5.08
343	486	1.00	2.12	0.16		3.27
344	190	0.45	4.85	0.32		5.62
345	335	0.33	2.80	0.13		3.26
346	328	1.19	5.66	0.41		7.25
347	434	0.44	2.29	0.21		2.94
348	332	0.71	4.46	0.26		5.44
349	499	0.72	4.81	0.32		5.84
601	1,756	1.49	0.74	0.05		2.27
602	304	0.99	7.86	0.24		9.09
Total	**83,265**	**0.26**	**1.88**	**0.09**		**2.22**

Table 19. 2012 Antlerless Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
103	1	1,186	1	1,186	0	**241**	**0.0%**
	2	368	0	151	217		
	3	17	0	0	17		
	4	7	0	0	7		
		1,578	**1**	1,337	**241**		
108	1	514	2	514	0	**98**	**0.0%**
	2	520	1	520	0		
	3	451	0	451	0		
	4	365	0	267	98		
		1,850	**3**	**1,752**	**98**		
110	1	1,667	118	0	1,667	**1,973**	**4.6%**
	2	200	7	0	200		
	3	14	0	0	14		
	4	1	0	0	1		
		1,882	**125**	**0**	**1,882**		
118	1	504	1	504	0	**98**	**0.0%**
	2	571	0	571	0		
	3	203	0	106	97		
	4	1	0	0	1		
		1,279	**1**	**1,181**	**98**		
119	1	716	1	716	0	**96**	**0.0%**
	2	753	0	753	0		
	3	182	0	92	90		
	4	6	0	0	6		
		1,657	**1**	**1,561**	**96**		
122	1	628	1	221	407	**494**	**0.0%**
	2	76	0	0	76		
	3	10	0	0	10		
	6	1	0	0	1		
		715	**1**	**221**	**494**		
169	1	4,271	8	1,940	2,331	**2,947**	**0.0%**
	2	582	0	0	582		
	3	27	0	0	27		
	4	6	0	0	6		
	5	1	0	0	1		
		4,887	**8**	**1,940**	**2,947**		
171	1	1,879	5	1,744	135	**1,470**	**0.0%**
	2	1,315	1	0	1,315		
	3	18	0	0	18		
	4	2	0	0	2		
		3,214	**6**	**1,744**	**1,470**		

Table 19. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
172	1 2 3 4	2,971 2,291 19 1 **5,282**	9 0 0 0 **9**	2,971 352 0 0 **3,323**	0 1,939 19 1 **1,959**	**1,959**	**0.0%**
183	1 2 3	2,850 174 17 **3,041**	5 3 2 **10**	619 0 0 **619**	2,231 174 17 **2,422**	**2,422**	**0.0%**
184	1 2 3 4	4,587 1,803 20 6 **6,416**	13 1 0 0 **14**	1,052 0 0 0 **1,052**	3,535 1,803 20 6 **5,364**	**5,364**	**0.0%**
197	1 2 3 4 5	2,250 180 12 4 1 **2,447**	3 0 0 0 0 **3**	972 0 0 0 0 **972**	1,278 180 12 4 1 **1,475**	**1,475**	**0.0%**
199	1 2 3 4	147 9 3 2 **161**	0 0 0 0 **0**	15 0 0 0 **15**	132 9 3 2 **146**	**146**	**0.0%**
234	1 2 3	294 10 3 **307**	1 1 0 0 2	31 0 0 **31**	263 10 3 **276**	**276**	**0.0%**
235	1 2 3	65 29 2 **96**	0 0 0 **0**	36 0 0 **36**	29 29 2 **60**	**60**	**0.0%**
237	1 2 3 5	234 98 8 1 **341**	1 1 0 0 **2**	234 14 0 0 **248**	0 84 8 1 **93**	**93**	**0.0%**
238	1 2 3	86 19 8 **113**	0 0 0 **0**	67 0 0 **67**	19 19 8 **46**	**46**	**0.0%**

Table 19. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
250	1	451	0	451	0	**176**	**0.0%**
	2	203	0	42	161		
	3	13	0	0	13		
	4	2	0	0	2		
		669	**0**	**493**	**176**		
251	1	233	1	83	150	**194**	**0.0%**
	2	44	0	0	44		
		277	**1**	**83**	**194**		
252	1	316	0	316	0	**132**	**0.0%**
	2	249	1	153	96		
	3	35	0	0	35		
	4	1	0	0	1		
		601	**1**	**469**	**132**		
253	1	500	1	500	0	**174**	**0.0%**
	2	310	0	193	117		
	3	52	0	0	52		
	4	4	0	0	4		
	6	1	0	0	1		
		867	**1**	**693**	**174**		
258	1	1,815	2	272	1,543	**1,938**	**0.0%**
	2	383	1	0	383		
	3	11	0	0	11		
	4	1	0	0	1		
		2,210	**3**	**272**	**1,938**		
260	1	565	4	283	282	**293**	**0.0%**
	2	9	0	0	9		
	3	2	0	0	2		
		576	**4**	**283**	**293**		
261	1	204	1	76	128	**136**	**0.0%**
	2	6	0	0	6		
	3	2	0	0	2		
		212	**1**	**76**	**136**		
262	1	267	0	78	189	**273**	**0.0%**
	2	81	1	0	81		
	3	1	0	0	1		
	4	2	0	0	2		
		351	**1**	**78**	**273**		
263	1	671	3	398	273	**294**	**0.0%**
	2	18	0	0	18		
	3	3	0	0	3		
		692	**3**	**398**	**294**		

Table 19. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
265	1	713	3	274	439	**477**	**0.0%**
	2	36	0	0	36		
	3	1	0	0	1		
	4	1	0	0	1		
		751	**3**	**274**	**477**		
266	1	659	2	328	331	**470**	**0.0%**
	2	137	0	0	137		
	3	2	0	0	2		
		798	**2**	**328**	**470**		
269	1	417	25	263	154	**221**	**0.0%**
	2	62	5	0	62		
	3	4	4	0	4		
	4	1	0	0	1		
		484	**34**	**263**	**221**		
270	1	231	0	231	0	**23**	**0.0%**
	2	26	0	12	14		
	3	8	0	0	8		
	4	1	0	0	1		
		266	**0**	**243**	**23**		
271	1	259	0	132	127	**183**	**0.0%**
	2	40	1	0	40		
	3	15	0	0	15		
	4	1	0	0	1		
		315	**1**	**132**	**183**		
272	1	289	0	283	6	**143**	**0.0%**
	2	114	1	0	114		
	3	19	1	0	19		
	4	4	0	0	4		
		426	**2**	**283**	**143**		
273	1	1,119	1	0	1,119	**1,213**	**-0.2%**
	2	79	0	0	79		
	3	15	1	0	15		
	4	3	0	0	3		
		1,216	**2**	**0**	**1,216**		
274	1	273	0	273	0	**134**	**0.0%**
	2	129	0	32	97		
	3	29	0	0	29		
	4	6	0	0	6		
	5	2	0	0	2		
		439	**0**	**305**	**134**		

Table 19. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
275	1	439	2	439	0	**184**	**0.0%**
	2	199	0	130	69		
	3	98	0	0	98		
	4	15	0	0	15		
	5	2	0	0	2		
		753	**2**	**569**	**184**		
276	1	1,082	1	915	167	**551**	**0.0%**
	2	301	1	0	301		
	3	82	0	0	82		
	4	1	0	0	1		
		1,466	**2**	**915**	**551**		
277	1	2,173	1	2,149	24	**901**	**0.0%**
	2	793	0	0	793		
	3	75	0	0	75		
	4	8	0	0	8		
	5	1	0	0	1		
		3,050	**1**	**2,149**	**901**		
278	1	673	0	673	0	**350**	**0.0%**
	2	369	3	86	283		
	3	63	0	0	63		
	4	3	0	0	3		
	5	1	0	0	1		
		1,109	**3**	**759**	**350**		
279	1	312	1	248	64	**265**	**0.0%**
	2	168	0	0	168		
	3	30	0	0	30		
	4	2	0	0	2		
	5	1	0	0	1		
		513	**1**	**248**	**265**		
280	1	358	1	358	0	**185**	**0.0%**
	2	178	0	58	120		
	3	58	0	0	58		
	4	5	0	0	5		
	5	2	0	0	2		
		601	**1**	**416**	**185**		
281	1	639	0	639	0	**306**	**0.0%**
	2	247	0	15	232		
	3	66	1	0	66		
	4	7	0	0	7		
	5	1	0	0	1		
		960	**1**	**654**	**306**		
282	1	111	0	111	0	**23**	**0.0%**
	2	54	1	54	0		
	3	29	0	8	21		
	4	2	0	0	2		
		196	**1**	**173**	**23**		

Table 19. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
283	1	327	1	327	0	**132**	**0.0%**
	2	148	0	118	30		
	3	89	0	0	89		
	4	13	0	0	13		
		577	**1**	**445**	**132**		
284	1	304	1	304	0	**91**	**0.0%**
	2	174	0	174	0		
	3	143	0	108	35		
	4	46	0	0	46		
	5	8	0	0	8		
	6	2	0	0	2		
		677	**1**	**586**	**91**		
285	1	824	1	542	282	**655**	**0.0%**
	2	354	0	0	354		
	3	14	0	0	14		
	4	3	0	0	3		
	5	2	0	0	2		
		1,197	**1**	**542**	**655**		
286	1	273	1	273	0	**90**	**0.0%**
	2	167	1	167	0		
	3	100	0	17	83		
	4	7	0	0	7		
		547	**2**	**457**	**90**		
288	1	278	0	278	0	**91**	**0.0%**
	2	162	1	162	0		
	3	160	0	79	81		
	4	10	0	0	10		
		610	**1**	**519**	**91**		
289	1	131	0	131	0	**43**	**0.0%**
	2	83	0	83	0		
	3	66	0	41	25		
	4	17	0	0	17		
	5	1	0	0	1		
		298	**0**	**255**	**43**		
290	1	649	0	649	0	**294**	**0.0%**
	2	392	0	199	193		
	3	95	0	0	95		
	4	6	0	0	6		
		1,142	**0**	**848**	**294**		
291	1	902	0	902	0	**660**	**0.0%**
	2	749	0	208	532		
	3	120	0	0	120		
	4	4	0	0	4		
	5	3	0	0	3		
	6	1	0	0	1		
		1,770	**0**	**1,110**	**660**		

Table 19. (Continued).

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
292	1	865	0	198	667	**745**	**0.0%**
	2	61	1	0	61		
	3	17	0	0	17		
		943	**1**	**198**	**745**		
294	1	285	0	258	27	**175**	**0.0%**
	2	111	1	0	111		
	3	30	0	0	30		
	4	7	0	0	7		
		433	**1**	**258**	**175**		
295	1	522	2	522	0	**259**	**0.0%**
	2	271	1	156	115		
	3	129	1	0	129		
	4	15	0	0	15		
		937	**4**	**678**	**259**		
296	1	306	1	306	0	**131**	**0.0%**
	2	269	1	267	2		
	3	122	1	0	122		
	4	7	0	0	7		
		704	**3**	**573**	**131**		
297	1	249	0	122	127	**194**	**0.0%**
	2	65	0	0	65		
	3	2	0	0	2		
		316	**0**	**122**	**194**		
298	1	1,256	2	822	434	**581**	**0.0%**
	2	130	0	0	130		
	3	16	0	0	16		
	4	1	0	0	1		
		1,403	**2**	**822**	**581**		
299	1	354	0	354	0	**216**	**0.0%**
	2	251	0	120	131		
	3	85	0	0	85		
		690	**0**	**474**	**216**		
TOTAL		**67,308**	**274**	**34,542**	**32,766**	**32,854**	

Table 21. 2012 Muzzleloader Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
103	1 2	46 8 **54**	0 0 **0**	45 0 **45**	1 8 **9**	**9**	**0.0%**
108	1 2 3	24 13 6 **43**	0 0 0 **0**	24 13 4 **41**	0 0 2 **2**	**2**	**0.0%**
110	1 2 3	22 2 1 **25**	0 0 0 **0**	0 0 0 **0**	22 2 1 **25**	**27**	**7.4%**
118	1 2 3	15 8 3 **26**	0 0 0 **0**	15 8 1 **24**	0 0 2 **2**	**2**	**0.0%**
119	1 2 3	31 35 4 **70**	0 0 0 **0**	31 35 0 **66**	0 0 4 **4**	**4**	**0.0%**
122	1 2	7 1 **8**	0 0 **0**	2 0 **2**	5 1 **6**	**6**	**0.0%**
169	1 2 3	80 5 1 **86**	0 0 0 **0**	33 0 0 **33**	47 5 1 **53**	**53**	**0.0%**
171	1 2	48 17 **65**	0 0 **0**	35 0 **35**	13 17 **30**	**30**	**0.0%**
172	1 2	77 32 **109**	0 0 **0**	68 0 **68**	9 32 **41**	**41**	**0.0%**
183	1 2	92 3 **95**	0 0 **0**	17 0 **17**	75 3 **78**	**78**	**0.0%**
184	1 2	135 24 **159**	0 0 **0**	23 0 **23**	112 24 **136**	**136**	**0.0%**
197	1 2 3	37 3 1 **41**	0 0 0 **0**	16 0 0 **16**	21 3 1 **25**	**25**	**0.0%**
199	1	4 **4**	0 **0**	0 **0**	4 **4**	**4**	**0.0%**

Table 21. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
234	1 2	22 3 **25**	0 0 **0**	1 0 **1**	21 3 **24**	**24**	**0.0%**
235	1 2	12 7 **19**	0 0 **0**	4 0 **4**	8 7 **15**	**15**	**0.0%**
238	1 2	6 2 **8**	0 0 **0**	4 0 **4**	2 2 **4**	**4**	**0.0%**
250	1 2	60 19 **79**	0 0 **0**	55 0 **55**	5 19 **24**	**24**	**0.0%**
251	1 2	7 2 **9**	0 0 **0**	3 0 **3**	4 2 **6**	**6**	**0.0%**
252	1 2	53 19 **72**	0 0 **0**	53 1 **54**	0 18 **18**	**18**	**0.0%**
253	1 2 3	79 33 1 **113**	0 0 0 **0**	79 8 0 **87**	0 25 1 **26**	**26**	**0.0%**
258	1 2	62 6 **68**	0 0 **0**	6 0 **6**	56 6 **62**	**62**	**0.0%**
260	1	20 **20**	0 **0**	6 **6**	14 **14**	**14**	**0.0%**
262	1 2	26 6 **32**	0 0 **0**	5 0 **5**	21 6 **27**	**27**	**0.0%**
263	1	14 **14**	0 **0**	8 **8**	6 **6**	**6**	**0.0%**
264	1	33 **33**	0 **0**	21 **21**	12 **12**	**12**	**0.0%**
265	1 2	33 1 **34**	0 0 **0**	11 0 **11**	22 1 **23**	**23**	**0.0%**
266	1 2	41 7 **48**	0 0 **0**	18 0 **18**	23 7 **30**	**30**	**0.0%**

Table 21. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
269	1 2	54 3 **48**	0 0 **0**	28 0 **28**	26 3 **29**	**29**	**0.0%**
270	1	23 **23**	0 **0**	21 **21**	2 **2**	**2**	**0.0%**
271	1 2	26 1 **27**	0 0 **0**	10 0 **10**	16 1 **17**	**17**	**0.0%**
272	1 2	18 3 **21**	0 0 **0**	14 0 **14**	4 3 **7**	**7**	**0.0%**
273	1 2	75 6 **81**	0 0 **0**	0 0 **0**	75 6 **81**	**87**	**6.9%**
274	1 2 3	35 10 1 **46**	0 0 0 **0**	30 0 0 **30**	5 10 1 **16**	**16**	**0.0%**
275	1 2 4	42 16 1 **59**	0 0 0 **0**	42 1 0 **43**	0 15 1 **16**	**16**	**0.0%**
276	1 2	95 25 **120**	0 0 **0**	71 0 **71**	24 25 **49**	**49**	**0.0%**
277	1 2 3	248 54 1 **303**	0 0 0 **0**	204 0 0 **204**	44 54 1 **99**	**99**	**0.0%**
278	1 2	104 34 **138**	0 0 **0**	88 0 **88**	16 34 **50**	**50**	**0.0%**
279	1 2	45 14 **59**	0 0 **0**	24 0 **24**	21 14 **35**	**35**	**0.0%**
280	1 2 3	34 9 1 **44**	0 0 0 **0**	29 0 0 **29**	5 9 1 **15**	**15**	**0.0%**
281	1 2	96 24 **120**	0 0 **0**	76 0 **76**	20 24 **44**	**44**	**0.0%**

Table 21. (Continued).

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
282	1 2	11 5 **16**	0 0 **0**	11 3 **14**	0 2 **2**	**2**	**0.0%**
283	1 2	48 21 **69**	0 0 **0**	48 3 **51**	0 18 **18**	**18**	**0.0%**
284	1 2 3	41 20 2 **63**	0 0 0 **0**	41 13 0 **54**	0 7 2 **9**	**9**	**0.0%**
285	1 2	62 15 **77**	0 0 **0**	32 0 **32**	30 15 **45**	**45**	**0.0%**
286	1 2	38 19 **57**	0 0 **0**	38 9 **47**	0 10 **10**	**10**	**0.0%**
288	1 2	34 18 **52**	0 0 **0**	34 9 **43**	0 9 **9**	**9**	**0.0%**
289	1 2 3	32 11 1 **44**	0 0 0 **0**	32 5 0 **37**	0 6 1 **7**	**7**	**0.0%**
290	1 2 3	134 48 1 **183**	0 0 0 **0**	127 0 0 **127**	7 48 1 **56**	**56**	**0.0%**
291	1 2 3	141 71 1 **213**	0 0 0 **0**	123 0 0 **123**	18 71 1 **90**	**90**	**0.0%**
292	1 2	61 4 **65**	0 0 **0**	10 0 **10**	51 4 **55**	**55**	**0.0%**
294	1 2	45 9 **54**	0 0 **0**	29 0 **29**	16 9 **25**	**25**	**0.0%**
295	1 2	**83** **46** **129**	0 0 **0**	83 5 **88**	0 41 **41**	**41**	**0.0%**
296	1 2	55 36 **91**	0 0 **0**	55 17 **72**	0 19 **19**	**19**	**0.0%**

Table 21. (Continued).

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
297	1	10	0	4	6	**6**	**0.0%**
		10	**0**	**4**	**6**		
298	1	44	0	26	18	**19**	**0.0%**
	2	1	0	0	1		
		45	**0**	**26**	**19**		
299	1	57	0	57	0	**34**	**0.0%**
	2	36	0	4	32		
	3	1	0	0	1		
	4	1	0	0	1		
		95	**0**	**61**	**34**		
TOTAL		**3,743**	**0**	**2,125**	**1,618**	**1,626**	

Table 22. 2012 Special Permit Areas for Firearms Hunters.

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
901 - Rice Lake NWR	1	65	0	35	30	**40**
	2	10	0	0	10	
		75	**0**	**35**	**40**	
902 - Saint Croix State Park	1	657	0	430	227	**400**
	2	173	0	0	173	
	3	2	0	0	2	
		832	**0**	**430**	**402**	
903 - Savanna Portage State Park	1	20	0	7	13	**20**
	2	8	0	0	8	
		28	**0**	**7**	**21**	
904 - Gooseberry Falls State Park	1	44	0	15	29	**40**
	2	10	0	0	10	
	3	1	0	0	1	
		55	**0**	**15**	**40**	
905 - Split Rock Lighthouse State Park	1	23	0	0	23	**30**
	2	3	0	0	3	
		26	**0**	**0**	**26**	
906 - Tettegouche State Park	1	87	0	0	87	**125**
	2	1	0	0	1	
		88	**0**	**0**	**88**	
907 - Scenic State Park	1	30	0	1	29	**30**
	2	2	0	0	2	
		32	**0**	**1**	**31**	
908 - Hayes Lake State Park	1	20	0	0	20	**75**
		20	**0**	**0**	**20**	
909 - Lake Bemidji State Park	1	15	0	0	15	**30**
	2	5	0	0	5	
		20	**0**	**0**	**20**	
910 - Zippel Bay State Park	1	56	0	5	51	**55**
	2	4	0	0	4	
		60	**0**	**5**	**55**	
913 - Lake Carlos State Park	1	19	0	10	9	**20**
	2	11	0	0	11	
		30	**0**	**10**	**20**	
914 - William O'Brien State Park	1	70	0	43	27	**60**
	2	33	0	0	33	
		103	**0**	**43**	**60**	
915 - Lake Bronson State Park	1	43	0	25	18	**30**
	2	12	0	0	12	
		55	**0**	**25**	**30**	

Table 22. (Continued).

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
916 - Maplewood State Park	1	158	0	158	0	**100**
	2	125	0	125	0	
	3	92	0	31	61	
	4	37	0	0	37	
	6	2	0	0	2	
	9	1	0	0	1	
		415	**0**	**314**	**101**	
917 - Old Mill State Park	1	11	0	1	10	**10**
		11	**0**	**1**	**10**	
918 - Lake Alexander Woods SNA	1	57	0	32	25	**40**
	2	15	0	0	15	
		72	**0**	**32**	**40**	
919 - Glacial Lakes State Park	1	24	0	0	24	**30**
		24	**0**	**0**	**24**	
920 - Zumbro Falls SNA	1	9	0	0	9	**12**
	2	1	0	0	1	
		10	**0**	**0**	**10**	
921 - Forestville/Mystery Cave State Park	1	130	0	50	80	**130**
	2	47	0	0	47	
	3	4	0	0	4	
		181	**0**	**50**	**131**	
922 - Lake Louise State Park	1	48	0	48	0	**25**
	2	24	0	1	23	
	3	2	0	0	2	
		74	**0**	**49**	**25**	
923 - Zumbro Falls SNA	1	14	0	4	10	**12**
	2	2	0	0	2	
		16	**0**	**4**	**12**	
924 - Whitewater State Game Refuge	1	77	0	19	58	**75**
	2	17	0	0	17	
	3	1	0	0	1	
		95	**0**	**19**	**76**	
925 - Vermillion Highlands Research, Recreation, and WMA	1	47	0	47	0	**25**
	2	41	0	31	10	
	3	16	0	0	16	
		106	**0**	**78**	**26**	
926 - Baker Park Reserve	1	149	0	149	0	**72**
	2	82	0	18	64	
	3	8	0	0	8	
		1	0	1	0	
		240	**0**	**168**	**72**	

Table 22. (Continued).

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
927 - Elm Creek Park Reserve	1	273	0	272	1	**155**
	2	152	0	14	138	
	3	17	0	0	17	
		442	**0**	**286**	**156**	
928 - Wild River SP	1	168	0	168	0	**75**
	2	100	0	29	71	
	3	3	0	0	3	
	4	1	0	0	1	
		272	**0**	**197**	75	
929 - Frontenac State Park - B	1	96	0	58	38	**60**
	2	22	0	0	22	
		118	**0**	**58**	**60**	
930 - Mille Lacs Kathio State Park	1	79	0	59	20	**40**
	2	20	0	0	20	
	9	1	0	0	1	
		100	**0**	**59**	**41**	
		3,598	**0**	**1,886**	**1,712**	**1,814**

Table 23. 2012 Special Permit Areas for Muzzleloader Hunters.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
936 - Crow Wing SP	1	143	0	143	0	40
	2	70	0	70	0	
	3	61	0	42	19	
	4	20	0	0	20	
	9	1	0	0	1	
		295	**0**	**255**	**40**	
937 - Soudan SP	1	23	0	6	17	20
	2	2	0	0	2	
	3	1	0	0	1	
		26	**0**	**6**	**20**	
938 - City of Tower	1	11	0	0	11	20
	2	1	0	0	1	
		12	**0**	**0**	**12**	
939 - Lake Shetek SP	1	25	0	25	0	15
	2	22	0	08	14	
	3	2	0	0	2	
		49	**0**	**33**	**16**	
940 – Rice Lake SP	1	122	0	122	0	20
	2	48	0	36	12	
	3	7	0	0	7	
	4	1	0	0	1	
		178	**0**	**158**	**20**	
942- Sibley SP	1	117	0	107	10	50
	2	39	0	0	39	
	3	1	0	0	1	
		157	**0**	**107**	**50**	
943 – Big Stone Lake SP	1	21	0	21	0	10
	2	8	0	1	7	
	3	3	0	0	3	
		32	**0**	**22**	**10**	
944 – Vermilion Highlands WMA	1	29	0	28	1	25
	2	23	0	0	23	
	3	1	0	0	1	
		53	**0**	**28**	**25**	
TOTAL		**802**	**0**	**609**	**193**	**200**
GRAND TOTAL		**75,451**	**274**	**39,162**	**36,289**	**36,494**

2012 MINNESOTA ELK HARVEST REPORT

Leslie McInenly, Big Game Program Leader
Joel Huener, Wildlife Area Manager
Christine Reisz, Area Wildlife Manager

INTRODUCTION

A limited number of licenses are offered to Minnesota residents to hunt elk. In 2012, there were three established zones; 1) Zone 10 near Grygla, Minnesota, 2) Zone 20 - Kittson County Central and 3) Zone 30 - Kittson County Northeast (Figures 1 and 2). In 2012, there were three regular season hunts (September 15-23; December 1-9; December 15-23). Hunts were held during the first season in all zones, during the second season in zones 10 and 20, and during the third season only in zone 20. The early hunt is structured so that it falls within the breeding season when bull elk are most vulnerable and elk can be located by vocalizations. The late season is primarily used as a mechanism to harvest antlerless elk because patterns are more predictable, elk are in larger groups, and snow cover, when present, can aid in locating and tracking animals. In 2012, unsuccessful hunters from the September and December seasons were authorized to hunt in a special January 12-20, 2013, antlerless-only extended season in the Kittson County zone to help meet population objectives.

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 23 licenses were available and 1127 individuals or parties 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 2012, a total of 8 elk were harvested in the zones (Table 2). Long-term elk harvest for the zones is depicted in Table 3 on pages 3 and 4.

Table 1. License allocation and application numbers for three elk hunting zones, 2012.

Zone	Either-Sex	Antlerless	Bull-only	Total	Total Applicants
10 – Grygla	2	3	0	5	471
20 – Kittson Central	3	13	0	16	442
30 – Kittson NE	0	0	2	2	214
Total	**5**	**16**	**2**	**23**	**1127**

Table 2. Distribution of the 2012 Minnesota elk harvest. License allocation totals represent the actual number sold, not the number authorized through rule.

Grygla Hunt Zone (10)

Season	Either-Sex Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken
September 15 - 23	2	0	1 (5x5)	0	1
December 1 - 9	0	3	0	0	0
Total	**2**	**3**	**1**	**0**	**1**

Kittson County Central Hunt Zone (20)

Season	Either-Sex Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken
September 15 - 23	1	5	3 (2 bulls*, 1calf)	1	4
December 1 - 9	1	4	0	0	0
December 15 - 23	1	4	0	0	0
January 12-20 (extended season)	0	11**	0	2	2
Total	**3**	**13**	**3**	**3**	**6**

* One sub-legal spike bull was illegally harvested and subsequently confiscated. One 8x8 bull was also harvested.
** Hunters/parties with unfilled tags from Zone 20 were invited back for a special extended season hunt. Six parties hunted during the period from January 12-15; five parties hunted during the period from January 17-20. One cow was harvested in each of the extended season periods.

Kittson County Northeast Hunt Zone (30)

Season	Bull-only Licenses	Bulls taken	Total elk taken
September 15 - 23	2	1 (6x6)	1
Total	**2**	**1**	**1**

Table 3. Grygla and Kittson County elk harvests, 1987-2012.

	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
2011	3	2	2	0
2012	2	1	3	0
Total	28	19	66	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[a]	4	5
2010	1	1	3	3
2011	2	3[b]	8[c]	4
2012	5	4[d]	13	3
Total	21	18	38	25

[a] One additional bull (6x7) was wounded but not retrieved in 2009. It was found dead later and is counted in the total.
[b] One bull was a male calf and was legally tagged as an antlerless animal.
[c] Three unsuccessful hunters from the Grygla zone were invited to participate in the January extended season in Kittson County, however only 2 participated and were included in the number of antlerless permits issued.
[d] One bull was a sub-legal spike and was confiscated.

Figure 1. Grygla Hunt Zone.

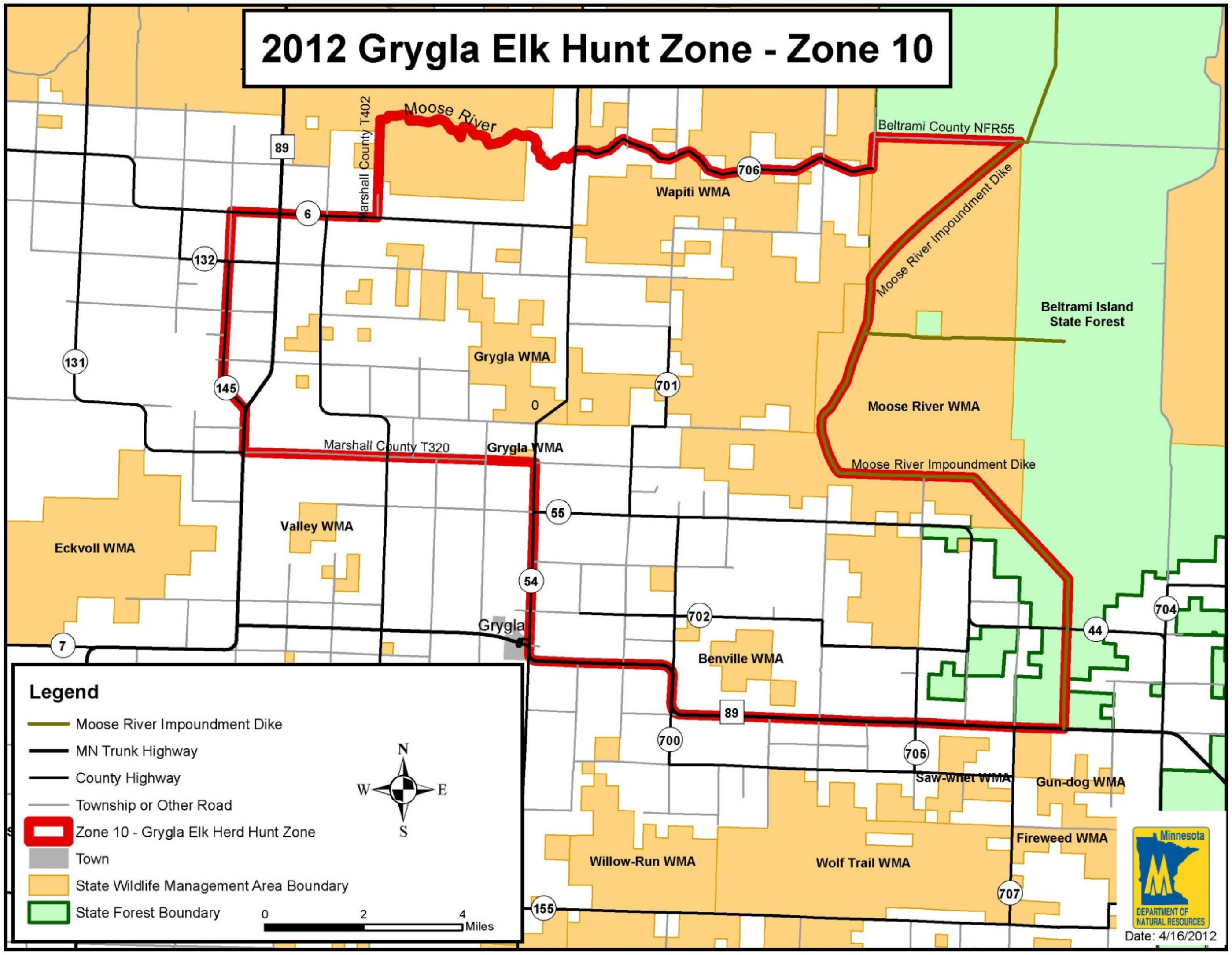
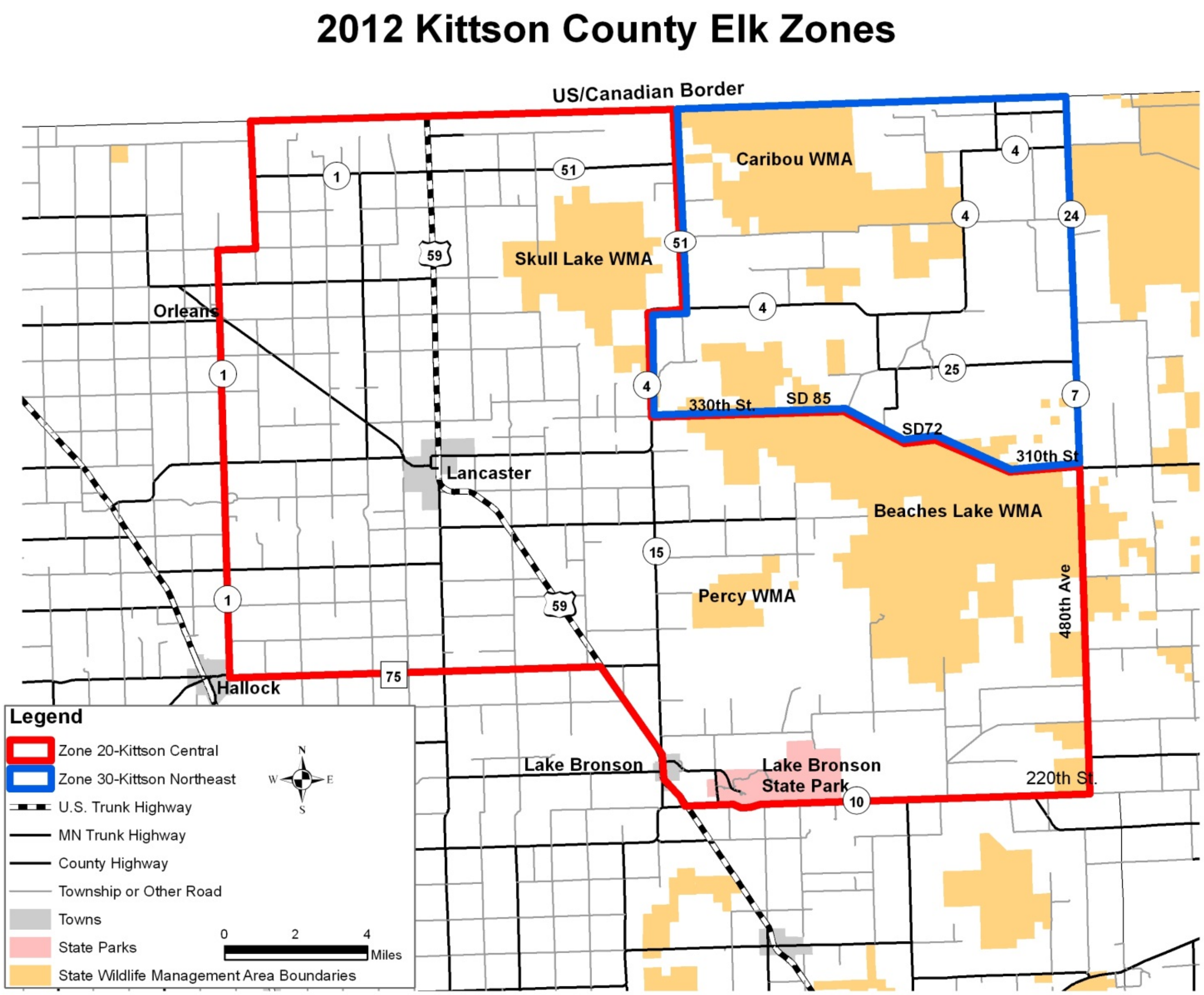


Figure 2. Kittson County Hunt Zones.



2012 MINNESOTA MOOSE HARVEST

Glenn D. DelGiudice, 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. 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 1 of 8 registration stations and provide information on the location where they killed their moose and date of kill. Hunters also are requested to collect biological samples from the moose harvested and these are submitted at the registration station.

RESULTS

In 2012, State hunters harvested 46 moose in northeastern Minnesota (Figure 1). No season was held in northwestern Minnesota. Of the 1,460 parties that applied for this year's moose hunt, 76 (5%) were drawn and purchased a license (Table 1). Additionally, 11 hunting parties which returned permits last year (2011) prior to the hunt, because of access restrictions caused by the Pagami Creek wildfire, were offered the opportunity to hunt the same zones (20, 24, 25, 62, and 64) in 2012 and all accepted. So a total of 87 licenses were purchased this year (Table 1). 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 49 permits and band members killed 16 moose (11 bulls and 5 cows). The Fond du Lac band issued 64 moose permits (bulls only) of 72 available. The final harvest was 20 bulls (18 by hunters and 2 subsistence/ceremony animals). The Fond du Lac season closed on 31 December 2012.

DISCUSSION

The success rate of State hunters in 2012 was 53%, a decrease of 5% from 2011 (Tables 1 and 2). This was the sixth year of hunting for bulls only. The success rate for members of the 1854 Treaty Authority was 33%, up 7% from last year. The success rate for the Fond du Lac band hunters was 28%, up 3% from last year.

Table 1. Moose harvested, licenses offered and sold, application rate, and party success in 2012 moose hunt by State hunters in northeastern Minnesota.

Zone	Bulls	Licenses Offered	Licenses Sold*	Party Applications**	Chances for Permit	% Success‡
20	1	2 (2)	2 (2)	27	7%	25%
21	1	3	3	63	5%	33%
22	1	2	2	17	12%	50%
24	1	1 (1)	1 (1)	49	2%	50%
25	0	1 (1)	1 (1)	51	2%	0%
26	0	1	1	19	5%	0%
27	1	4	4	44	9%	25%
28	1	2	2	19	11%	50%
29	2	2	2	71	3%	100%
30	2	5	5	143	3%	40%
31	1	3	3	156	2%	33%
32	1	2	2	26	8%	50%
33	1	2	2	52	4%	50%
36	3	5	5	34	15%	60%
37	1	2	2	23	9%	50%
60	3	3	3	19	16%	100%
61	3	5	5	60	8%	60%
62	4	5 (5)	5 (5)	89	6%	40%
63	3	3	3	26	12%	100%
64	4	6 (2)	6 (2)	57	11%	50%
70	2	2	2	75	3%	100%
72	1	2	2	67	3%	50%
73	2	2	2	40	5%	100%
74	2	2	2	30	7%	100%
76	2	3	3	68	4%	67%
77	0	2	2	36	6%	0%
79	2	2	2	27	7%	100%
80	1	2	2	72	3%	50%
Total	46	76	76 (11)	1,460	5%	53%

* 11 Parties (in parentheses) returned their license in 2011 prior to the hunt, because of access restrictions caused by the Pagami Creek wildfire. These same 11 parties were offered the opportunity to hunt the same zones (20, 24, 25, 62, and 64) in 2012 and all accepted.

** Number of 2, 3, or 4-person parties minus rejected applications.

‡ Success based on licenses sold.

Table 2. Applicants, permit numbers, moose harvested, and success rates of State moose hunters in northeastern Minnesota since 1993.

Year	Party Applicants*	Permits	Licenses Purchased**	Moose Harvested	Party Success
1993	2,934	315	315	264	84%
1994	3,022	189	189	155	82%
1995	3,181	188	188	156	83%
1996	3,830	207	207	156	75%
1997	3,958	198	198	152	77%
1998	4,157	182	182	125	69%
1999	3,919	189	189	136	72%
2000			No Season		
2001	3,164	182	176	125	71%
2002	2,580	208	202	141	70%
2003	2,328	224	217	144	66%
2004	3,062	246	240	151	63%
2005	3,060	284	276	164	59%
2006	2,952	279	269	161	60%
2007	2,566	233	229	115	50%
2008	2,706	247	245	110	45%
2009	2,746	225	223	103	46%
2010	2,415	213	212	109	51%
2011	1,963	105	92	53	58%
2012	1,460	76	87	46	53%

* Number of 2, 3, or 4-person parties minus rejected applications.

** In 2011 - 11 parties returned their licenses, because access to portions of their hunting zone (20, 24, 25, 62, and 64) was restricted. In 2012 – these same 11 parties were offered the opportunity to hunt the same zones and all accepted.

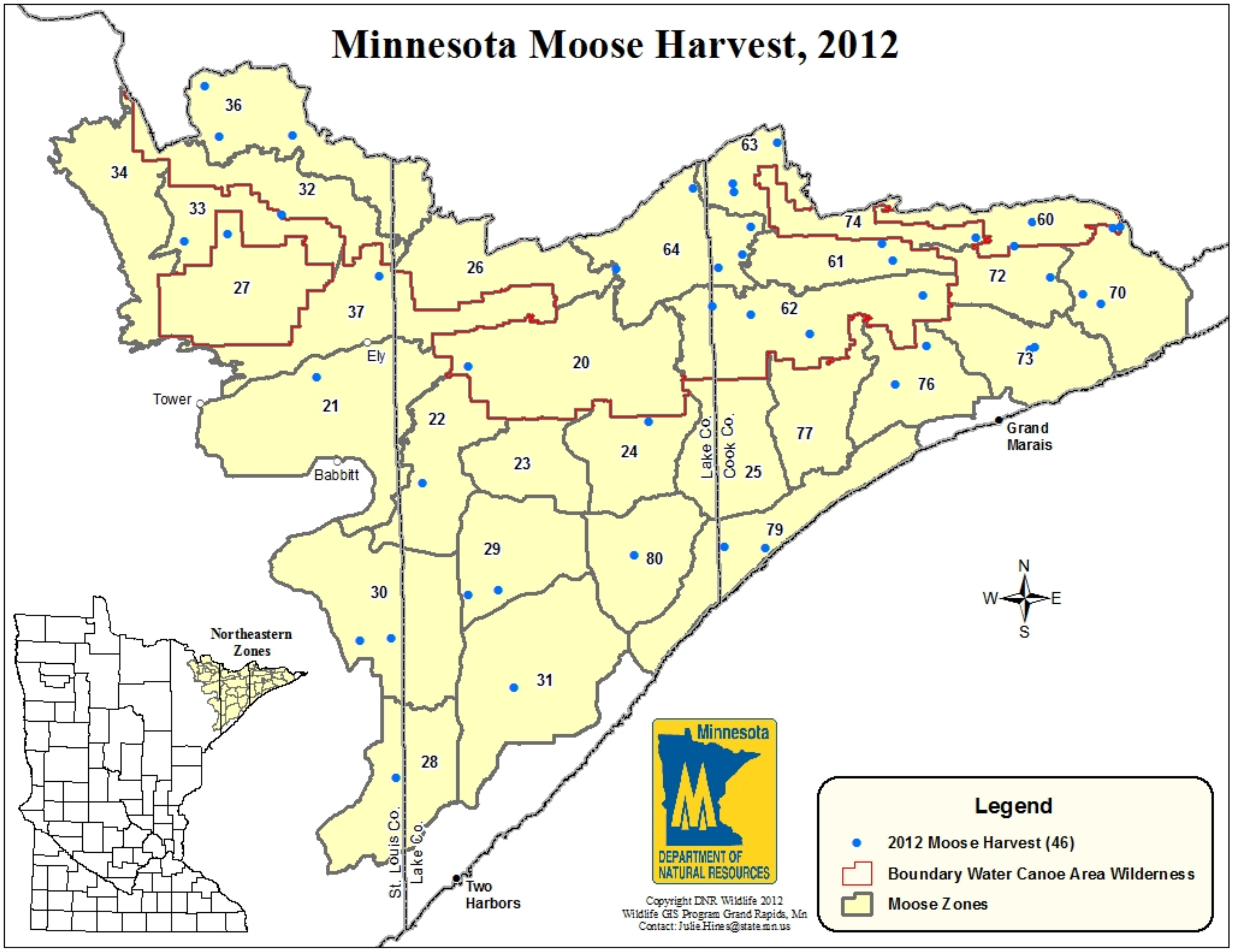


Figure 1. Moose zones and locations of harvested moose during the State's 2012 moose season.

MINNESOTA SANDHILL CRANE HARVEST REPORT, 2012

Margaret Dexter, Wildlife Research Unit

Two distinct populations of sandhill cranes (*Grus Canadensis*) occur in Minnesota. Sandhill cranes that breed and stage during fall in NW Minnesota are part of the Mid-continent population whereas sandhill cranes in the remainder of the state are part of the Eastern population. The Mid-continent population, including cranes in NW Minnesota 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's Northwest Goose Zone (Figure 1) beginning in 2010. The season was open from the first Saturday in September through the second Sunday in October (4 Sep – 10 Oct 2010 and 3 Sep – 9 Oct 2011). In 2012 the season was 15 September – 21 October. The bag limit remained the same at 2 per day and 4 in possession. Hunters were required to purchase a $3.00 sandhill crane permit. A sample of sandhill crane permit holders were selected to receive a harvest survey from the U.S. Fish and Wildlife Service after the season. This survey is used to monitor harvest levels and hunting activity (Table 1).

LITERATURE CITED

Central Flyway Webless Migratory Bird Technical Committee. 2006. Management Guidelines for the Mid-Continent Population of Sandhill Cranes. Special Report in files of the Central Flyway Representative. Denver, Colorado.

Kruse, K.L., J.A. Dubovsky, and T.R. Cooper. 2013. Status and harvests of sandhill cranes:Mid-Continent, Rocky Mountain, Lower Colorado River Valley and Eastern Populations. Administrative Report, U.S. Fish and Wildlife Service, Denver, Colorado. 14pp.) http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html

Table 1. Sandhill crane permit sales, estimated number of active hunters and harvest for NW Minnesota, 2010-2012. (Kruse, K.L. et al. 2013).

Year	Number of Permits	Active Hunters	Harvest
2010	1,954	964	830
2011	1,342	643	765
2012	1,032	410	407

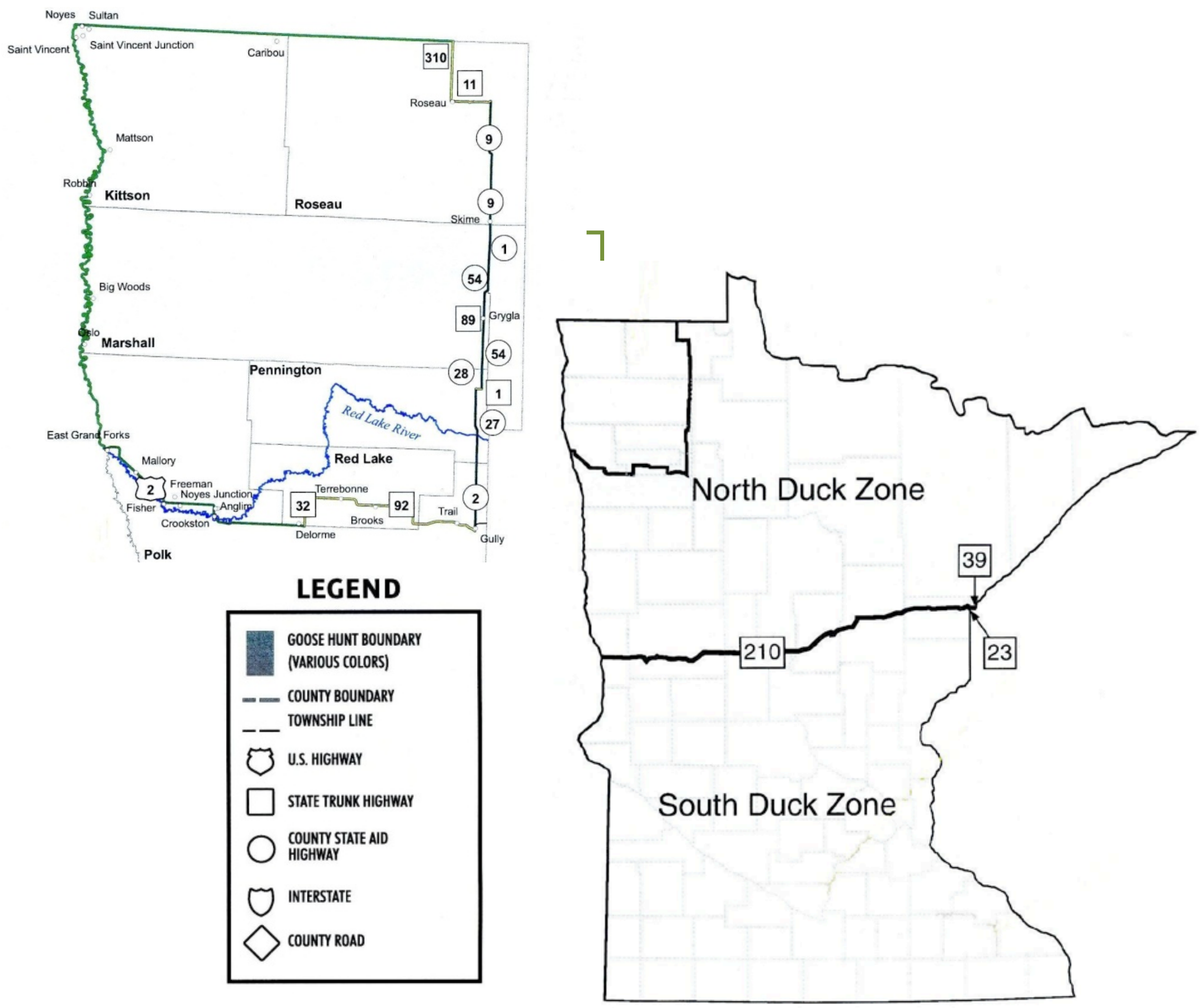


Figure 1. Sandhill crane hunting zone in Minnesota, 2010-2013.

TRAPPING HARVEST STATISTICS

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

2012 TRAPPER HARVEST SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources (MNDNR) annually conducts a mail survey of licensed trappers. Annual harvest estimates from the survey data are used to help assess and set trapping regulations and season structure. Beginning in 2000, survey cards were sent to all trappers with a valid mailing address.

METHODS

The sampling frame consisted of all individuals with active MNDNR trapping licenses (all types) listed in the Electronic License System (ELS) database in late February 2013. There were 9,998 active trapping licenses in the ELS database, which consisted of 7,873 Resident Regular Trappers, 510 Resident Junior Trappers, 1,175 Resident Senior Trappers, 432 "active" Lifetime Trappers, and 8 Nonresident (MN landowners) license holders. License type was reclassified as "adult" or "youth" for analysis purposes.

The MNDNR Trapper Harvest Survey is a census but the response rate is <100% (mean = 80%, range: 59–91%). Thus, uncertainty in harvest estimates is strictly a function of non-response rather than random sampling. However, if non-response (unit and item) is completely random then data from respondents can be treated as a random sample, which is how the Trapper Harvest Survey has been analyzed historically. The critical assumption is that non-response is completely random (e.g., if you repeated the survey, non-respondents would be a random subset of licensed trappers). For consistency with previous analyses, response data were treated as a random sample.

A postcard survey (Figure 1) was sent to all trapping license holders with a valid mailing address at the close of the license year. 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. For this year, in an effort to reduce postage and printing costs the number of follow-up mailings was reduced to one.

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. Duel key-entry and quality control checks were used to minimize transcription errors. The data were tabulated using Viking Data Entry VDE+ software and analyzed using the R programming language (ver. 3.0; R Development Core Team 2009).

RESULTS

There were 9,983 licensed trappers (99.8%) with deliverable addresses for the mail survey; 5,844 of these individuals returned useable questionnaires (response rate = 58.5%; Figure 2). Ninety-five percent of respondents were adults, which is similar to the proportion of adult licensees in the ELS database. However, young adults (18-25) were less likely to respond to the survey than older adults (Figure 3). . Seventy eight percent of respondents (adults = 77%, youth = 90%) reported setting traps for at least one species (Table 1).

Table 2 presents estimated number of trappers, take per trapper, and estimated harvest for the 2012-13 trapping season. Historic trapper estimates are presented in Table 3 and Figures 4 and 5.

Minnesota Department of Natural Resources
Division of Fish and Wildlife
Wildlife Research Unit
500 Lafayette Road, Box 20
St. Paul, MN 55155

RETURN SERVICE REQUESTED

Dear Trapper:

You are being asked as a trapping license buyer to assist us in evaluating the 2012-2013 trapping season **(March 2012-February 2013).** For Spring Beaver, please report only animals taken between March 2012 and April 2012. We need this information to estimate the season's harvest and to help set future furbearer trapping seasons. Similar to past years we are also asking for the **average number of traps you set per day** for each species. If a trap is set for multiple species, count the trap for both species when answering the question. For example, if you ran 20 mink/coon traps each day, enter 20 traps/day for both mink and coon.

YOUR RESPONSE IS NEEDED EVEN IF YOU DID NOT SET TRAPS THIS YEAR.

Please fill out the attached questionnaire and mail as soon as possible. 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

2012 Trapper Report

1. Did you set traps / snares in Minnesota during the 2012-2013 trapping season?
   ☐ No ☐ Yes (Please check one)
2. Indicate your harvest, the number of days you trapped for each species, the average number of traps you had set PER DAY for each species, and the county in which you trapped **most** for each species. Report only animals **YOU personally** trapped in Minnesota. Animals taken by hunting should **NOT** be reported here.

Species Trapped		*Number YOU Trapped All Season*	*# Days Trapped All Season*	*Average # Traps/Snares Set Per Day*	*County You Trapped In Most*
Muskrat	80				
Mink	32				
Gray Fox	96				
Striped skunk	34				
Coyote (brush wolf)	97				
Beaver (Mar-April '12)	81				
Beaver (Oct '12-Feb '13)	82				
Pine marten	37				
Otter	38				
Fisher	36				
Badger	35				
Long-tailed weasel	31				
Short-tailed weasel	30				
Opossum	10				
Bobcat	98				
Raccoon	94				
Red Fox	95				

Minnesota Department of Natural Resources
Division of Fish and Wildlife
Wildlife Research Unit
500 Lafayette Road, Box 20
St. Paul, MN 55155

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 171 ST. PAUL, MN

POSTAGE WILL BE PAID BY ADDRESSEE

Department of Natural Resources - Wildlife
STATE OF MINNESOTA
395 JOHN IRELAND BLVD
SAINT PAUL, MN 55101-9798

Figure 1. Trapper survey card 2012.

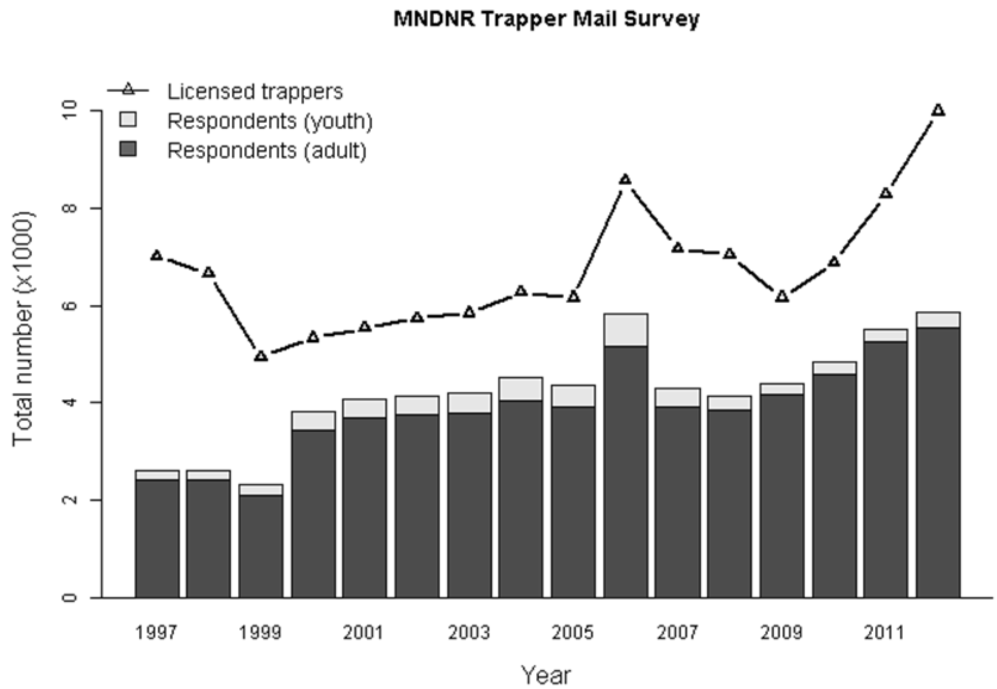


Figure 2. Trapper response to mail surveys, 1997 -98 through 2012- 13.

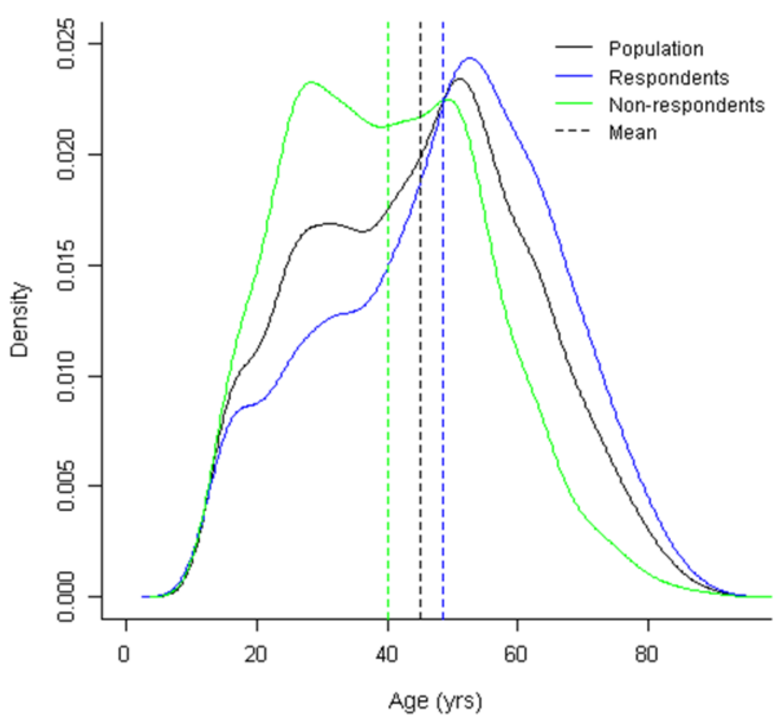


Figure 3. Response by age for trapper harvest survey, 2012-13.

Table 1. Use of trapper licenses, 2000-01 through 2012-13.

		Return from mail survey	Projections from license sales
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]
2011-12	Trapped	4,498 (81.5%)	6,748
	Did not trap	1,019 (18.5%)	1,532
		5,517 (100.0%)	8,280[a]
2012-13	Trapped	4,537 (77.6%)	7,747
	Did not trap	1,307 (22.4%)	2,236
		5,844 (100.0%)	9,983[a]

[a] excludes duplicates.

Table 2. Estimated number of trappers, mean harvest/trapper, and total harvest in Minnesota, 2012-13.

	Estimated trappers	95% CI	Mean harvest/ trapper	Estimated total harvest	95% CI
Muskrat	4,110	81	58.9	242,120	15,680
Mink	3,110	77	5.9	18,460	1,340
Short-tailed weasel	690	42	6.5	4,500	570
Long-tailed weasel	540	37	3.7	2,030	320
Raccoon	4,680	82	17.1	79,800	4,440
Striped skunk	1,940	65	6.5	12,620	850
Badger	360	31	1.6	570	80
Opossum	1,100	52	6.2	6,780	590
Red fox	2,240	69	3.4	7,540	500
Gray fox	1,180	53	2.2	2,550	200
Coyote	2,360	70	4.7	11,130	810
Beaver (Mar-Apr 2012)	1,810	64	19.1	34,600	2,460
Beaver (Oct ‘12-Feb ‘13)	2,620	73	9.4	24,590	1,820

Table 3. Minnesota trapper license sales and estimated annual harvest, 1998-99 through 2012-2013[a]

	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	2011-12	2012-13
Trapper license sales [b]	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	8,280	9,998
Estimated harvest [c]															
Muskrat	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	352,030	242,120
Mink	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	15,770	18,460
Short-tailed weasel	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	7,300	4,500
Long-tailed weasel	1,863	1,619	1,354	2,243	1,138	1,781	1,007	651	3,494	2,013	1,118	838	1,732	3,020	2,030
Raccoon (Oct - Feb)	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	98,240	79,800
Raccoon (Mar -Aug)[f]	6,849	4,263	3,702	6,468	4,137	4,933	4,940	3,594							
Striped skunk	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	12,250	12,620
Eastern spotted skunk [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	400	319	205	407	358	552	455	339	461	499	424	316	344	490	570
Opossum	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	4,400	6,780
Red fox (Oct - Feb)	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	7,250	7,540
Red fox (Mar -Aug)[f]	458	379	357	447	612	635	334	222							
Gray fox	976	743	468	525	892	915	898	797	1,703	1,360	1,320	1,084	1,110	2,100	2,550
Coyote	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	8,780	11,130
Beaver (Oct 12- Feb 13)	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	26,620	24,590
Beaver (Mar 12-Apr 12)	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	29,500	34,600
Registered harvest															
Otter	1,946	1,635	1,578	2,301	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814	2,294	3,171
Lynx [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Bobcat [e]	103	206	231	250	544	483	631	590	890	702	853	884	1,012	1,711	1,875
Fisher	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	1,473	1,293
Marten	2,299	2,423	1,629	1,928	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842	2,525	1,472

[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, 2013 - 9,998 trapping licenses were sold in 2012 510 (5.1%) were junior licenses, 7,873 (78.7%) were Regular adult licenses, 1,175 (11.7%) were Senior licenses, 432 (4.3%) 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.

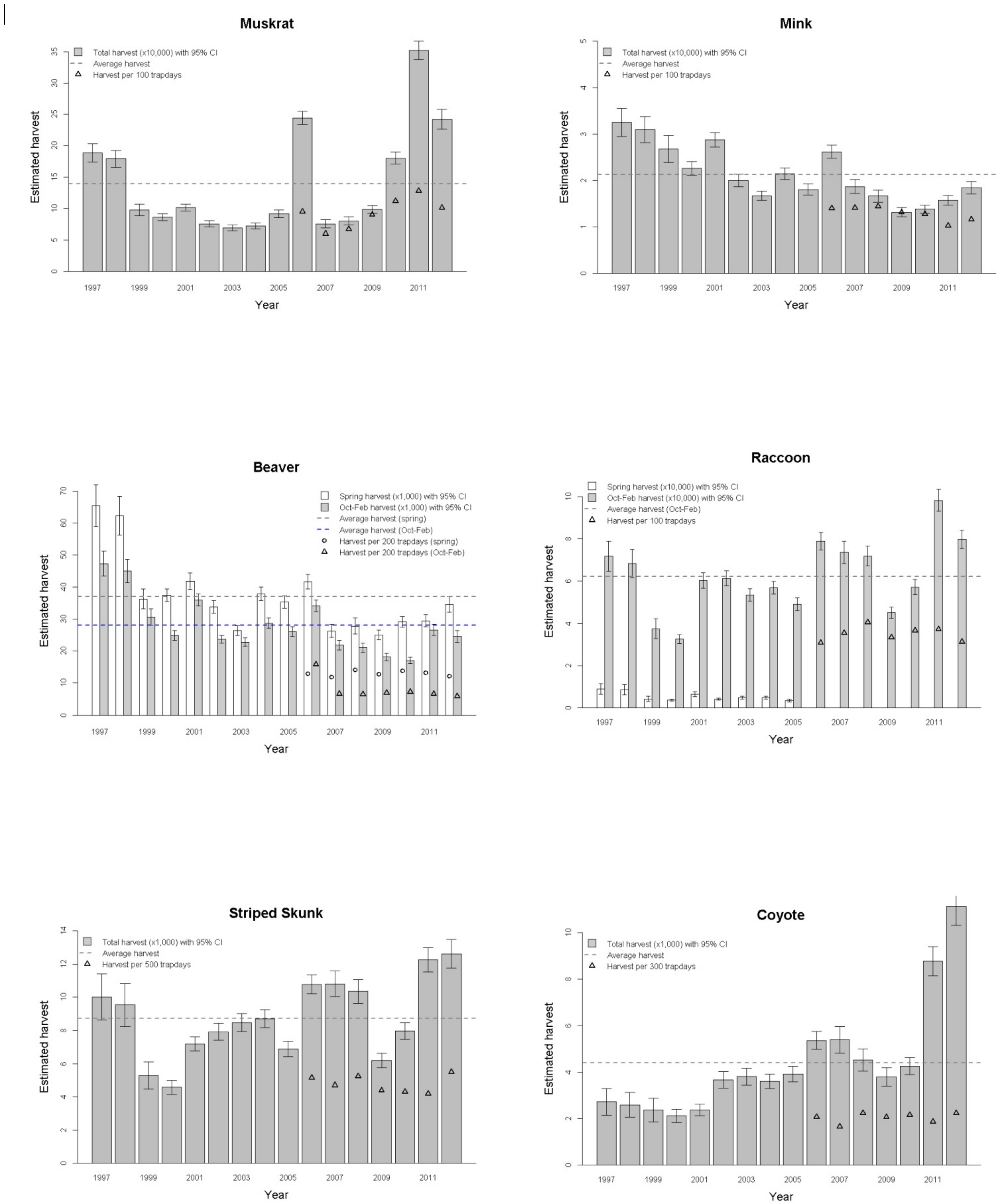


Figure 4. Historic harvest by Minnesota trappers, 1997-2012

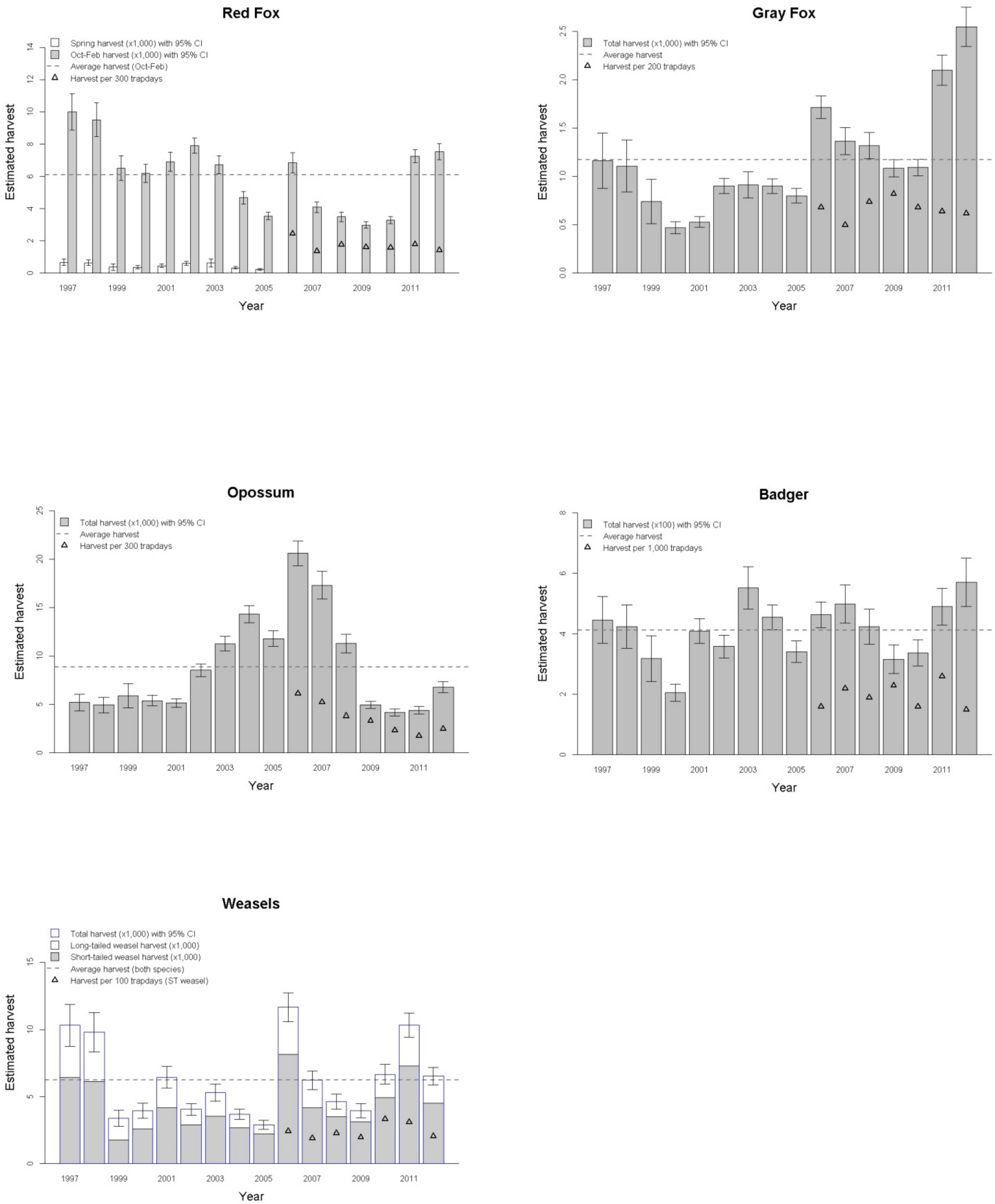


Figure 4. (continued).

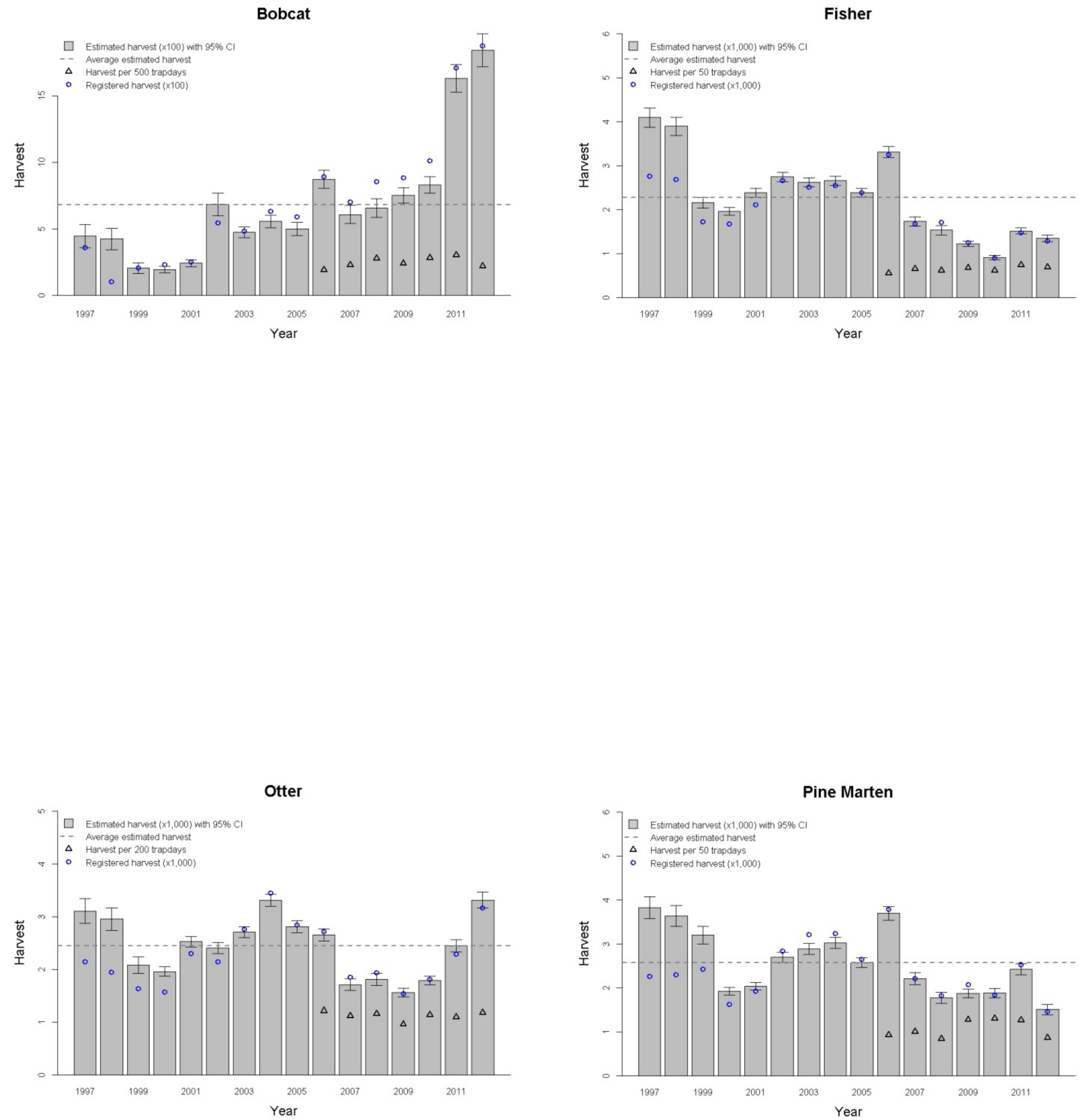


Figure 5. Registered fur harvest, 1997-2012.

MINNESOTA FUR BUYERS SURVEY FOR THE 2012-2013 HUNTING AND TRAPPING SEASON

Jason Abraham, Wildlife Season Setting/Furbearer Specialist
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 2013, questionnaires were mailed to the 43 licensed fur buyers in Minnesota. The survey asked them to report the number and type of fur purchased from Minnesota trappers and hunters in 2021-13 and the "average price" paid to those hunters and trappers based on all furs purchased. A total of 32 usable surveys were received, for a return rate of 74 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 2011-12 was $1,970,338.77, a 23 percent decrease from 2012-2013.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2012-13.

Species	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	51773	5.00	10.05	7.91
Mink Female	2519	9.00	25.00	17.53
Mink male	3587	10.00	25.00	18.27
Raccoon	32587	10.00	18.10	16.60
Red Fox	1307	10.00	50.00	33.52
Gray Fox	389	10.00	30.00	19.20
Coyote	4235	10.00	121.00	22.04
Bobcat	285	75.00	181.00	144.79
River Otter	814	30.00	85.00	72.12
Beaver 10-2	5742	8.00	20.50	18.47
Beaver 3-4	2286	10.00	22.00	12.80
L.T. Weasel	27	1.00	6.00	2.51
S.T. Weasel	704	1.00	7.00	4.10
Striped Skunk	529	2.00	31.00	5.00
Badger	104	10.00	22.50	14.54
Opossum	177	1.00	3.50	1.52
Fisher Male	277	45.00	80.00	62.38
Fisher Female	86	40.00	90.00	63.02
Marten Male	124	45.00	80.00	56.57
Marten Female	21	40.00	80.00	54.29
Deer Hides	22881	3.00	6.12	5.18
Bear Hides	39	5.00	40.00	30.28

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 2002-03 through 2012-13.

	Average pelt prices paid hunters and trappers in Minnesota (dollars)										
Species	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-2013
Muskrat	2.11	2.05	1.9	2.81	5.79	2.96	1.85	4.43	5.33	5.86	7.91
Mink (female)	6.52	7.23	10.22	10.23	13.18	9.05	7.45	8.02	9.33	11.54	17.53
Mink (male)	9.55	11.41	11.34	14.29	18.04	12.32	9.14	9.37	13.66	14.68	18.27
S.T. Weasel	2.63	2.53	2.52	2.6	3.58	3.18	3.57	3.02	1.50	2.10	2.51
L.T. Weasel	1.94	3.34	3.05	2.56	4.35	5	2.21	3.12	2.87	4.02	4.10
Raccoon	10.33	11.45	10.49	9.61	11.92	14.32	9.34	9.18	10.87	12.57	16.60
Striped Skunk	5.81	4.66	3.95	3.77	4.46	5.27	2.56	3.66	3.29	3.55	5.00
Badger	13.18	14.23	12.94	13.4	15.71	13.92	7.70	8.81	10.43	13.47	14.54
Opossum	1.22	1.23	1.51	1.4	1.52	1.76	1.21	1.30	2.64	5.80	1.52
Red Fox	22.08	20.02	17.28	16.96	17.68	14.69	11.79	10.85	13.35	22.87	33.52
Gray Fox	9.05	13.64	12.58	15	22.36	30.09	14.08	11.55	14.64	15.11	19.20
Coyote	16.12	18.37	15.24	13.57	17.76	13.51	7.12	8.62	9.47	17.99	22.04
Bobcat	71.54	95.9	98.99	95.74	101.07	93.41	74.74	42.77	71.44	98.18	144.79
Beaver (fall-winter)	10.05	12.57	13.62	14.48	18.35	14.6	14.63	12.49	11.95	14.29	18.47
Beaver (spring)	9.99	11.09	13.8	16.49	14.81	17.77	9.36	14.47	14.50	19.96	12.80
Otter	61.16	85.33	87.23	88.89	42.85	29.49	24.33	35.65	34.53	51.40	72.12
Fisher (male)	26.7	27.15	30.02	36.03	76.33	63.09	22.27	34.45	38.19	47.69	62.38
Fisher (female)	25.44	25.71	27.47	31.46	67.82	48.24	37.22	34.90	37.31	39.59	63.02
Marten (male)	28	30.09	30.65	37.47	74.04	58.72	30.61	26.76	39.80	42.32	56.57
Marten (female)	27.3	26.7	27.42	31.53	66.09	50.05	28.19	29.95	36.57	39.49	54.29
Deer Hides	3.48	5.41	3.95	4.14	4.51	3.92	3.53	4.44	4.41	3.95	5.18
Bear Hides	40.56	41.55	46.61	39.3	43.03	36.57	29.81	43.00	33.38	28.79	30.28

REGISTERED FURBEARER HARVEST STATISTICS

Forest Wildlife Populations and Research Group
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REGISTERED FURBEARER HARVEST STATISTICS, 2012-13 REPORT

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring harvest is an important component of population management for some 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 population 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, or may be more subject to effects of habitat change. Hence, detailed harvest information is desirable to help ensure sustainable populations. For the past 35 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 usually 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, while otter harvest is allowed statewide (Figure 1). The only change from the 2011 season structure was a reduction in the length of the fisher/marten season from 9 days to 6 days. All harvest summaries are provided in the following tables.

NOTE: This report does not include tribal harvests, or any confiscations.

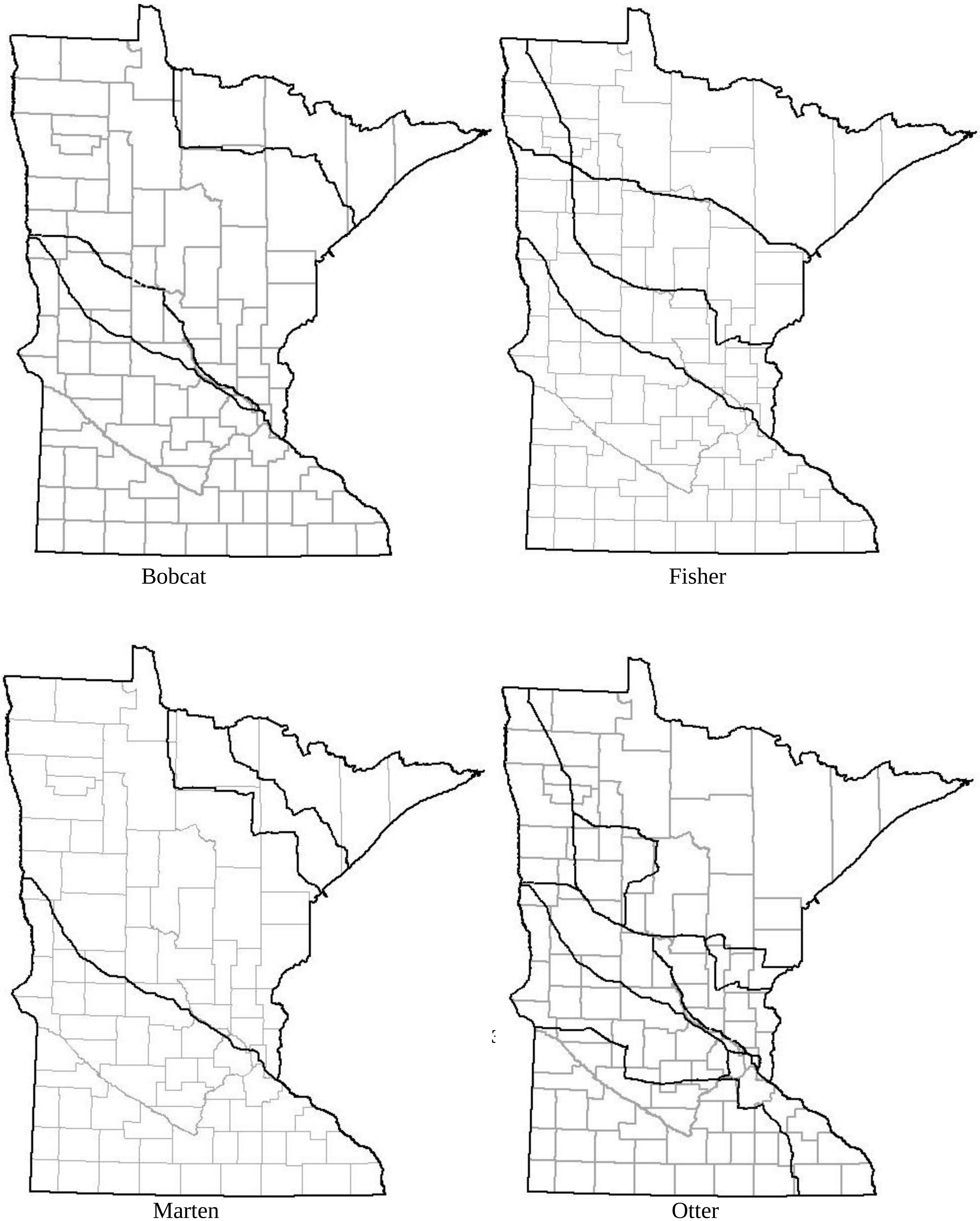

Figure 1. Open trapping areas for fisher, marten, bobcat, and otter, 1977 - present.

Table 1. Registered furbearer seasons and harvests, 1984-2012.

	Bobcat				Fisher				Marten				Otter			
Year	Season	Days	Limit	Harvest	Season	Days	Limit	Harvest	Season	Days	Limit	Harvest	Season[a]	Days	Limit	Harvest
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	11/27-12/5	9	2	903	11/27-12/5	9	5	1842	10/23-1/9	78	4	1814
2011-12	11/26-1/8	44	5	1711	11/26-12/4	9	2	1473	11/26-12/4	9	5	2525	10/22-1/8	78	4	2294
2012-13	11/24-1/6	44	5	1875	11/24-11/29	6	2	1293	11/24-11/29	6	5	1472	10/27-1/6	71	4	3171

[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).

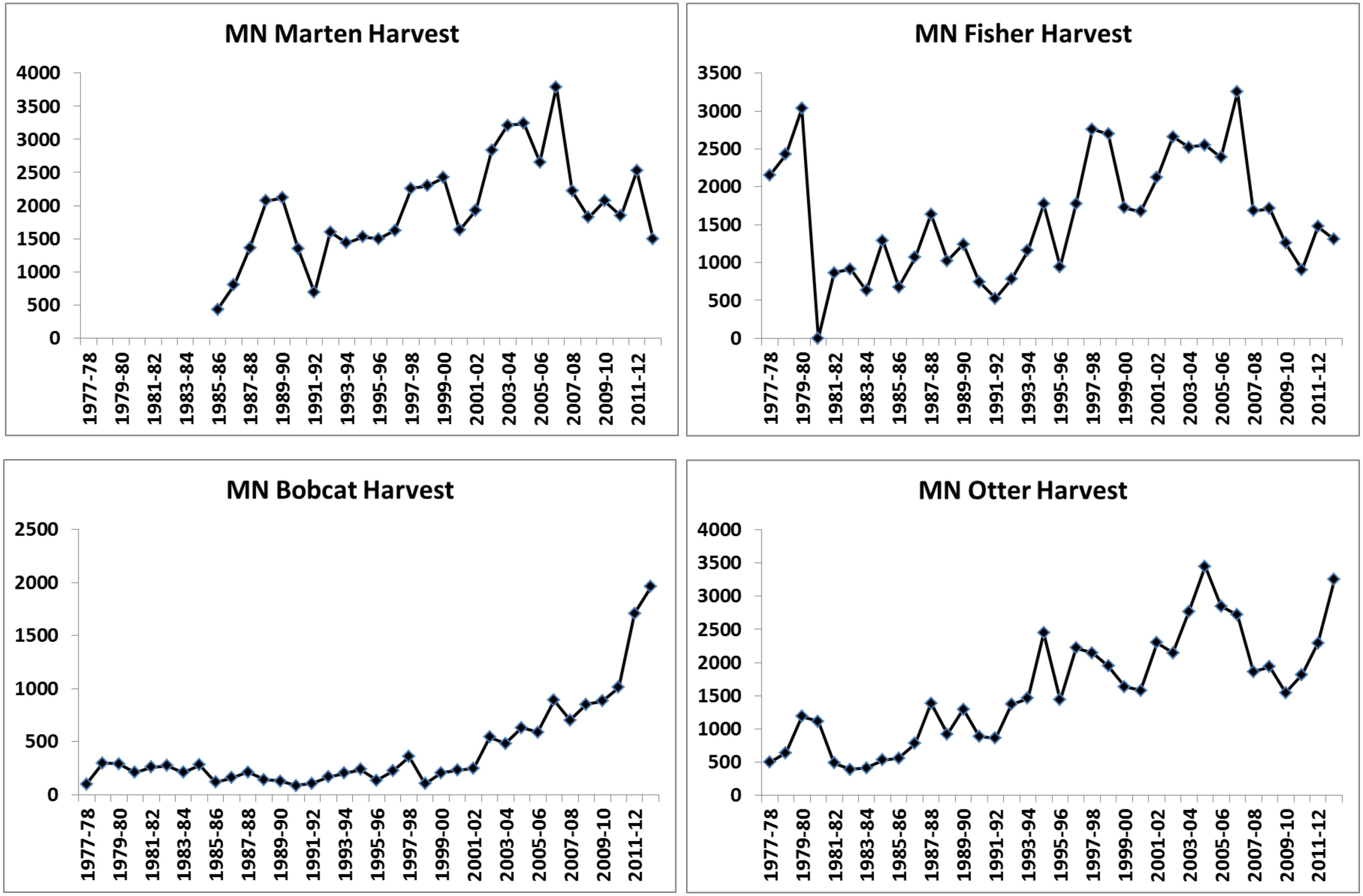

Figure 2. Harvest of registered furbearers in Minnesota, 1977-present.

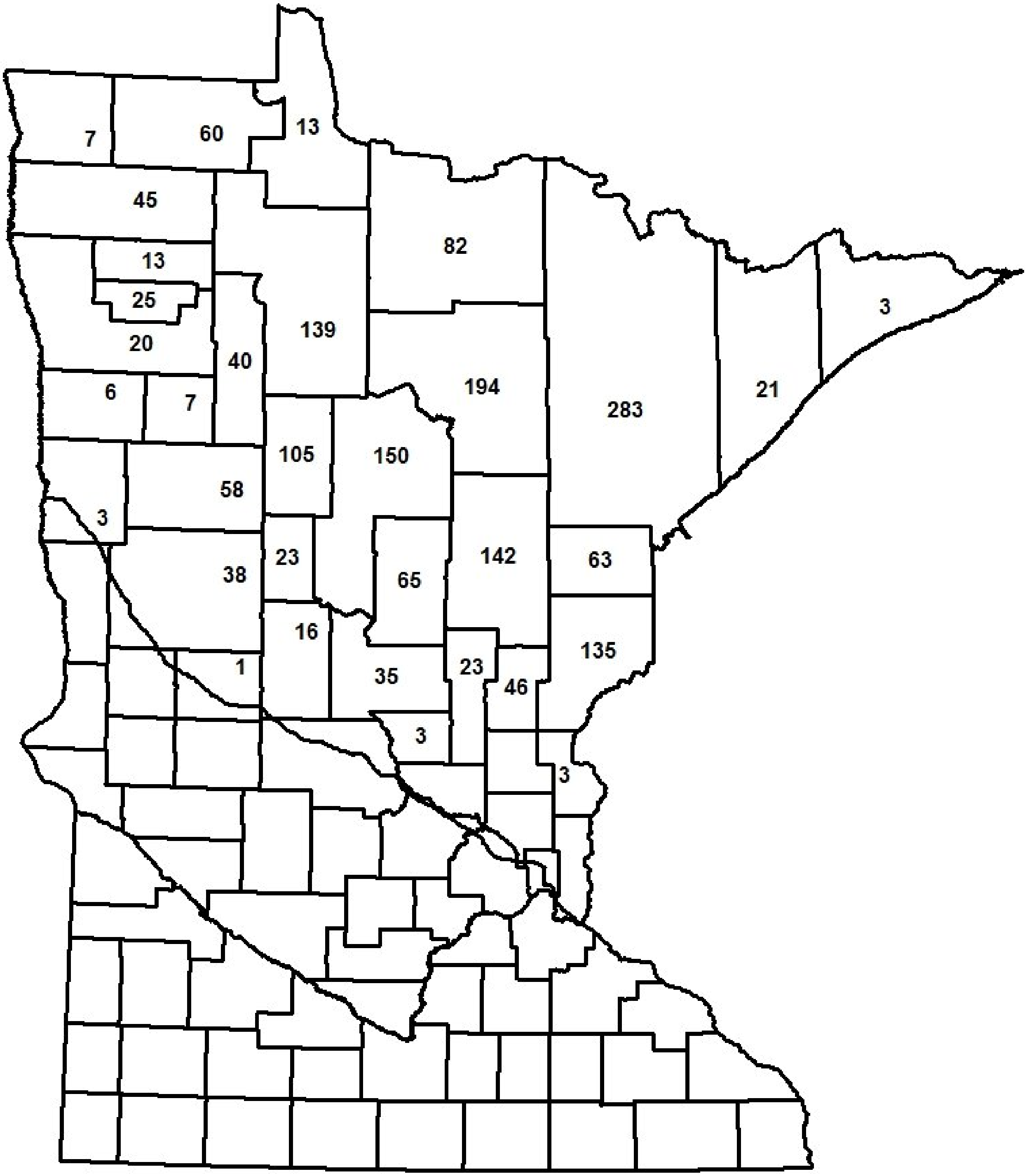

Figure 3. Bobcat harvest by county, 2012-13.

Table 2. Bobcat harvest by county and sex, 2012-13.

County	Sex*			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Aitkin	56	86		142	7.12
Anoka	0	0		0	0.00
Becker	31	27		58	4.01
Beltrami	74	65		139	4.55
Benton	1	2		3	0.73
Carlton	33	30		63	7.20
Cass	55	95		150	6.22
Chisago	2	1		3	0.68
Clay	1	2		3	0.28
Clearwater	21	19		40	3.88
Cook	2	1		3	0.19
Crow Wing	30	35		65	5.62
Douglas	0	1		1	0.14
Hubbard	57	47	1	105	10.51
Isanti	0	0		0	0.00
Itasca	84	110		194	6.63
Kanabec	18	28		46	8.63
Kittson	3	4		7	0.63
Koochiching	29	53		82	2.60
Lake	7	14		21	0.92
Lake of the Woods	6	6	1	13	0.73
Mahnomen	4	3		7	1.20
Marshall	22	22		44	2.43
Mille Lacs	12	11		23	3.38
Morrison	15	20		35	3.04
Norman	5	1		6	0.68
Otter Tail	24	14		38	1.71
Pennington	4	9		13	2.10
Pine	68	67		135	9.42
Polk	10	10		20	1.00
Red Lake	13	12		25	5.77
Roseau	30	30		60	3.57
St. Louis	141	140	2	283	4.20
Sherburne	0	0		0	0.00
Stearns	0	0		0	0.00
Todd	6	10		16	1.63
Wadena	9	13	1	23	4.23
Unknown	5	4		9	
Total	878	992	5	1875	

* 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, 2002-2012.

County	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Aitkin	35	19	37	32	46	56	64	82	73	121	142
Anoka	0	0	0	0	0	0	0	0	0	1	0
Becker	26	19	28	19	46	24	37	25	39	70	58
Beltrami	63	47	66	34	90	33	49	70	108	139	139
Benton	0	0	0	0	0	1	5	2	0	4	3
Carlton	11	20	27	25	34	25	45	44	37	94	63
Cass	59	48	56	103	137	50	98	115	117	164	150
Chisago	1	0	0	0	0	3	0	0	1	0	3
Clay	0	1	0	0	0	0	0	1	3	1	3
Clearwater	24	19	18	18	42	25	43	27	30	58	40
Cook	1	1	2	3	0	0	1	0	1	3	3
Crow Wing	20	15	19	18	27	21	36	38	29	64	65
Douglas	0	0	0	0	0	0	0	0	0	0	1
Hubbard	31	21	35	22	69	40	49	81	59	129	105
Isanti	0	2	0	1	0	0	0	0	0	0	0
Itasca	74	76	93	68	113	86	72	106	132	186	194
Kanabec	10	9	17	11	14	16	23	11	16	21	46
Kittson	5	8	6	3	5	4	9	4	9	10	7
Koochiching	23	25	14	22	16	37	31	25	54	66	82
Lake	0	0	1	2	1	0	1	2	7	15	21
Lake of the Woods	6	4	6	3	2	9	12	16	10	28	13
Mahnomen	0	3	7	2	7	8	0	4	2	9	7
Marshall	24	14	20	16	19	32	18	15	31	42	44
Mille Lacs	10	4	11	9	8	13	11	10	10	13	23
Morrison	6	14	18	18	17	23	28	13	23	25	35
Norman	0	0	0	0	1	0	0	1	0	3	6
Otter Tail	0	0	5	1	7	9	7	7	14	21	38
Pennington	1	0	6	3	2	11	9	6	5	4	13
Pine	49	44	59	47	59	87	101	49	50	94	135
Polk	2	2	4	1	3	0	4	9	9	17	20
Red Lake	1	1	0	6	1	0	0	7	16	20	25
Roseau	22	28	27	28	36	32	18	19	26	46	60
St. Louis	30	25	37	44	45	39	58	56	81	202	283
Sherburne	0	0	0	0	0	0	0	1	0	3	0
Stearns	0	0	0	0	0	1	0	0	0	0	0
Todd	3	6	5	7	12	6	14	10	9	14	16
Wadena	7	8	3	17	16	9	7	21	9	17	23
Unknown	0	0	4	7	15	2	3	7	2	7	9
Total	544	483	631	590	890	702	853	884	1012	1711	1875

Table 4. Bobcat harvest by sex and week, 2012-13 season.

Date	Sex*			Total	% of Total	Cumulative %
	Male	Female	Unknown			
Nov.24 - Nov.30	137	154	2	293	15.63	15.63
Dec.1 - Dec.7	151	162	1	314	16.75	32.37
Dec.8 - Dec.14	155	155		310	16.53	48.91
Dec.15 - Dec.21	145	180	1	326	17.39	66.29
Dec.22 - Dec.28	126	164	1	291	15.52	81.81
Dec.29 - Jan.6**	148	165		313	16.69	98.51
Unknown	16	12		28	1.49	100%
Total	878	992	5	1875	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, 1987-2012.

Number (%) of Takers	Number Taken					
	1	2	3	4	5	Total Takers
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
2011-12	351 (47)	126 (17)	86 (12)	62 (8)	118 (16)	743
2012-13	380 (45)	167 (20)	108 (13)	82 (10)	100 (12)	837

* Product of categories above may not equal total harvest due to some missing names/license numbers

Table 6. Bobcat harvest by method of take, 1985-2012.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
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
2011-12	1708	1606	94	670	2.4	47	102	6	74	1.4	60
2012-13	1875	1681	90	721	2.3	46	194	10	130	1.5	52

[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

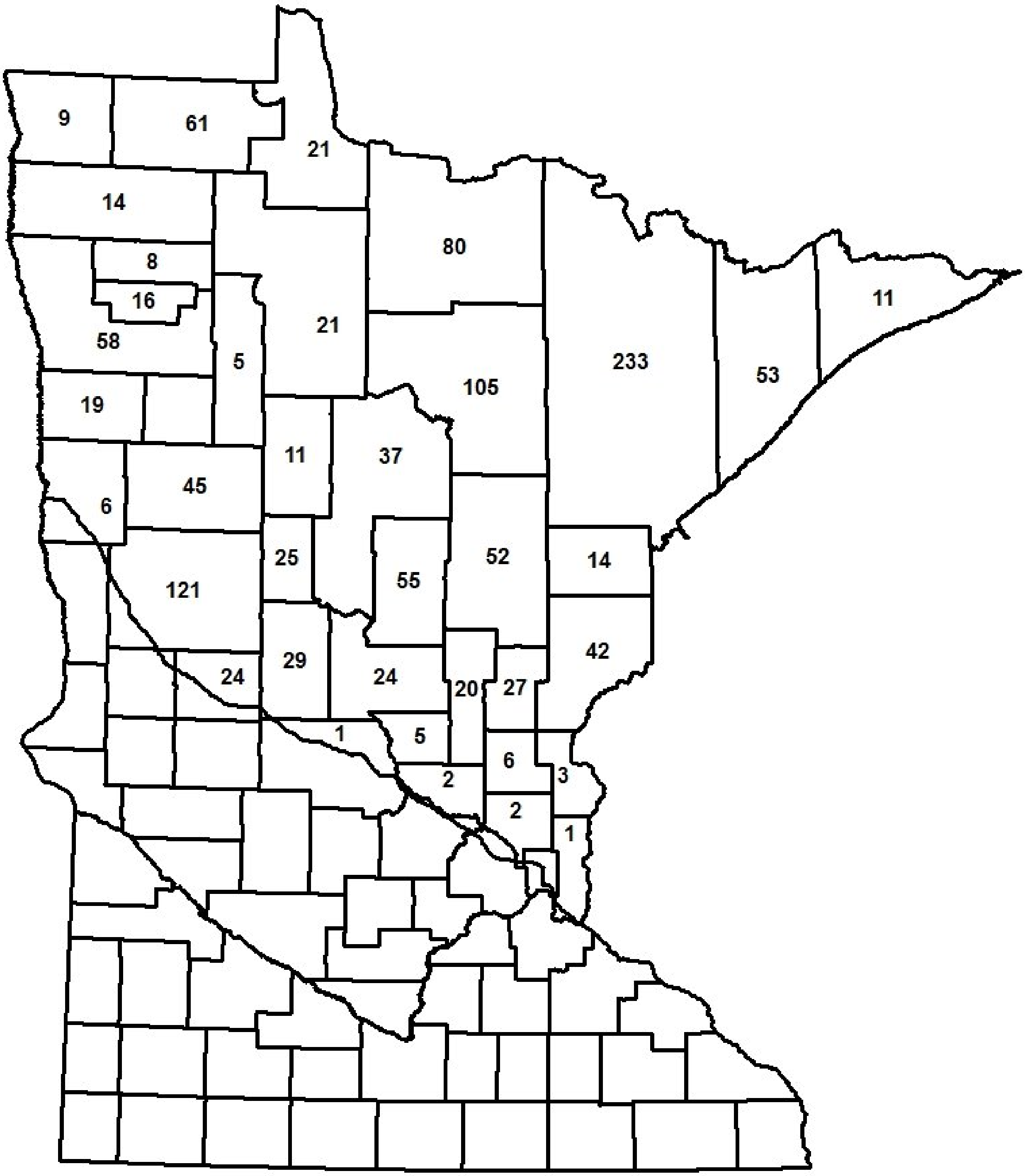

Figure 4. Fisher harvest by county, 2012.

Table 7. Fisher harvest by county and sex, 2012 season.

	Sex				Harvest/
County	Male	Female	Unknown	Total	100 Mile^2
Aitkin	29	23		52	2.61
Anoka	2	0		2	0.45
Becker	24	21		45	3.11
Beltrami	11	10		21	0.69
Benton	2	3		5	1.21
Carlton	9	5		14	1.60
Cass	17	20		37	1.53
Chisago	2	1		3	0.68
Clay	5	1		6	0.57
Clearwater	4	1		5	0.49
Cook	5	6		11	0.69
Crow Wing	30	25		55	4.76
Douglas	10	14		24	3.33
Grant	0	0		0	0.00
Hubbard	8	3		11	1.10
Isanti	1	5		6	1.33
Itasca	59	46		105	3.59
Kanabec	14	13		27	5.06
Kittson	5	4		9	0.81
Koochiching	44	36		80	2.54
Lake	27	26		53	2.32
Lake of the Woods	12	8	1	21	1.18
Mahnomen	0	0		0	0.00
Marshall	10	4		14	0.77
Mille Lacs	8	12		20	2.94
Morrison	15	8	1	24	2.08
Norman	10	9		19	2.17
Otter Tail	69	52		121	5.44
Pennington	3	5		8	1.29
Pine	30	12		42	2.93
Polk	30	27	1	58	2.90
Red Lake	7	9		16	3.69
Roseau	38	23		61	3.63
St. Louis	107	126		233	3.46
Sherburne	2	0		2	0.44
Stearns	0	1		1	0.07
Todd	24	5		29	2.96
Wadena	9	16		25	4.60
Washington	1	0		1	0.24
Wilkin	0	0		0	0.00
Unknown	12	14	1	27	
Total	695	594	4	1,293	

Table 8. Comparison of fisher harvest by county, 2001-2012.

County	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Aitkin	103	122	124	96	97	156	67	75	50	35	55	52
Anoka	0	0	1	0	0	0	0	2	0	0	1	2
Becker	46	96	88	92	49	87	57	36	44	30	32	45
Beltrami	73	117	74	71	47	54	40	15	22	10	25	21
Benton	0	0	1	0	1	1	0	3	2	0	5	5
Carlton	37	48	42	40	35	49	13	19	15	12	12	14
Cass	134	225	205	186	149	209	80	77	57	43	41	37
Chisago	2	6	5	6	2	18	7	4	10	6	10	3
Clay	0	0	0	0	0	1	0	3	0	6	10	6
Clearwater	45	45	52	41	35	54	19	37	13	6	8	5
Cook	33	27	28	24	40	35	29	10	11	17	28	11
Crow Wing	82	106	106	113	79	140	81	116	42	48	64	55
Douglas	0	0	3	3	3	6	2	5	2	6	15	24
Grant	0	0	0	0	0	0	0	0	0	1	0	0
Hubbard	64	59	62	32	20	51	20	38	18	13	10	11
Isanti	0	0	0	2	3	5	1	5	9	1	4	6
Itasca	298	354	319	323	320	405	195	195	166	88	142	105
Kanabec	4	19	21	13	15	26	11	26	20	13	21	27
Kittson	7	3	11	2	7	2	5	8	5	7	5	9
Koochiching	156	178	171	179	209	221	105	115	96	51	116	80
Lake	54	72	74	87	85	87	49	54	49	45	56	53
Lake of the Woods	48	115	78	33	63	74	17	42	21	9	33	21
Mahnomen	12	16	14	13	9	27	25	6	3	0	3	0
Marshall	19	18	21	25	18	26	19	26	6	7	13	14
Mille Lacs	3	16	22	14	16	20	15	17	18	18	17	20
Morrison	1	6	3	7	5	23	21	14	10	8	10	24
Norman	0	1	1	11	6	4	9	12	7	4	10	19
Otter Tail	1	12	40	52	60	158	110	152	67	100	138	121
Pennington	4	10	18	42	22	22	16	8	2	4	8	8
Pine	29	44	54	56	42	82	39	74	30	26	22	42
Polk	24	46	65	47	38	72	61	49	31	25	54	58
Red Lake	16	15	16	29	34	32	29	23	23	10	17	16
Roseau	180	106	141	114	110	127	84	89	58	20	79	61
St. Louis	608	734	611	740	688	898	407	283	296	186	350	233
Sherburne	0	0	2	0	0	0	0	0	3	1	6	2
Stearns	0	0	0	1	0	0	0	1	1	0	4	1
Todd	2	5	14	18	23	21	13	33	22	18	15	29
Wadena	31	39	32	31	40	44	27	37	23	23	31	25
Washington	0	0	0	0	0	0	1	0	0	0	1	1
Wilkin	0	0	0	0	0	0	0	0	0	0	1	0
Unknown	1	0	2	9	18	14	8	3	7	6	1	27
Total	2,117	2,660	2,521	2,552	2,388	3,251	1,682	1,712	1,259	903	1,473	1,293

Table 9. Fisher harvest by date and sex, 2012 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 24	0	0	0	0	0.00	0.00
Nov. 25	0	0	0	0	0.00	0.00
Nov. 26	178	166	1	345	26.68	26.68
Nov. 27	128	124		252	19.49	46.17
Nov. 28	121	78		199	15.39	61.56
Nov. 29	80	77	1	158	12.22	73.78
Unknown	188	149	2	339	26.22	100%
Total	695	594	4	1,293	100%	

Table 10. Distribution of fisher harvest* among trappers, 1993-2012.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993	239 (34)	460 (66)	----	----	----	699	1.7
1994	321 (31)	725 (69)	----	----	----	1046	1.7
1995	232 (40)	355 (60)	----	----	----	587	1.6
1996	321 (31)	726 (69)	----	----	----	1047	1.7
1997	351 (23)	1205 (77)	----	----	----	1556	1.8
1998	443 (28)	1141 (72)	----	----	----	1584	1.7
1999	397 (37)	664 (63)	----	----	----	1061	1.6
2000	301(38)	251 (31)	129 (16)	121 (15)	----	802	2.1
2001	294 (33)	271 (31)	146 (17)	168 (19)	----	879	2.2
2002	336 (35)	234 (25)	138 (15)	117 (12)	123 (13)	948	1.8
2003	403 (39)	249 (24)	150 (15)	107 (11)	115 (11)	1024	1.7
2004	390 (37)	260 (25)	184 (17)	95 (9)	132 (12)	1061	1.7
2005	407 (40)	251 (24)	150 (15)	102 (10)	118 (11)	1028	1.7
2006	510 (37)	328 (24)	208 (15)	150 (11)	171 (13)	1367	1.7
2007	416 (50)	193 (23)	104 (12)	68 (8)	57 (7)	838	1.7
2008	382 (48)	182 (23)	91 (11)	65 (8)	79 (10)	799	1.6
2009	372 (55)	156 (23)	69 (10)	42 (6)	38 (6)	677	1.6
2010	330 (54)	279 (46)	----	----	----	609	1.5
2011	553 (55)	451 (45)	----	----	----	1004	1.4
2012	453 (52)	415 (48)	----	----	----	868	1.5

* Product of categories above may not equal total harvest due to some missing name/license numbers

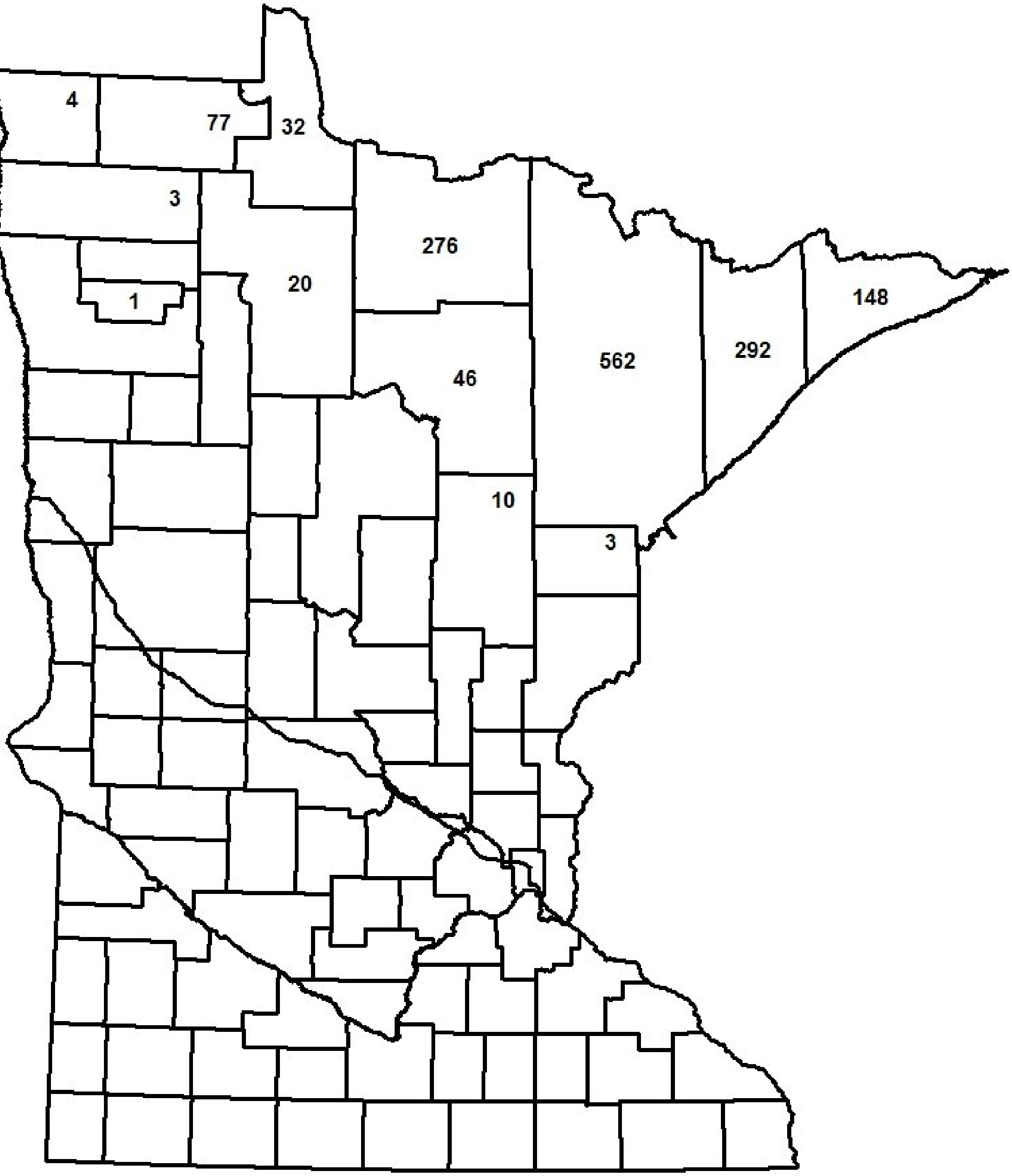

Figure 5. Marten harvest by county, 2012.

Table 11. Marten harvest by county and sex, 2012 season.

County	Sex			Total	Harvest/ 100 Mile^2
	Male	Female	Unknown		
Aitkin	10	0		10	0.50
Beltrami	11	9		20	0.65
Carlton	2	1		3	0.34
Cass	0	0		0	0.00
Clearwater	0	0		0	0.00
Cook	107	41		148	9.22
Crow Wing	0	0		0	0.00
Itasca	28	18		46	1.57
Kanabec	0	0		0	0.00
Kittson	3	1		4	0.36
Koochiching	178	97	1	276	8.75
Lake	167	121	2	290	12.68
Lake of the Woods	22	10		32	1.80
Mahnomen	0	0		0	0.00
Marshall	0	3		3	0.17
Pennington	0	0		0	0.00
Pine	0	0		0	0.00
Red Lake	1	0		1	0.23
Roseau	51	26		77	4.59
St. Louis	350	212		562	8.34
Unknown	0	0	0	0	
Total	930	539	3	1,472	

Table 12. Comparison of marten harvest by county in Minnesota, 2001-2012.

County	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Aitkin	3	5	6	6	6	13	4	12	5	4	13	10
Beltrami	24	30	38	65	17	19	8	6	10	2	11	20
Carlton	11	4	11	1	10	6	1	4	8	5	6	3
Cass	1	3	2	3	1	4	0	1	2	1	2	0
Clearwater	0	0	1	1	0	0	0	0	0	0	0	0
Cook	164	228	411	318	369	446	269	151	244	191	205	148
Crow Wing	0	0	0	0	0	0	0	0	1	0	1	0
Itasca	102	147	141	136	98	155	74	72	91	73	118	46
Kanabec	0	0	0	0	0	2	0	0	0	0	0	0
Kittson	0	0	0	0	0	0	0	0	0	1	0	4
Koochiching	327	525	534	549	418	592	348	300	354	336	516	276
Lake	243	492	541	551	536	892	520	438	496	491	577	290
Lake of the Woods	13	104	71	122	54	46	31	17	17	13	49	32
Mahnomen	0	0	0	2	0	0	0	0	0	0	0	0
Marshall	1	1	1	5	3	0	1	0	4	0	3	3
Pennington	0	0	0	0	0	0	1	0	0	0	0	0
Pine	0	0	1	2	1	1	1	0	0	1	0	0
Red Lake	0	0	0	0	0	0	0	0	0	0	0	1
Roseau	48	116	104	127	51	31	69	46	32	13	98	77
St. Louis	991	1,184	1,352	1,346	1,065	1,579	885	769	803	709	926	562
Unknown	0	0	0	7	24	2	9	7	6	2	0	0
Total	1,928	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842	2,525	1,472

Table 13. Marten harvest by date and sex, 2012 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 24	9	5		14	0.95	0.95
Nov. 25	198	130		328	22.28	23.23
Nov. 26	187	131		318	21.60	44.84
Nov. 27	202	101		303	20.58	65.42
Nov. 28	157	84	2	243	16.51	81.93
Nov. 29	159	77		236	16.03	97.96
Unknown	18	11	1	30	2.04	100%
Total	930	539	3	1,472	100%	

Table 14. Distribution of marten harvest* among trappers, 1993-2012.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993	76 (10)	681 (90)	----	----	----	757	1.9
1994	165 (20)	681 (80)	----	----	----	846	1.8
1995	78 (10)	711 (90)	----	----	----	789	1.9
1996	157 (18)	734 (82)	----	----	----	891	1.8
1997	161 (13)	1050 (87)	----	----	----	1211	1.9
1998	187 (15)	1056 (85)	----	----	----	1243	1.8
1999	164 (17)	318 (34)	213 (23)	246 (26)	----	941	2.6
2000	188 (28)	190 (28)	123 (18)	173 (26)	----	674	2.4
2001	147 (23)	175 (27)	138 (21)	187 (29)	----	647	2.6
2002	149 (21)	138 (19)	147 (21)	123 (17)	160 (22)	717	1.9
2003	126 (15)	135 (16)	159 (19)	170 (20)	265 (31)	855	1.8
2004	165 (17)	153 (16)	171 (18)	164 (18)	282 (30)	935	1.8
2005	191 (22)	158 (18)	139 (16)	156 (18)	215 (25)	859	1.8
2006	206 (18)	201 (17)	226 (19)	203 (17)	335 (29)	1171	1.8
2007	176 (23)	160 (21)	147 (19)	141 (18)	142 (19)	766	2.0
2008	153 (24)	139 (22)	108 (17)	110 (17)	122 (19)	632	1.9
2009	121 (19)	105 (16)	106 (17)	134 (21)	173 (27)	639	1.9
2010	95 (17)	77 (14)	120 (22)	92 (17)	170 (31)	554	1.8
2011	154 (19)	131 (16)	179 (22)	166 (20)	181 (22)	811	2.0
2012	198 (33)	134 (22)	131 (22)	73 (12)	64 (11)	600	1.9

* 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, 2012. (Combined limit = 5, not to exceed 2 fisher)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		115	82	62	31	64
	1	318	49	21	25	40	
	2	304	34	31	46		
	3						
	4						
	5				Total takers of at least 1 fisher or marten		1,222

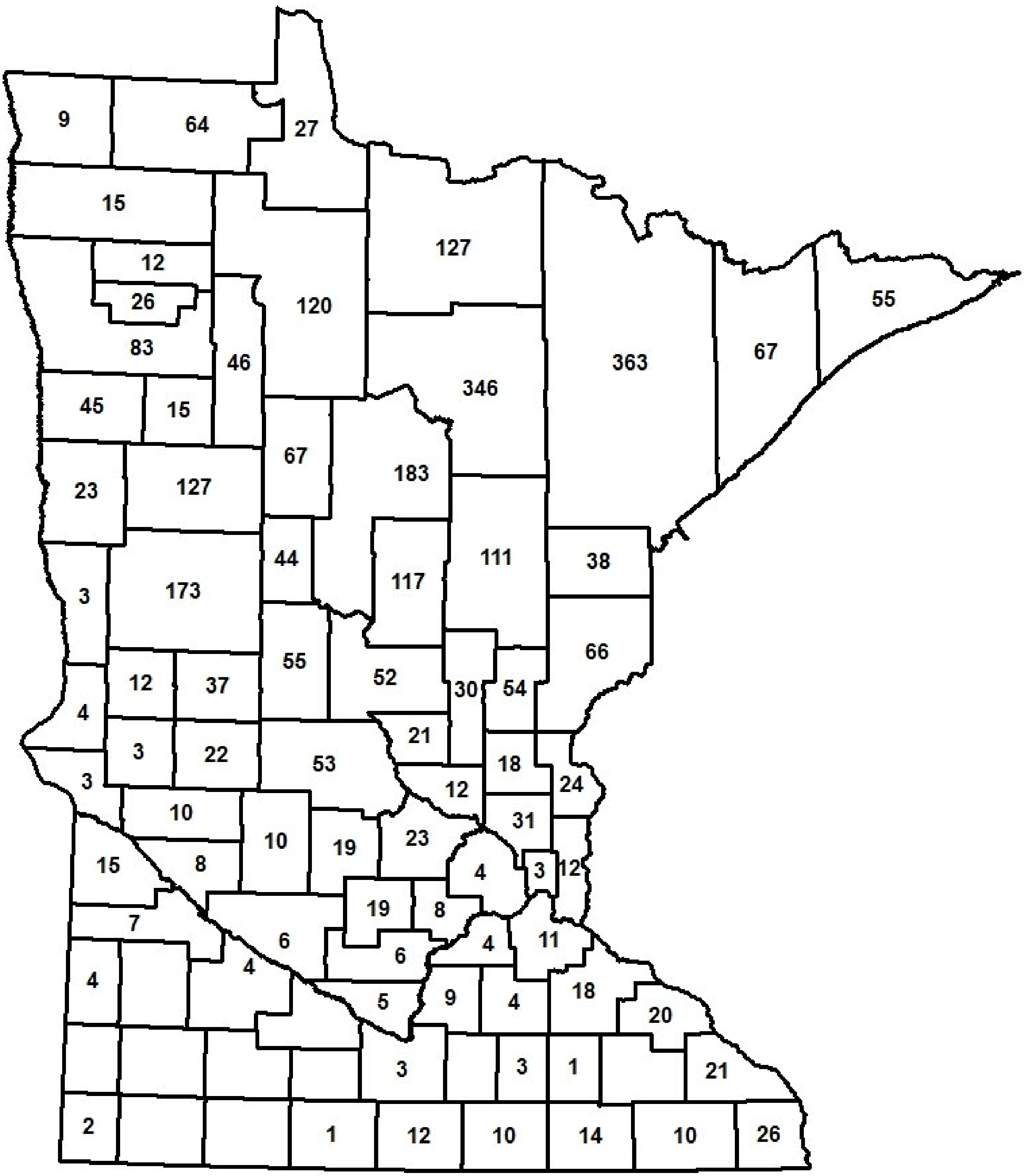

Figure 6. Otter harvest by county, 2012-13.

Table 16. Otter harvest by county and sex, 2012-13 season.

County	Sex: Male	Female	Unknown	Total	Harvest/ 100 Mile^2
Aitkin	58	52	1	111	5.57
Anoka	15	16		31	6.96
Becker	72	55		127	8.79
Beltrami	69	51		120	3.93
Benton	10	11		21	5.09
Big Stone	1	2		3	0.57
Blue Earth	2	1		3	0.39
Carlton	23	15		38	4.35
Carver	5	3		8	2.13
Cass	112	71		183	7.58
Chippewa	7	1		8	1.36
Chisago	12	12		24	5.43
Clay	14	9		23	2.18
Clearwater	31	15		46	4.47
Cook	33	22		55	3.43
Crow Wing	73	44		117	10.12
Dakota	7	4		11	1.88
Dodge	1	0		1	0.23
Douglas	22	13	2	37	5.14
Faribault	7	4	1	12	1.66
Fillmore	7	3		10	1.16
Freeborn	7	3		10	1.39
Goodhue	9	8	1	18	2.31
Grant	5	6	1	12	2.08
Hennepin	1	3		4	0.66
Houston	16	10		26	4.57
Hubbard	35	32		67	6.70
Isanti	9	9		18	3.99
Itasca	224	122		346	11.83
Kanabec	30	19	3	52	9.75
Kandiyohi	6	4		10	1.16
Kittson	8	1		9	0.81
Koochiching	70	54	3	127	4.03
Lac Qui Parle	8	7		15	1.93
Lake	41	25		66	2.89
Lake of the Woods	15	11	1	27	1.52
Le Sueur	4	5		9	1.90
Lincoln	2	2		4	0.73
McLeod	11	8		19	3.76
Mahnomen	8	7		15	2.57
Marshall	8	5	2	15	0.83
Martin	1	0		1	0.14
Meeker	11	8		19	2.95
Mille Lacs	15	15		30	4.41
Morrison	28	22	2	52	4.51
Mower	6	8		14	1.97
Nicollet	3	2		5	1.07
Norman	26	19		45	5.13
Olmsted	0	0		0	0.00
Otter Tail	107	66		173	7.78
Pennington	10	2		12	1.94
Pine	45	21		66	4.61
Polk	49	34		83	4.15
Pope	14	8		22	3.07
Ramsey	2	1		3	1.77
Red Lake	17	8	1	26	6.00
Redwood	3	1		4	0.45

Table 16 (continued). Otter harvest by county and sex, 2012-13 season.

County	Sex: Male	Female	Unknown	Total	Harvest/ 100 $Mile^2$
Renville	5	1		6	0.61
Rice	2	2		4	0.78
Rock	2	0		2	0.41
Roseau	30	34		64	3.81
St. Louis	218	145		363	5.39
Scott	2	2		4	1.09
Sherburne	8	4		12	2.66
Sibley	1	5		6	1.00
Stearns	25	28		53	3.81
Steele	0	3		3	0.69
Stevens	1	2		3	0.52
Swift	2	8		10	1.33
Todd	26	29		55	5.62
Traverse	2	2		4	0.68
Wabasha	16	4		20	3.64
Wadena	23	19	1	43	7.92
Washington	10	2		12	2.83
Wilkin	3	0		3	0.40
Winona	16	5		21	3.28
Wright	13	10		23	3.22
Yellow Medicine	4	3		7	0.92
Unknown	24	14	2	40	
Total	1,868	1,282	21	3,171	

Table 17. Comparison of otter harvest by county, 2001-2012.

County	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Aitkin	100	78	87	113	132	124	53	65	54	59	107	111
Anoka	17	17	13	32	22	16	26	18	26	8	13	31
Becker	125	104	105	178	107	117	54	55	39	53	95	127
Beltrami	108	127	173	216	170	154	105	80	74	77	112	120
Benton	10	6	7	19	14	16	9	11	3	13	13	21
Big Stone	0	0	0	0	0	0	0	2	1	0	3	3
Blue Earth	0	0	0	0	0	0	0	0	0	0	2	3
Carlton	33	40	38	53	36	39	36	29	30	35	29	38
Carver	0	0	0	0	0	0	2	5	6	5	15	8
Cass	197	189	198	255	231	236	124	160	90	135	140	183
Chippewa	0	0	0	0	0	0	0	0	0	5	7	8
Chisago	26	18	22	20	28	33	16	15	18	23	19	24
Clay	1	7	7	15	18	35	8	14	7	23	42	23
Clearwater	47	61	52	62	48	41	39	35	19	38	41	46
Cook	26	31	41	56	46	39	13	12	16	19	36	55
Crow Wing	96	108	119	141	102	111	63	99	76	66	107	117
Dakota	0	0	0	0	0	0	0	5	7	1	0	11
Dodge	0	0	0	0	0	0	0	0	0	3	1	1
Douglas	1	0	12	27	16	30	18	28	11	14	34	37
Faribault	0	0	0	0	0	0	0	0	0	0	1	12
Fillmore	0	0	0	0	0	0	6	1	1	5	5	10
Freeborn	0	0	0	0	0	0	0	0	0	5	10	10
Goodhue	0	0	0	0	0	0	3	3	7	11	7	18
Grant	0	0	0	0	0	0	3	3	6	1	8	12
Hennepin	0	0	0	0	0	0	1	3	6	2	3	4
Houston	0	0	0	0	0	0	9	15	11	11	10	26
Hubbard	61	64	70	91	80	72	59	72	41	52	42	67
Isanti	33	33	27	35	38	30	30	17	18	14	9	18
Itasca	337	310	382	483	362	334	205	201	191	247	281	346
Kanabec	56	40	38	57	79	62	44	29	23	17	22	52
Kandiyohi	0	0	0	0	0	0	2	6	6	8	8	10
Kittson	1	2	3	3	3	5	11	2	3	8	2	9
Koochiching	118	96	164	167	131	118	70	95	61	81	62	127
Lac Qui Parle	0	0	0	0	0	0	0	0	0	2	6	15
Lake	57	57	81	88	65	60	35	34	45	28	36	66
Lake of the Woods	17	21	42	31	34	24	30	17	8	15	27	27
Le Sueur	0	0	0	0	0	0	0	0	0	3	0	9

Table 17 (continued). Comparison of otter harvest by county, 2001-2012.

County	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Lincoln	0	0	0	0	0	0	0	0	0	0	0	4
McLeod	0	0	0	0	0	0	6	6	8	12	18	19
Mahnomen	17	7	23	24	29	26	24	7	7	9	20	15
Marshall	13	35	34	29	18	7	6	2	0	13	13	15
Martin	0	0	0	0	0	0	0	0	0	0	0	1
Meeker	0	0	0	0	0	0	13	13	16	12	28	19
Mille Lacs	20	22	33	48	51	21	33	26	28	19	15	30
Morrison	45	36	46	64	77	60	45	43	31	29	29	52
Mower	0	0	0	0	0	0	0	0	0	8	20	14
Nicollet	0	0	0	0	0	0	0	0	0	2	1	5
Norman	3	4	1	16	17	11	9	17	11	12	21	45
Olmsted	0	0	0	0	0	0	0	2	3	2	3	0
Otter Tail	51	32	45	113	85	81	50	82	32	65	109	173
Pennington	6	12	16	18	33	15	9	0	1	4	2	12
Pine	42	61	78	99	51	111	50	74	37	38	44	66
Polk	60	63	72	104	45	47	32	25	19	36	49	83
Pope	0	0	0	0	0	0	11	12	12	11	20	22
Ramsey	0	0	0	0	0	0	0	0	0	0	0	3
Red Lake	18	27	35	58	26	30	19	8	20	22	19	26
Redwood	0	0	0	0	0	0	0	0	0	0	2	4
Renville	0	0	0	0	0	0	0	0	0	0	1	6
Rice	0	0	0	0	0	0	0	0	0	1	9	4
Rock	0	0	0	0	0	0	0	0	0	0	0	2
Roseau	36	27	72	69	60	53	32	53	23	32	33	64
St. Louis	453	316	483	508	428	344	290	251	233	253	239	363
Scott	0	0	0	0	0	0	3	3	1	4	2	4
Sherburne	11	11	24	25	15	29	26	10	17	7	19	12
Sibley	0	0	0	0	0	0	0	0	0	6	6	6
Stearns	5	17	13	22	21	33	9	38	24	13	41	53
Steele	0	0	0	0	0	0	0	0	0	1	0	3
Stevens	0	0	0	0	0	0	1	3	1	6	1	3
Swift	0	0	0	0	0	0	9	4	5	2	11	10
Todd	24	30	49	53	63	81	35	37	32	41	63	55
Traverse	0	0	0	0	0	0	1	0	2	0	1	4
Wabasha	0	0	0	0	0	0	15	7	18	7	8	20
Wadena	23	23	35	34	38	32	15	19	15	16	20	43
Washington	4	12	10	8	11	16	18	19	11	16	18	12

Table 17 (continued). Comparison of otter harvest by county, 2001-2012.

County	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Wilkin	0	0	0	0	0	0	2	0	0	0	0	3
Winona	0	0	0	0	0	0	11	19	13	15	20	21
Wright	0	1	2	3	2	5	7	9	8	11	17	23
Yellow Medicine	0	0	0	0	0	0	0	0	0	0	0	7
Unknown	3	0	14	13	14	22	6	18	12	2	17	40
Totals	2,301	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814	2,294	3,171

Table 18. Otter harvest by sex and week, 2012-13 season.

Date	Sex			Total	% of	Cumulative
	Male	Female	Unknown	Harvest	Total	%
Oct.27 - Nov.2	308	201	7	516	16.27	16.27
Nov.3 - Nov.9	292	169	1	462	14.57	30.84
Nov.10 - Nov.16	245	186	1	432	13.62	44.47
Nov.17 - Nov.23	246	179	1	426	13.43	57.90
Nov.24 - Nov.30	222	162	3	387	12.20	70.10
Dec.1 - Dec.7	155	97	1	253	7.98	78.08
Dec.8 - Dec.14	121	89		210	6.62	84.71
Dec.15 - Dec.21	97	79	1	177	5.58	90.29
Dec.22 - Dec.28	80	59	2	141	4.45	94.73
Dec.29 - Jan.6*	83	53	1	137	4.32	99.05
Unknown	19	8	3	30	0.95	100%
Total	1,868	1,282	21	3,171	100%	

* 9-day interval.

Table 19. Distribution of otter harvest* among trappers, 1993-2012.

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
2011-12	438 (42)	227 (22)	149 (14)	236 (22)	1050	2.2
2012-13	468 (35)	330 (24)	175 (13)	376 (28)	1349	2.3

* Product of categories above may not equal total harvest due to some unknown name/license numbers

WILDLIFE DAMAGE COMPLAINTS

NOTE: Wildlife damage complaint information is collected statewide from wildlife managers. The data is compiled and summarized by the Wildlife Damage Extension Specialist at the Brainerd area office.

WILDLIFE DAMAGE COMPLAINTS, 2011

Eric Nelson, Wildlife Damage Program Coordinator
Tom Engel, Wildlife GIS Project Consultant

Wildlife damage complaint information is collected statewide from wildlife managers. The 2011 information was compiled and summarized by MNIT and the Wildlife Damage Program Coordinator, 1601 Minnesota Drive, Brainerd, MN 56401.

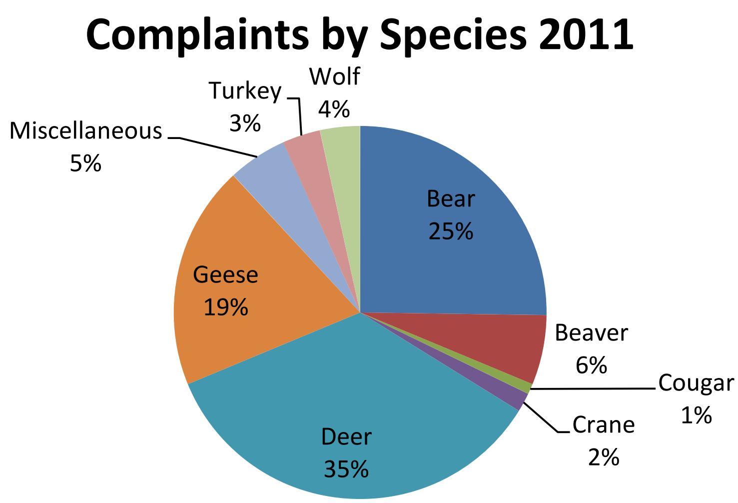

Figure 1**.** Wildlife complaints by species for the year 2011, in Minnesota.

Wildlife managers recorded a total of 547 wildlife complaints in 2011, down 11% from 2010 total of 614complaints. Three species; black bear, white-tailed deer, and Canada geese account for 79% (n=435) of the complaints received (Figure1). Five other species of special interest for wildlife damage; cougar, beaver, turkey, sandhill crane, and wolf comprise an additional 16% (n=84) of the recorded complaints. Fourteen species are represented in 5% (n=28) of the miscellaneous complaints received, one was for trumpeter swan.

During calendar year 2011 direct technical assistance and materials were provided for depredation sites within 16 wildlife office work areas including all four state wildlife regions. Materials and assistance were provided for permanent, woven wire, deer exclusion fences to 18 specialty crop producers and farmers. Crops protected included mixed vegetables (n=4), apple orchards (n=7), berries (n=1), a tree nursery (n=1), a vineyard (n=1), a landscape nursery (n=1) and hay yards (n=3). In addition, materials were provided to expand one energized fence for an orchard and materials were provide for the expansion of a woven wire fence for a vegetable producer. Technical assistance was provided to two community organizations that built permanent fencing, at their own cost, for community gardens located in Brainerd and Cambridge. Materials were also provided for landowner installation at four different locations including sheet metal and corral panels for three stored forage sites and energized fence materials for a vineyard.

The number of deer shooting permits (n=367) was up 6.5 times the level in 2010 when 56 permits were issued. No landowner permits were issued for tuberculosis control however, 312 permits were issued for control of chronic wasting disease (Figure 9).

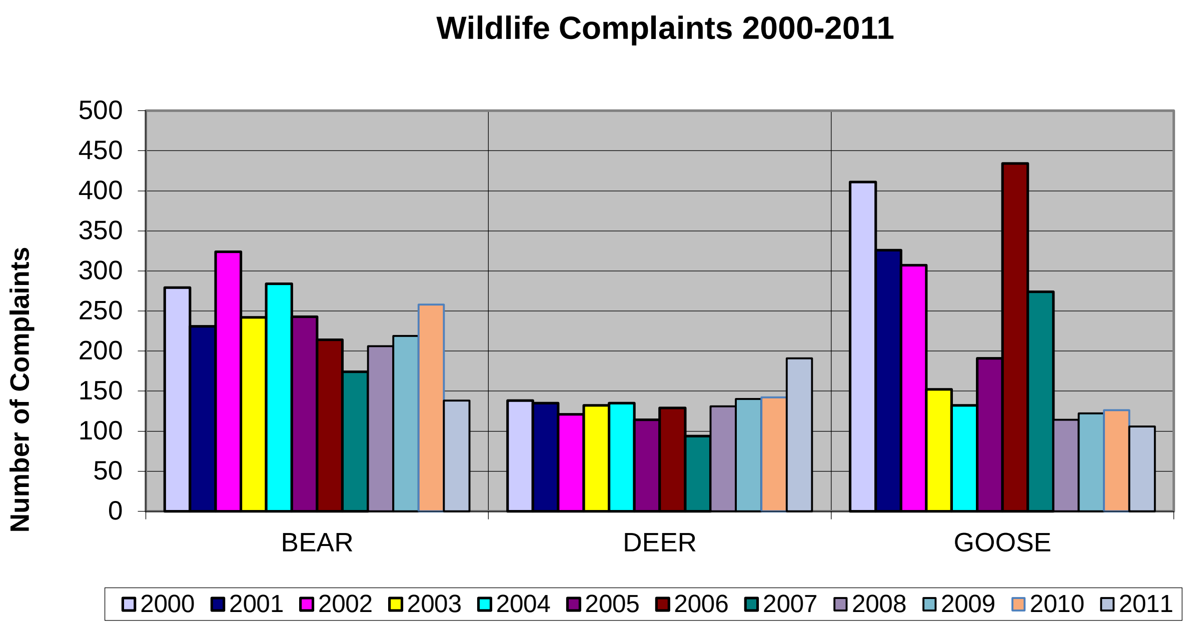

Figure 2. Number of wildlife complaints recorded for bear, deer and geese from 2000-2011, in Minnesota.

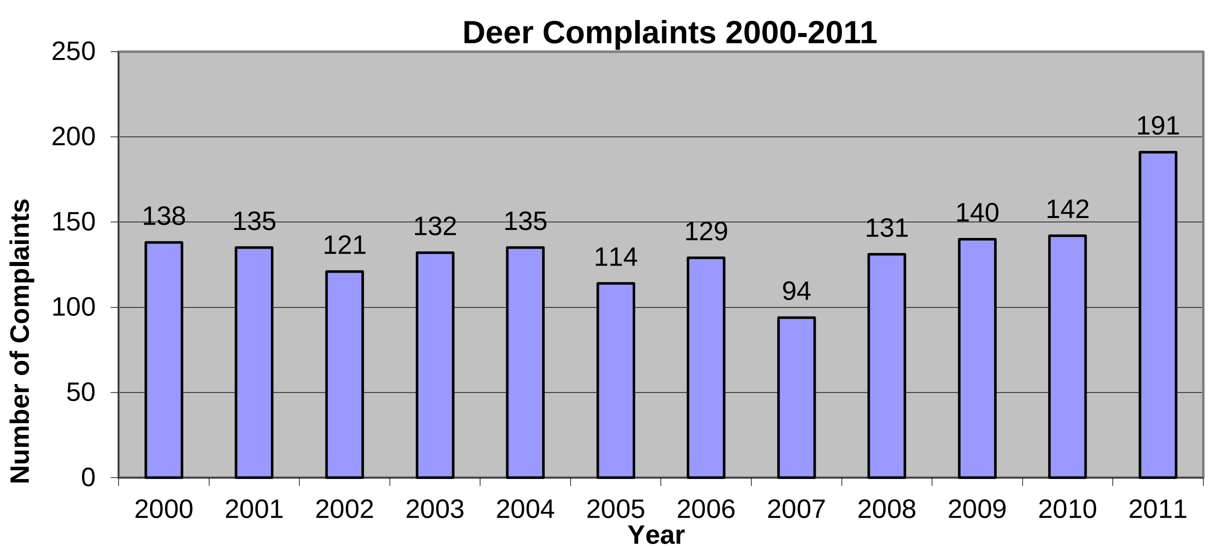

Figure 3**.** Number of deer complaints from 2000-2011, in Minnesota.

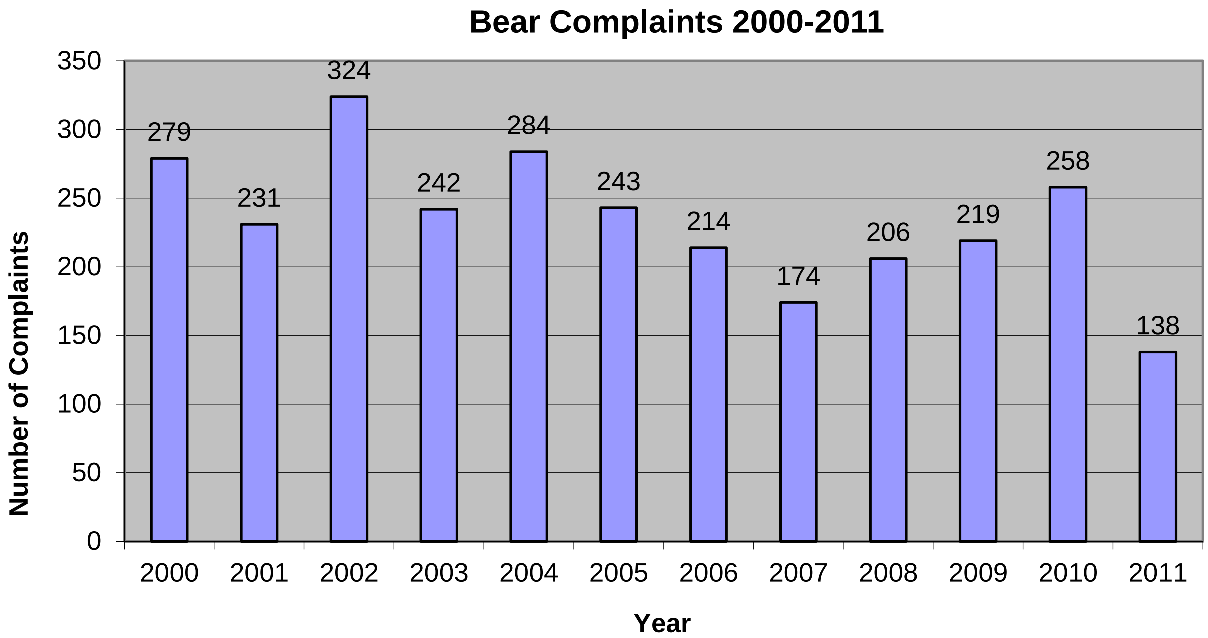

Figure 4. Number of bear complaints from 2000-2011 in Minnesota.

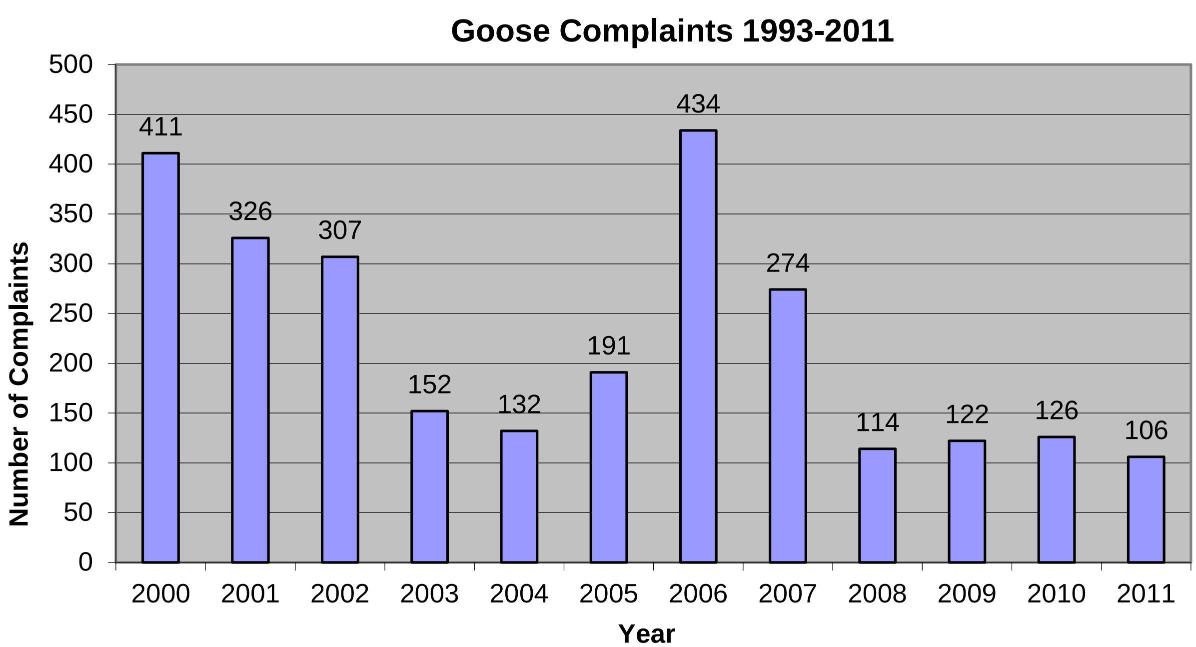

Figure 5. Number of goose complaints from 2000-2011, in Minnesota.

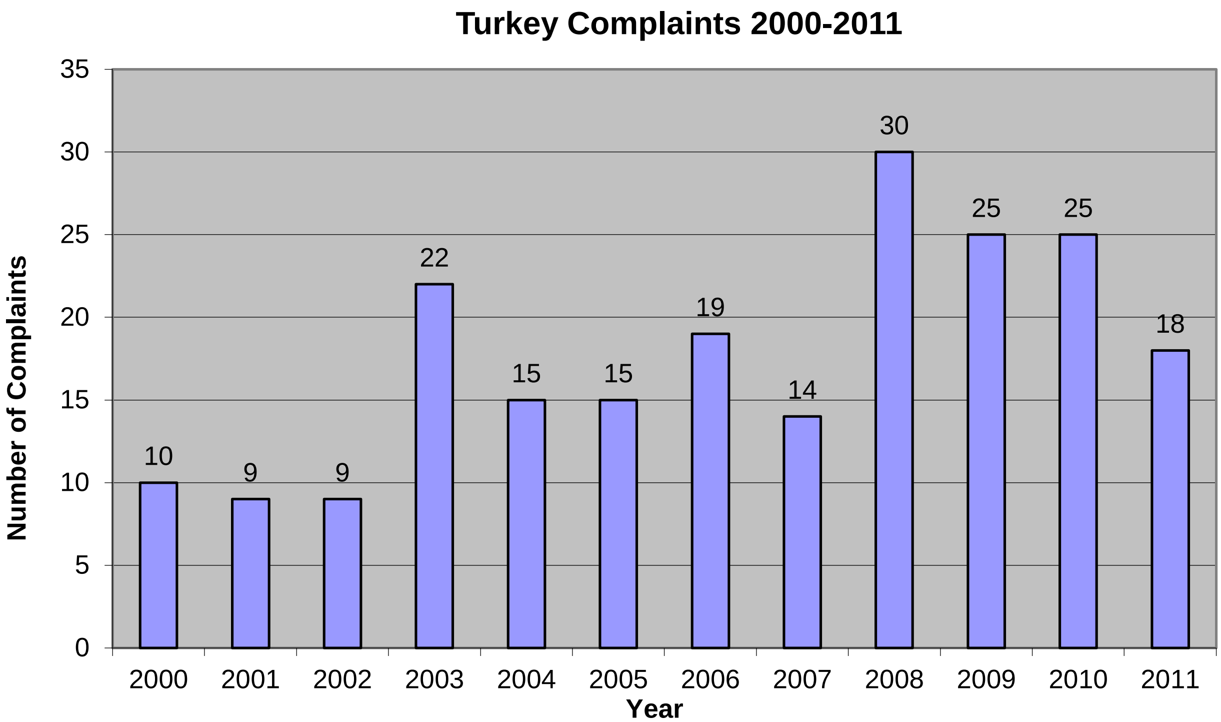

Figure 6. Number of turkey complaints from 2000-2011, in Minnesota.

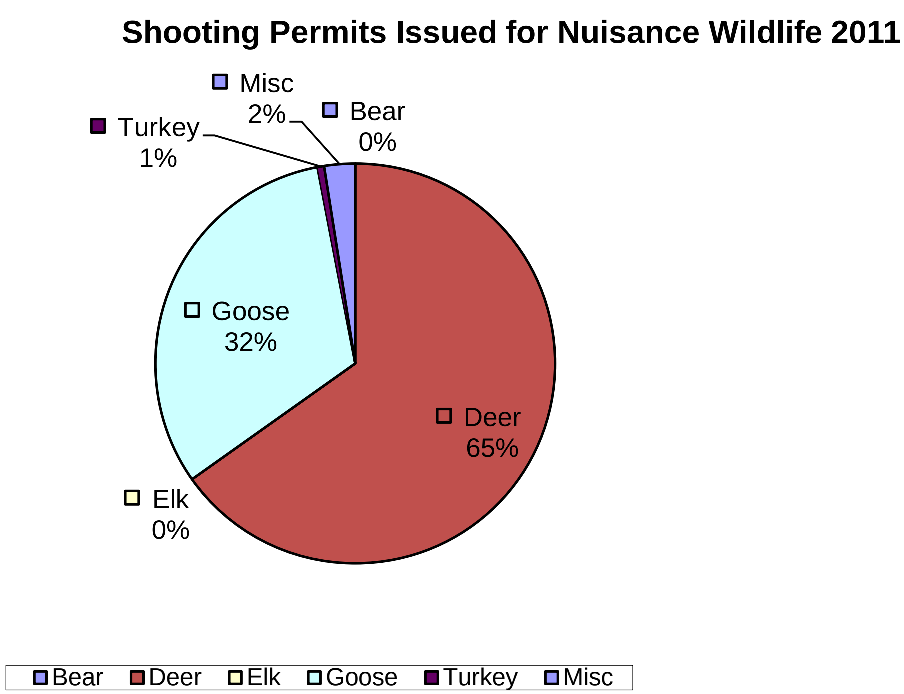

Figure 7. Shooting permits issued for nuisance wildlife control in Minnesota for 2011.

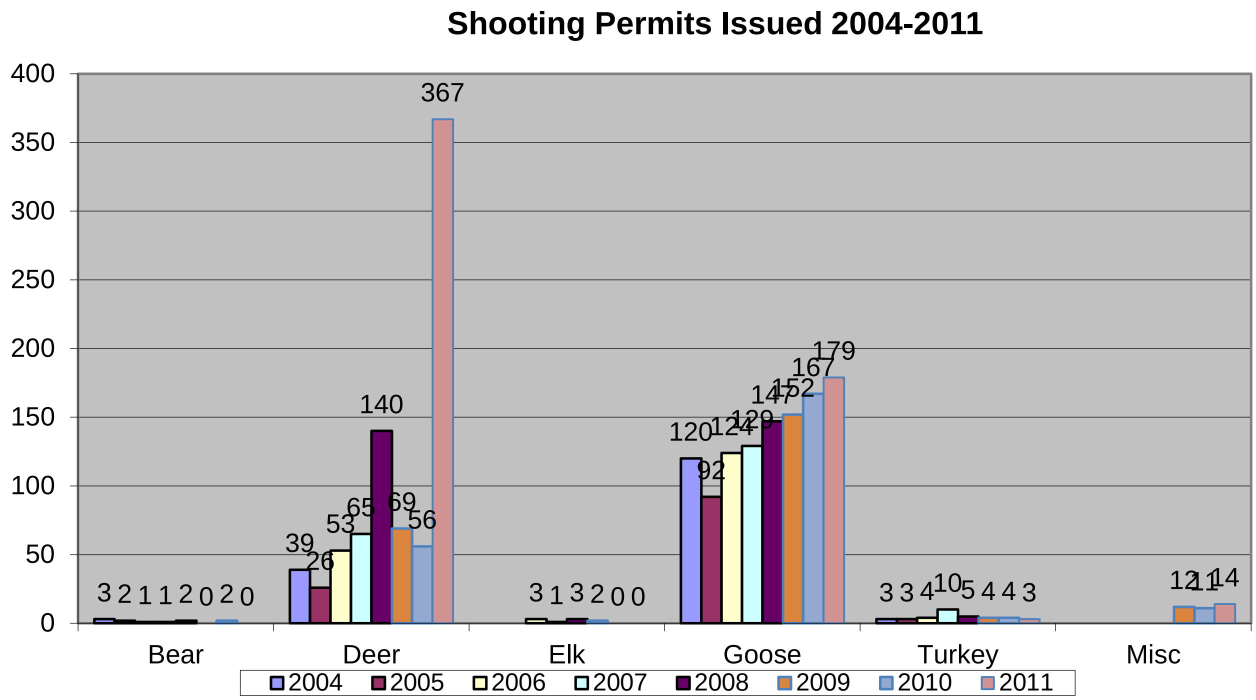

Figure 8. Shooting permits issued for nuisance wildlife control in Minnesota for 2004-2011.

The fourteen miscellaneous permits issued in 2011 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 gulls and one permit for fisher.

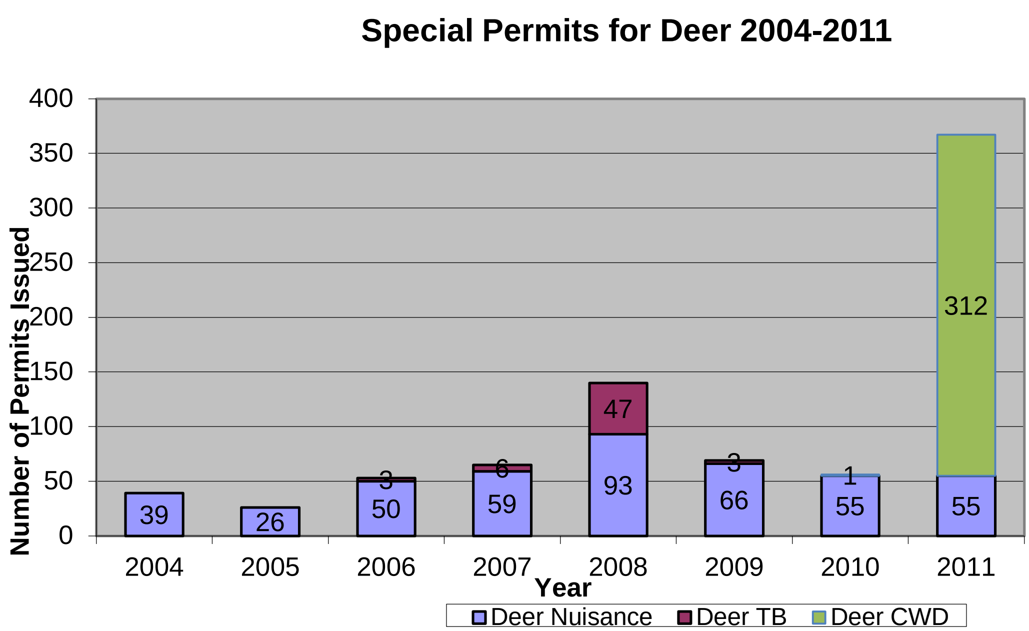

Figure 9. Shooting permits issued showing the portion related to tuberculosis (TB) and chronic wasting disease (CWD) control efforts in Minnesota for the period 2006-2011.

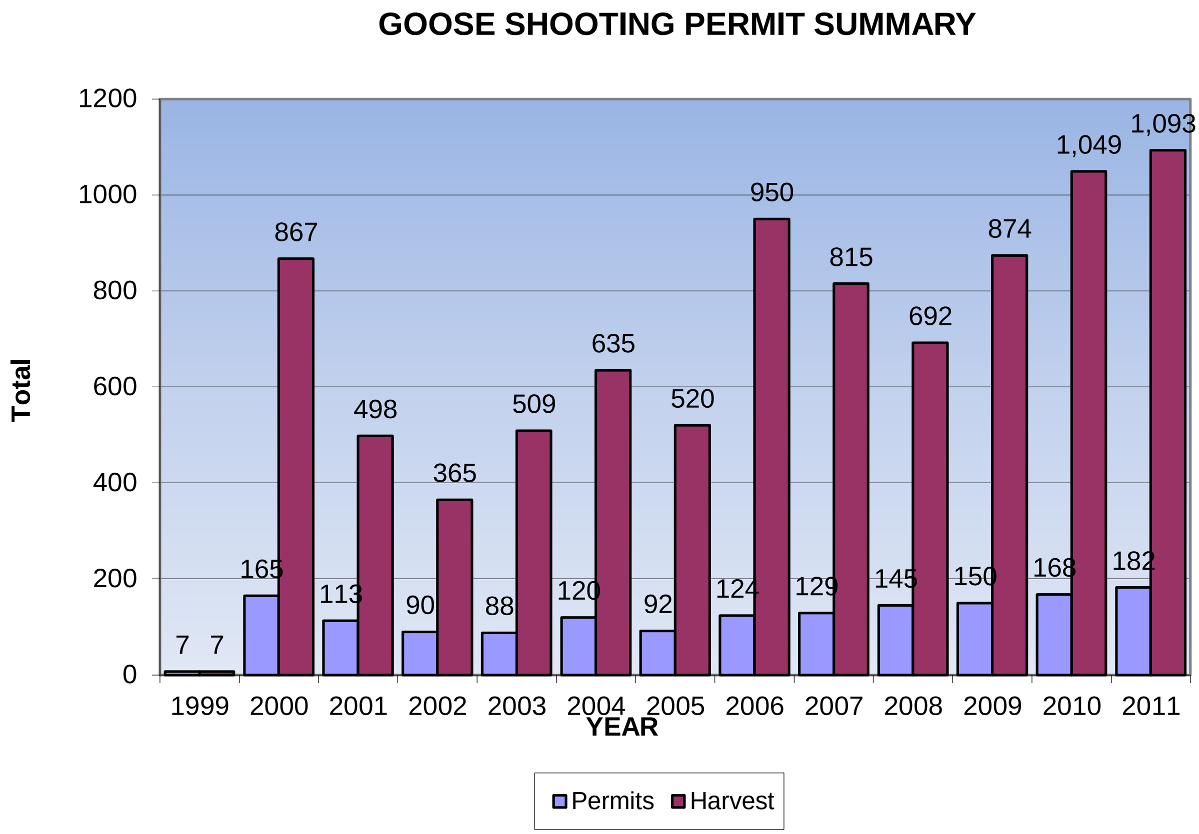

Figure 10. Comparison of nuisance goose shooting permits and harvest in Minnesota 1999-2011.

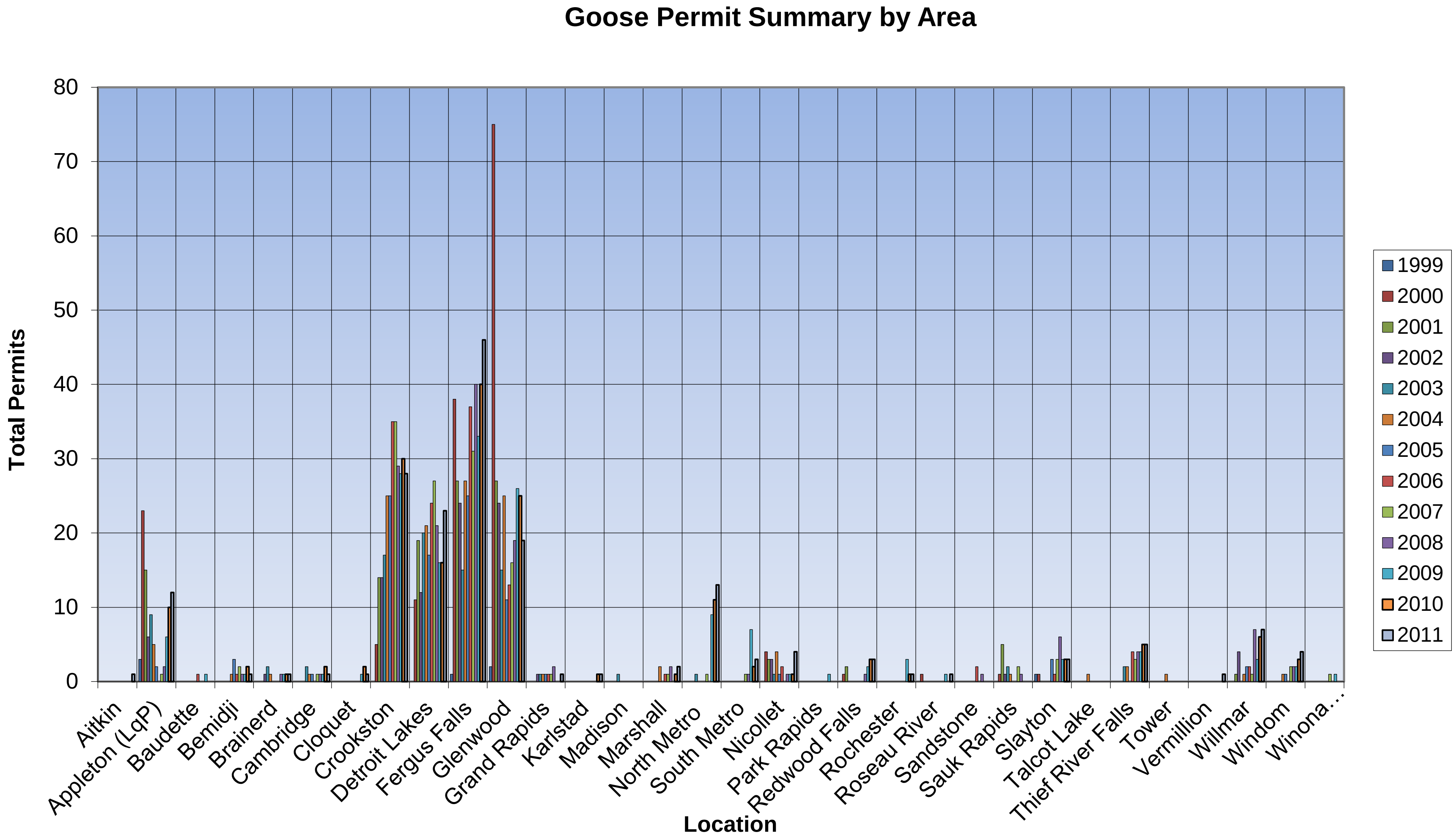

Figure 11. Nuisance goose permits issued by area wildlife offices in Minnesota 1999-2011.

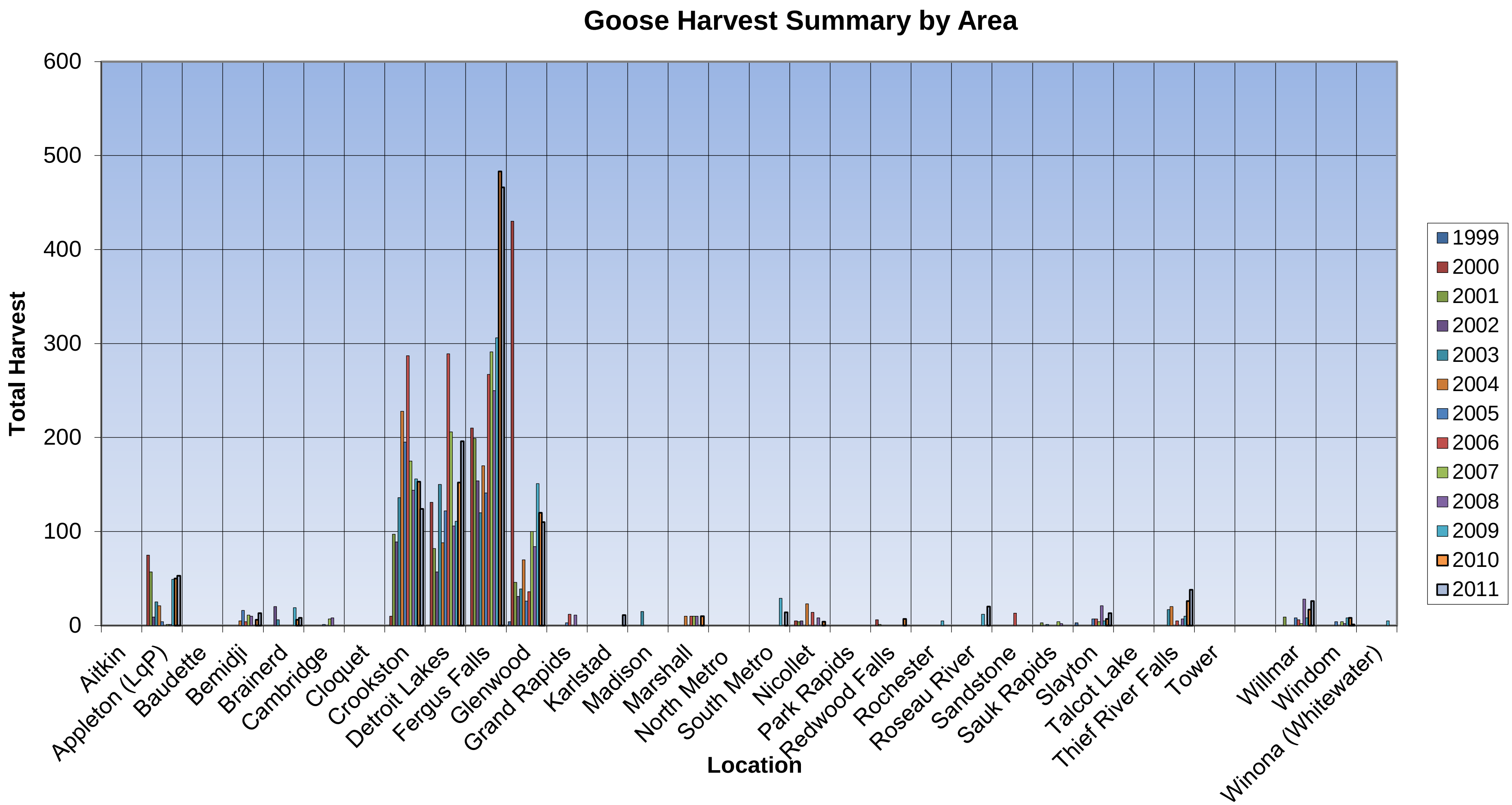

Figure 12. Nuisance goose harvest by area wildlife office in Minnesota 1999-2011.

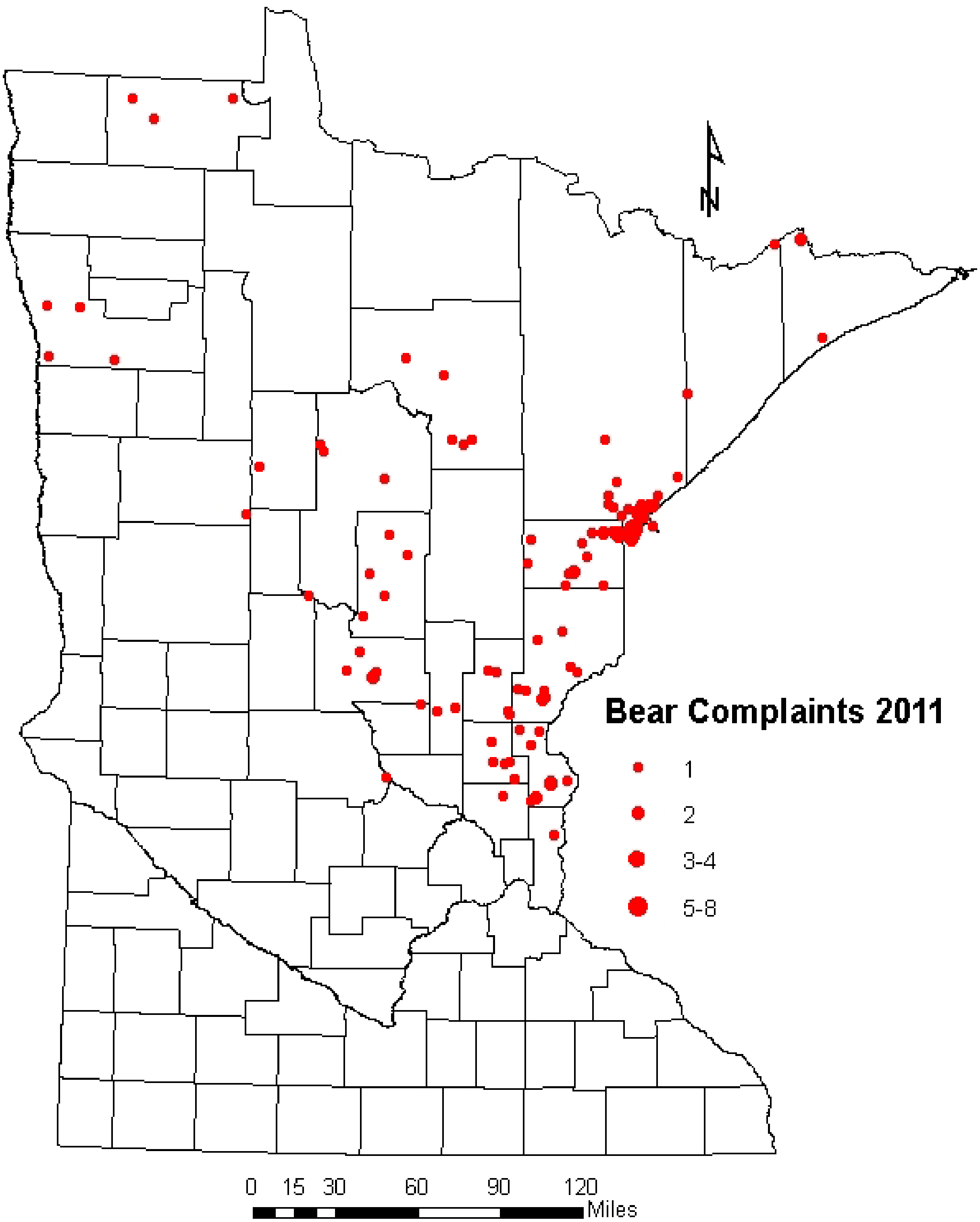

Figure 13. Location of bear damage complaints in 2011 (n= 138). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

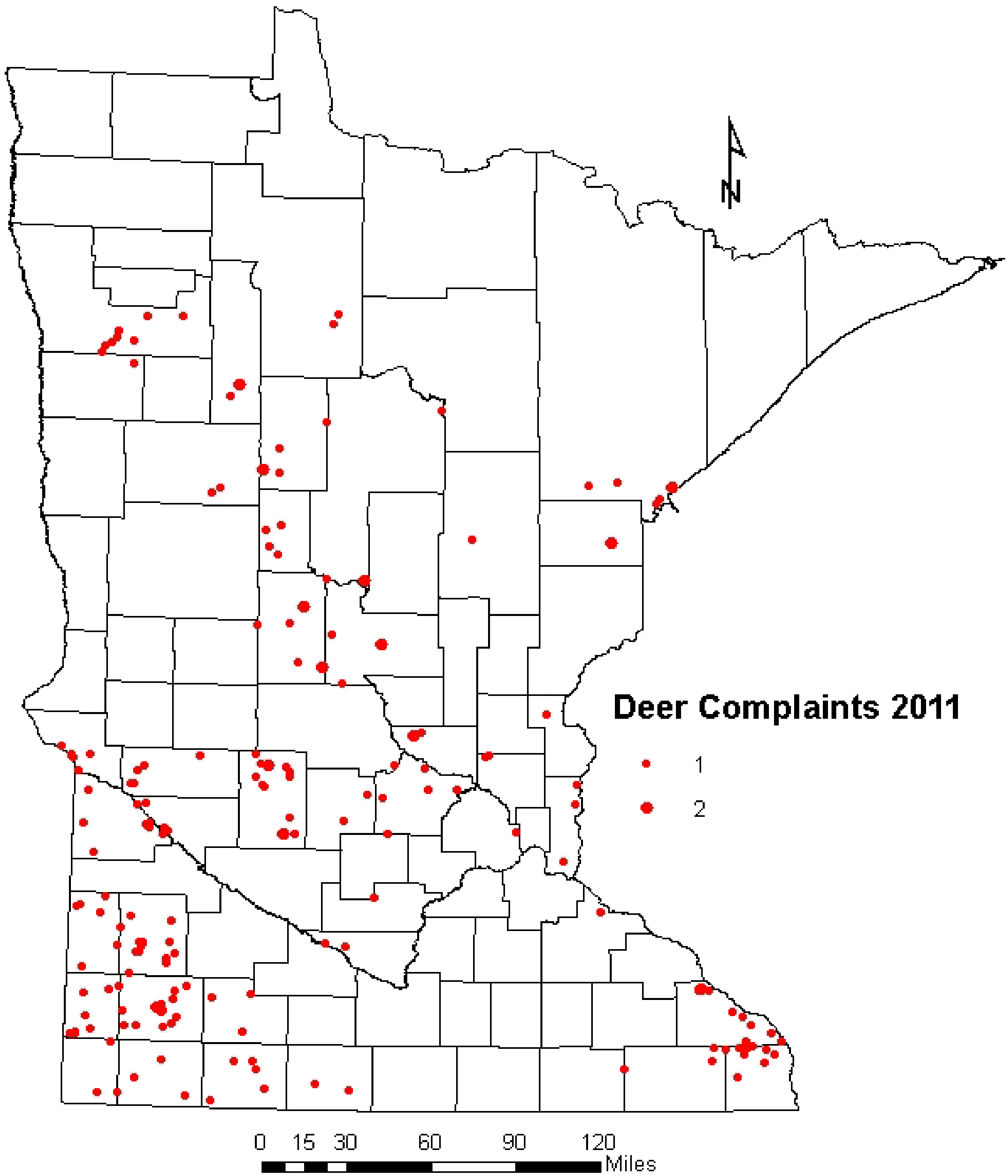

Figure 14. Location of deer damage complaints in 2011 (n= 191). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

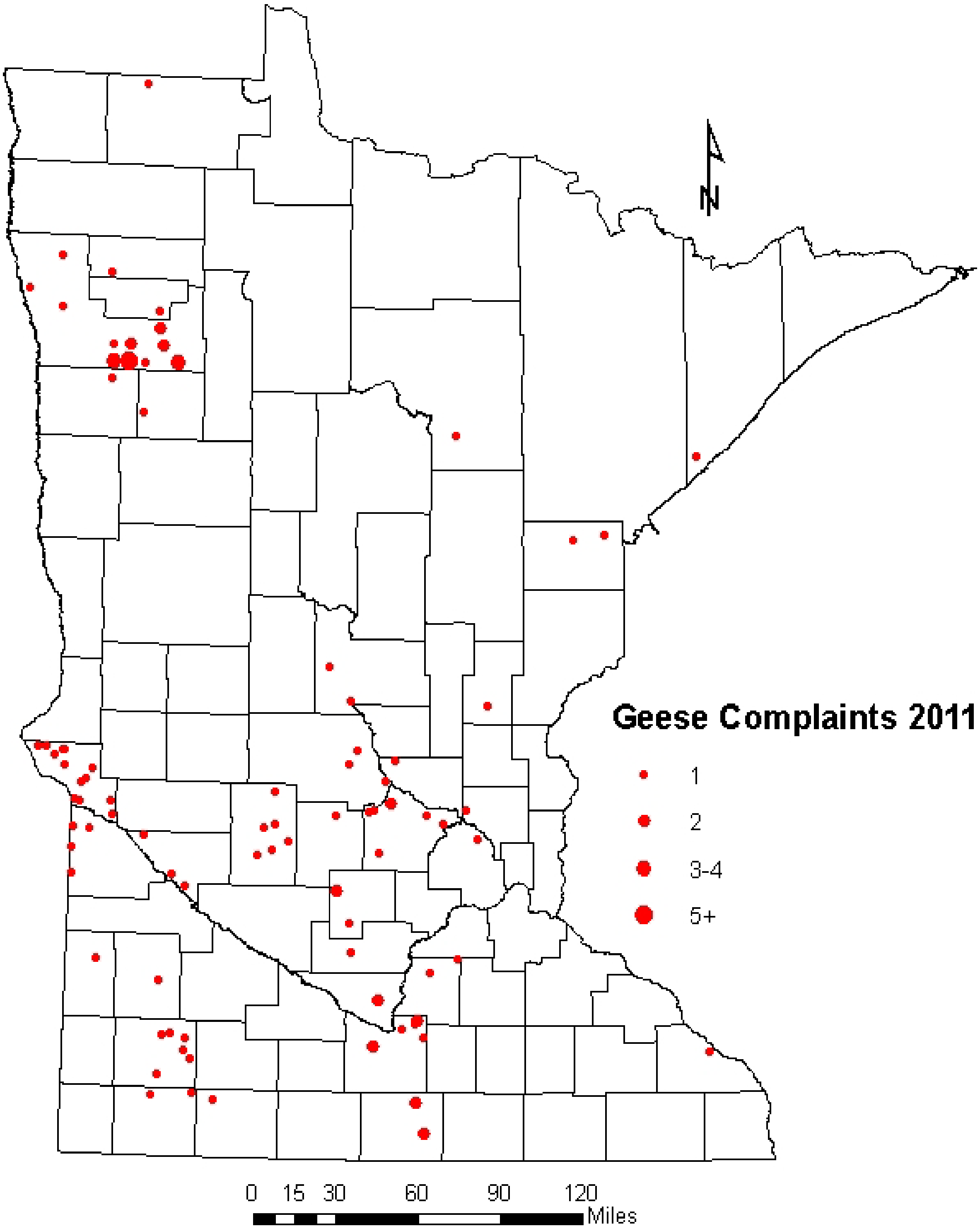

Figure 15. Location of goose damage complaints in 2011 (n= 106). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

WILDLIFE DAMAGE COMPLAINTS, 2012

Eric Nelson, Wildlife Damage Program Coordinator
Tom Engel, Wildlife GIS Project Consultant

Wildlife damage complaint information is collected statewide from wildlife managers. The 2012 information was compiled and summarized by MNIT and the Wildlife Damage Program Coordinator, 1601 Minnesota Drive, Brainerd, MN 56401.

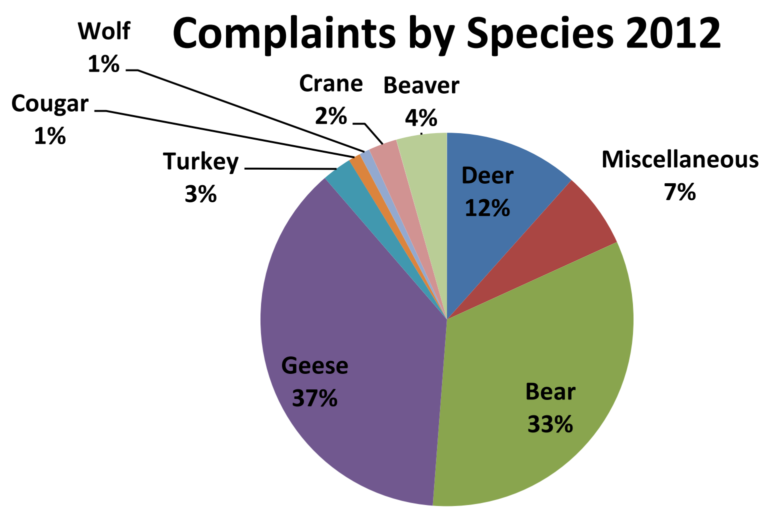

Figure 1. Wildlife complaints by species for the year 2012, in Minnesota.

Wildlife managers recorded a total of 803 wildlife complaints in 2012, up 68% from 2011 total of 547 complaints. Three species; black bear, white-tailed deer, and Canada geese account for 82% (n=636) of the complaints received (Figure1). Five other species of special interest for wildlife damage; cougar, beaver, turkey, sandhill crane, and wolf comprise an additional 11% (n=69) of the recorded complaints. Twenty seven species are represented in 7% (n=51) of the miscellaneous complaints received, four were for trumpeter swan.

During calendar year 2012 direct technical assistance and materials were provided for depredation sites within 15 wildlife office work areas including all four state wildlife regions. Materials and assistance were provided for permanent, woven wire, deer exclusion fences to 18 specialty crop producers and farmers of which 10 were landowner installed. Crops protected included mixed vegetables (n=4), apple orchards (n=2), berries (n=1), tree nursery (n=2), vineyard (n=4), apiary (n=1) and stored forage (n=4). Technical assistance was provided to 1 nonprofit organization in Black Duck that built permanent fencing, at their own cost, for educational gardening plots. Materials were also provided for landowner installation at 3 different locations needing movable or portable abatement options.

The number of deer shooting permits (n=40) was down 9.2 times the level in 2011 when 367 permits were issued. In 2012 no landowner permits were issued for tuberculosis or chronic wasting disease control however, 312 permits were issued in 2011 for control of chronic wasting disease (Figure 9). The number of goose shooting permits (n=234) was up 29% from the 2011 total of 182 permits (Figure 10).

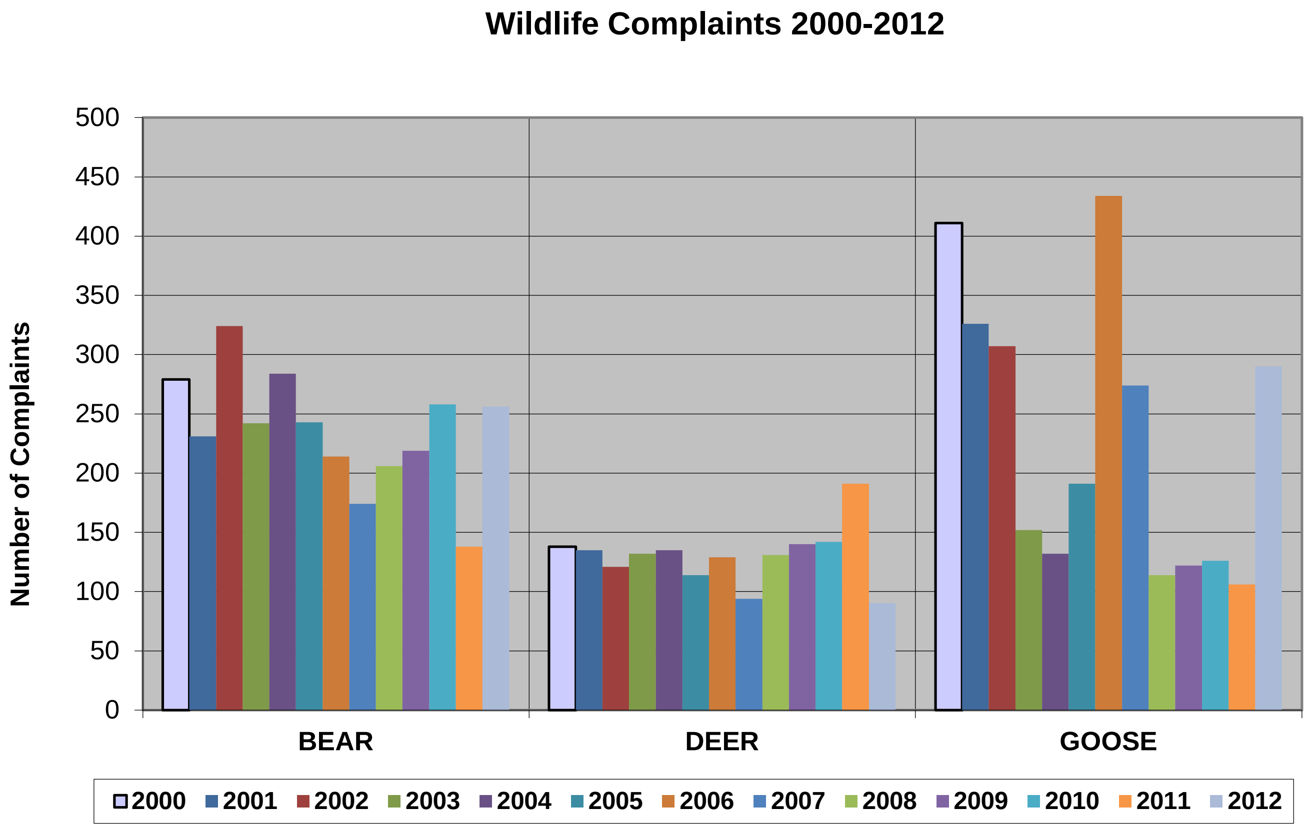

Figure 2. Number of wildlife complaints recorded for bear, deer and geese from 2000-2012, in Minnesota.

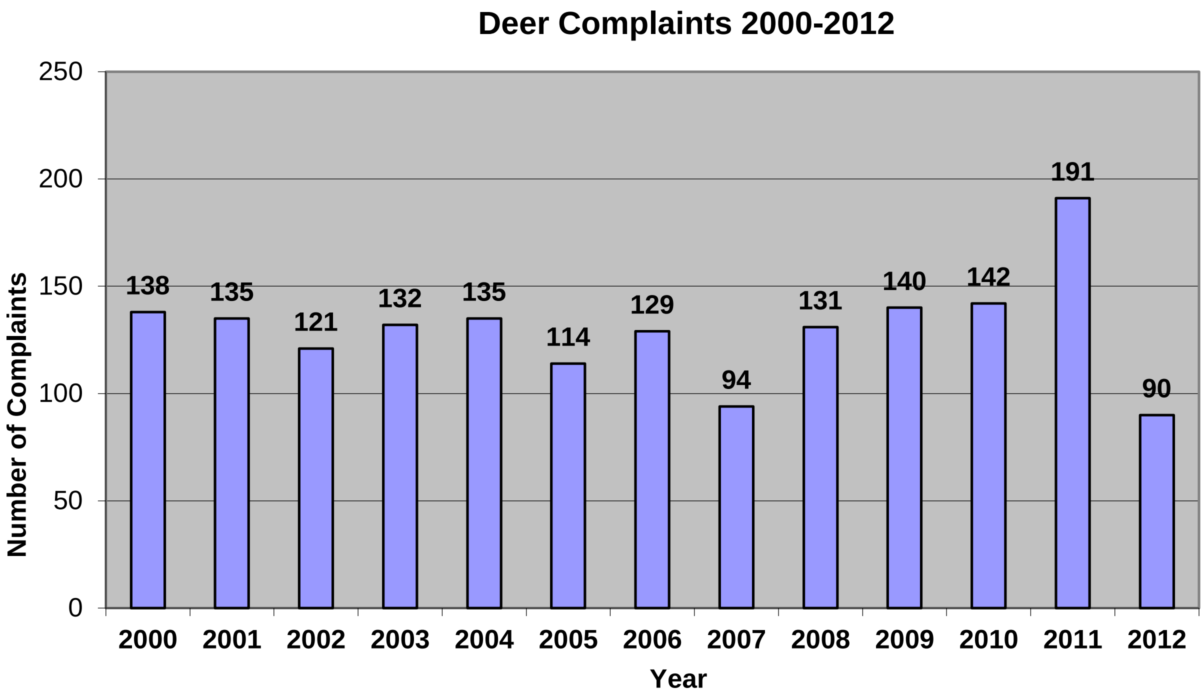

Figure 3. Number of deer complaints from 2000-2012, in Minnesota.

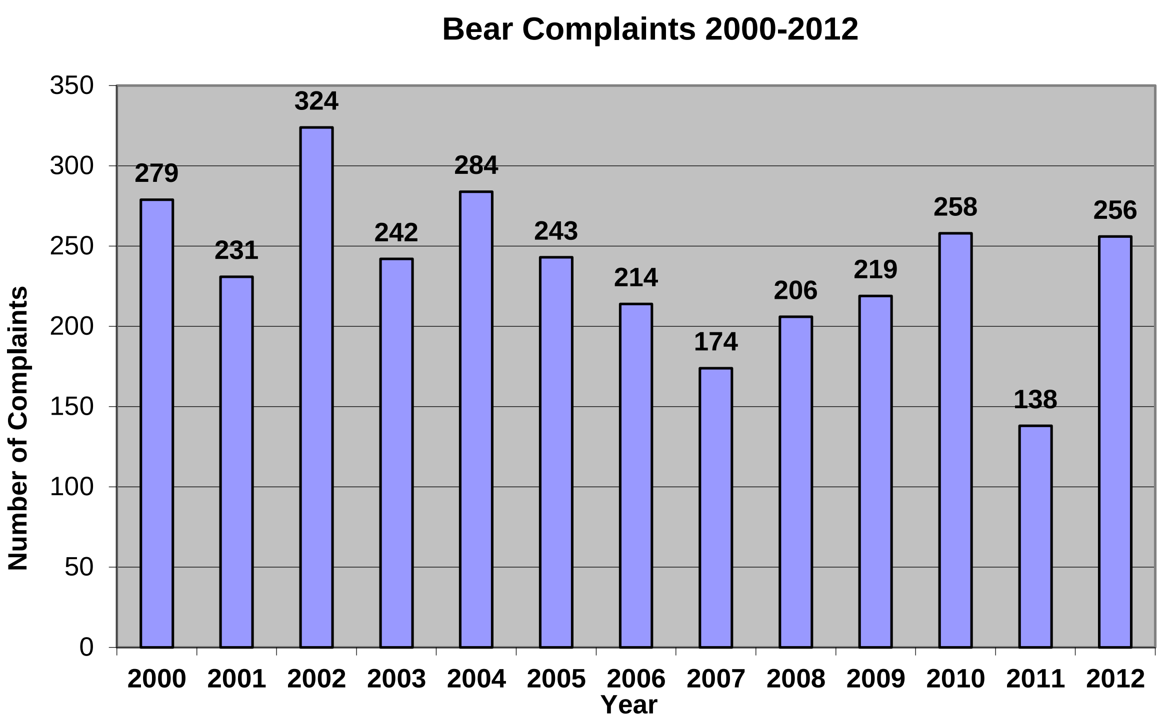

Figure 4. Number of bear complaints from 2000-2012 in Minnesota.

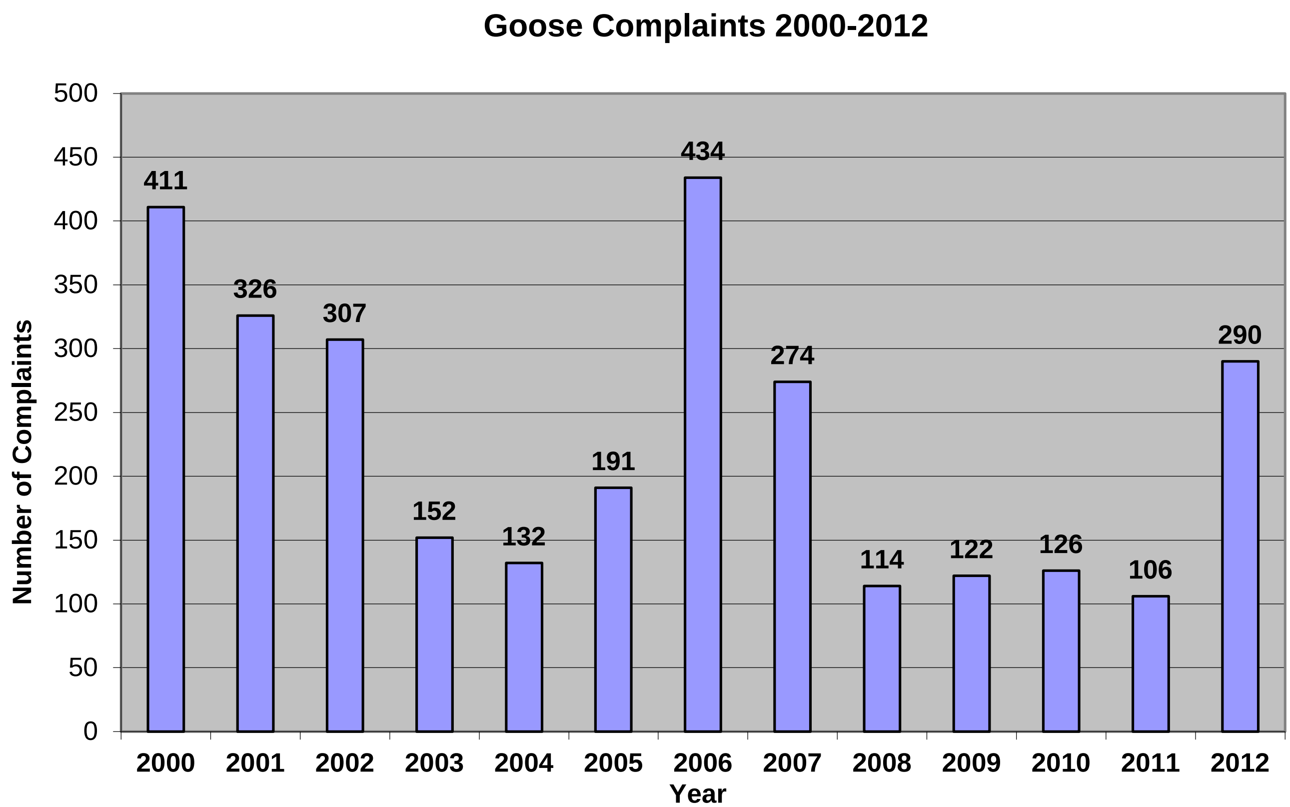

Figure 5. Number of goose complaints from 2000-2012, in Minnesota.

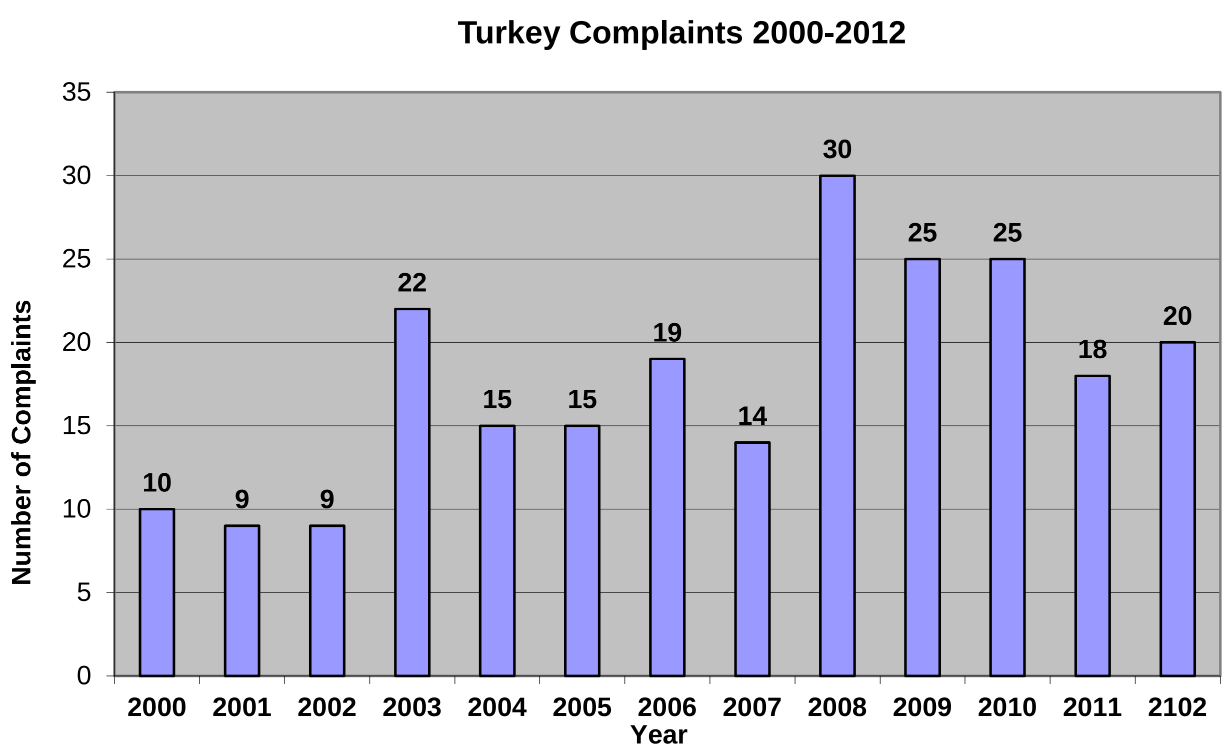

Figure 6. Number of turkey complaints from 2000-2012, in Minnesota.

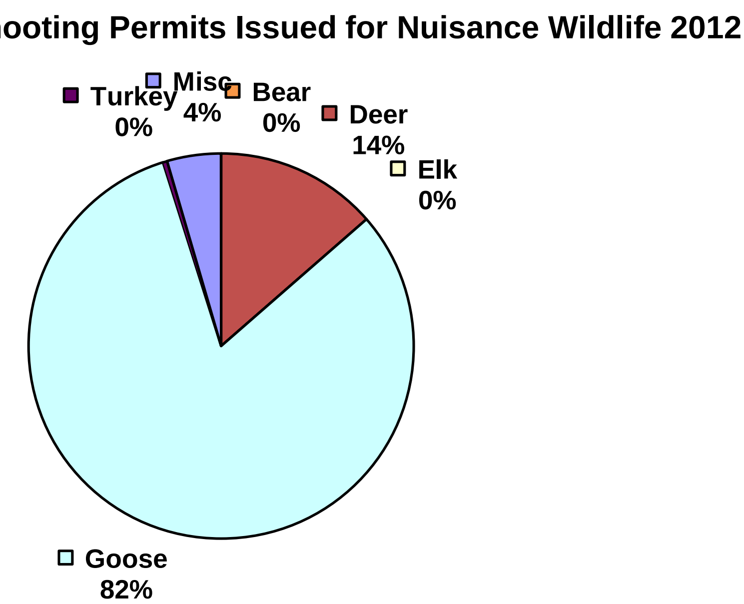

Figure 7. Shooting permits issued for nuisance wildlife control in Minnesota for 2012. Miscellaneous permits issued represent one permit for otter, one permit for raccoon, and 11 multi-species permits to airport authorities for animals posing a hazard to air traffic. One turkey permit was issued.

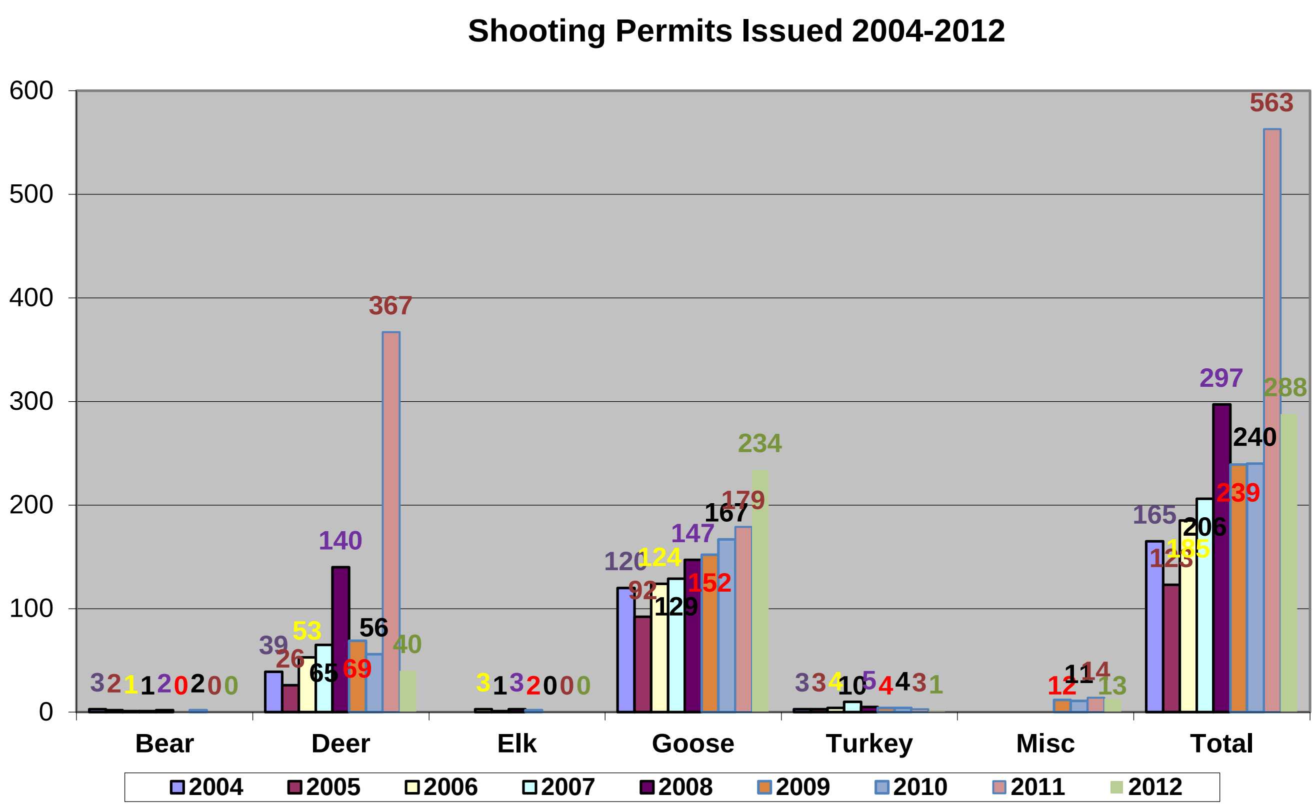

Figure 8. Shooting permits issued for nuisance wildlife control in Minnesota for 2004-2012. The majority of miscellaneous permits issued represent multi-species permits that were issued primarily to airport authorities for the control of birds posing a hazard to air traffic.

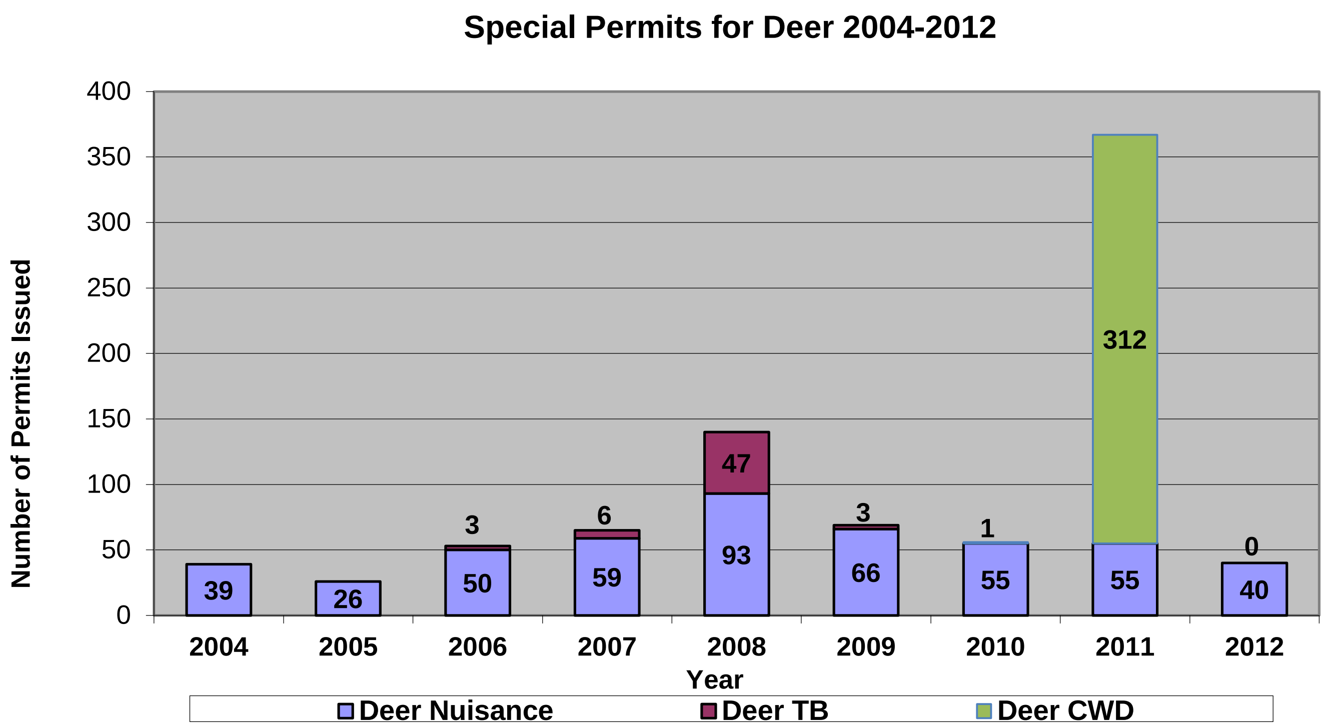

Figure 9. Shooting permits issued showing the portion related to tuberculosis (TB) and chronic wasting disease (CWD) control efforts in Minnesota for the period 2006-2012.

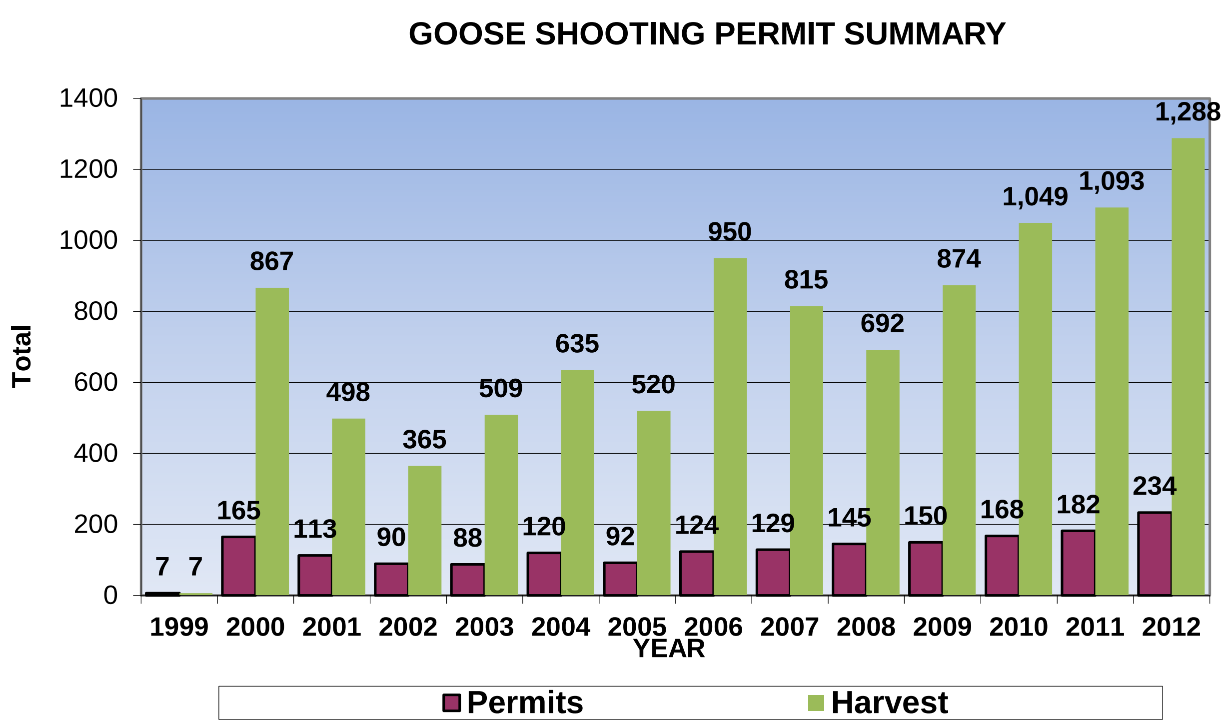

Figure 10. Comparison of nuisance goose shooting permits and harvest in Minnesota 1999-2012.

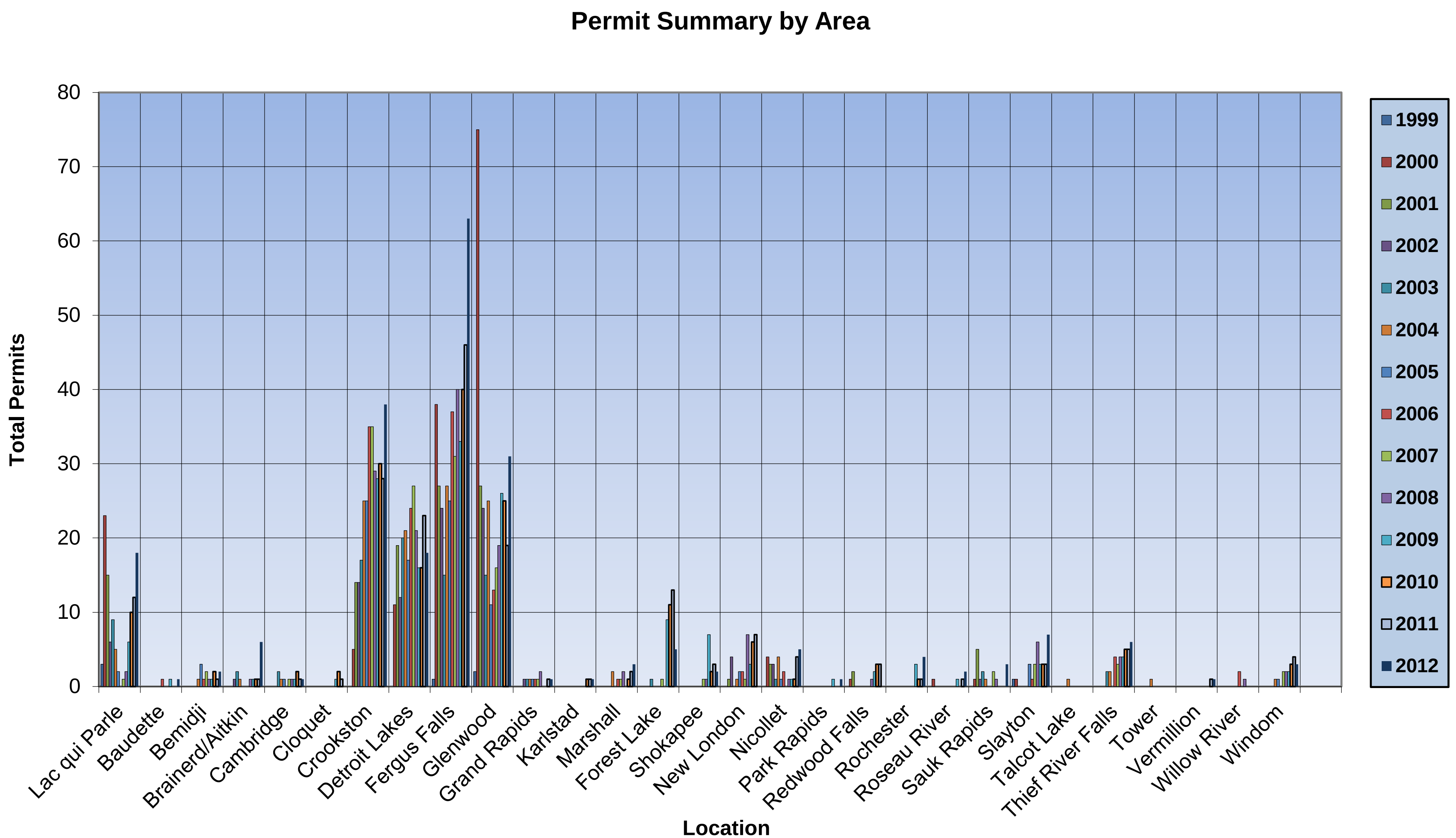

Figure 11. Nuisance goose permits issued by area wildlife offices in Minnesota 1999-2012.

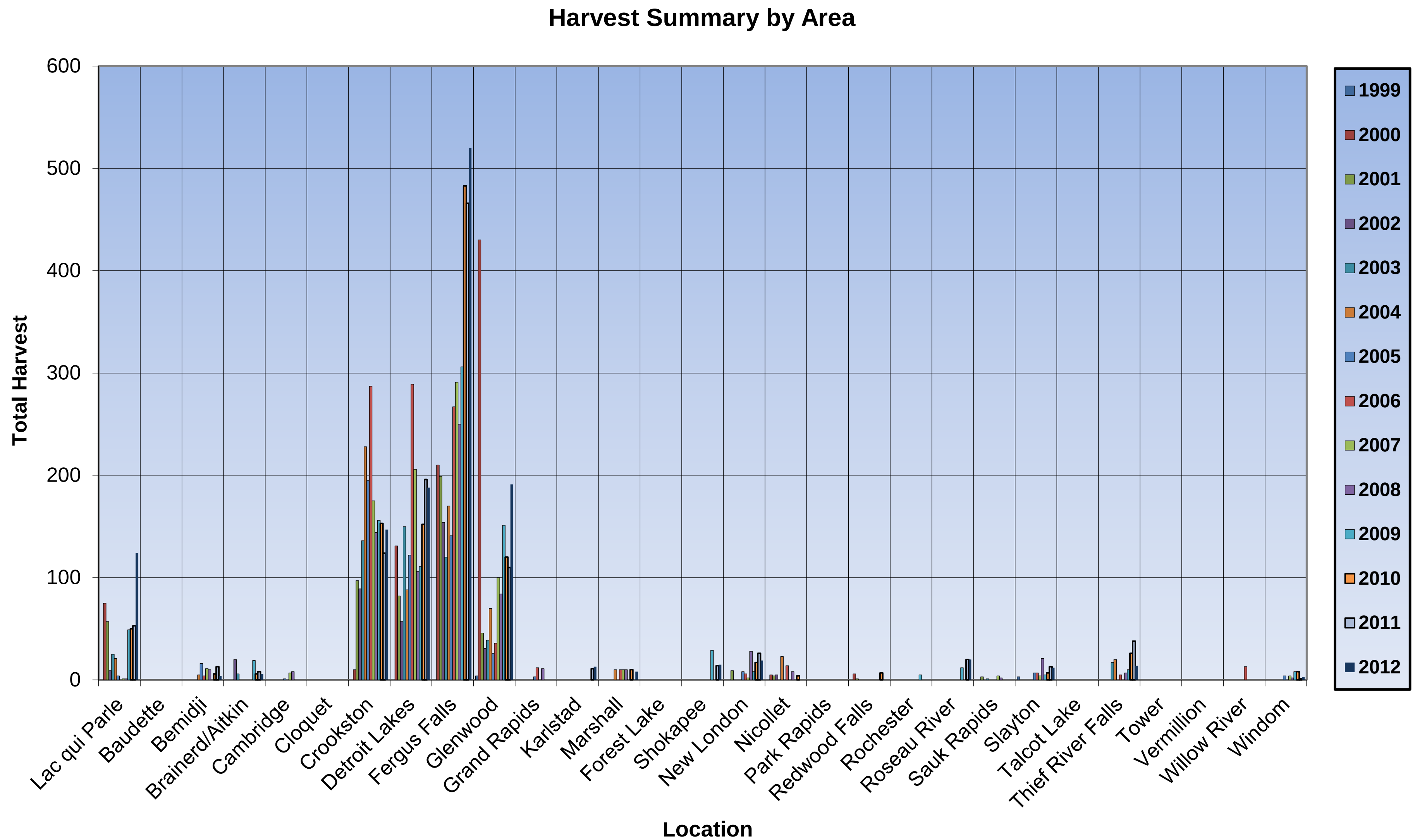

Figure 12. Nuisance goose harvest by area wildlife office in Minnesota 1999-2012.

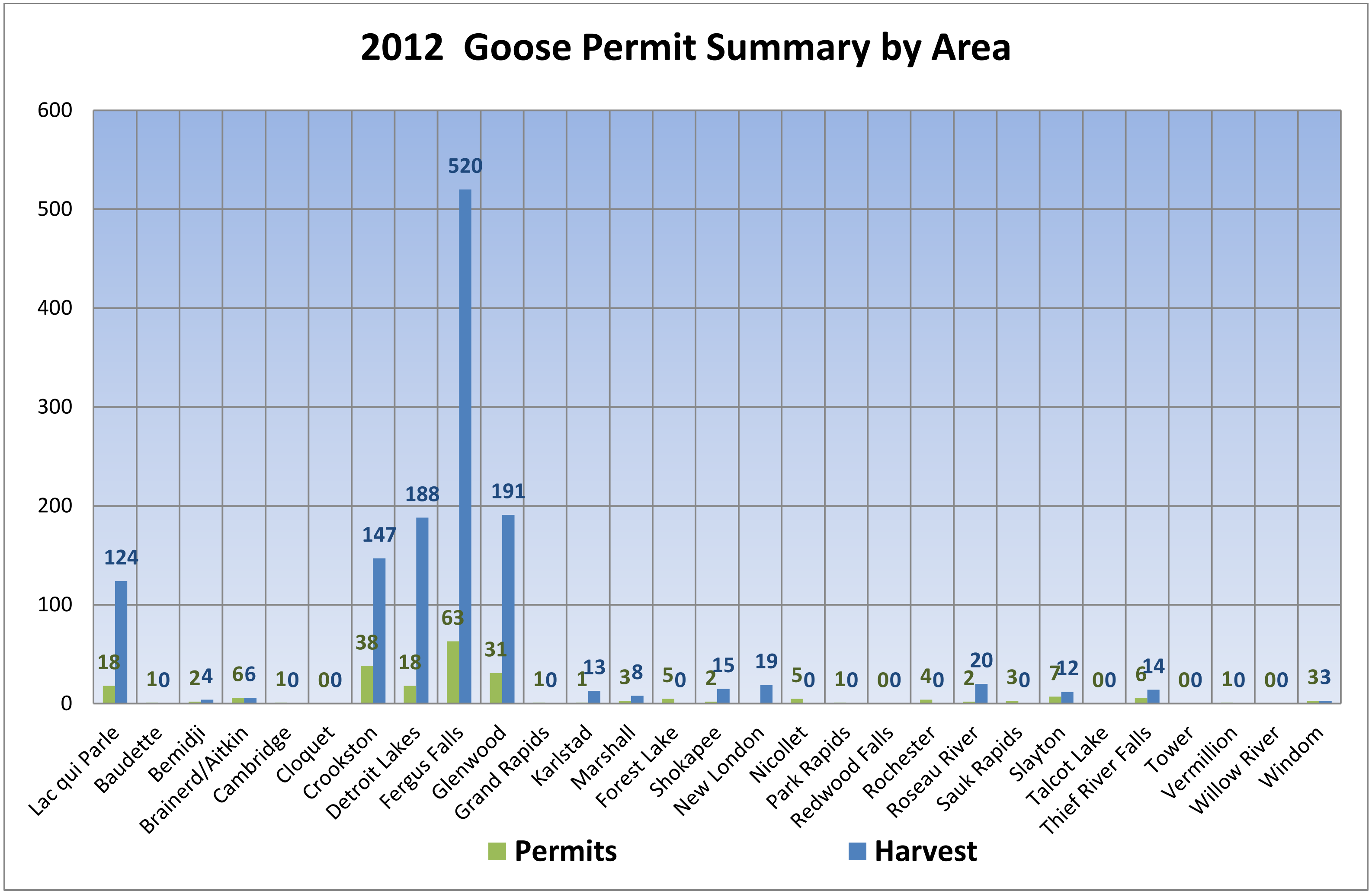

Figure 13. Nuisance goose permit summary by area wildlife office in Minnesota for 2012. All offices that have issued at least one nuisance goose removal permit since 1999 are listed above. Offices with zeros under the permit bar did not issue permits for 2012.

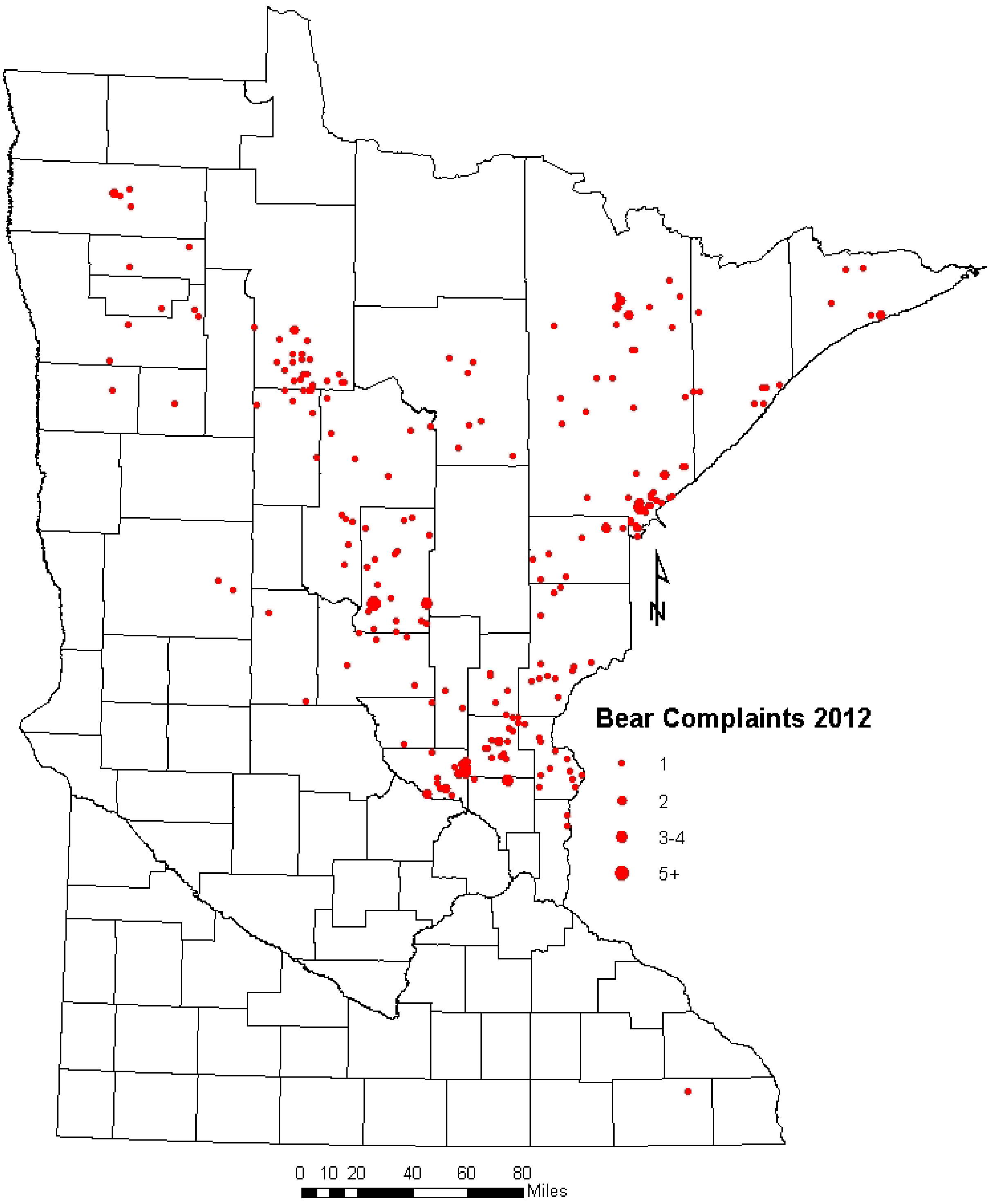

Figure 14. Location of bear damage complaints in 2012 (n= 256). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

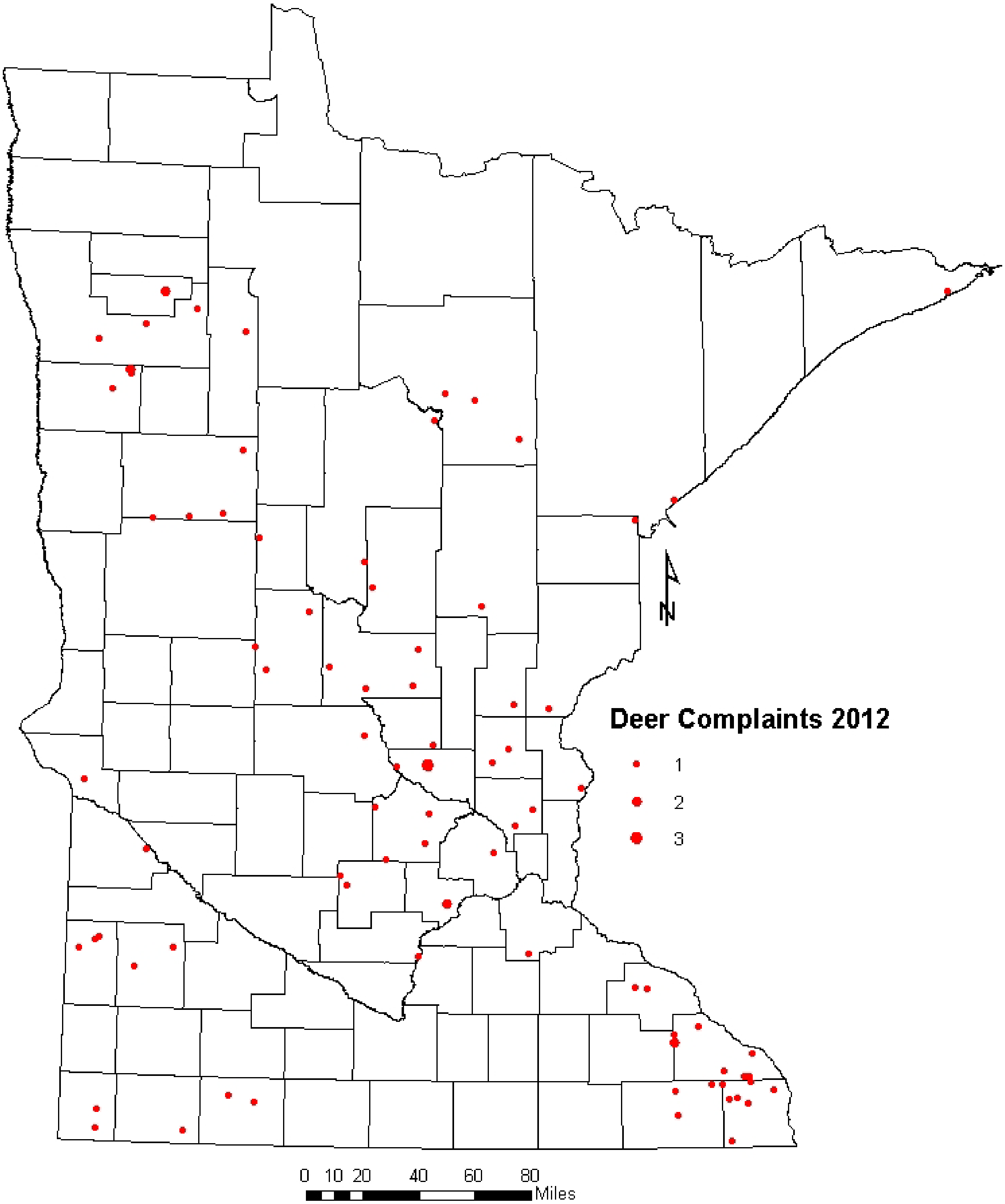

Figure 15. Location of deer damage complaints in 2012 (n= 90). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

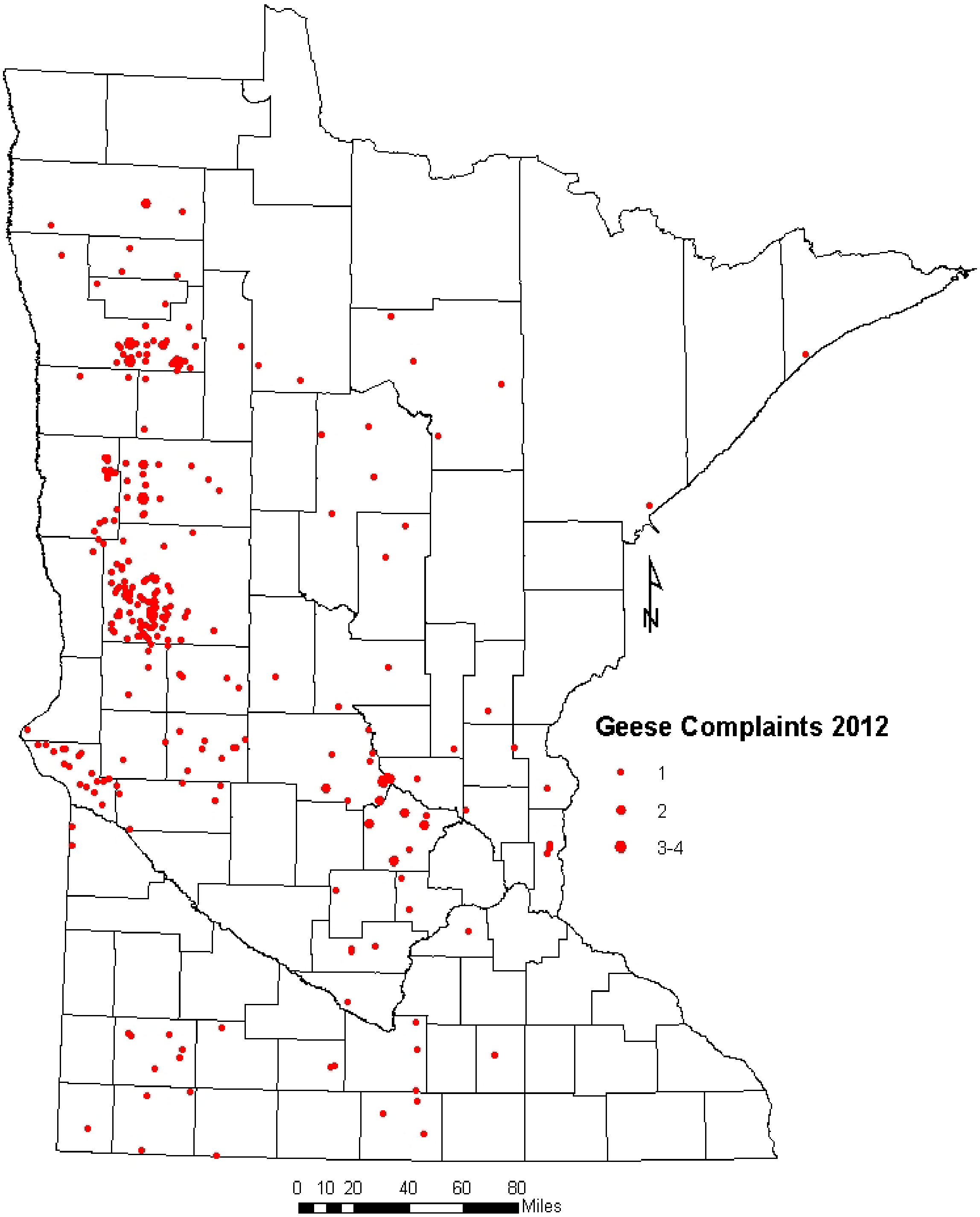

Figure 16. Location of goose damage complaints in 2012 (n= 290). Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.