Status of Wildlife Populations

Fall 2007

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

STATUS OF WILDLIFE POPULATIONS, FALL 2007

(Including 1995-2006 Hunting and Trapping Harvest Statistics)

Minnesota
DEPARTMENT OF
NATURAL RESOURCES

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

Status of Wildlife Populations, Fall 2007

(Including 1995-2006 Hunting and Trapping Harvest Statistics)

This is the 31st 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 Research and Policy Unit. This publication will be posted on the DNR website and available on CD. 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. Three new reports in this edition are 2006 Minnesota Fall Wild Turkey Population Survey, 2007 Spring Turkey Hunter Report, and the 2006 Elk Population and Harvest Report.

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

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

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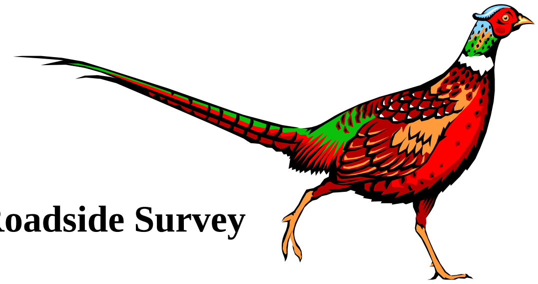

2007 Minnesota August Roadside Survey

Kurt J. Haroldson, Farmland Wildlife Populations & Research Group

ABSTRACT

Population indices for ring-necked pheasants in 2007 were similar to last year. Gray partridge, cottontail rabbit, and white-tailed jackrabbit indices were also similar to 2006, whereas deer and mourning dove indices decreased significantly. The winter of 2006-07 was average to mild throughout Minnesota's agricultural zone, and spring weather was warm and dry. Overwinter survival of farmland wildlife in 2007 was probably above average, but reproductive success varied by species.

The pheasant index remained high in 2007 (106.7 birds/100 mi), similar to the last 2 years and 48% above the 10-year average, but 63% below the benchmark years of 1955-64 (soil-bank years with marginal cropland in long-term set-aside, a diversified agricultural landscape, more small grains and tame hay, and less pesticide use). Adult pheasants indices were >50% above the 10-year average in 2007, which reflected high overwinter survival associated with mild winter weather. Although the number of broods was above the 10-year and long-term averages, mean brood size was below both averages. Overall, the size of the fall population will be close to 2005 and 2006 levels. The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the West Central and South Central regions.

The gray partridge index was similar to last year and the 10-year mean, but 44% below the long-term average. No significant changes were observed at the regional level. The number of adults observed was similar to last year, but the proportion of adults with broods and brood size increased in 2007. Gray partridge counts were highest in the Southwest region.

The cottontail rabbit index was similar to last year, the 10-year average, and the long-term average. Counts of cottontail rabbits were highest in the East Central and South Central regions. The jackrabbit index also held steady in 2007. The statewide index was also similar to the 10-year average, but remained 84% below the long-term average. The range-wide jackrabbit population peaked in the late 1950's and declined to its lowest level in 1993, from which populations have not recovered. Counts of white-tailed jackrabbits were highest in the Southwest region.

The number of mourning doves observed in 2007 decreased 20% from last year, but was similar to the 10-year and long-term averages. Counts decreased significantly only in the West Central region. Similarly, the white-tailed deer index declined by 35% from last year, with significant declines in the Northwest and West Central regions.

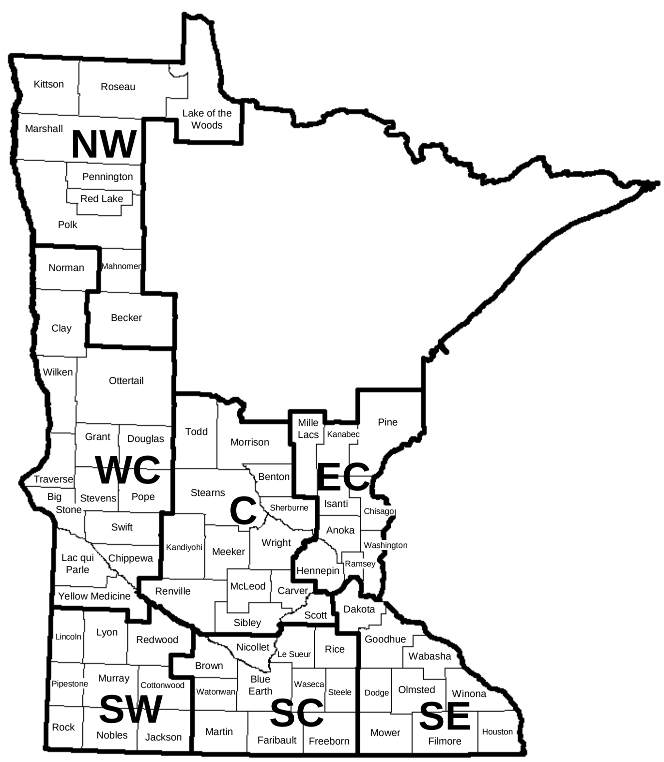

Figure 1. Survey regions for Minnesota's August Roadside Survey.

INTRODUCTION

This report is a summary of the 2007 Minnesota August roadside survey. The annual survey is conducted during the first 2 weeks in August by Minnesota Department of Natural Resource (MNDNR) enforcement and wildlife personnel throughout the farmland region of Minnesota (Figure 1). The August roadside survey consists of 171 25-mile routes (1-4 routes/county); 152 routes are located in the ring-necked pheasant range.

Observers drove each route in the early morning at 15-20 miles/hour and recorded the number of pheasants, gray (Hungarian) partridge, cottontail rabbits, white-tailed jackrabbits, and other wildlife they saw. Counts conducted on cool, clear, calm mornings with heavy dew yield the most consistent results because wildlife, especially pheasants, gray partridge, and rabbits, move to warm, dry areas (e.g., gravel roads) during early-morning hours. The 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 were reported by agricultural region and range-wide; however, population indices for species with low detection rates are imprecise and should be interpreted cautiously.

ACKNOWLEDGMENTS

I thank all cooperators for their efforts in completing routes in 2007; without their help the survey would not be possible. Angela Isackson and Tonya Klinkner provided assistance with data entry. John Giudice reviewed and provided comments on drafts of this report. Tabor Hoek of the Minnesota Board of Water & Soil Resources (BWSR) provided enrollment data on cropland-retirement programs in Minnesota.

WEATHER SUMMARY

The severity of the winter of 2006-07 was moderate to mild throughout most of the farmland region in Minnesota (the sixth consecutive mild winter). Regional temperatures were 3-29^{o}F above the long-term average for each month, December – March (MCWG, http://climate.umn.edu/cawap/monsum/ monsum.asp). In conjunction with warm weather, most regions experienced only intermittent snow cover. However, snow persisted for up to 12 continuous weeks in portions of the Northwest, South Central, and Southeast regions (MCWG, http://climate.umn.edu/doc/snowmap.htm). Although March entered like a lion with deep, heavy snow across the farmland region, snow cover persisted for only 2-3 weeks. Temperature trends reversed in April with below normal temperatures and a mid-month snowstorm. However, spring weather in May and June was warmer in all regions and drier than normal in all regions except portions of northwestern and west central Minnesota, where torrential rains in early June led to rural flooding. Conditions for overwinter survival of farmland wildlife were better than average due to breaks in snow cover except in portions of south central and southeastern Minnesota. Favorable conditions for reproduction were provided by warm, dry weather in May and June and continuing through the summer except in portions of west central and northwestern Minnesota. However, many late-summer nests, which are not counted by this survey, were likely destroyed by extreme rainfall and flooding during mid-August in parts of the Southeast and South Central regions.

HABITAT CONDITIONS

Habitat conditions in the pheasant range continue to maintain their highest levels since the mid-1990s. Over 1 million acres of habitat are currently enrolled in farm programs (e.g., CRP, CREP, RIM, WRP), and another 659,000 acres of habitat are protected as Wildlife Management Areas (WMA) and Waterfowl Protection Areas. Within the pheasant range, protected grasslands account for about 6.3% of the landscape (range: 3.0-10.7%; Table 1).

Farm programs make up the largest portion of protected grasslands in the state. Sign-up for the Minnesota CREP II began June 2005 targeting enrollment of up to 120,000 new acres of environmentally sensitive cropland in the Red River Watershed in northwestern Minnesota, the Lower Mississippi Watershed in southeastern Minnesota, and the Missouri/Des Moines River Watershed in southwestern Minnesota. Although progress continues on the CRP and CREP II, the expiration of a large proportion of existing CRP contracts (beginning in fall 2007) is still a major concern for future wildlife populations. Re-enrollment and extension opportunities may capture many of the CRP contracts that will expire during 2007-2010, but this will partly depend on commodity prices and competing economic opportunities (e.g., ethanol production).

The MNDNR continues to expand the habitat base through accelerated WMA acquisition. In addition the Working Lands Initiative will attempt to protect and expand large wetland-grassland complexes in 12 counties in western Minnesota.

SURVEY CONDITIONS

Cooperators completed 170 of the 171 routes in 2007. 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 89% of the survey routes, which was fewer than for 2006 (96%) and the 8-year average (91%). Clear skies (<30% cloud cover) were present at the start of 83% of routes, with wind speeds <4 mph recorded for 75% of routes. The survey period was extended to August 20th to allow all routes to be completed.

RING-NECKED PHEASANT

The average number of pheasants observed per 100 miles was similar to 2006 and 48% above the 10-year average (Table 2; Figure 2A). The pheasant index was similar to the long-term average (Table 2), but remained below the benchmark years of 1955-64 by 63%. Total pheasants observed per 100 miles ranged from 27.4 in the Southeast to 222.5 in the Southwest (Table 3, Figure 5). Changes from last year were not significant in any region (Table 3).

The range-wide hen index (hens/100 mi) was similar to last year, 56% (95% CI: 30-82%) above the 10-year average (Table 2), and varied from 2.9 hens/100 miles in the Southeast to 36.0 hens/100 miles in the Southwest. The cock index also was similar to 2006 and 52% (95% CI: 27-78%) above the 10-year average (Table 2). The 2007 hen:cock ratio was 1.6, which was similar to 2006 (1.6) and 2005 (2.0).

Given the above-average fall population in 2006 and likely above-average overwinter survival, the spring breeding population was expected to be higher than average. Data from spring pheasant surveys, conducted as part of a CRP/pheasant study, indicated unusually high breeding pheasant populations, with the highest hen indices in 5 years of monitoring (Kurt Haroldson, MNDNR, unpublished data). These surveys were conducted on 36 study areas located in Lincoln, Lyon, Cottonwood, and Jackson Counties in the Southwest; Pope County in the West Central; and LeSueur, and Rice Counties in the South Central region during April 20 – May 31.

The number of pheasant broods observed per 100 miles was similar to last year, 57% above the 10-year average, and 31% above the long-term average (Table 2). The brood index continues to remain below the benchmark years (1955-64). Regional brood indices ranged from 4.2 broods/100 miles in the Southeast to 38.7 broods/100 miles in the Southwest. Average brood size in 2007 (4.6 ± 0.1 [SE] chicks/brood) was similar to last year (4.8 ± 0.1 [SE] chicks/brood), but below the 10-year mean (5.0 chicks/brood) and the long-term average (5.6 chicks/brood; Table 2). The median hatch date for pheasants was June 11 (n = 659), 3 days later than last year and 4 days later than the 10-year average (Table 2). The distribution of estimated hatch dates for observed broods was unimodal and approximately normally distributed, which suggests that many early nesting attempts were successful (vs. wide-spread nest failure, which often leads to an extensive renesting effort and a bimodal peak in hatch dates). Average age of broods observed was 8.2 weeks (range: 1-16 wks).

A high range-wide pheasant index was expected given the mild winter and warm, dry weather during the reproductive season. The combination of relatively high hen and brood numbers compensated for below-average brood size, and led to a large pheasant index for 2007. In addition the above-average cock index contributed additional birds to the 2007 population. Overall, the size of the fall population will be similar to 2005 and 2006 levels. The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the West Central and South Central regions.

GRAY PARTRIDGE

Rangewide, the gray partridge index (8.5 partridge/100 miles) was similar to last year and the 10-year average. However, the 2007 index was 44% below the long-term average (Table 2, Figure 2B). Within regions, the partridge index ranged from 0.0/100 miles in the East Central region to 25.7/100 miles in the Southwest (Table 3, Figure 6). There were no significant regional changes from last year (Table 3).

The number of adults observed per 100 miles was similar to last year, but 36% below the 10-year mean and 49% below the long-term average (Table 2). The proportion of adult partridge observed with broods (34%) increased from 2006 (28%) and was similar to the 10-year average (34%) and long-term average (33%). Average brood size in 2007 (9.9 chicks/brood) was larger than in 2006 (7.5 chicks/brood), the 10-year average (7.6 chicks/brood), and the long-term average (8.9 chicks/brood). Total broods observed per 100 miles were similar to 2006, but 36% below the 10-year average, and 51% below the long-term average (Table 2). The median hatch date was June 20 (n = 28), which was 6 days earlier than in 2006 and the same as the 10-year average.

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. The improved reproductive success this year may be a response to the dry weather during the nesting season. Gray partridge in their native range (southeastern Europe and northern Asia) are associated with arid climates and only produce well in the Midwest during dry or drought years. Consequently, gray partridge are more strongly affected by weather conditions during nesting and brood rearing than are pheasants. The Southwest region offers the best opportunity for harvesting gray partridge in 2007.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (7.1 rabbits/100 mi) was similar to last year, the 10-year average, and the long-term average (Table 2, Figure 3A). There continues to be high variability in counts and percent change by region (Table 3). The cottontail rabbit index ranged from 0.4 rabbits/100 miles in the Northwest to 20.3 rabbits/100 miles in the East Central region (Table 3, Figure 7). The best opportunities for harvesting cottontail rabbits are in the East Central and South Central regions.

The index of white-tailed jackrabbits held steady in 2007. The statewide index (0.3 rabbits/100 mi) was also similar to the 10-year average (0.4), but remained 84% (95% CI: 69-98%) below the long-term average (Table 2, Figure 3B). The range-wide jackrabbit population peaked in the late 1950's and declined to its lowest level (0.2 rabbits/100 mi) in 1993, from which populations have not recovered (Figure 3B). The long-term decline in jackrabbits probably reflects the loss of their preferred habitats (i.e., pasture, hayfields, and small grains). The greatest potential for white-tailed jackrabbit hunting is likely in the Southwest region (Table 3, Figure 8). However, indices of relative abundance and annual percent change should be interpreted cautiously because estimates are based on low numbers of sightings.

WHITE-TAILED DEER

The index for white-tailed deer (9.8 deer/100 mi) declined by 35% (95% CI: 17-52%) from last year and 27% (95% CI: 9-44%) from the 10-year average, but was similar to the long-term average (Table 2, Figure 4A). Among regions, deer indices also declined significantly from 2006 in the Northwest and West Central regions (Table 3). Modeling projections based on independent data indicate similar changes from last year for deer populations in the Northwest and West Central regions.

MOURNING DOVE

The number of mourning doves observed per 100 miles in 2007 decreased 20% (95% CI: 3-38%) from last year, but was similar to the 10-year average and the long-term average (Table 2, Figure 4B). The mourning dove index ranged from 102.2 doves/100 miles in the Northwest region to 353.8 doves/100 miles in the Southwest. Regional changes in dove counts were not significant except in the West Central region (95% CI: -5 to -52%, Table 3). The number of mourning doves heard along U.S. Fish and Wildlife Service call-count survey (CCS) routes (n = 7) in Minnesota were similar to last year. Trend analyses indicated the number of mourning doves heard along the CCS routes declined 3.4% per year (90% CI: -8.6 to 1.8%) during 1998-2007 and 1.9% per year (90% CI: -3.4 to -0.3%) during 1966-2007 (Dolton et al. 2007). In fall 2004, Minnesota held its first modern dove hunting season.

OTHER SPECIES

Notable incidental sightings: 2 bald eagles (Jackson and Pope Counties), 2 coyotes (Kandiyohi, and Otter Tail Counties), 1 indigo bunting (Nicollet County), 1 lesser yellow legs (Murray County), 13 prairie chickens (Clay, Norman, and Red Lake Counties), 2 red fox (Roseau and Stevens Counties), 5 red-headed woodpeckers (Olmsted, Redwood, Rice, Rock, and Watonwan Counties), 1 ruffed grouse (Polk County), 124 sandhill cranes (16 counties), 17 sharp-tailed grouse (Lake of the Woods, Marshall, Polk, and Roseau Counties), 1 snowshoe hare (Polk County), 1 Swainsons hawk (Polk County), 1 timber wolf (Marshall County), 3 trumpeter swans (Polk and Sherburne Counties), and 2 upland sandpipers (Stearns and Yellow Medicine Counties).

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Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within pheasant range, 2007[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	(ac/mi^2)
WC[b]	380,434	37,450	17,079	822	18,683	169,791	102,336	726,595	10.7	68.4
SW	128,288	24,549	12,214	579	766	15,307	52,788	234,491	6.2	39.7
C	149,298	14,490	17,028	714	2,976	83,257	45,054	312,818	5.2	33.1
SC	99,381	27,610	11,813	3,730	8,926	7,114	29,720	188,293	4.7	29.8
SE	95,117	2,262	5,554	554	620	18,438	47,051	169,595	4.6	29.3
EC	5,011	0	1,265	0	4	4,548	83,874	94,702	3.0	18.9
Total	857,529	106,360	64,953	6,398	31,975	298,456	360,822	1,726,493	6.3	40.1

[a] Unpublished data, Tabor Hoek, BWSR, 23 August 2007.

[b] Does not include Norman County.

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

[d] MNDNR Wildlife Management Areas (WMA).

Table 2. Rangewide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2007.

Species / Subgroup	Change from 2006[a]					Change from 10-year average[b]				Change from long-term average[c]			
	n	2006	2007	%	95% CI	*n*	1997-06	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	150	115.4	106.7	-8	±14	147	73.2	48	±21	149	104.0	4	±17
Cocks		11.1	10.0	-10	±17		6.6	52	±26		11.6	-13	±17
Hens		17.8	16.3	-8	±14		10.7	56	±26		15.0	10	±21
Broods		18.1	17.5	-3	±14		11.4	57	±23		13.5	31	±23
Chicks per brood		4.8	4.6	-4			5.0	-8			5.6	-18	
Broods per 100 hens		101.2	107.5	6			108.3	-1			101.6	6	
Median hatch date		Jun 08	Jun 11				Jun 07						
Gray partridge													
Total partridge	169	6.3	8.5	36	±76	166	11.1	-22	±35	149	16.7	-44	±27
Adults		2.0	1.9	-4	±48		3.0	-36	±27		4.2	-49	±23
Broods		0.6	0.7	17	±65		1.0	-36	±28		1.4	-51	±22
Chicks per brood		7.5	9.9	33			7.6	30			8.9	11	
Broods per 100 adults		27.9	34.1	22			33.8	1			33.2	3	
Median hatch date		Jun 26	Jun 20				Jun 20						
Eastern cottontail	169	7.2	7.1	-2	±24	166	6.3	13	±22	149	6.8	17	±23
White-tailed jackrabbit	169	0.3	0.3	9	±60	166	0.4	-34	±38	149	1.9	-84	±14
White-tailed deer	169	15.0	9.8	-35	±17	166	13.5	-27	±18	159	7.6	6	±24
Mourning dove	169	291.3	231.8	-20	±17	166	224.5	5	±17	149	278.2	-11	±17

[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 = 1955-2006, except for deer = 1974-2006. Does not include Northwest region (8 counties in Northwest were added to survey in 1982). Estimates for all species except deer based on routes (*n*) surveyed ≥40 years; estimates for deer based on routes surveyed ≥25 years.

Table 3. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2007.

Region Species	Change from 2006[a]					Change from 10-year average[b]				Change from long-term average[c]			
	n	2006	2007	%	95% CI	*n*	1997-06	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	19	0.0	1.7			19	0.0	7900	±11965	19	4.1	-59	±94
Eastern cottontail		1.7	0.4	-75	±187		1.1	-60	±61		1.0	-56	±82
White-tailed jackrabbit		0.4	0.0	-100	±144		0.5	-100	±47		0.7	-100	±45
White-tailed deer		60.4	34.4	-43	±28		40.1	-14	±50		27.2	6	±95
Mourning dove		136.5	102.2	-25	±53		88.1	16	±90		130.6	-22	±64
West Central													
Ring-necked pheasant	37	122.0	117.8	-4	±28	35	58.4	110	±59	36	106.5	14	±35
Gray partridge		0.2	1.5	614	±972		2.7	-50	±62		11.1	-86	±24
Eastern cottontail		3.8	4.1	9	±56		3.1	32	±51		4.3	-1	±42
White-tailed jackrabbit		0.3	0.3	0	±137		0.8	-70	±55		2.6	-91	±24
White-tailed deer		11.2	5.1	-55	±30		11.8	-56	±15		8.2	-38	±22
Mourning dove		316.2	225.9	-29	±23		305.6	-25	±20		394.1	-43	±14
Central													
Ring-necked pheasant	30	107.0	72.8	-32	±33	28	62.1	26	±39	29	76.7	-2	±31
Gray partridge		3.0	3.2	8	±226		5.3	-35	±92		10.6	-69	±51
Eastern cottontail		9.8	5.6	-43	±42		6.3	-19	±43		6.5	-18	±48
White-tailed jackrabbit		0.0	0.1				0.2	-38	±136		1.4	-90	±22
White-tailed deer		7.1	4.3	-40	±60		6.5	-30	±50		3.9	13	±70
Mourning dove		249.3	215.7	-14	±36		191.0	19	±38		238.0	-7	±31
East Central													
Ring-necked pheasant	13	82.3	64.3	-22	±49	14	54.3	14	±52	14	88.1	-30	±42
Gray partridge		0.0	0.0				0.1	-100	±147		0.2	-100	±133
Eastern cottontail		7.5	20.3	172	±159		9.2	116	±112		8.4	138	±124
White-tailed jackrabbit		0.0	0.0				0.0				0.3	-100	±59
White-tailed deer		10.5	11.4	8	±80		13.9	-24	±64		7.4	44	±92
Mourning dove		150.7	140.3	-7	±40		94.6	52	±63		128.6	12	±56

Table 3. Continued.

Region / Species	Change from 2006 *n*	2006	2007	%	95% CI	Change from 10-year average *n*	1997-06	%	95% CI	Change from long-term average *n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	242.2	222.5	-8	±35	19	134.1	66	±49	19	117.1	90	±67
Gray partridge		28.6	25.7	-10	±108		40.0	-36	±53		44.6	-42	±44
Eastern cottontail		10.9	5.7	-48	±46		9.1	-38	±30		8.4	-33	±31
White-tailed jackrabbit		1.5	1.3	-14	±53		0.9	46	±104		4.1	-70	±30
White-tailed deer		13.2	8.8	-33	±51		11.3	-22	±40		7.4	19	±62
Mourning dove		533.4	353.8	-34	±53		335.7	5	±38		314.7	12	±31
South Central													
Ring-necked pheasant	32	103.9	121.4	17	±26	32	89.6	36	±36	32	137.9	-12	±30
Gray partridge		11.5	13.5	18	±108		21.8	-38	±53		20.2	-33	±69
Eastern cottontail		8.5	12.6	49	±49		8.6	46	±43		7.6	66	±47
White-tailed jackrabbit		0.0	0.3				0.3	-16	±100		1.9	-87	±26
White-tailed deer		4.5	4.9	8	±62		5.1	-5	±52		3.2	40	±71
Mourning dove		290.5	310.5	7	±50		243.0	28	±64		255.9	21	±71
Southeast													
Ring-necked pheasant	19	31.1	27.4	-12	±59	19	42.3	-35	±40	19	82.3	-67	±30
Gray partridge		2.7	17.5	542	±812		7.2	141	±265		15.0	16	±129
Eastern cottontail		9.5	4.8	-49	±43		8.3	-42	±36		8.0	-39	±25
White-tailed jackrabbit		0.0	0.2				0.2	25	±295		0.7	-70	±73
White-tailed deer		12.0	11.6	-3	±28		16.7	-31	±19		9.5	22	±45
Mourning dove		319.4	206.3	-35	±58		214.6	-4	±40		231.3	-11	±33

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

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

[c] LTA = 1955-2006, except for Northwest region (1982-2006) and white-tailed deer (1974-2006). Estimates based on routes (*n*) surveyed $\geq$40 years (1955-2006), except for Northwest ($\geq$20 years) and white-tailed deer ($\geq$25 years).

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

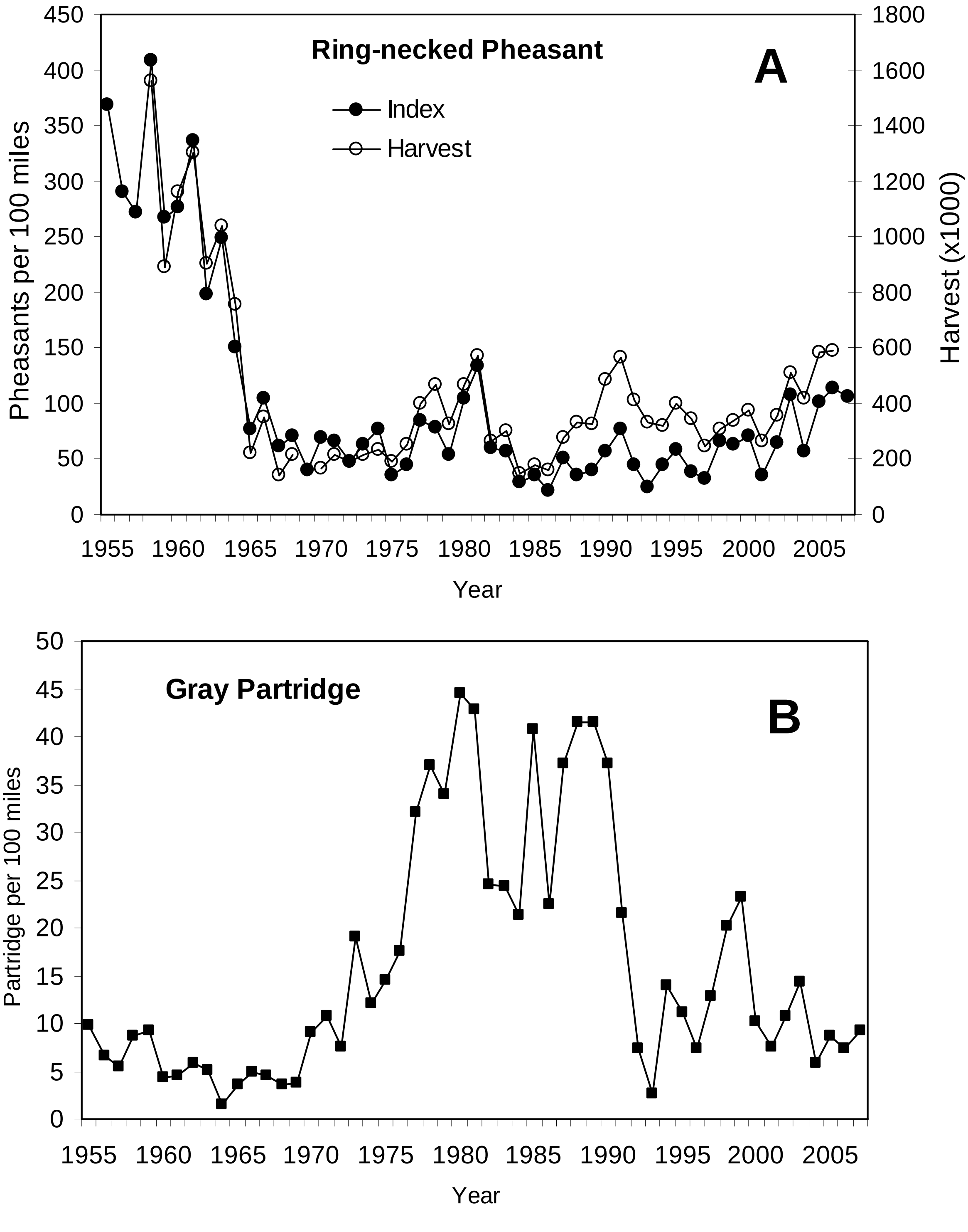


Figure 2. Rangewide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven. Does not include the Northwest region. Based on all survey routes completed.

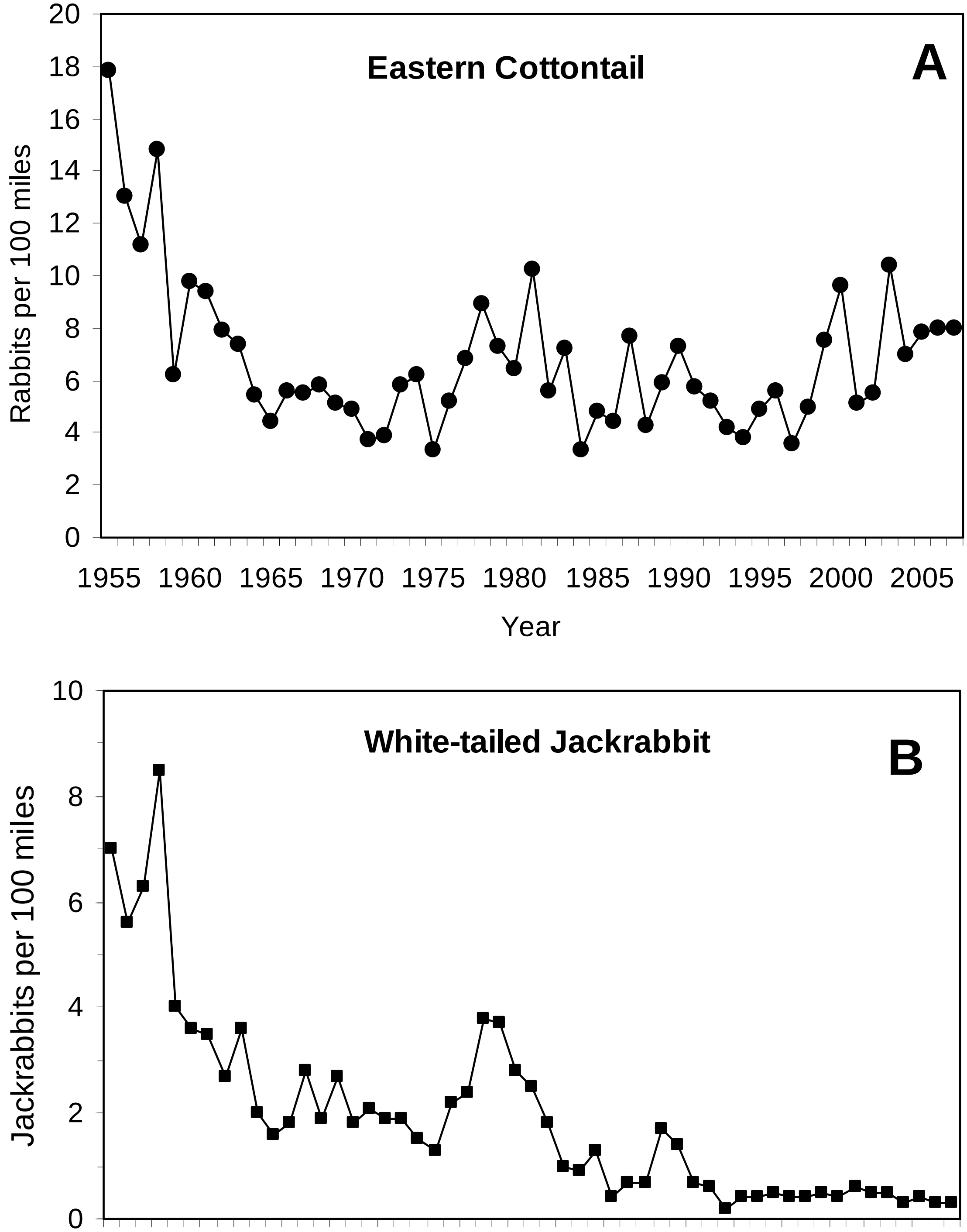
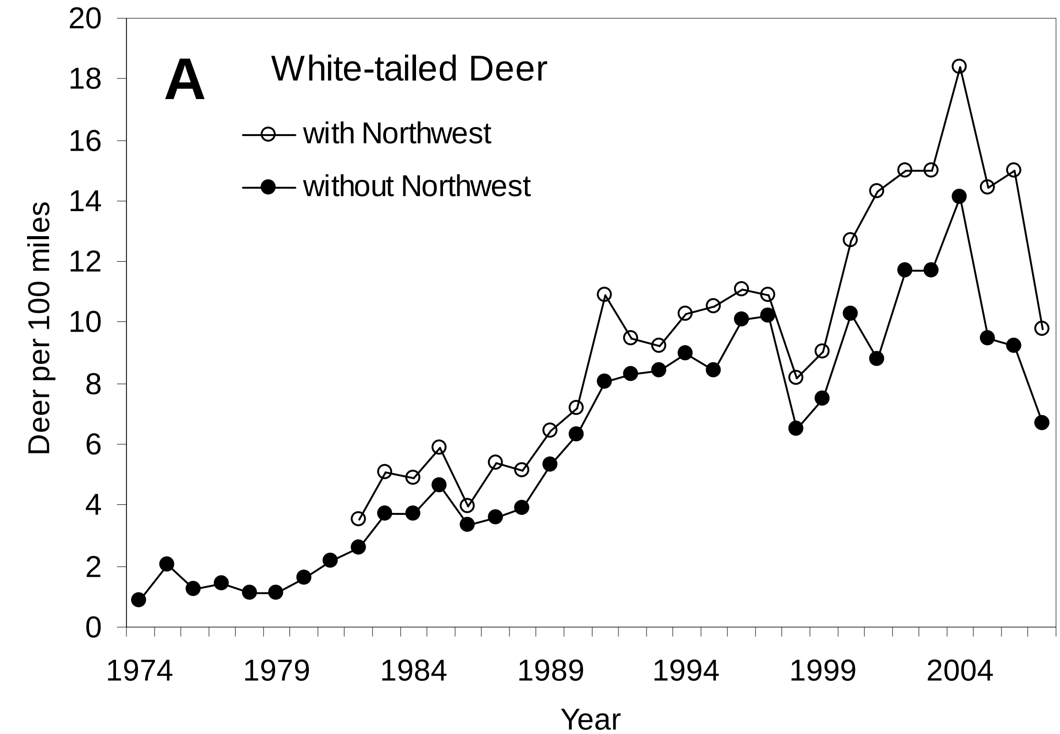


Figure 3. Rangewide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven. Does not include the Northwest region. Based on all survey routes completed.



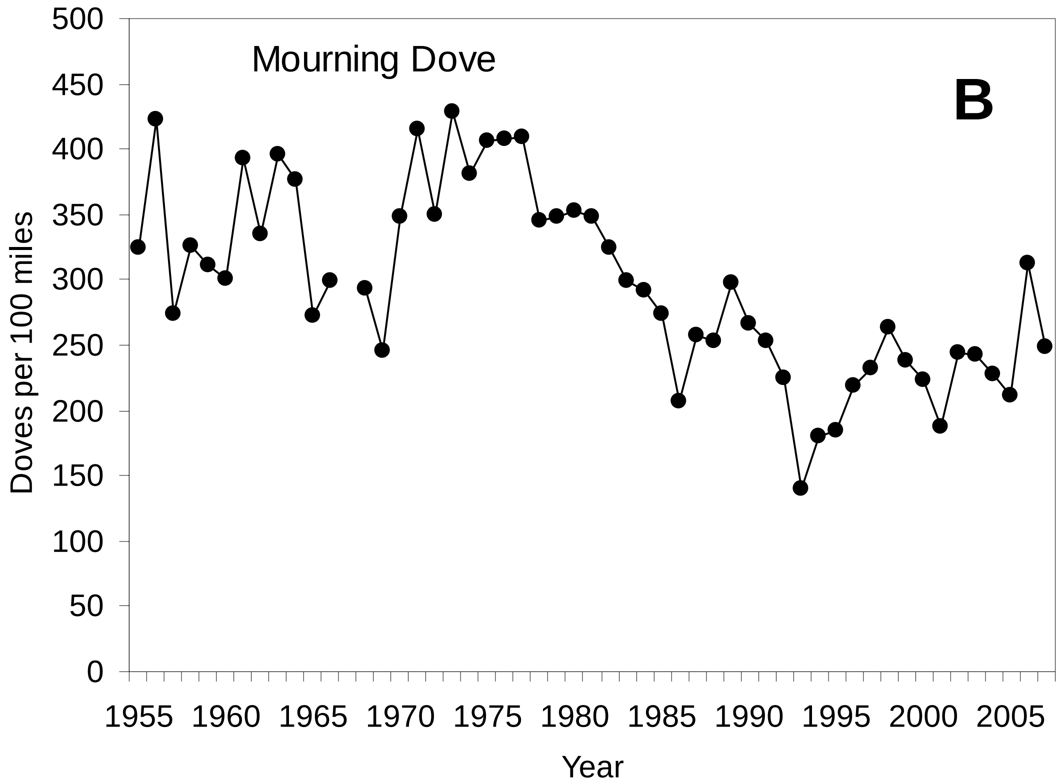
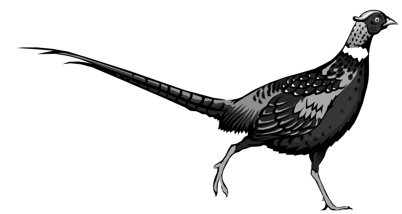


Figure 4. Rangewide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.



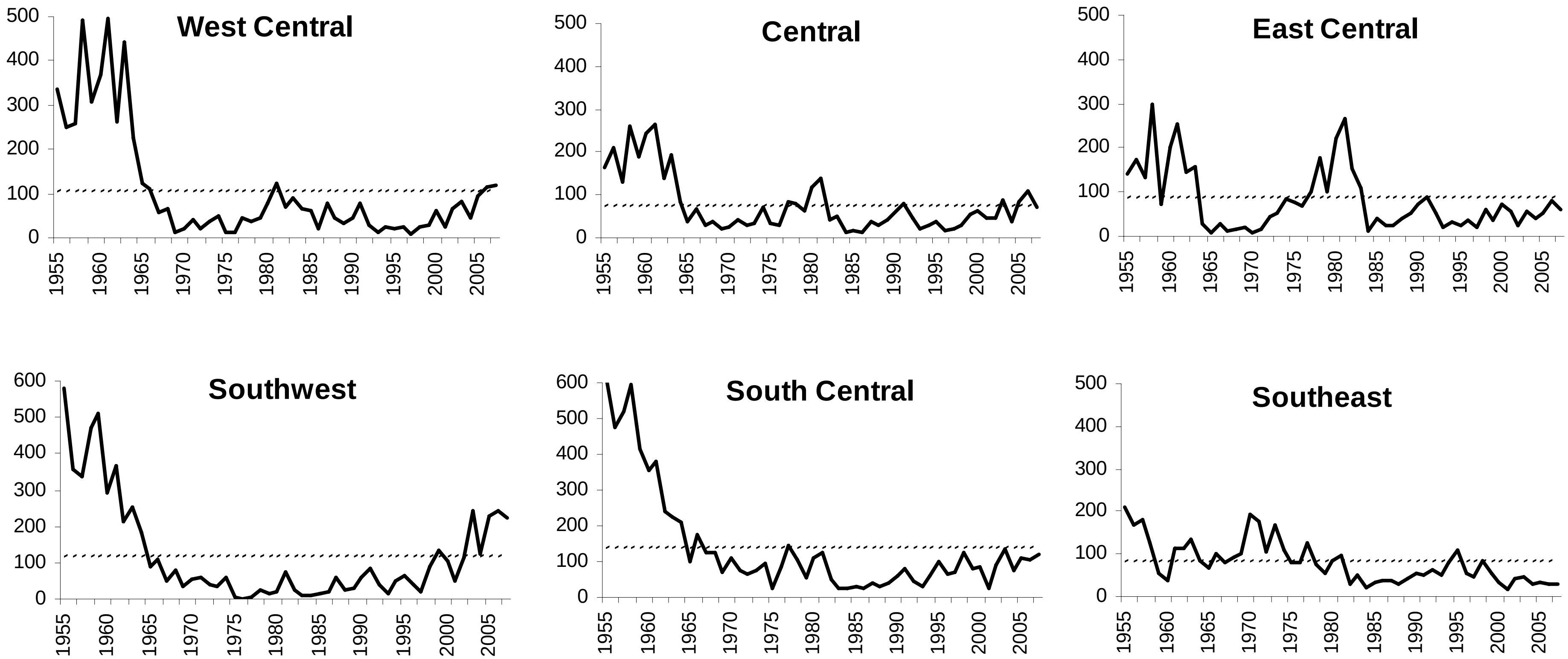


Figure 5. Regional index (——) and long-term average (......) of **ring-necked pheasants seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same scale among survey regions.

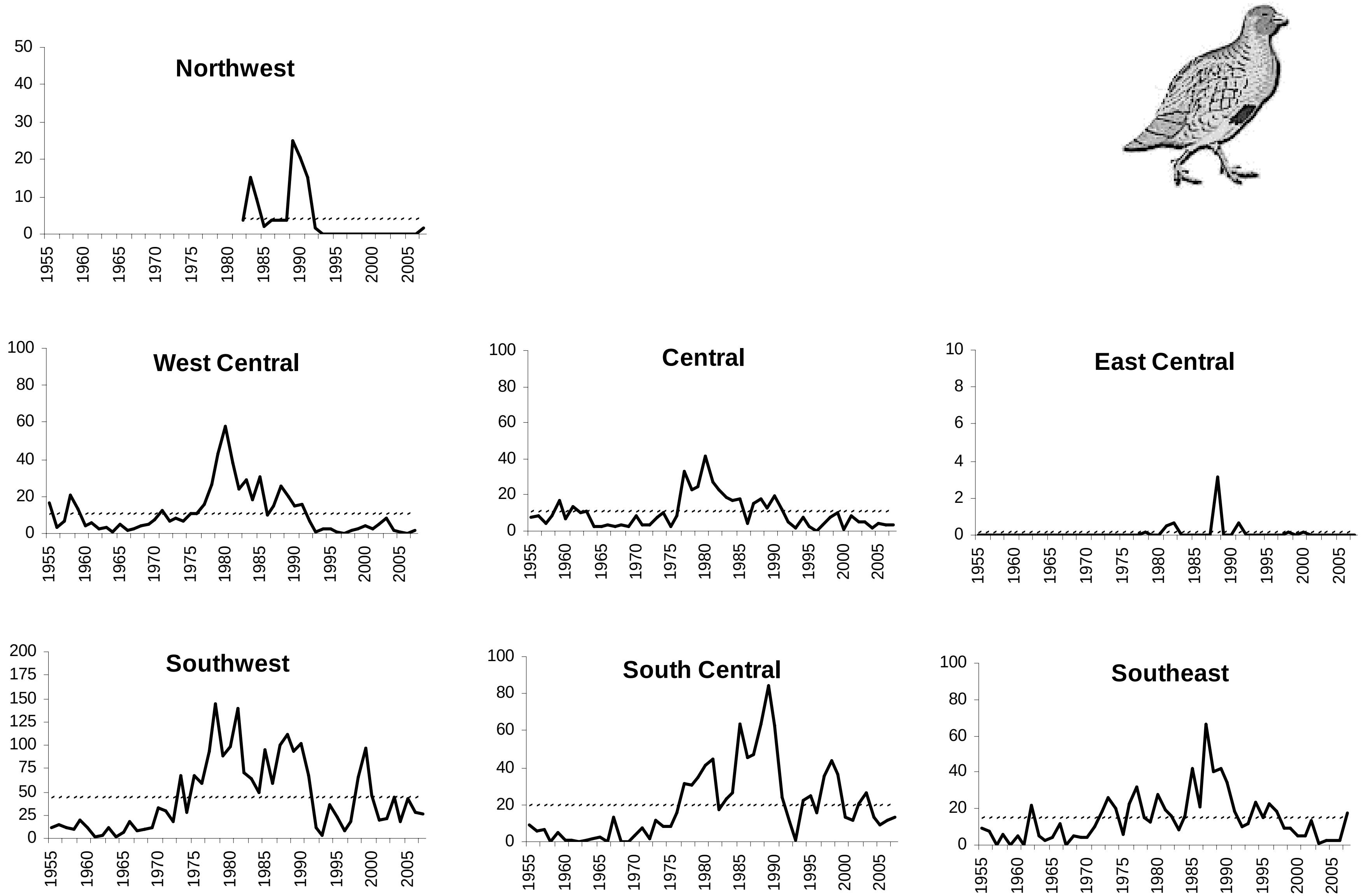


Figure 6. Regional index (——) and long-term average (····) of **gray partridge seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

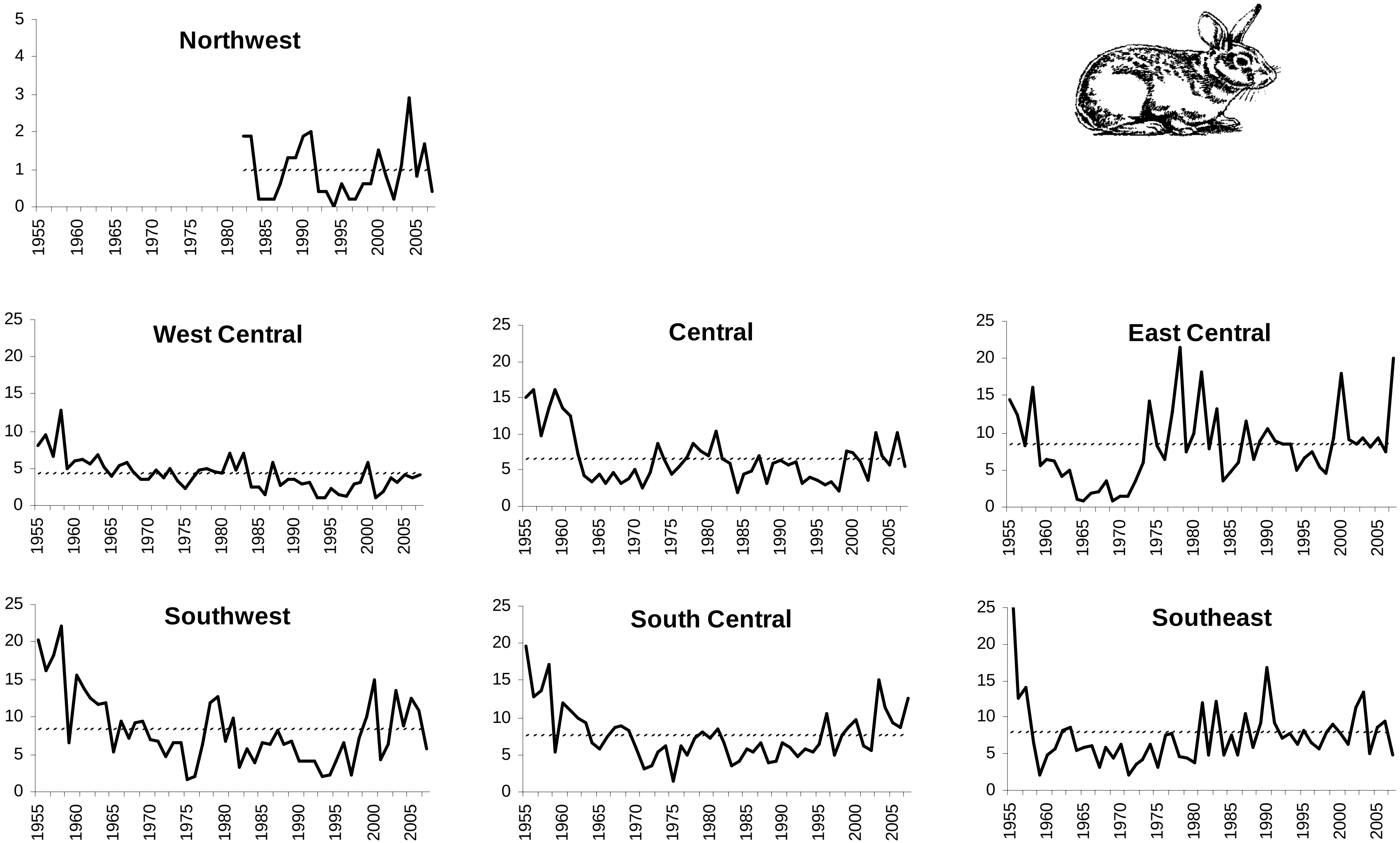


Figure 7. Regional index (——) and long-term average (······) of **cottontail rabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

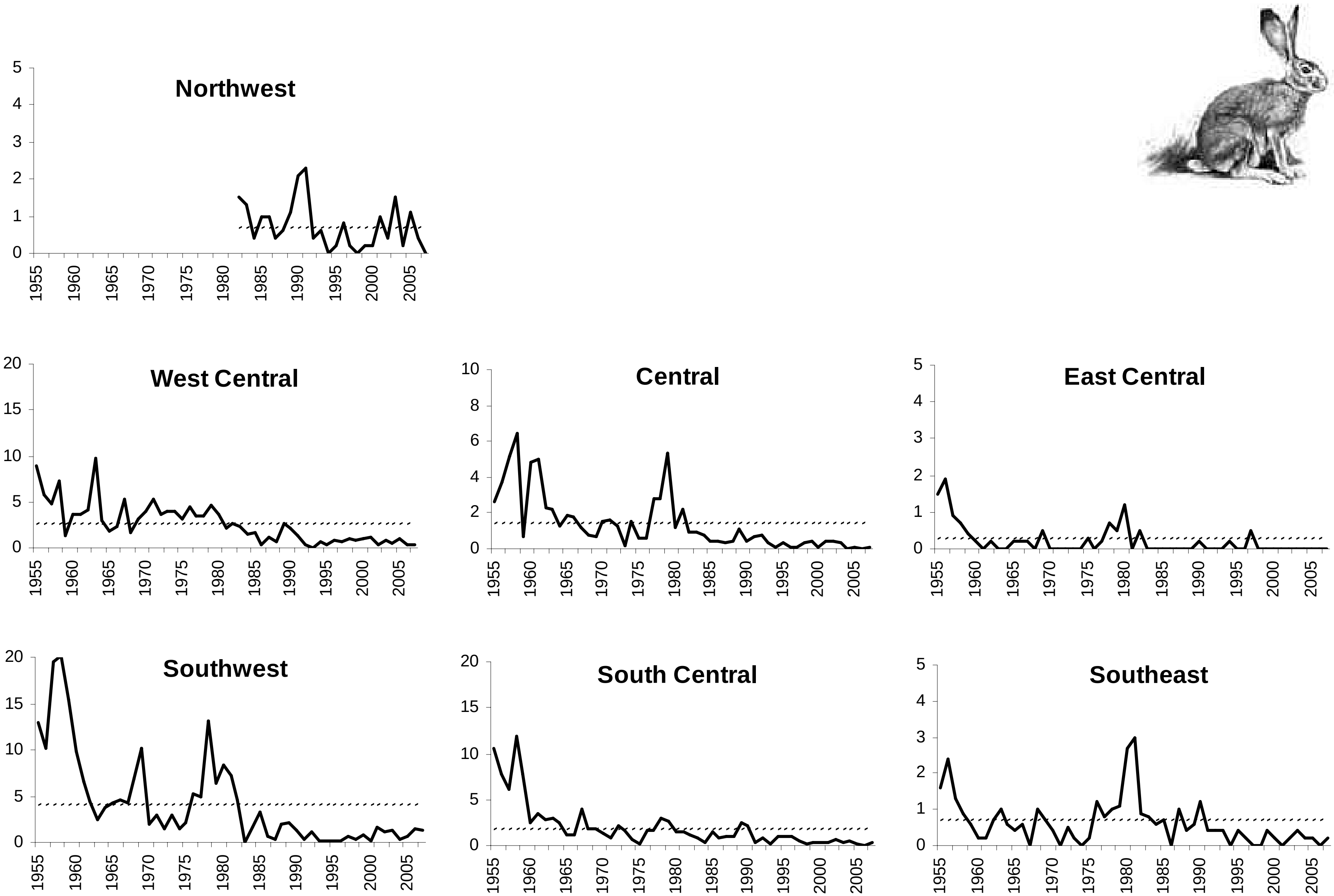


Figure 8. Regional index (____) and long-term average (.......) of **white-tailed jackrabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

Monitoring Population Trends of White-tailed Deer in Minnesota's Farmland/Transition Zone – 2007

Marrett D. Grund, Farmland Wildlife Populations and Research Group

INTRODUCTION

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

This document 1) identifies where the farmland population model was applied to model deer population dynamics in Minnesota, 2) describes the structure of and data inputs for the farmland population model, 3) discusses general trends of deer density and current abundance, and 4) describes trends of harvest patterns in the farmland/transition zone.

METHODS

Minnesota Farmland/Transition Zone

There were 4 deer management units (DMUs) in Minnesota's farmland/transition zone (Figure 1). Permit areas (PAs) delineated within DMUs served as the basis for population modeling and managing antlerless harvests (Figure 2). There were 86 PAs in Minnesota's farmland zone in 2006. However, the 2 PAs encompassing the Twin Cities metro region were not modeled.

Population Modeling

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

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

Model Recalibration Efforts

Previous research demonstrated that this model provides reliable population estimates if the model is recalibrated every 4-5 years using field surveys (Grund and Woolf 2004). Thus, in an effort to recalibrate the model, population estimates using aerial (Haroldson et a. 2005) and ground surveys (Grund et al. 2005) were begun in 2004. Population densities have been estimated in 22 farmland PAs over the past 3 years (Table 1). Several PAs have been surveyed using both techniques due to concurrent studies. Preliminary estimates from both techniques have been useful to recalibrate models. However, additional research needs to be conducted to refine field protocols and produce more precise population estimates.

Population Trends and Densities

Deer densities continue to increase throughout most of the transition zone. Deer densities were highest in the Big Woods DMU, lowest in the Prairie DMU, and at intermediate levels in the Northwest (Agassiz & Red River DMUs). Detailed long-term trends in deer densities are presented in Table 2.

In the Northwest DMUs, simulated deer densities indicated a slight downward trend over the last couple of years. Efforts to reduce deer in this area may be having an impact. However, current deer densities remain well above goal in most northwestern permit areas.

In the Big Woods DMU, which incorporates most of the transition zone, simulated deer densities continue to increase. The rate of increase is most rapid in the Southeast and Metro PAs, despite efforts to reduce deer populations in these areas.

In the Prairie DMU, the farmland model suggests that deer densities have increased slowly over the last couple of years. Rate of increase is fastest in the North and Southwest permit areas. This trend reflects objectives and management strategies of most wildlife managers in southwestern Minnesota who wish to either maintain or slightly increase deer herds in their respective work areas.

Harvest Trends and Model Performance

In northwestern Minnesota, registered harvest densities have steadily increased over the past 5-6 years. Harvest densities are higher and have increased at a faster rate in the Agassiz DMU than in the Red River DMU. I use antlered and antlerless harvest trends as an ancillary index to measure population dynamics over time. In most situations, the trend in harvests agreed with what I would expect from simulated population densities. The efforts the DNR have made to recalibrate the farmland model in the northwest have improved model performance thereby making the ancillary population indices logical. Consequently, the farmland model has become a more useful management tool in these Northwest DMU permit areas.

Harvest densities fluctuated substantially across the Big Woods DMU and across years. Trends in harvest densities have been most stable in the Metro and most variable in the Southeast permit areas of the Big Woods DMU. Harvest densities have generally increased in the central and northern portions of the Big Woods DMU over the past 4-6 years. In the southeastern and metro portions of the Big Woods DMU, trends in harvest densities agreed with output generated by the farmland model. The DNR has recalibrated the farmland model in most southeastern and metro PAs thereby improving model performance. In almost all PAs located in the northern and central areas of the Big Woods DMU, trends in harvest densities did not agree with simulated estimates. In most of these areas, the farmland model is performing so poor that it cannot be used to make science-based management recommendations. Thus, I highly recommend recalibrating the farmland model in these permit areas.

In the Prairie DMU, harvest densities have substantially declined over the past decade. However, the farmland model indicated that populations have increased in most Prairie DMU permit areas. Based on my interpretation of these trends, the farmland model is performing very poorly in most Prairie PAs and I highly recommend recalibrating the farmland model in these areas. Based on the marked declines in harvests over the past 10-15 years and the fact that current densities are 25-50% below newly established goals, antlerless harvest quotas have generally been reduced by 50-75% from 2006 in most Prairie DMU permit areas.

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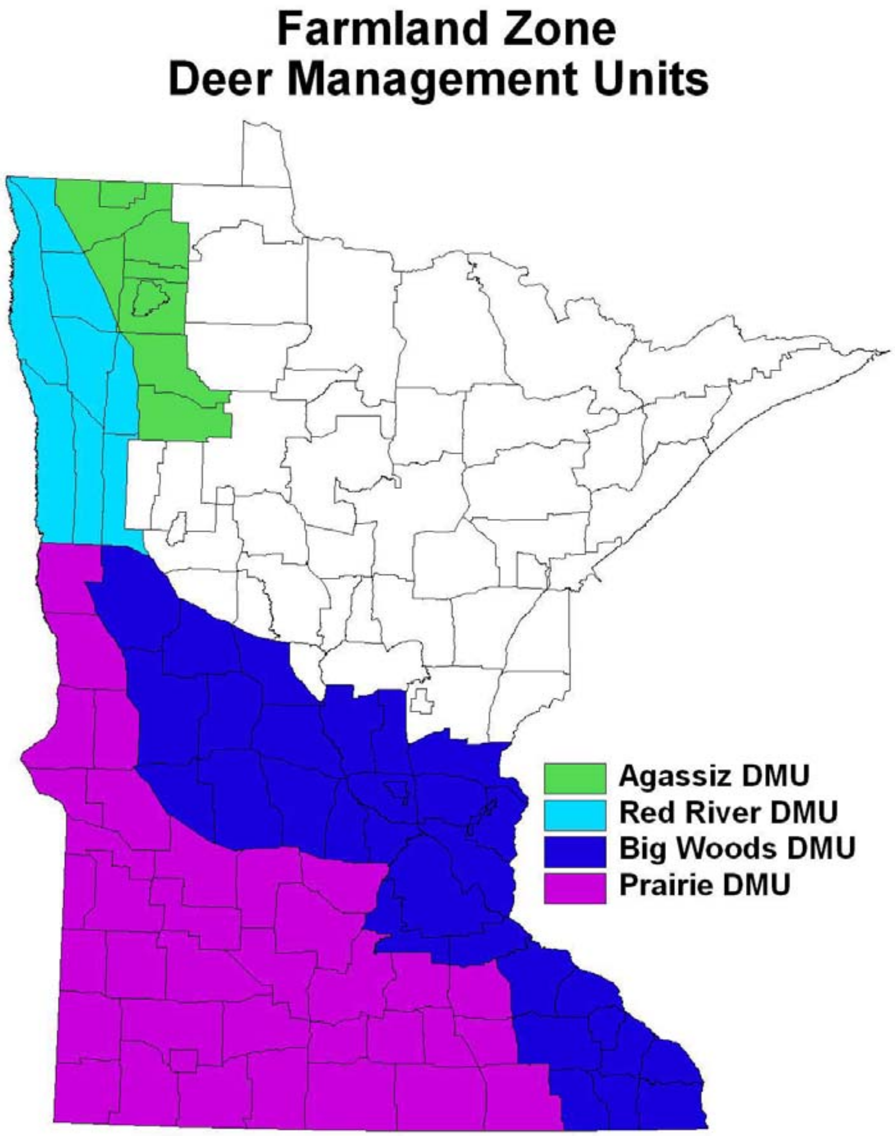


Figure 1. Deer management units in the farmland zone of Minnesota, 2005.

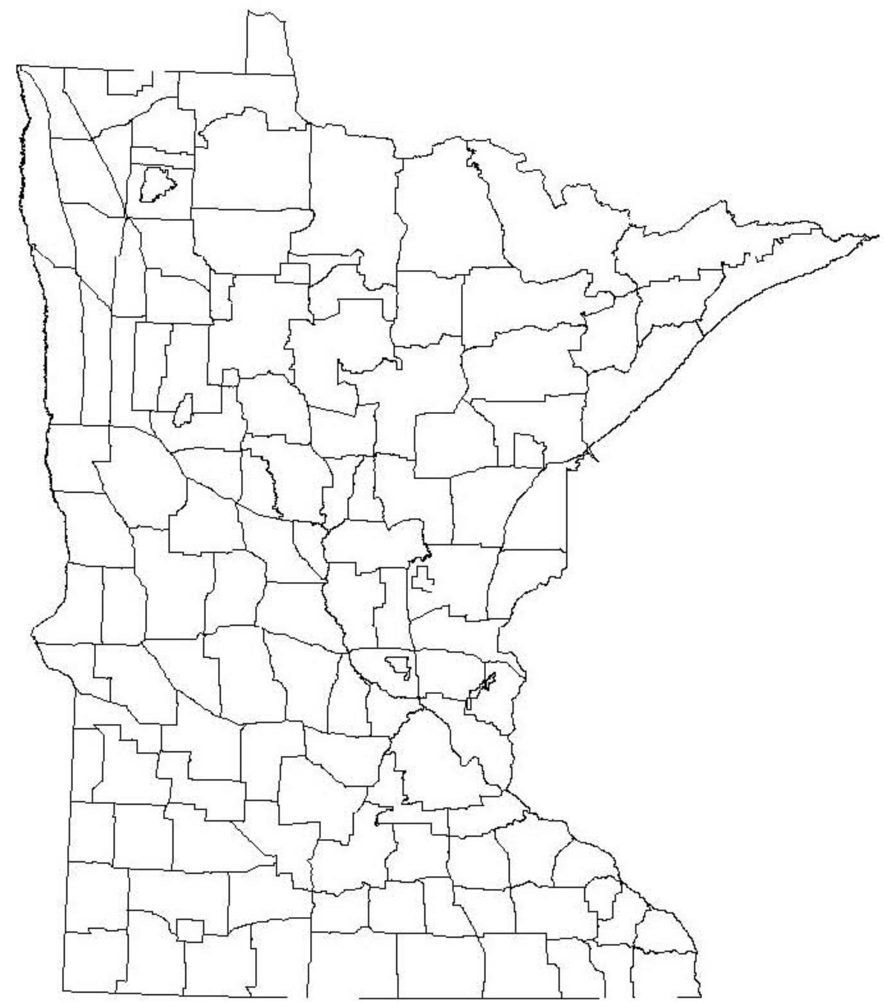
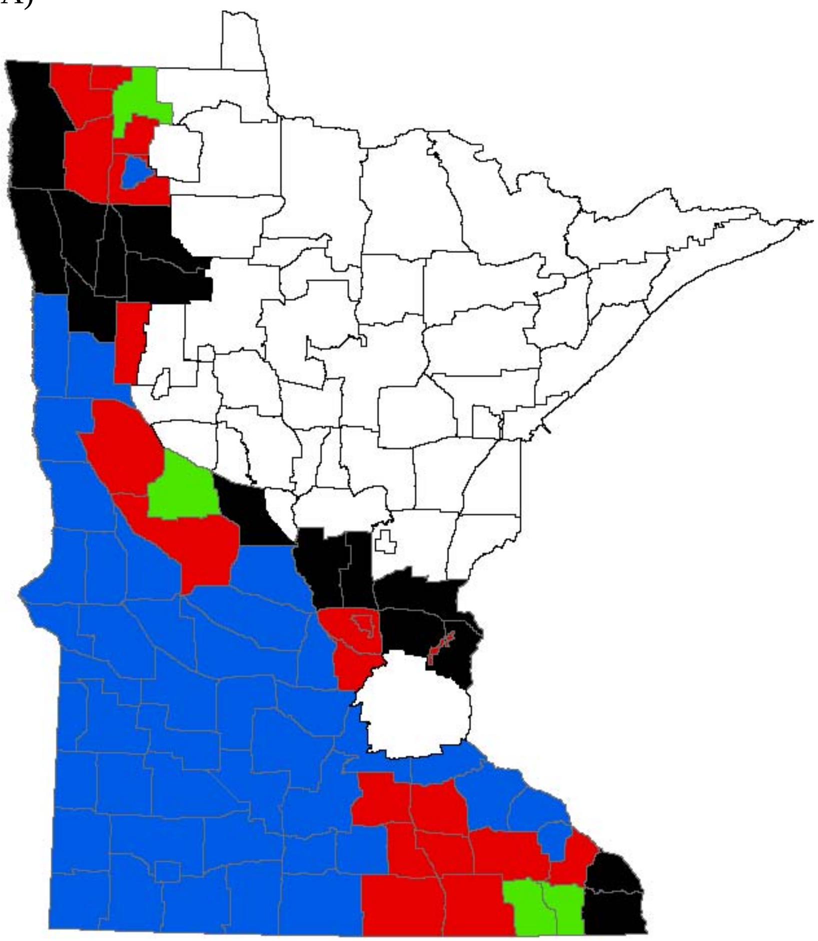
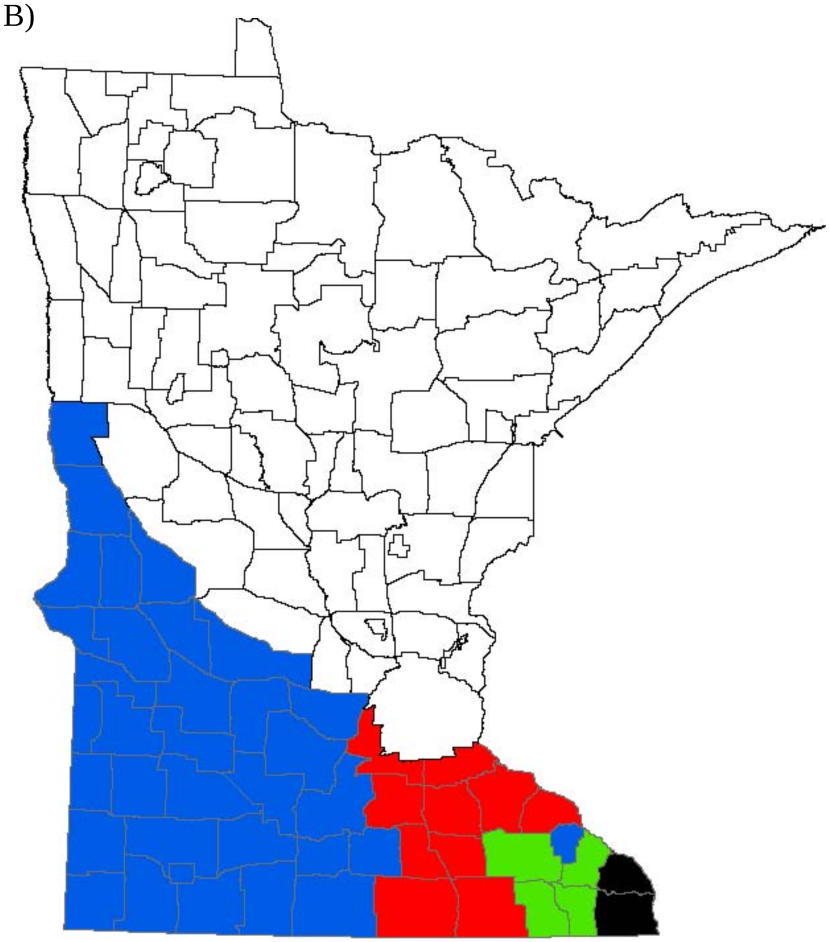


Figure 2. Deer permit areas in Minnesota, 2006.

A)



B)



Figures 3A and B. Management strategies in Zones 2, 3A, and 4A (top figure), and in Zones 3B and 4B (bottom figure) during 2007. Permit areas shaded in blue, red, green, and black represent lottery, managed, intensive, and intensive plus early antlerless- only strategies, respectively.

Table 1. Deer density (deer/mi^2) estimates for permit areas in Minnesota's Farmland/Transition Zone where field surveys have been conducted, 2005-2007.

Permit Area	Winter	Survey Type	Density Estimate (CIs)	Simulated Winter Estimate Prior to Field Survey
201	2006	AerialSurvey	2(1-3)	6
204	2006	AerialSurvey	5(3-6)	5
206	2005	AerialSurvey	5(4-7)	5
209	2006	Aerial Survey	10 (8-12)	5
209	2006	GroundSurvey	6(4-8)	5
210	2006	AerialSurvey	6(5-8)	12
210	2006	GroundSurvey	11 (7-17)	12
225	2007	AerialSurvey	8(6-10)	25
227	2007	Aerial Survey	10 (8-12)	27
236	2006	Aerial Survey	18 (14-22)	35
236	2006	GroundSurvey	13 (8-21)	35
252	2005	AerialSurvey	3(2-4)	2
252	2006	GroundSurvey	1(1-2)	2
256	2006	AerialSurvey	7(5-9)	5
256	2006	GroundSurvey	3(2-5)	5
257	2005	AerialSurvey	6(4-8)	6
257	2006	GroundSurvey	6(4-9)	6
342	2005	AerialSurvey	9(8-11)	19
343	2007	Aerial Survey	10 (9-12)	29
344	2007	Aerial Survey	20 (16-23)	49
346	2007	Aerial Survey	23 (17-29)	31
347	2007	Aerial Survey	13 (10-15)	13
349	2007	Aerial Survey	20 (17-24)	35
420	2006	AerialSurvey	3(2-4)	3
421	2005	AerialSurvey	1(0-1)	5
423	2006	AerialSurvey	1(0-1)	5

Table 2. Pre-fawning deer density estimates[a] (deer/mi^2) by Deer Management Unit (DMU), sub-unit (DMSU), and permit area (PA) in Minnesota's Farmland/Transition Zone, 1994-2006.

DMU	DMSU	PA	Area mi^2	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
RED RIVER	*West*	252	1039	3	2	2	2	2	2	2	2	2	2	2	2	2
		253	1021	4	4	3	3	3	3	3	3	3	2	3	3	2
		Total	2060													
	East	254	396	7	6	6	6	7	7	8	8	8	8	7	7	6
		255	631	8	7	7	7	8	8	8	8	9	9	8	7	6
		256	654	7	6	6	6	7	7	8	8	8	7	7	7	6
		257	413	13	11	10	10	11	11	11	10	10	8	8	7	5
		258	618	9	8	8	8	8	9	9	9	9	9	8	6	4
		259	494	8	7	7	7	7	8	8	9	9	9	8	8	7
		Total	3206													
Red River Total			5266													
AGASSIZ		201	155	4	2	2	3	3	4	5	5	5	5	5	6	6
		202	156	10	7	6	8	9	10	11	11	11	9	9	8	7
		203	108	7	3	2	2	3	4	5	6	7	7	7	8	11
		204	718	7	6	5	5	6	6	6	6	6	5	5	5	4
		205	642													
		206	471	9	7	6	7	7	8	9	9	9	8	7	5	3
		207	300	8	6	6	6	7	8	8	8	9	8	7	6	4
		208	448	4	3	2	3	3	4	4	4	5	4	4	4	4
		209	576	6	5	5	6	6	6	7	7	7	7	7	5	4
		210	485	12	11	10	10	11	11	11	11	12	11	11	11	10
Agassiz Total			4059													

DMU	DMSU	PA	Area mi ^{2}	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
BIG WOODS	*North*	239	924	14	14	13	13	15	16	16	17	18	19	20	22	25
		240	642	21	21	20	21	23	25	26	27	29	31	33	37	42
		412[c]	575	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7
		213[c]	644	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13
		214	557	17	17	17	17	18	19	19	19	20	19	18	18	16
		215	702	9	9	9	9	9	9	9	10	10	9	8	7	5
		416	544	10	10	9	9	9	8	8	8	8	7	7	8	9
		417[c]	939	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8
		218[c]	760	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
		219	393	10	10	9	8	8	9	9	9	10	11	12	14	17
		229	288	5	5	5	5	5	6	6	6	7	7	8	9	10
		Total	7799													
	Central	221	642	9	9	9	10	11	12	11	12	13	12	13	13	13
		222	412	13	13	13	13	14	14	14	15	15	14	14	14	13
		223	376	13	13	13	13	13	13	13	14	15	15	16	18	20
		224	48	15	15	16	18	18	20	22	25	27	28	31	26	42
		225	619	19	18	18	18	18	19	19	19	20	20	22	24	25
		Total	2097													
	Metro	227	472	13	13	13	13	13	14	15	15	18	20	23	13	13
		235	33	18	22	16	19	21	23	22	26	24	17	18	18	18
		236	374	17	16	16	16	17	17	19	20	23	26	31	18	19
		338	452	5	4	4	4	4	4	5	6	7	9	11	15	21
		339	395	6	6	5	4	5	5	5	6	8	10	12	16	23
		Total	1726													

DMU	DMSU	PA	Area mi ^{2}	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	Southeast	341	611	12	13	14	15	16	17	17	18	21	24	28	31	21
		342	352	11	10	10	11	11	12	11	13	15	17	13	13	13
		343	663	8	8	8	8	8	9	9	11	13	16	19	23	11
		344	189	17	17	16	15	14	14	15	17	20	24	28	37	20
		345	326	11	10	11	11	11	11	10	10	11	12	14	17	19
		346	319	17	17	18	18	18	19	19	20	23	25	27	29	23
		347	434	9	10	10	9	9	9	9	10	11	12	13	13	13
		348	332	16	17	17	17	17	16	15	15	16	17	17	16	13
		349	492	12	13	14	15	16	17	17	18	21	24	28	31	21
		Total	3718													
Big Wood Total			15340													
PRAIRIE	*North*	420	651	4	4	3	3	3	4	4	4	4	4	4	3	3
		421	749	3	3	3	3	3	3	3	3	4	4	5	6	7
		422	634	3	2	2	2	2	2	2	2	3	3	3	4	5
		423	531	4	4	4	3	3	3	3	3	4	4	4	5	7
		424	766	6	7	5	4	4	4	3	3	3	4	4	5	6
		425	779	2	2	1	1	1	1	1	1	1	2	2	2	3
		426	614	4	3	3	3	3	3	3	3	4	4	5	6	8
		427	837	2	2	2	1	1	2	2	2	2	2	3	4	5
		428	550	4	4	4	3	4	4	4	4	5	6	6	7	9
		Total	6111													
	River	431	360	7	8	7	6	6	5	4	4	4	4	4	5	5
		433	397	10	10	9	9	8	8	8	8	9	9	10	11	13
		435	575	6	6	5	5	5	5	5	4	5	5	6	8	10
		440	662	5	5	4	4	4	4	4	4	4	4	4	4	5
		442	806	5	5	4	4	4	4	4	4	5	6	6	8	9
		443	386	7	7	6	6	5	5	5	5	5	5	5	6	6
		Total	3186													

DMU	DMSU	PA	Area mi 2	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	Southwest	446	345	7	7	7	6	6	6	6	5	5	5	5	6	6
		447	675	3	3	2	2	2	2	2	2	2	3	3	4	5
		448	447	3	3	3	2	2	3	4	4	4	5	6	7	8
		449	625	4	3	3	3	2	3	4	4	5	6	7	8	10
		450	816	2	2	2	1	2	1	1	1	2	2	2	2	3
		451	687	3	3	3	3	3	3	3	3	3	4	5	6	7
		452	637	3	3	3	3	3	4	4	4	4	5	5	6	7
		453	729	2	2	2	2	2	2	2	2	3	4	5	6	8
		454	840	4	4	3	3	3	3	3	3	4	4	5	6	7
		455	95	5	5	4	4	4	4	4	4	4	4	5	5	6
		456	712	4	4	3	3	3	3	4	4	4	5	6	7	8
		457	666	3	3	2	2	3	3	3	3	3	3	3	4	5
		458	715	3	3	3	2	2	2	2	2	3	3	3	4	5
		459	974	3	3	3	3	3	3	3	3	3	4	4	5	6
		Total	8963													
	Southeast	461	481	9	9	9	8	8	8	7	7	8	7	7	7	6
		462	506	8	8	9	8	8	8	8	7	8	8	8	9	9
		463	453	4	3	3	3	3	3	3	3	4	4	4	5	6
		464	377	5	5	4	4	4	4	4	4	5	6	7	8	9
		465	385	5	5	5	4	4	4	4	4	5	5	5	6	6
		466	931	4	4	4	4	4	4	4	4	4	4	5	6	7
		467	774	4	4	4	3	4	4	4	4	4	4	4	4	3
		Total	3907													
Prairie Total			22167													
Farmland Zone Total			46832													

[a] Density estimates are subject to change as new data are incorporated or the model is revised.

[b] Excluding permit areas 228 & 337, which were not modeled.

[c] New permit area so no historical information is available

Fetus Survey Data Results Of White-Tailed Deer In The Farmland/Transition Zone Of Minnesota – 2007

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INTRODUCTION

Fetus surveys are used to gather information on productivity (number of fetuses per doe) of juvenile (≤12 months of age) and adult (>12 months of age) female white-tailed deer (*Odocoileus virginianus*) in the farmland/transition zone of Minnesota (Figure 1). These data, along with other biological information, are incorporated into the farmland deer population model. The farmland deer population model is used to simulate herd dynamics, predict changes in population size, and determine deer management strategies for 85 permit areas.

A simple and effective method for estimating productivity rates is through direct examination of the reproductive tracts of female deer killed by motor vehicles. The objectives of this survey were to estimate 1) pregnancy rates of juvenile and adult white-tailed deer in the farmland/transition zone of Minnesota and 2) fetal rates of adult and juvenile white-tailed deer in the farmland/transition zone of Minnesota.

METHODS

Reproductive data required for the farmland deer population model include age class of the female, pregnancy status, number of fetuses present, and gender of the fetuses. These data were collected from road-killed females from 1 February to 31 May. Personnel participating in the survey included all wildlife staff in the farmland/transition zone. Area Wildlife Managers were encouraged to contact local Department of Transportation staff and law enforcement officials to facilitate locating dead deer in a timely fashion. Where possible, the use of volunteers was also encouraged.

Equipment for data collection included a sharp knife or scalpel, vinyl gloves, and self-addressed, postage-paid postcards. When examining deer, staff located and opened the uterus to check for fetuses. Staff recorded pregnancy/lactation status, age class of the female, number and gender of all fetuses present, and the location of the road-killed animal (Figure 2). Notes on body condition or any other unusual observations were also recorded.

Data were also collected from a special hunt conducted from late February to mid April in the bovine tuberculosis (TB) zone in the Northwest DMU. These data were summarized separately from the road-killed deer.

RESULTS & DISCUSSION

A total of 79 road-killed deer were examined in 2007. Three (4%) of these deer came from the Northwest Deer Management Unit (DMU; Table 1), 59 (75%) from the Big Woods DMU (Table 2), and 17 (22%) from the Prairie DMU (Table 3).

Pregnancy rates for fawns ranged from 0% in the Northwest DMU to 17% in the Prairie DMU. Throughout the farmland/transition zone, 9% of fawns were pregnant. Pregnancy rates for adults ranged from 55% in the Prairie DMU to 100% in the Northwest DMU and averaged 67% across the farmland/transition zone.

Fetal rates for fawns ranged from no fetuses/fawn in the Northwest DMU to 0.3 fetuses/fawn in the Prairie DMU, and averaged 0.18 fetuses/fawn across the farmland/transition zone. Fetal rates for adults ranged from 2.0 fetuses/adult in the Northwest to 0.9 fetuses/adult in the Prairie DMU. Fetal rates averaged 1.24 fetuses/adult throughout the farmland/transition zone.

A total of 290 deer from the special TB hunt were examined. The pregnancy rate for fawn and adults was 3% and 93%, respectively. Fetal rate for fawns was 1.0 fetuses/fawn and for adult does was 1.5 fetuses/adult. The sex ratio of fetuses was 50:50 for both fawns and adult does.

Table 1. Reproductive performance of white-tailed deer in Minnesota for the Northwest[a] Deer Management Unit, 1980 – 2007.

	Fawns			Adults		
Year	N	Percent Pregnant	Fetuses per doe	N	Percent Pregnant	Fetuses per doe
1980	8	50	0.6	12	92	1.7
1981	4	0	0.0	11	100	1.7
1982	6	67	0.7	18	94	1.8
1983	15	27	0.3	26	85	1.6
1984	10	40	0.6	23	87	1.7
1985	6	17	0.2	11	91	1.7
1986	3	0	0.0	6	83	1.3
1987	3	0	0.0	5	100	1.6
1988	3	33	0.3	4	50	0.8
1989	14	21	0.3	27	93	1.7
1990	18	22	0.2	29	93	1.7
1991	11	9	0.1	15	87	1.6
1992	13	8	0.1	24	96	1.6
1993	7	0	0.0	11	100	1.6
1994	7	14	0.1	13	92	1.4
1995	4	25	0.3	6	100	2.0
1996	5	0	0.0	21	81	1.3
1997	4	0	0.0	12	100	1.5
1998	3	0	0.0	7	86	1.6
1999	5	0	0.0	14	100	1.6
2000	7	14	0.1	11	100	2.0
2001	4	0	0.0	8	100	1.8
2002	7	14	0.1	13	100	1.8
2003	0	0	0.0	3	100	1.7
2004	2	50	0.5	2	100	2.0
2005	6	33	0.3	9	89	1.9
2006	4	25	0.5	9	100	2.0
2007	1	0	0.0	2	100	2.0
Mean (1980's)		26	0.3		88	1.6
Mean (1990's)		8	0.1		94	1.6
Mean (2000's)		17	0.2		99	1.9

[a]Red River (East and West) and Agassiz Deer Management Units were combined into the Northwest Deer Management Unit due to small sample sizes.

Table 2. Reproductive performance of white-tailed deer in Minnesota for the Big Woods Deer Management Unit[a], 1978 – 2007.

	Fawns			Adults		
Year	N	Percent Pregnant	Fetuses per doe	N	Percent Pregnant	Fetuses per doe
1978	74	47	0.5	113	96	1.8
1979	87	30	0.3	119	92	1.7
1980	87	61	0.7	107	97	1.8
1981	78	58	0.6	132	92	1.7
1982	95	43	0.5	197	95	1.8
1983	83	55	0.7	167	95	1.8
1984	77	22	0.3	123	95	1.8
1985	60	50	0.6	105	96	1.8
1986	79	37	0.4	116	88	1.6
1987	45	44	0.5	146	94	1.8
1988	14	64	0.8	31	97	1.8
1989	51	31	0.3	85	96	1.8
1990	96	32	0.3	125	95	1.8
1991	50	20	0.2	71	96	1.8
1992	67	24	0.3	100	95	1.8
1993	47	38	0.4	95	93	1.7
1994	46	15	0.2	99	94	1.7
1995	21	19	0.2	54	91	1.8
1996	59	15	0.2	112	96	1.8
1997	40	33	0.4	96	88	1.6
1998	53	23	0.3	109	91	1.7
1999	49	37	0.4	95	91	1.6
2000	62	23	0.3	76	91	1.6
2001	36	14	0.1	65	94	1.7
2002	70	23	0.3	97	95	1.8
2003	66	20	0.2	90	95	1.6
2004	65	20	0.2	60	88	1.6
2005	93	29	0.4	99	91	1.7
2006	22	41	0.5	63	97	1.8
2007	27	7	0.1	32	69	1.3
Mean (1980’s)		47	0.5		95	1.8
Mean (1990’s)		26	0.3		93	1.7
Mean (2000’s)		22	0.3		90	1.6

[a]The majority of samples (approximately 68%) from this Deer Management Unit were obtained from the Big Woods Metro sub-unit. Consequently, the data reported in this table may not reflect reproductive performances throughout the remainder of the Big Woods Management Unit.

Table 3. Reproductive performance of white-tailed deer in Minnesota for the Prairie Deer Management Unit, 1978 – 2007.

	Fawns			Adults		
Year	N	Percent Pregnant	Fetuses per doe	N	Percent Pregnant	Fetuses per doe
1978	25	44	0.6	69	100	1.9
1979	83	34	0.4	92	90	1.8
1980	51	63	0.7	55	91	1.7
1981	57	44	0.5	65	92	1.8
1982	50	46	0.6	85	94	1.9
1983	42	62	0.9	51	96	1.9
1984	30	23	0.3	69	84	1.6
1985	21	38	0.4	49	94	1.9
1986	25	64	0.8	56	93	1.7
1987	27	52	0.6	47	94	0.9
1988	20	40	0.5	16	100	1.9
1989	37	38	0.4	54	89	1.7
1990	43	42	0.4	62	97	1.8
1991	30	20	0.2	67	94	1.8
1992	37	19	0.2	51	94	1.9
1993	39	38	0.4	75	93	1.8
1994	32	16	0.2	46	98	1.9
1995	39	21	0.3	50	92	1.7
1996	28	14	0.1	30	90	1.6
1997	26	4	0.0	49	92	1.7
1998	18	17	0.2	38	97	1.7
1999	26	19	0.2	47	96	1.7
2000	13	23	0.4	23	87	1.6
2001	18	6	0.1	39	87	1.5
2002	19	32	0.4	26	92	1.7
2003	18	22	0.2	123	93	1.7
2004	10	10	0.1	9	89	1.7
2005	16	13	0.1	39	90	1.7
2006	2	0	0	16	94	1.9
2007	6	17	0.2	11	55	0.9
Mean (1980's)		47	0.5		93	1.7
Mean (1990's)		21	0.2		94	1.8
Mean (2000's)		15	0.2		90	1.7

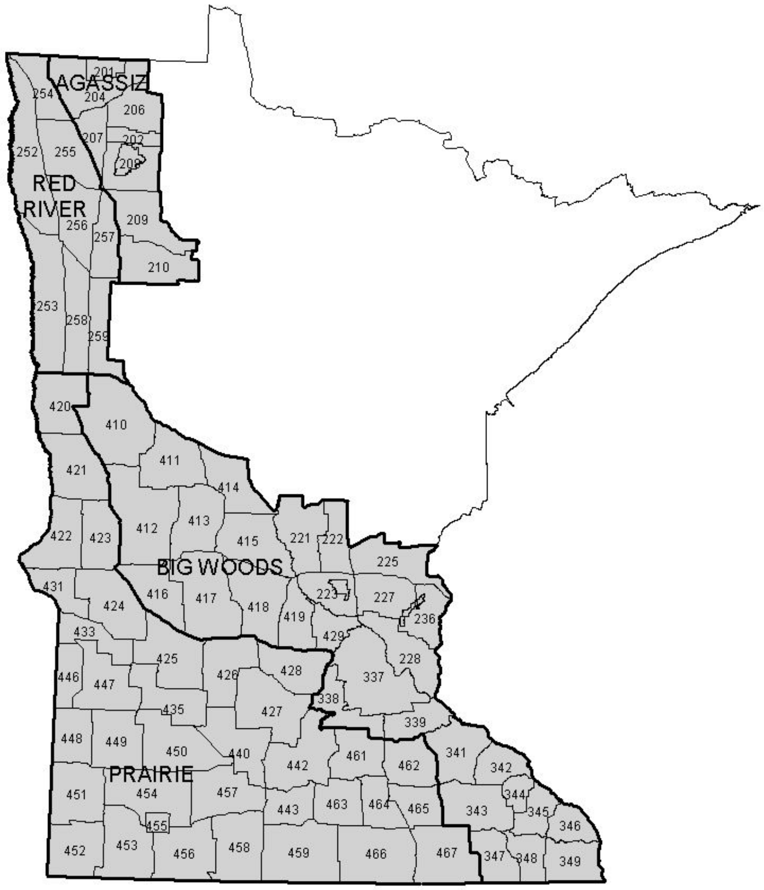

Figure 1. Permit areas within the Farmland Zone of Minnesota

FETUS SURVEY REPORT FORM

Name ______________________________ Date ____________

Sex: _____ Age: Juv. (<12 months) _____ Adult (>12 months) _____

Pregnant: Yes _____ No _____ (Lactating _____)

Number of fetuses __________ Sex of Fetuses ____________

County ____________________ Highway _________________

Permit area ________ Twp ______ Rng ______ Sec ______

Miles _____ direction _____ from __________________________

Comments ____

Figure 2. Postcard for reporting fetus survey data

2006 Minnesota Fall Wild Turkey Population Survey

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INTRODUCTION

The fall wild turkey population survey is a mail survey of deer hunters (regular firearm) in Minnesota's wild turkey range and potential range. The survey is scheduled once every 2 years and consists of asking randomly selected deer hunters where they hunted (permit area [PA]), if they saw wild turkeys while hunting, and the approximate location (miles and direction from nearest town) of turkey sightings. The purpose of the survey is to estimate a wild turkey population index (the proportion of deer hunters observing wild turkeys [HOWT]) in 16 turkey management units (TMU) and their subset PAs.

METHODS

For the 2006 fall wild turkey population survey, 18,247 hunters were randomly selected from regular firearm deer permit holders in 16 TMUs, which included 108 PA's (Figures 1 and 2). The area surveyed was selected by the Minnesota Department of Natural Resources (MNDNR) Turkey Committee to include Minnesota's current and potential wild turkey range. Prior to 2006, the survey consisted of a stratified sample of antlerless deer hunters (lottery winners), where the PA of each hunter was known prior to drawing the sample (i.e., hunters mostly hunted in the PA for which they had an antlerless permit). Beginning in 2006, the sampling frame was modified because of regulation changes (antlerless permits are no longer required for managed or intensive areas) to all regular firearm deer hunters (excluding muzzleloader, all-season, and multi-zone licenses). Hunters can hunt anywhere within their selected hunting period and zone, but most hunters pursue deer within relatively small, traditional areas (Welsh and Kimmel 1990). Therefore, PAs listed in the Electronic Licensing System (ELS) database were used as a stratification variable and a random sample of regular firearm deer hunters was selected from each PA.

The 2006 survey included 1 new TMU, and there were several boundary and PA-name changes since 2002. It should be noted that turkey PAs equal deer PAs in most cases, except where turkey PAs consist of >1 deer PA (combined PAs). A new TMU "P" was created from 9 PAs in northern Minnesota (previously part of the non-survey area). Within TMU "K" old PA-417 (was in TMU "L") and PA-418 (was in TMU "K") were modified; new PA's are numbered 417 and 218, and both are now part of TMU "K." A new customized TMU "L" includes the change of old PA-413 (was in TMU "N") now being part of a new PA-213 in TMU "L." The boundary between old PA-412 and PA-413 was modified and now designated PA-412 (smaller) and PA-213. Also within TMU "L" old PA-410 was renamed PA-239. Modifications within TMU "N" included name changes of old PA-411 to PA-240, old PA-414 to PA-214, and old PA-409 to PA-241.

TMU “O” had a minor boundary change (ignored) involving eastern edge of PA-209 and PA-210. Also within TMU “O” several name changes occurred with old PA-402 to PA-253, old PA-407 to PA-258, old PA-408 to PA-259, old PA-406 to PA-257, old PA-405 to PA-256, old PA-401 to PA-252, old PA-403 to PA-254, and old PA-404 to PA-255. No changes were made to TMU’s “A-J” or “M.” Survey data collected from TMUs or PAs with boundary changes are not directly comparable to 2002.

Sample size was estimated for each TMU based on a family-wise Type I error rate of 0.15 (α_c = 0.15/15 = 0.01), a desired margin of error = 0.07 (half-width of CI for HOWT change), mean HOWT = 0.5, a finite population correction factor, and a response rate of 60%. A per-contrast alpha (α_c) of 0.01 was used as a tradeoff between controlling the Type I error rate (probability of rejecting a true null) and having reasonable power to detect a change of $\geq$7% at the TMU scale. Each estimated TMU sample size was then divided among PAs based on the proportion of hunters in each PA (ELS database).

Selected hunters were mailed a postcard questionnaire requesting information on PA hunted, number of turkeys observed while hunting, and location of turkey observations (miles and direction from nearest town). The first mailing occurred 24 November 2006. A second mailing was sent on 12 January 2007 to all non-respondents. A third mailing was sent on 14 March 2007 to all remaining non-respondents.

We estimated HOWT for each TMU and PA and compared estimates to those of the previous survey (Kruger and Dingman 2002). We also used log-linear models (Eberhardt and Simmons 1992) to estimate the mean annual rate of change (λ) in HOWT during 1999-2006. We constructed an 85% family of confidence intervals (CI) for parameter estimates at the TMU scale. These are equivalent to 99% CIs where the per-family Type I error rate is 0.15 (see above). We did not attempt to control the Type I error rate at the PA scale because sample sizes were small. Thus, we constructed 95% confidence intervals at the PA scale. Estimated changes in HOWT (compared to 2002) were considered meaningful if the CI did not include zero, and precision was deemed acceptable if the CI was less than ±7% (desired margin of error). Likewise, we interpreted estimated finite rates of change (λ) as meaningful if the CI did not include 1, and we deemed precision as acceptable if the CI was less than ±0.07. Finally, we generated maps of turkey observations to monitor potential range changes. We excluded questionable observations (where distance between the turkey observation and the center of the hunter-listed PA was >3x the diameter of the PA) and locations that were outside the state boundary.

RESULTS

The overall response rate was 44.1%, which was lower than the expected response rate (60%) used in sample-size calculations. The response rate per mailing ranged from 28.2% in mailing 1 to 8.5% in mailing 3. The percentage of hunters that reported seeing turkeys was independent of mailing (χ^2_2 = 1.35, P = 0.51), which indicated that non-response bias was negligible (at least at the range-wide scale).

Compared to 2002, the HOWT index increased in 9 TMUs and was unchanged (CI included zero) in 6 TMUs (Table 1). The desired level of precision (±7%) was achieved in 6 of the 9 TMUs with an increase, but none of the TMUs with "no change" (Figure 1). Thus, conclusions about "no change" at the TMU scale should be viewed cautiously. Ninety-five PAs (88%) had comparable data for estimating change in HOWT from the 2002 survey (Table 2). The HOWT index decreased in 1 PA (345) and increased in 26 PAs (227, 228, 156, 157, 159, 183, 464, 466, 449, 458, 431, 154, 221, 247, 249, 215, 219, 239,421, 424, 214, 240, 241, 243, 246, 248); the remaining 68 CIs included zero (indicating no meaningful change or the change was undetectable due to poor precision). Most estimates at the PA scale were imprecise, e.g., only one PA (154) achieved the desired margin of error (Figure 2). This lack of precision primarily reflected small sample sizes.

One TMU (E) exhibited a positive annual rate of change during 1999-2006 and the associated CI achieved the desired margin of error. No negative trends were detected, but 14 TMUs had CI's that included $\lambda = 1$ with margins of error that exceeded 0.07. Thus, estimates of λ were imprecise and conclusions about "no change" at the TMU scale should be interpreted cautiously. Eighty-nine PAs had comparable data for estimating λ. Based on the 95% CI of λ, 1 PAs exhibited a negative rate of change, 11 PAs had positive rates of change, and 77 PAs had CIs that included $\lambda = 1$ (no change) (Table 2). However, only 6 of the 12 PAs with significant rates of changes had CIs that achieved the desired margin of error (i.e., estimates of change were imprecise). Likewise, only 5 of the 77 CIs that included $\lambda = 1$ achieved the desired bound. Thus, estimates of "no change" should be viewed cautiously at both the TMU and PA scale.

Wild turkey range in Minnesota has continued to expand as evidenced by the distribution of turkeys sighted by deer hunters during fall 2006 (Figure 3). Although some wild turkey observations were assumed to be game farm turkeys, turkey-distribution information is comparable to past surveys. Maps of turkey locations and number of turkeys observed by county and PA (Figure 4) are available upon request.

INTERPRETATIONS

Wild turkey population indices increased significantly in the northern third of their range (TMUs E, J, K, M, N, and O), possibly in response to consecutive mild winters. The survey lacked power to detect relatively small changes in HOWT (e.g., < ±14%) in the southern 2/3 of Minnesota's turkey range. The lack of a significant change should not be interpreted as population stability, but rather inability of the survey to detect small changes. Thus, the non-significant decrease in TMU A (Δ HOWT = -7.0) and all 4 subset PAs (Δ HOWT = -2.9 to –14.4) may have reflected a true population decline that the survey failed to detect or estimate precisely. Turkey populations are well established in TMU A, and the observed decline may represent normal fluctuation around a stable mean. For future surveys, we are considering analysis of population trends over >3 surveys to help reveal true population trends.

Population indices from this survey have been used to predict future population levels and allocate turkey-hunting permits to meet management objectives (Kimmel 2000). This report improved measures of uncertainty for population indices and estimated rates of change (previously assumed to be measured without error). These measures of uncertainty can be incorporated into turkey population models to realistically account for precision in management decisions. Options for dealing with uncertainty at the PA scale include managing at a broader scale (e.g., TMU) or looking for alternate techniques to interpret data at the PA scale.

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Table 1. Percent of deer hunters that observed wild turkeys (HOWT) by turkey management unit (TMU) in Minnesota, 1991-2006.

	2006			Average (1991-2002)			Absolute change from 2002			Mean rate of change (1999-2006)		
TMU	*n*	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	99% CI[a]	*n*	λ	99% CI[a]
A	469	64.1	2.2	7	65.7	1.7	980	-7.0	(-14.7, 0.7)	3	0.98	(0.73, 1.33)
B	350	60.7	2.7	7	62.4	3.3	664	-2.0	(-11.8, 7.8)	3	0.97	(0.33, 2.81)
C	524	68.8	2.1	7	60.9	3.3	1,049	3.4	(-4.1, 10.9)	3	0.99	(0.35, 2.83)
D	468	59.0	2.4	7	25.1	4.5	1,006	12.3	(4.1, 20.5)	3	1.06	(0.96, 1.16)
E	581	34.9	2.0	7	6.8	1.7	1,113	16.1*	(9.4, 22.8)	3	1.16*	(1.09, 1.23)
F	491	54.0	2.3	7	26.6	5.2	1,042	5.7	(-2.3, 13.7)	3	1.02	(0.82, 1.27)
G	538	34.9	2.1	7	7.0	2.3	1,082	8.1	(0.9, 15.3)	3	1.07	(0.86, 1.34)
H	629	51.2	2.1	7	23.3	5.0	1,183	2.5	(-5.2, 10.2)	3	1.02	(0.80, 1.30)
I	401	34.0	2.5	7	5.7	2.1	846	7.3	(-1.2, 15.8)	3	1.09	(0.36, 3.29)
J	540	30.4	2.0	7	3.9	1.8	1,083	13.8*	(7.1, 20.5)	3	1.11	(0.17, 7.18)
K[b]	613	50.4	2.0	7	8.9	3.0	1,321	19.5*	(12.5, 26.5)	3	1.10	(0.34, 3.50)
L[b]	430	42.8	2.5	7	3.6	1.7	891	13.8	(5.3, 22.3)	3	1.17	(0.07, 18.46)
M	468	23.3	2.2	7	4.4	0.9	969	10.5*	(3.5, 17.5)	3	1.20	(0.20, 7.09)
N[b]	581	29.9	2.0	7	3.0	1.0	1,113	17.4*	(11.0, 23.8)	3	1.16	(0.11, 12.86)
O	490	14.6	1.7	7	2.7	0.7	1,060	5.8*	(0.6, 11.0)	3	1.19	(0.09, 15.41)
P[c]	466	3.9	0.9									

[a] 85% family of confidence intervals (type I error rate controlled at $\alpha = 0.15$).

[b] Estimates of change should be interpreted cautiously because boundary changes occurred in 2006.

[c] New turkey management unit created in 2006.

* Desired level of precision was achieved.

Table 2. Percent of deer hunters that observed wild turkeys (HOWT) by turkey permit area (PA) in Minnesota, 1991-2006.

	2006			Average (1991-2002)			Absolute change from 2002			Mean annual rate of change			
PA	*n*	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	95% CI[a]	Period	*n*	λ	95% CI[a]
A-345	83	64.2	5.4	11	55.4	3.8	172	-14.4	(-28.1, -0.7)	1999-2006	3	0.98	(0.73, 1.32)
A-346	128	57.7	4.5	11	57.4	2.9	257	-5.1	(-17.3, 7.1)	1999-2006	3	0.98*	(0.97, 0.99)
A-348	88	64.0	5.4	11	73.2	2.2	218	-9.0	(-22.1, 4.1)	1999-2006	3	0.97*	(0.94, 1.01)
A-349	168	68.9	3.6	12	66.1	1.9	331	-2.9	(-12.7, 6.9)	1999-2006	3	0.99*	(0.98, 1.00)
B-344	350	60.7	2.7	11	60.4	3.0	664	-2.0	(-9.4, 5.4)	1999-2006	3	0.97	(0.78, 1.20)
C-341	184	62.4	3.6	11	47.4	5.3	365	8.2	(-2.0, 18.4)	1999-2006	3	0.97	(0.53, 1.77)
C-342	115	68.2	4.6	11	50.7	5.3	241	3.9	(-8.3, 16.1)	1999-2006	3	0.99	(0.84, 1.18)
C-343	133	74.0	3.8	11	48.1	5.9	260	-3.1	(-13.5, 7.3)	1999-2006	3	1.00	(0.90, 1.11)
C-347	90	74.9	4.9	11	63.2	2.2	181	2.4	(-10.9, 15.7)	1999-2006	3	1.01*	(0.98, 1.05)
D-227	173	57.8	3.8	9	16.9	3.8	382	22.4	(12.4, 32.4)	1999-2006	3	1.12*	(1.06, 1.18)
D-228	38	83.3	6.3	5	32.0	6.6	75	45.5	(25.5, 65.5)	1999-2006	3	1.08	(0.40, 2.93)
D-235	22	40.0	11.5	11	17.5	2.6	37	0.0	(-33.5, 33.5)	1999-2006	3	1.09	(0.49, 2.43)
D-236	115	59.3	4.7	10	28.5	5.9	312	4.0	(-7.6, 15.6)	1999-2006	3	1.04	(0.88, 1.22)
D-337	47	54.4	7.4	11	13.1	2.9	61	18.7	(-10.3, 47.7)	1999-2006	3	0.99	(0.38, 2.58)
D-338	68	57.4	6.5	11	28.5	5.0	134	-7.7	(-24.8, 9.4)	1999-2006	3	0.99	(0.85, 1.14)
E-152	15	12.5	11.1	2	33.3	17.8	22	-30.3	(-75.8, 15.2)	1999-2006	3	1.40	(0.01, 360.29)
E-156	115	19.7	3.7	2	5.8	3.9	210	11.3	(2.1, 20.5)	1999-2006	3	1.52	(0.21, 10.82)
E-157	179	39.7	3.7	7	4.2	2.3	342	23.1	(13.9, 32.3)	1999-2006	3	1.29	(0.86, 1.93)
E-159	92	45.0	5.5	7	4.9	2.4	195	24.6	(11.3, 37.9)	1999-2006	3	1.25	(0.92, 1.71)
E-183	99	23.3	4.3	2	8.6	0.6	184	15.1	(4.7, 25.5)	1999-2006	3	1.13	(0.40, 3.22)
E-225	83	52.2	5.8	9	12.3	3.5	162	9.1	(-6.6, 24.8)	1999-2006	3	1.11	(0.67, 1.84)
F-339	89	57.6	5.4	11	31.7	3.7	144	10.3	(-6.6, 27.2)	1999-2006	3	0.99	(0.58, 1.68)
F-461	81	48.8	5.6	11	20.9	4.8	202	-5.8	(-19.9, 8.3)	1999-2006	3	1.04	(0.58, 1.87)
F-462	84	50.0	5.8	11	37.2	4.9	179	-10.0	(-24.9, 4.9)	1999-2006	3	0.98	(0.82, 1.17)

Table 2. Continued.

PA	2006			Average (1991-2002)			Absolute change from 2002			Mean annual rate of change			
	n	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	95% CI[a]	Period	*n*	λ	95% CI[a]
F-463	42	45.7	8.1	11	13.6	3.2	91	17.2	(-3.2, 37.6)	1999-2006	3	1.04	(0.56, 1.96)
F-464	37	61.0	9.4	11	11.7	3.9	77	26.0	(2.5, 49.5)	1999-2006	3	1.09	(0.69, 1.71)
F-465	28	43.8	10.2	11	13.8	4.5	66	-3.5	(-29.0, 22.0)	1999-2006	3	1.01	(0.80, 1.27)
F-466	75	51.7	6.2	11	21.5	4.5	168	16.2	(0.7, 31.7)	1999-2006	3	1.01	(0.47, 2.13)
F-467	51	73.5	6.2	11	19.2	5.9	111	10.1	(-7.1, 27.3)	1999-2006	3	1.06	(0.86, 1.32)
G-446	38	41.4	8.3	8	10.0	5.0	78	8.9	(-12.9, 30.7)	1999-2006	3	1.02	(0.71, 1.46)
G-447	39	24.9	7.4	8	4.5	3.0	68	-2.7	(-24.5, 19.1)	1999-2006	3	1.05	(0.54, 2.03)
G-448	43	48.2	7.9	6	18.6	7.5	102	-2.6	(-22.6, 17.4)	2002-2006	2	0.99	NA
G-449	46	61.3	7.4	7	12.1	4.9	104	25.1	(5.9, 44.3)	2002-2006	2	1.14	NA
G-450	20	32.9	10.8	8	10.8	4.4	50	-7.1	(-34.5, 20.3)	1999-2006	3	0.99	(0.70, 1.39)
G-451	86	27.0	5.0	7	8.2	2.8	158	11.7	(-1.0, 24.4)	1999-2006	3	1.02	(0.38, 2.77)
G-454	80	19.2	4.6	7	8.7	3.1	154	-2.4	(-15.3, 10.5)	1999-2006	3	0.99	(0.87, 1.11)
G-456	36	23.9	7.9	10	6.2	1.3	88	16.2	(-0.9, 33.3)	1999-2006	3	1.16	(0.41, 3.28)
G-457	45	38.8	7.7	7	9.7	2.5	75	18.8	(-2.0, 39.6)	1999-2006	3	1.18*	(1.14, 1.21)
G-458	43	29.9	7.1	7	4.2	1.2	77	24.0	(7.9, 40.1)	1999-2006	3	1.21	(0.23, 6.30)
G-459	59	47.9	6.8	11	13.8	3.6	125	13.1	(-4.5, 30.7)	1999-2006	3	1.05	(0.80, 1.37)
H-431	41	57.3	7.9	11	7.2	2.1	94	29.0	(9.4, 48.6)	1999-2006	3	1.16	(0.92, 1.45)
H-433	78	32.1	5.7	7	10.7	3.5	161	4.4	(-10.3, 19.1)	1999-2006	3	1.09	(0.70, 1.71)
H-440	108	53.1	4.9	7	29.6	6.4	198	0.9	(-13.2, 15.0)	1999-2006	3	1.01*	(0.97, 1.04)
H-442	156	52.2	4.1	11	31.8	4.4	283	-2.9	(-14.7, 8.9)	1999-2006	3	0.97	(0.87, 1.09)
H-443	79	59.1	5.8	9	25.4	7.0	145	1.5	(-15.0, 18.0)	1999-2006	3	1.00*	(0.93, 1.07)
I-425	165	52.9	4.2	7	21.0	5.8	345	7.4	(-3.6, 18.4)	1999-2006	3	1.02	(0.91, 1.15)
I-426	115	19.2	3.7	8	9.1	3.0	294	-0.9	(-10.3, 8.5)	1999-2006	3	1.00	(0.92, 1.09)
I-427	116	33.8	4.5	9	9.1	3.2	175	-3.5	(-18.6, 11.6)	1999-2006	3	1.07	(0.46, 2.49)

Table 2. Continued.

PA	2006			Average (1991-2002)			Absolute change from 2002			Mean annual rate of change			
	n	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	95% CI[a]	Period	*n*	λ	95% CI[a]
I-428	168	44.3	4.0	9	11.0	3.6	330	9.7	(-1.1, 20.5)	1999-2006	3	1.13	(0.65, 1.98)
J-154	143	10.8	2.7	2	1.9	0.3	264	9.1*	(3.4, 14.8)	1999-2006	3	1.21	(0.25, 5.92)
J-221	69	51.4	6.2	8	6.1	2.7	141	26.4	(10.7, 42.1)	1999-2006	3	1.15	(0.86, 1.55)
J-222	77	39.4	5.8	8	4.5	1.9	138	14.8	(-0.9, 30.5)	1999-2006	3	1.26	(0.45, 3.56)
J-223	50	75.1	6.3	8	15.0	6.1	97	17.7	(-1.1, 36.5)	1999-2006	3	1.09	(0.95, 1.24)
J-224	16	50.9	13.9	5	16.4	9.8	27	-21.9	(-61.6, 17.8)	1999-2006	3	1.12	(0.18, 6.85)
J-242	46	5.7	3.7	1	5.6	NA	118	0.1	(-8.9, 9.1)	2002-2006	2	1.00	NA
J-247	62	15.7	5.1	2	3.6	1.3	117	13.9	(3.1, 24.7)	1999-2006	3	1.19	(0.11, 13.07)
J-249	77	32.3	5.3	2	13.0	2.0	181	17.9	(5.6, 30.2)	1999-2006	3	1.17	(0.85, 1.61)
K-215	184	55.7	3.8	8	14.9	5.2	429	19.8	(10.2, 29.4)	1999-2006	3	1.09	(0.94, 1.28)
K-218[b]	117	61.5	4.6										
K-219	88	41.9	5.6	11	10.1	0.8	161	24.1	(10.0, 38.2)	1999-2006	3	1.19	(0.87, 1.61)
K-229	39	36.7	8.1	5	14.2	5.1	76	4.2	(-17.8, 26.2)	1999-2006	3	1.08	(0.72, 1.63)
K-417[b]	118	37.8	4.5										
L-213[b]	38	47.7	8.3										
L-239	151	52.6	4.4	7	6.6	3.0	332	28.2	(17.6, 38.8)	1999-2006	3	1.22	(1.09, 1.37)
L-412[b]	117	31.0	4.3										
L-416	94	38.6	5.2	7	9.5	4.0	156	9.6	(-5.7, 24.9)	1999-2006	3	1.07*	(1.05, 1.10)
M-420	89	25.5	4.8	7	7.8	2.0	193	8.2	(-3.8, 20.2)	1999-2006	3	1.41	(0.16, 12.57)
M-421	66	23.6	5.5	7	1.6	0.4	170	22.7	(11.9, 33.5)	1999-2006	3	1.35	(0.08, 23.85)
M-422	55	48.7	7.1	7	12.4	3.9	123	17.8	(-0.0, 35.6)	1999-2006	3	1.12*	(1.07, 1.18)
M-423	93	11.4	3.4	7	3.9	1.4	203	-0.4	(-9.4, 8.6)	1999-2006	3	1.17	(0.27, 5.12)
M-424	163	20.1	3.3	7	4.2	1.0	278	10.6	(2.2, 19.0)	1999-2006	3	1.20*	(1.12, 1.27)
N-214	63	56.8	6.5	7	4.5	1.7	128	39.9	(24.2, 55.6)	1999-2006	3	1.32	(1.20, 1.47)

Table 2. Continued.

PA	2006			Average (1991-2002)			Absolute change from 2002			Mean annual rate of change			
	n	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	95% CI[a]	Period	*n*	λ	95% CI[a]
N-240	42	44.2	8.0	7	6.1	2.3	91	21.7	(2.1, 41.3)	1999-2006	3	1.17	(1.06, 1.29)
N-241	59	35.0	6.4	6	2.1	0.6	85	27.3	(11.2, 43.4)	2002-2006	2	1.43	NA
N-243	50	34.7	7.0	2	6.2	2.2	101	26.8	(11.1, 42.5)	1999-2006	3	1.36	(0.91, 2.02)
N-244	109	29.8	4.5	7	4.4	2.4	201	10.2	(-1.8, 22.2)	1999-2006	3	1.14	(0.89, 1.45)
N-245	94	8.5	3.3	2	5.6	1.7	201	2.0	(-6.0, 10.0)	1999-2006	3	1.14	(0.61, 2.14)
N-246	134	20.4	3.8	2	5.7	0.2	242	14.9	(6.3, 23.5)	1999-2006	3	1.18	(0.39, 3.57)
N-248	26	49.1	10.7	2	19.6	5.5	60	25.5	(0.2, 50.8)	1999-2006	3	1.21	(1.06, 1.39)
O-201	10	7.1	10.6	1	0.0	NA	18	7.1	NA	2002-2006	2	1.69	NA
O-202	20	3.0	6.2	2	1.7	0.8	69	1.0	(-11.9, 13.9)	1999-2006	3	1.21	(0.42, 3.46)
O-203	8	15.4	12.9	1	20.0	NA	13	-4.6	(-53.2, 44.0)	2002-2006	2	0.94	NA
O-204	36	9.0	6.9	2	4.6	4.0	85	0.9	(-14.8, 16.6)	1999-2006	3	1.37	(0.11, 17.78)
O-206	26	3.0	4.8	2	4.3	0.6	77	-0.9	(-11.7, 9.9)	1999-2006	3	0.94	(0.83, 1.06)
O-207	25	22.1	10.9	2	7.3	2.7	56	12.5	(-11.2, 36.2)	1999-2006	3	1.24	(1.04, 1.47)
O-208	17	18.5	10.7	2	0.0	0.0	39	18.5	NA	1999-2006	3	1.56	(0.11, 22.02)
O-209	32	13.5	6.5	2	3.0	1.9	62	13.5	NA	1999-2006	3	1.19	(0.02, 92.01)
O-210	67	8.4	3.9	2	1.5	0.6	108	5.9	(-3.1, 14.9)	1999-2006	3	1.24	(0.89, 1.73)
O-251	14	34.5	14.7	2	5.4	4.5	36	25.4	(-6.0, 56.8)	1999-2006	3	1.65	(0.32, 8.41)
O-252	12	39.0	17.4	2	29.2	2.9	20	14.0	(-34.7, 62.7)	1999-2006	3	1.04	(0.54, 1.97)
O-253	20	41.5	11.8	7	6.0	4.2	80	8.2	(-17.9, 34.3)	1999-2006	3	1.26	(0.27, 5.96)
O-254	12	0.0	0.0	2	15.6	6.7	23	-27.3	NA	1999-2006	3	0.68	(0.01, 34.35)
O-255	26	7.1	6.1	2	2.2	0.4	64	4.5	(-8.6, 17.6)	1999-2006	3	1.16	(0.73, 1.85)
O-256	29	13.8	7.2	7	2.9	0.6	57	10.3	(-5.4, 26.0)	1999-2006	3	1.17	(0.35, 3.92)
O-257	20	1.9	4.1	7	1.8	0.4	46	-1.9	(-12.9, 9.1)	1999-2006	3	0.98	(0.39, 2.49)
O-258	26	18.7	10.0	7	4.4	1.2	52	11.0	(-11.1, 33.1)	1999-2006	3	1.26	(1.00, 1.58)

Table 2. Continued.

PA	2006			Average (1991-2002)			Absolute change from 2002			Mean annual rate of change			
	n	HOWT	SE	*n*	HOWT	SE	*n*	Δ HOWT	95% CI[a]	Period	*n*	λ	95% CI[a]
O-259	18	29.5	12.4	7	2.6	1.4	41	12.1	(-16.7, 40.9)	1999-2006	3	1.60	(0.08, 32.54)
O-297	24	21.9	8.9	6	2.8	1.3	33	21.9	NA	1999-2006	3	1.59	(0.10, 26.03)
O-298	46	13.2	5.2	2	3.2	3.0	79	7.1	(-6.0, 20.2)	1999-2006	3	1.44	(0.26, 8.01)
P-170[c]	96	3.1	1.8										
P-172[c]	90	3.3	1.9										
P-174[c]	52	1.9	1.9										
P-181[c]	55	3.6	2.5										
P-182[c]	10	22.3	13.7										
P-184[c]	101	4.8	2.2										
P-197[c]	39	0.0	0.0										
P-199[c]	8	13.4	12.8										
P-287[c]	12	6.2	9.6										

[a] Confidence intervals are not adjusted for multiple comparisons, i.e., $\alpha \geq 0.25$.

[b] HOWT estimates are not comparable among survey years because of boundary changes.

[c] New turkey management unit and permit areas in 2006.

* Desired level of precision was achieved.

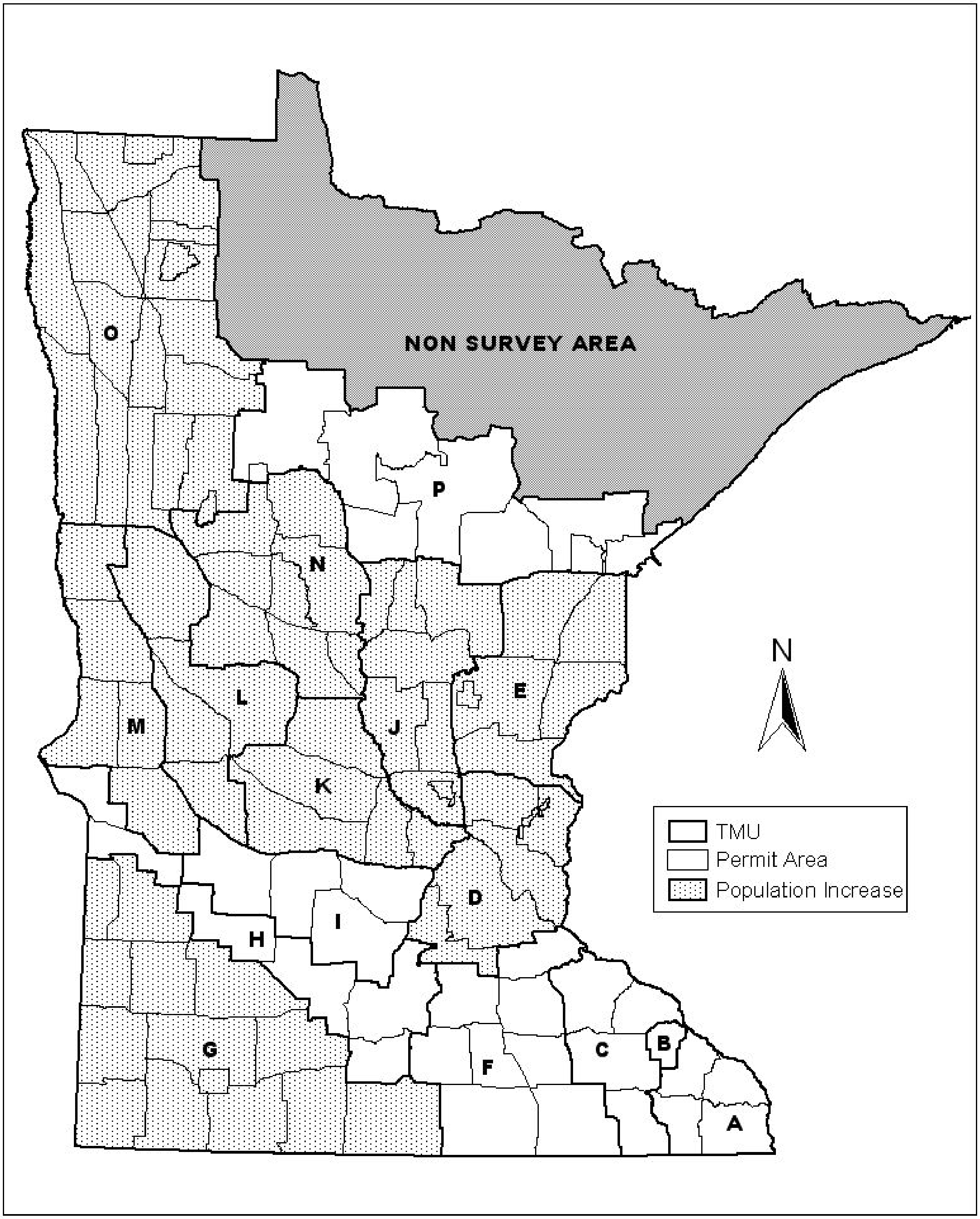


Figure 1. Location of turkey management units (TMUs) used for the wild turkey survey in Minnesota, fall 2006. Shaded TMUs had a significant increase in HOWT (population index) from the 2002 survey.

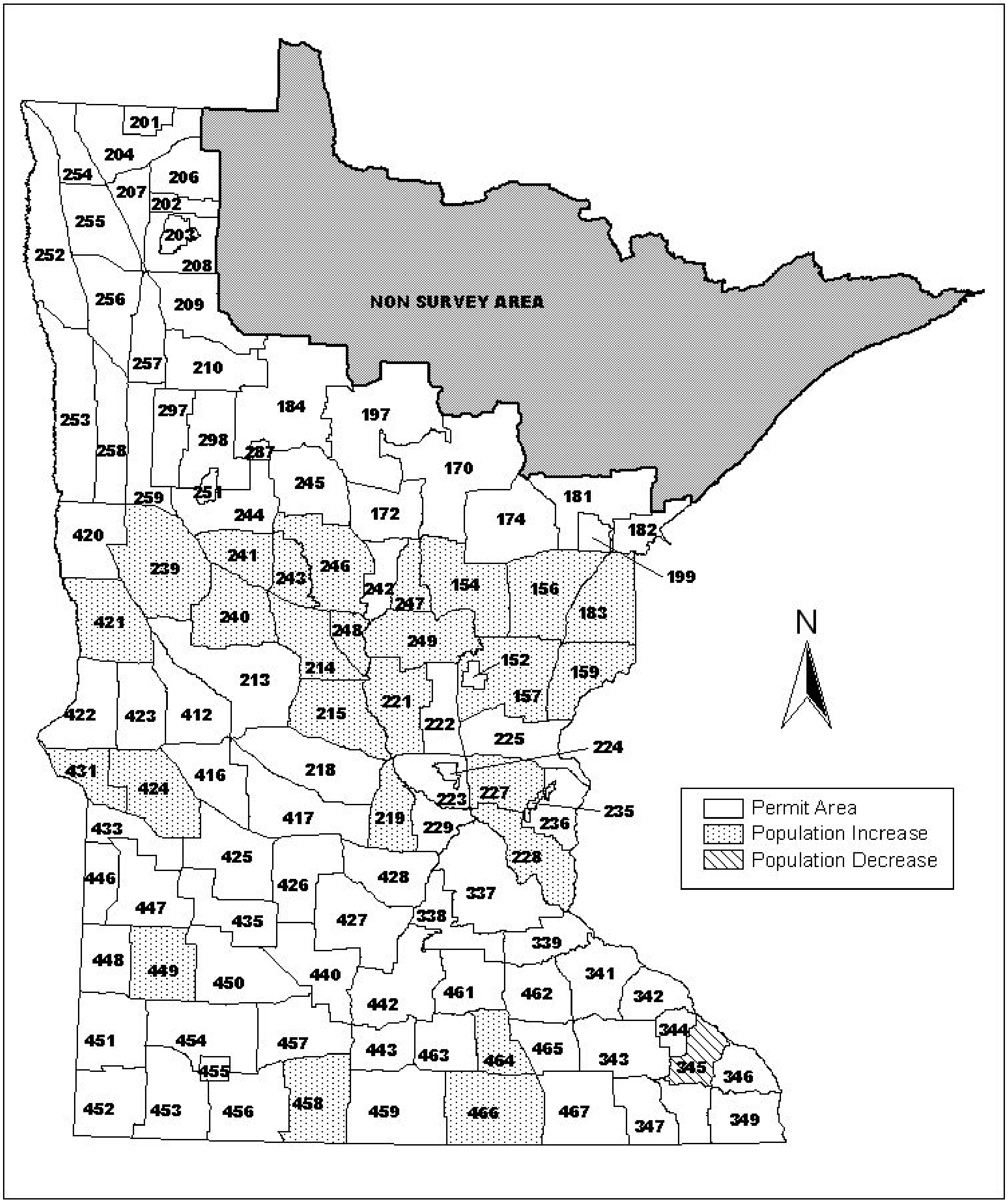


Figure 2. Location of deer hunting permit areas (PAs) used for the wild turkey survey in Minnesota, fall 2006. Shaded PAs had a significant increase in HOWT (population index) and barred PAs had a significant decrease in HOWT from the 2002 survey.

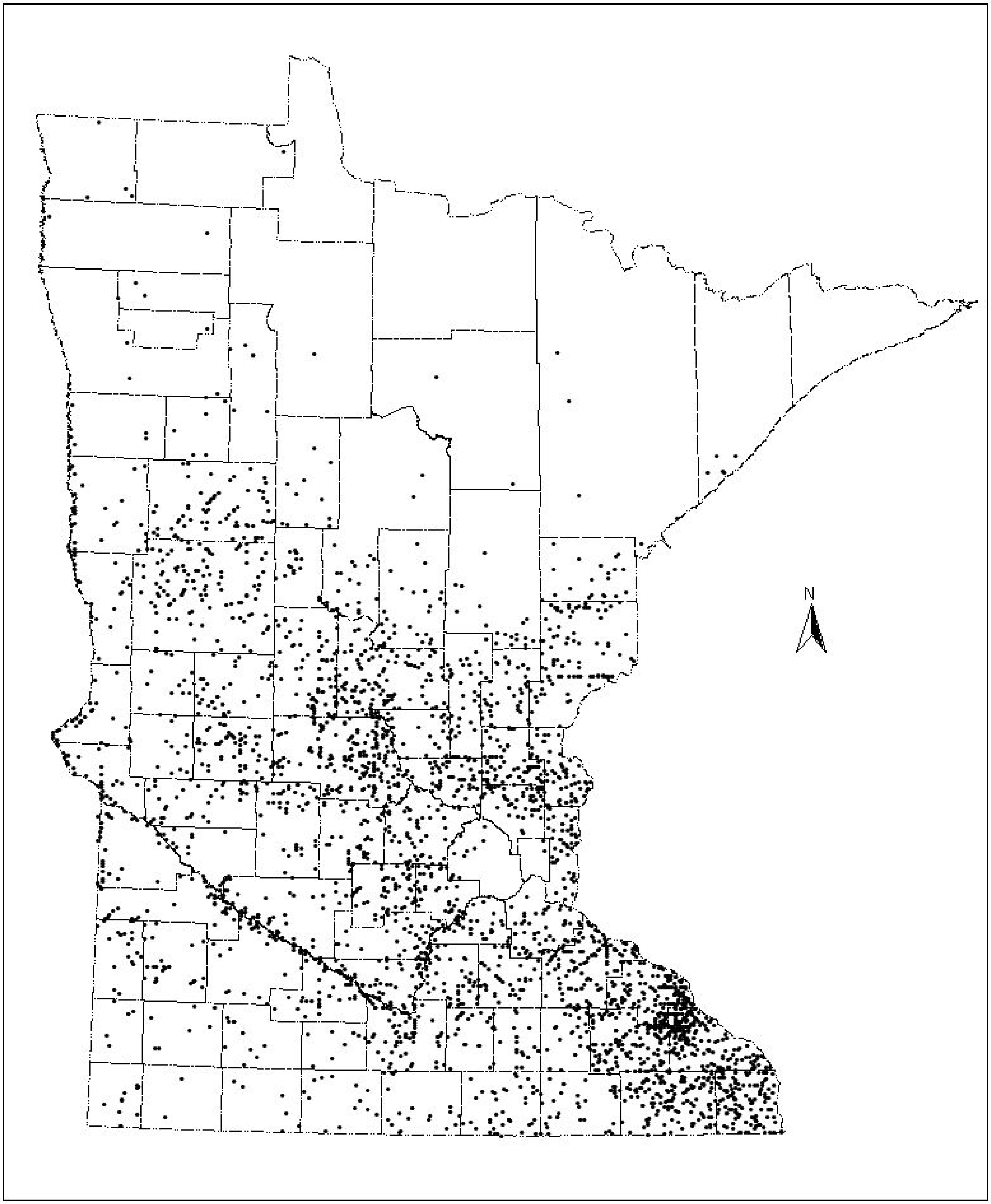
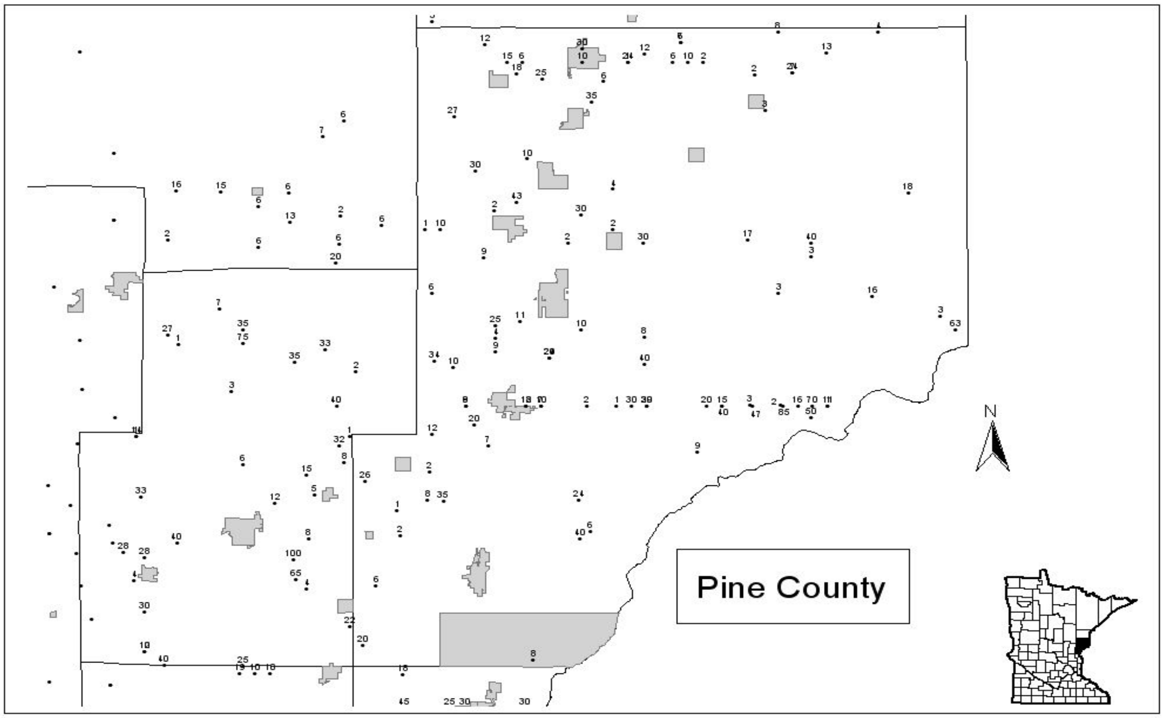
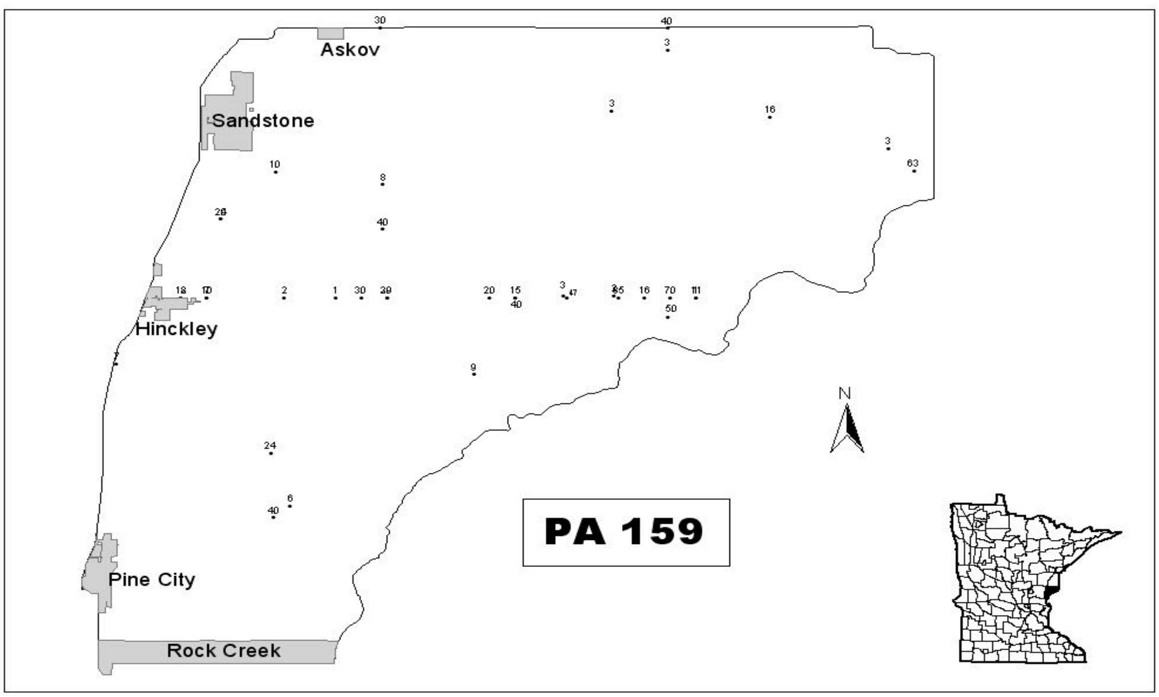


Figure 3. Distribution of wild turkey sightings based on a survey of regular firearm deer permit holders in Minnesota, fall 2006.



Pine County turkey sightings from a survey of regular firearm deer permit holders. Minnesota, November 2006.

Wild Turkey Sightings
Fall 2006



Permit Area 159 turkey sightings from a survey of regular firearm deer permit holders. Minnesota, November 2006.

Wild Turkey Sightings
Fall 2006

Figure 4. Example maps of distribution and number of wild turkey sightings by county (top) and by permit area (bottom) based on a survey of regular firearm deer permit holders in Minnesota, fall 2006.

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

Nick Reindl, Wildlife Damage Extension Specialist
Steve Benson, Wildlife GIS Coordinator

Wildlife damage complaint information is collected statewide from wildlife managers. The 2006 information was compiled by MIS – GIS and summarized by the Wildlife Depredation Specialist, 1601 Minnesota Drive, Brainerd, MN 56401.

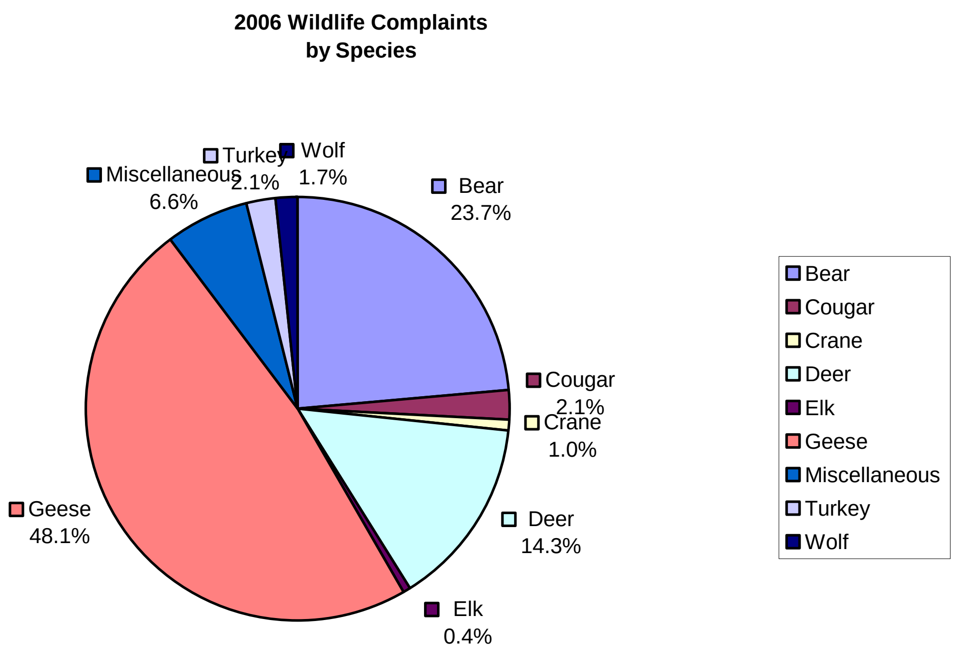


Figure 1. Wildlife complaints by species for the year 2006, in Minnesota.

Wildlife managers recorded a total of 907 wildlife complaints in 2006, up 39.8% when compared to the 2005 total of 649 complaints. Three species; black bear, white-tailed deer, and Canada geese account for 777, (85.7%) of the complaints received (Figure1). Five other species of special interest for wildlife damage; cougar, elk, turkey, sandhill crane, and wolf comprise an additional 66, (7.3 %) of the recorded complaints. Fourteen species are represented in 60 (6.6 %) of the miscellaneous complaints received.

The expenditure for depredation materials during FY06 was $75,333 (5% bear, 83% deer, 12% goose). The average expenditure for the previous six-year period, 2000-2005, was $79,660. During calendar year 2006 materials assistance for permanent deer exclusion fences was provided to fourteen growers; seven vegetable, one orchard, one strawberry, three grape, two tree nursery. Exclusion techniques included the installation of 11 woven-wire and three energized permanent deer fences.

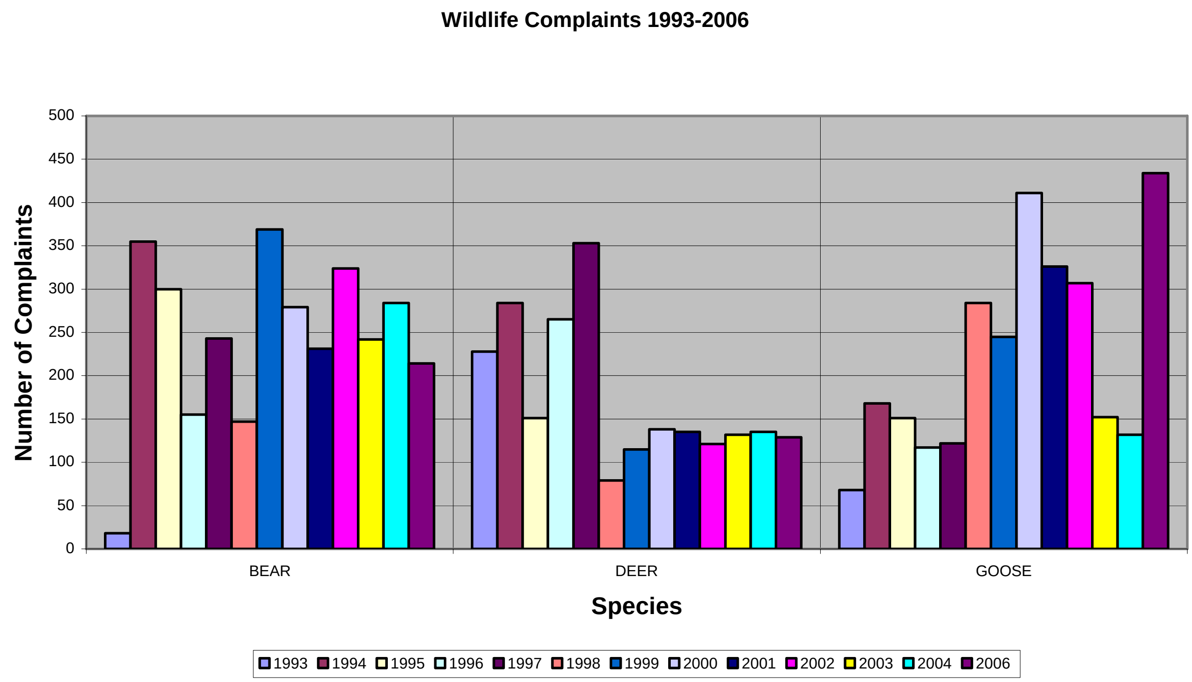


Figure 2. Number of wildlife complaints recorded by bear, deer & geese from 1993-2006, in Minnesota.

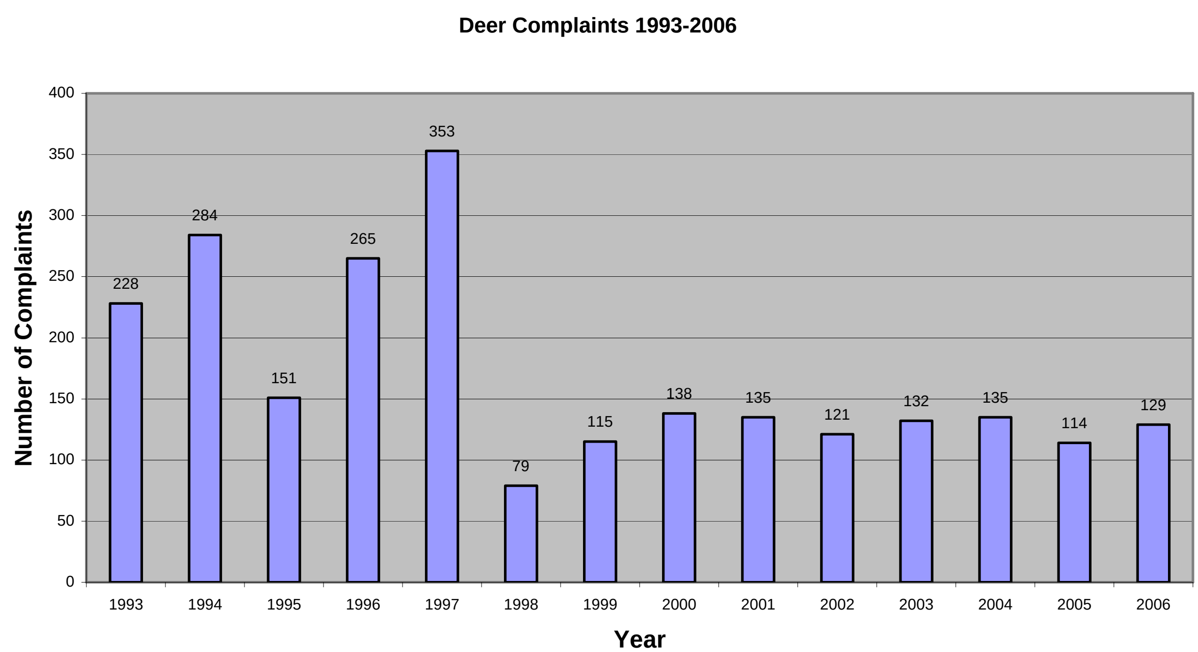


Figure 3. Number of deer complaints from 1993-2006, in Minnesota.

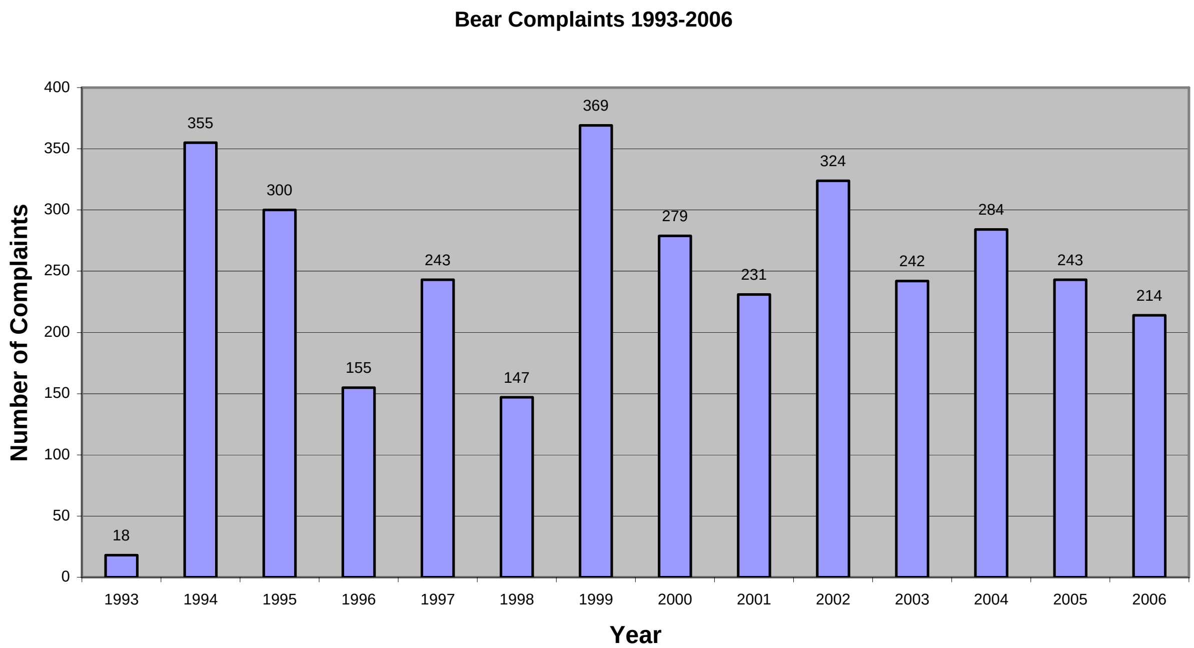


Figure 4. Number of bear complaints from 1993-2006 in Minnesota.

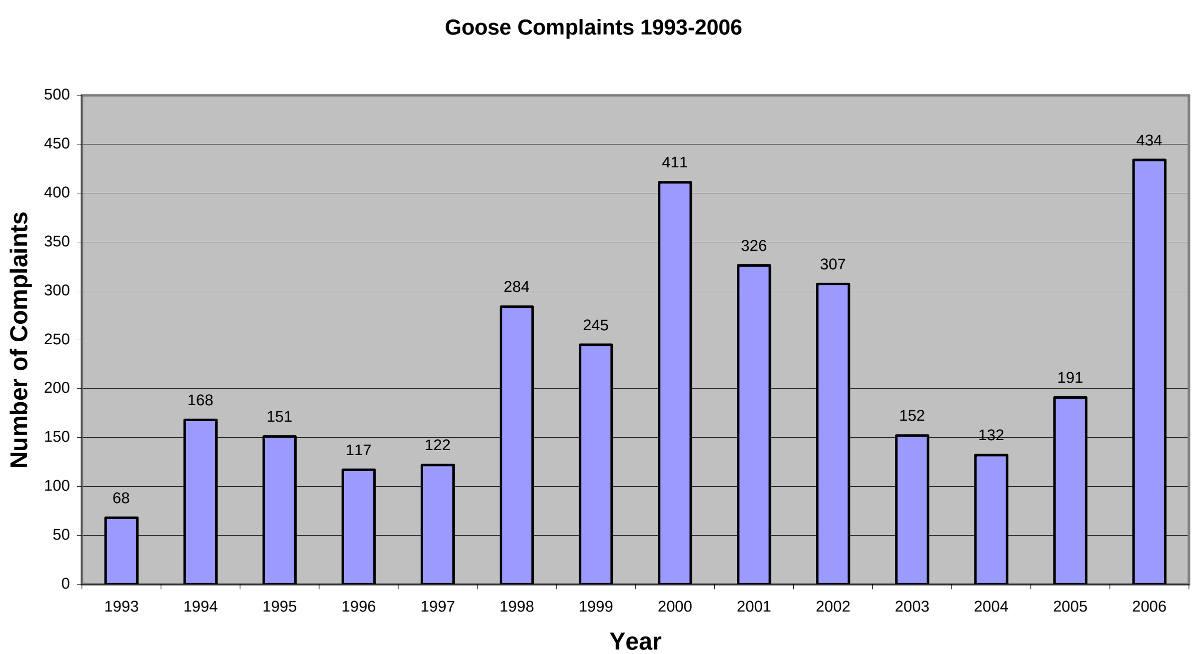


Figure 5. Number of goose complaints from 1993-2006, in Minnesota.

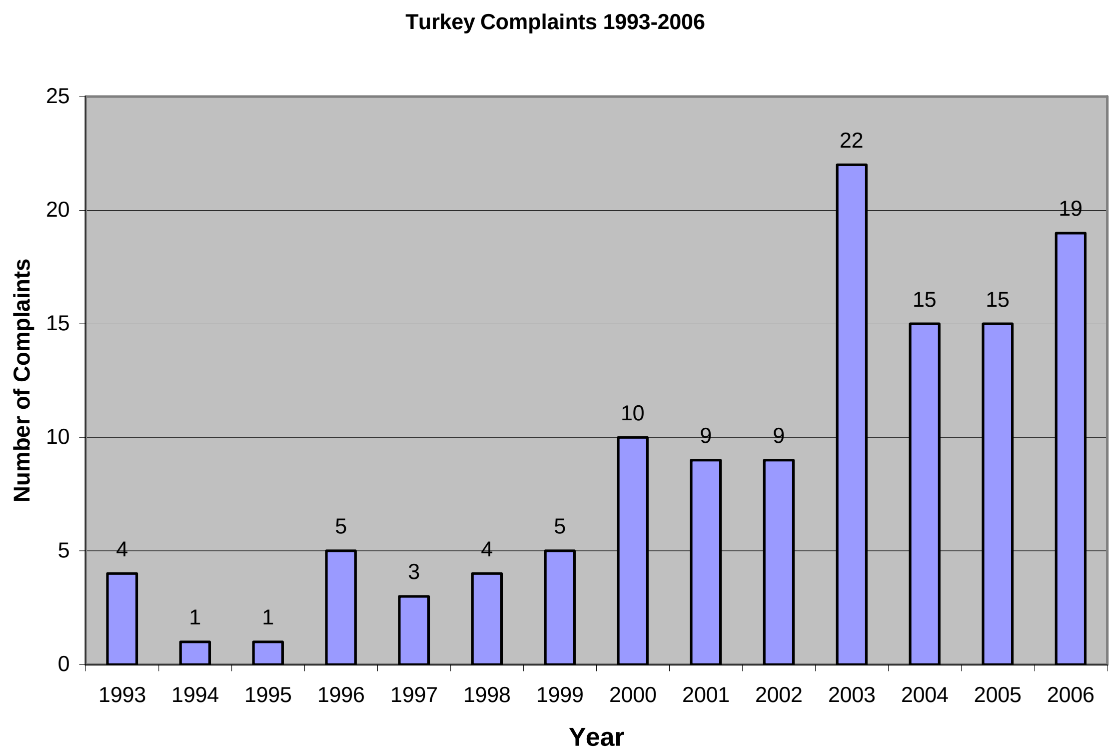


Figure 6. Number of turkey complaints from 1993-2006, in Minnesota.

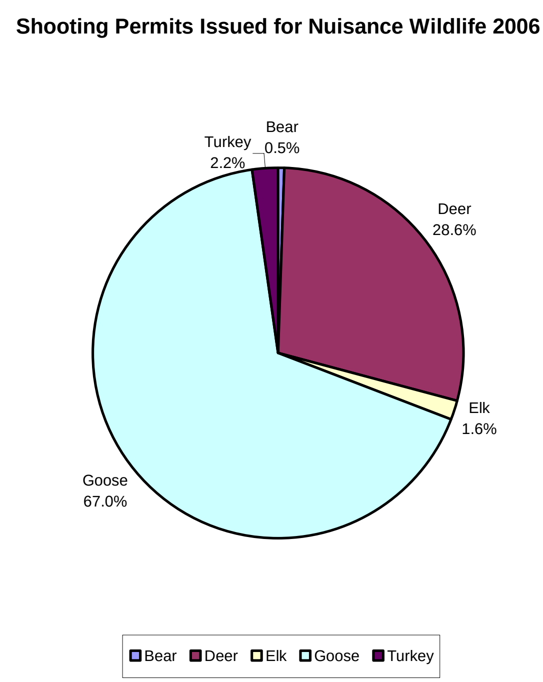


Figure 7. Shooting permits issued for nuisance wildlife control in Minnesota for 2006.

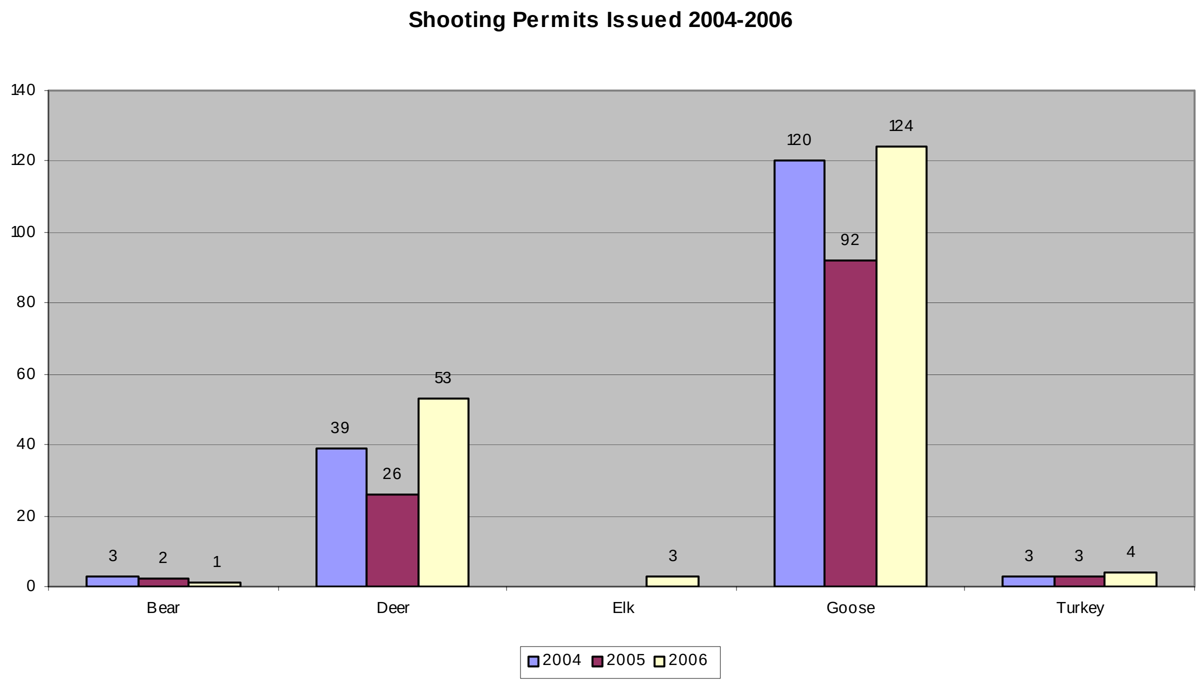


Figure 8. Shooting permits issued for nuisance wildlife control in Minnesota for 2004-2006.

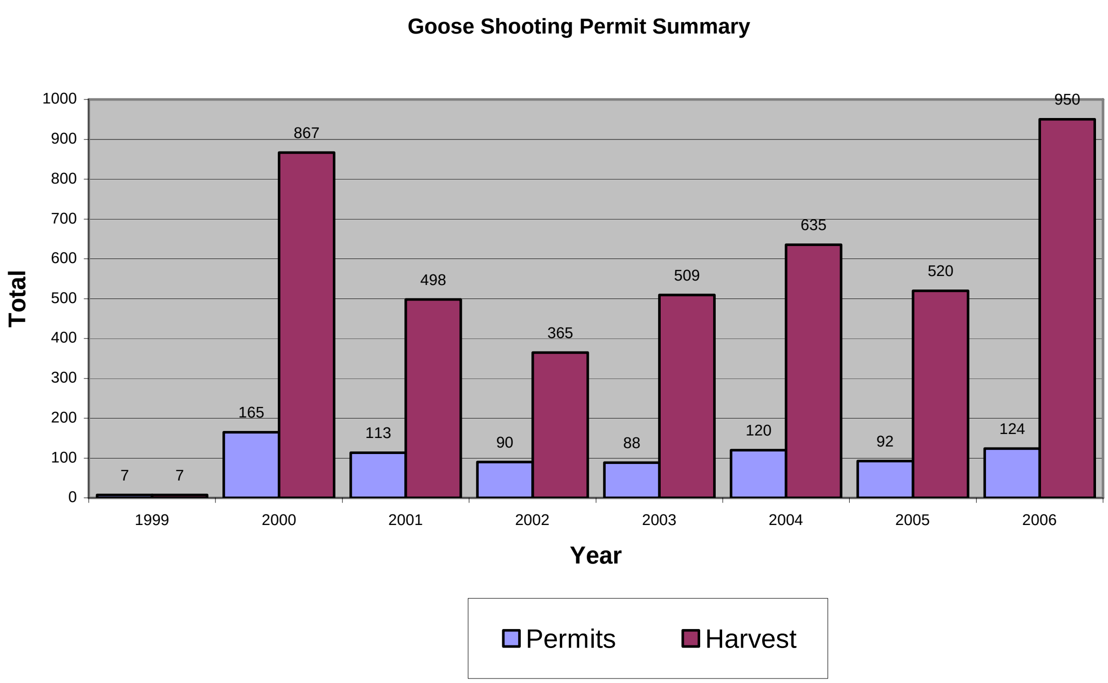


Figure 9. Comparison of nuisance goose shooting permits and harvest in Minnesota 1999-2006.

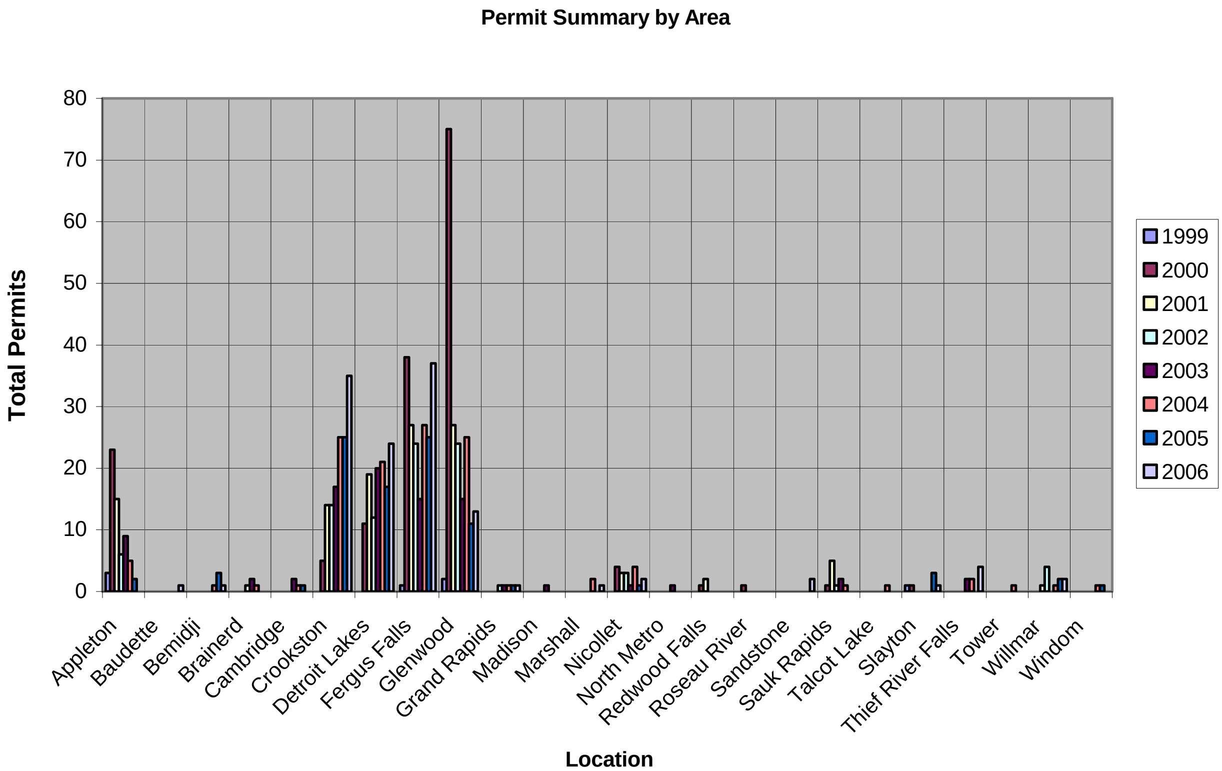


Figure 10. Nuisance goose permits issued by area wildlife offices in Minnesota 1999-2006.

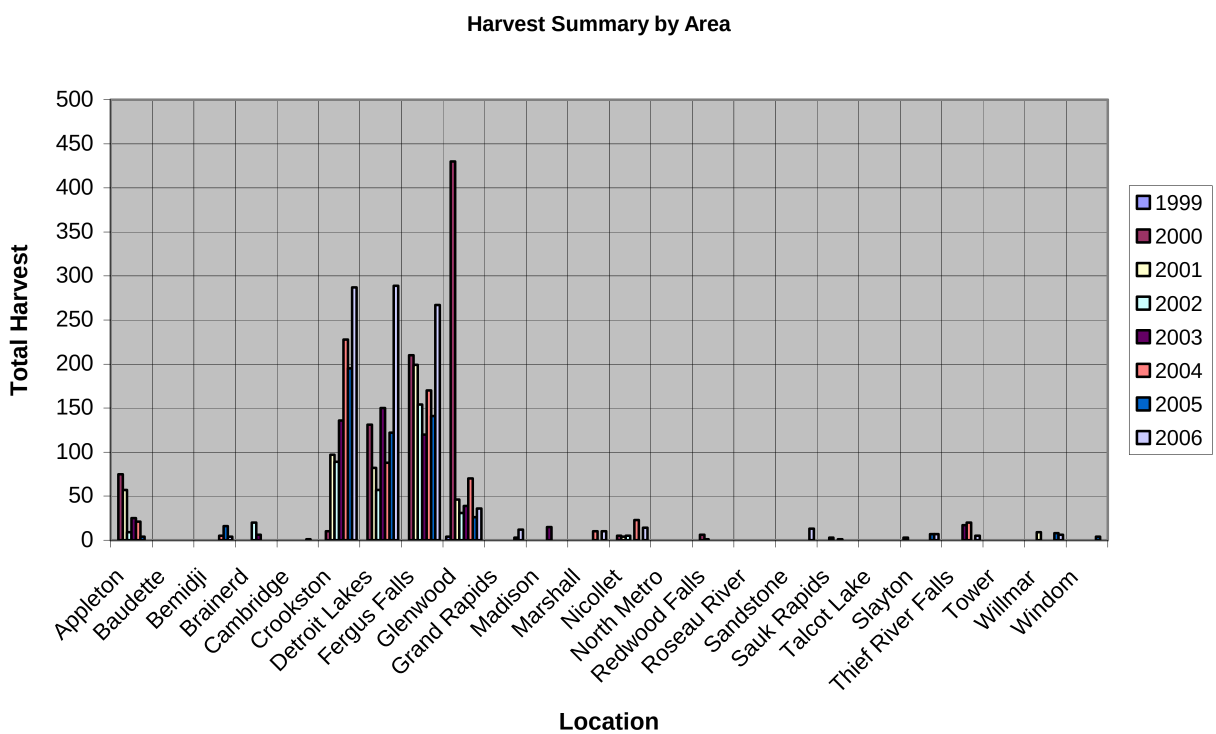
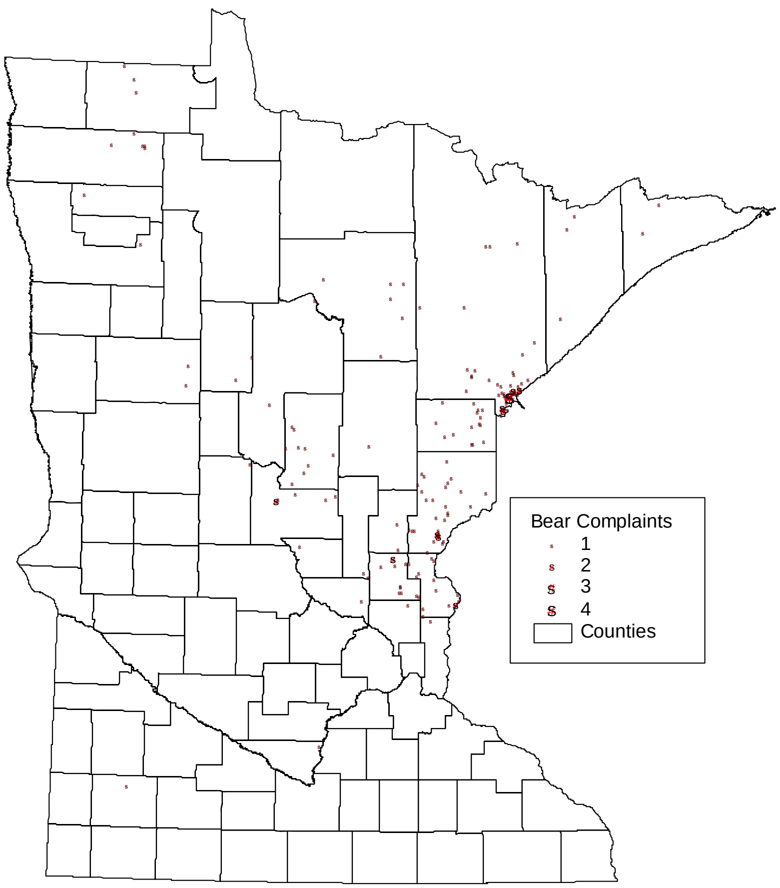
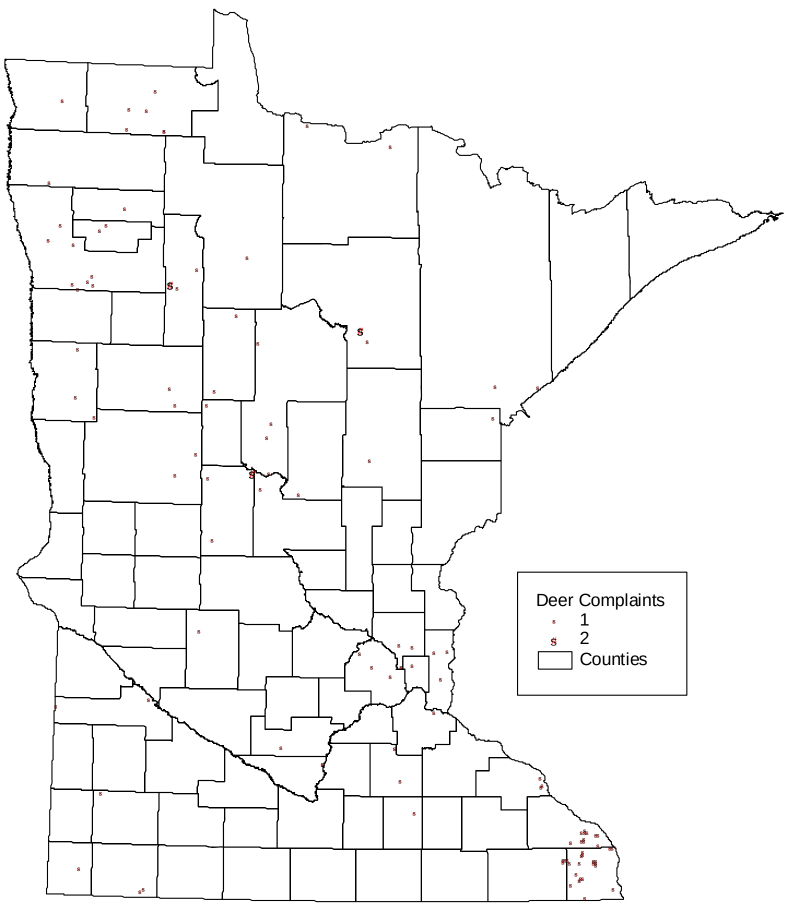


Figure 11. Nuisance goose harvest by area wildlife office in Minnesota 1999-2006.



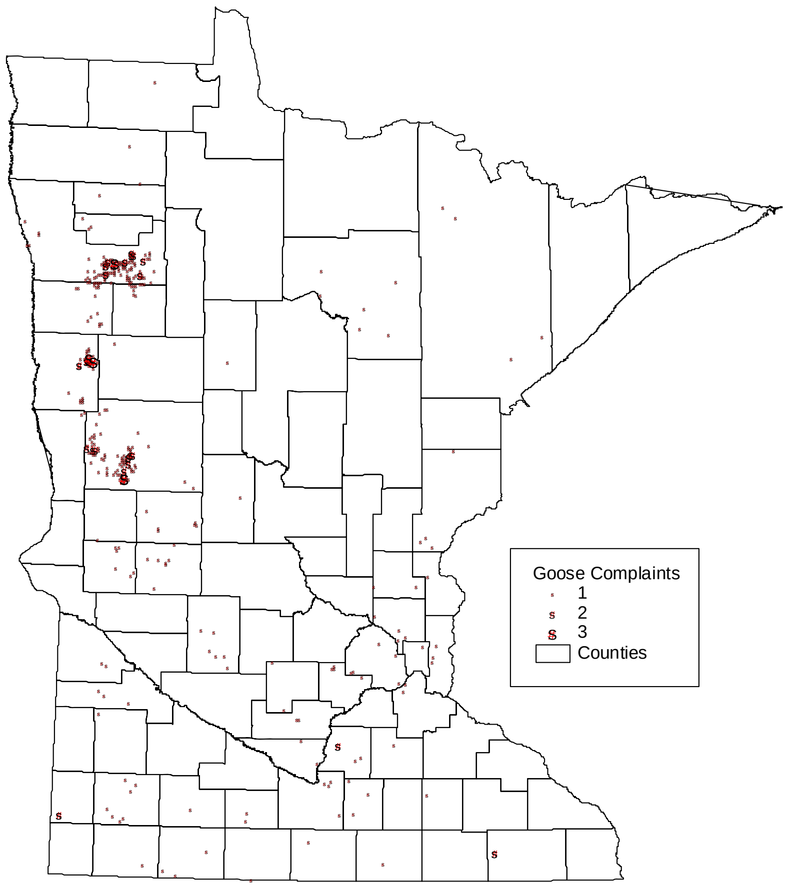
Location of bear damage complaints recorded in 2006 (n = 183)

Figure 12. Location of bear damage complaints in 2006 (n=183) 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.



Location of deer damage complaints recorded in 2006 (n = 113)

Figure 13. Location of deer damage complaints in 2006 (n=183) 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.



Location of goose damage complaints recorded in 2006 (n = 394)

Figure 14. Location of goose damage complaints in 2006 (n=183) Note: number of points mapped differs from the total number of complaints received due to insufficient location information provided in the complaint reports to accurately map.

CARNIVORE SCENT STATION SURVEY

AND

WINTER TRACK INDICES

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

Furbearer Winter Track Survey Summary, 2006

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

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

In winter, tracks of carnivores are readily observable following snowfall. Starting in 1991, Minnesota initiated a carnivore snow track survey in the northern portion of the State. The survey's primary objective is to use a harvest-independent method to monitor distribution and population trends of fisher and marten, 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, 54 track survey routes are distributed across the northern portion of the state (Figure 1). Each route is 10 miles long and follows secondary roads or trails. Route locations were subjectively determined based on availability of suitable roads/trails, but were chosen, where possible, to represent the varying forest habitat conditions in northern Minnesota. For data recording, each 10-mile route is divided into 20 0.5-mile segments.

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

Currently, 3 summary statistics (2 graphs) are presented for each species. First, I compute the percentage of 0.5-mile segments with species presence after removing any duplicates (e.g., if the same fox clearly traverses 2 adjacent 0.5-mile segments along the road, and it was the only 'new' fox 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 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 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 fox and coyotes which may start traveling as breeding pairs in winter, the approximate equivalence of these 2 indices will still be true if average (detected) group sizes are similar across years. However, the solitary tendencies in some species are not absolute, potential abundance (in relation to survey plot size) varies across species, and for wolves, pack size may vary annually. For these reasons, as well as to provide an intuitive count metric, both indices are currently presented. Because snowshoe hares are tallied only as present/absent, the 2 indices will by definition be equivalent. Hare survey data is also obtained via counts of animals observed on grouse drumming count surveys conducted in spring. Data for both the spring and winter indices are presented for comparison.

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

RESULTS

Forty of the 54 routes were completed this year (Figure 2). Total snow depths averaged 4" for completed routes, with surveys taking an average of 2.5 hours to complete. Survey routes were completed between Dec. 5th and Mar. 8th this year, with a mean survey date of Jan. 12th.

Track indices for both fisher and marten remained stable compared to 2005 (Figure 3). However, the distribution index (% of routes with presence) for marten declined 13% to its' lowest level (40%; tied with 2002) since the survey began (Figure 3). Considering both marten indices, this suggests that marten density may have increased around some routes, but their distribution was not as widespread compared to previous years. Fishers were detected on 67 % of the routes, similar to their long-term average.

In spite of a projected record harvest, bobcat track and distribution indices increased to record levels (Figure 3). While the cause of the apparent multi-year increase in bobcats is not entirely clear, it is likely a result of improved survival and reproduction stemming from mild winters, and increased hare numbers since the mid-90s. The number of wolf tracks recorded per route increased slightly (2.5 to 2.9), but track presence was recorded in slightly fewer segments (7.4% versus 7%). Wolves were detected on 80% of survey routes, compared to 72% last year (Figure 3). Following an upswing through 1999, track indices for red fox subsequently declined through 2004, but appear to be rebounding (Figure 3). They remain one of the most ubiquitous species recorded on the survey, with presence detected on 90% of the routes this year. Coyote track indices have increased in recent years, but no long-term trends are apparent, and they remain one of the least detected species on the survey (Figure 3). While weasel track indices declined to their lowest level last year, they increased this year, and are best characterized as stable with occasional 'irruptions' in density (Figure 3). Based on known cyclic tendencies, I continue to expect a decline in snowshoe hare indices. While spring indices did decline this year, winter indices increased, and no multi-year decline is yet apparent in either index (Figure 3).

DISCUSSION

Reliable interpretation of changes in track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000). Because this remains an untested assumption, caution is warranted when interpreting changes, particularly annual changes of low to moderate magnitude, or short-term trends.

Now that electronic data entry for all previous years is complete, I have begun the process of generating confidence intervals for track indices. While the process is not yet complete, confidence intervals should be available soon. With the possible exception of bobcat indices, it is unlikely that any of this year's observed changes were statistically significant. While we have added several track routes in recent years, I continue to review the adequacy of survey route sample size and distribution, and hope to initiate research to evaluate track survey assumptions and possible approaches for estimating, and hence correcting for, any differences in the probability of detecting animals across years (e.g., MacKenzie et al. 2004).

ACKNOWLEDGEMENTS

I wish to thank all those who participated in this year's survey, including DNR field staff, tribal participants from the Red Lake and Grand Portage Bands, and Tamarac National Wildlife Refuge.

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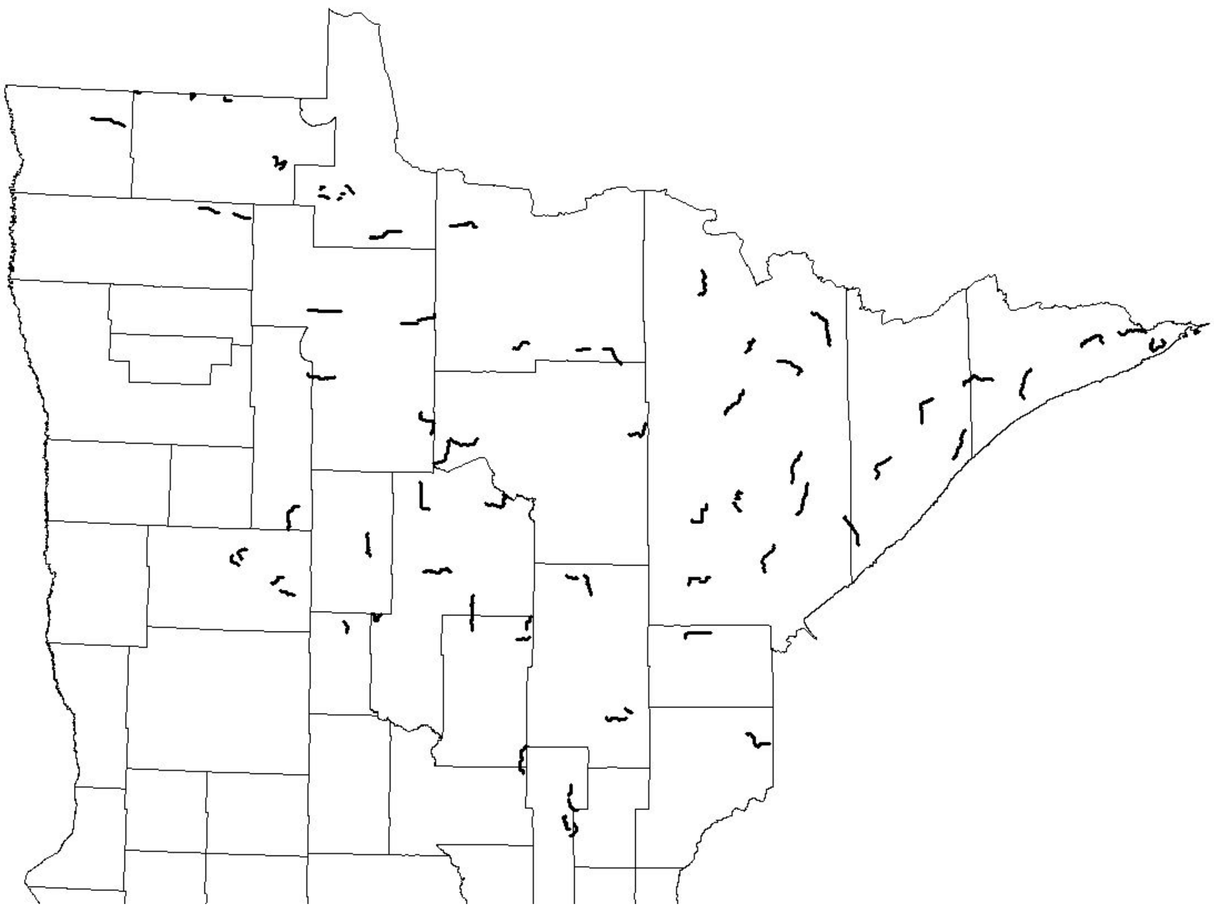

Figure 1. Locations of established furbearer winter track survey routes.

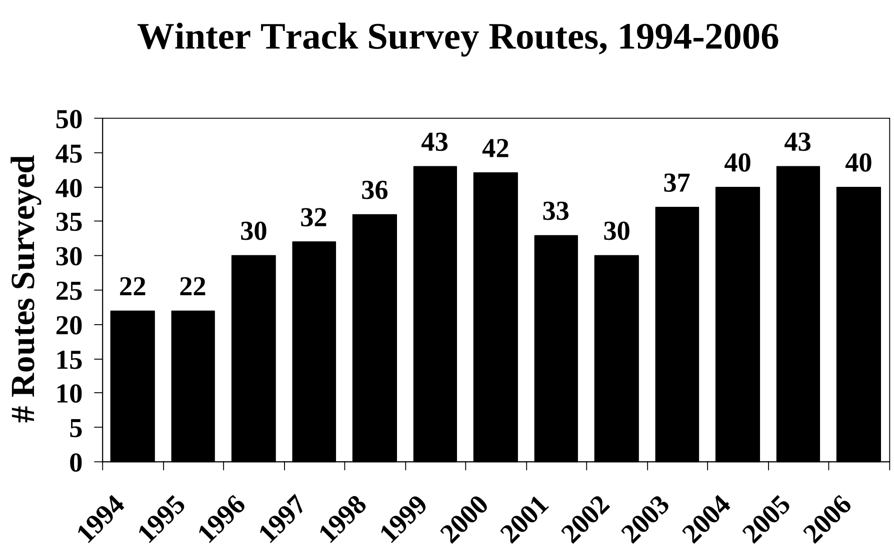

Figure 2. Number of winter track routes surveyed, 1994-2006.

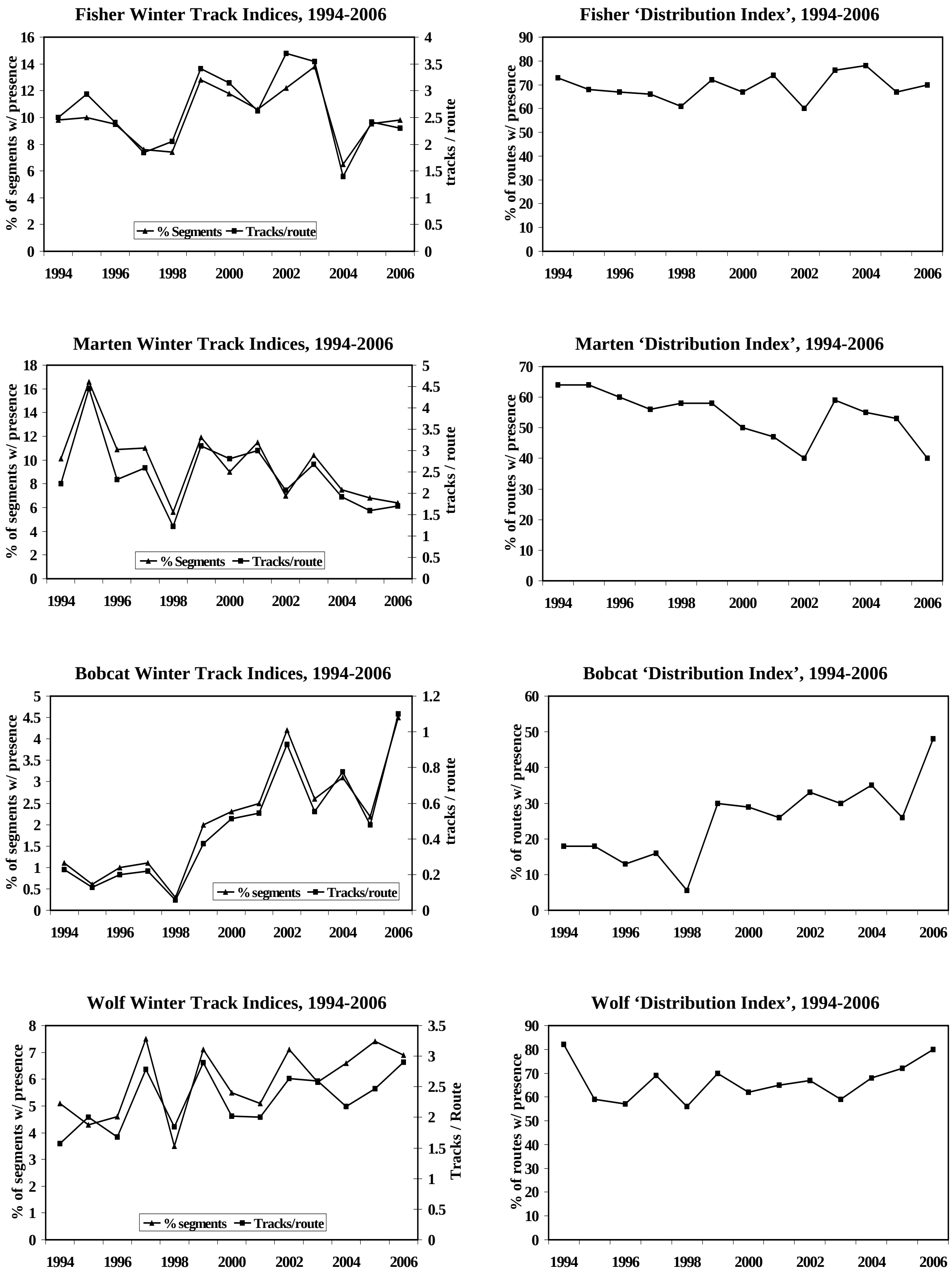

Figure 3. Winter track indices for selected species in Minnesota.

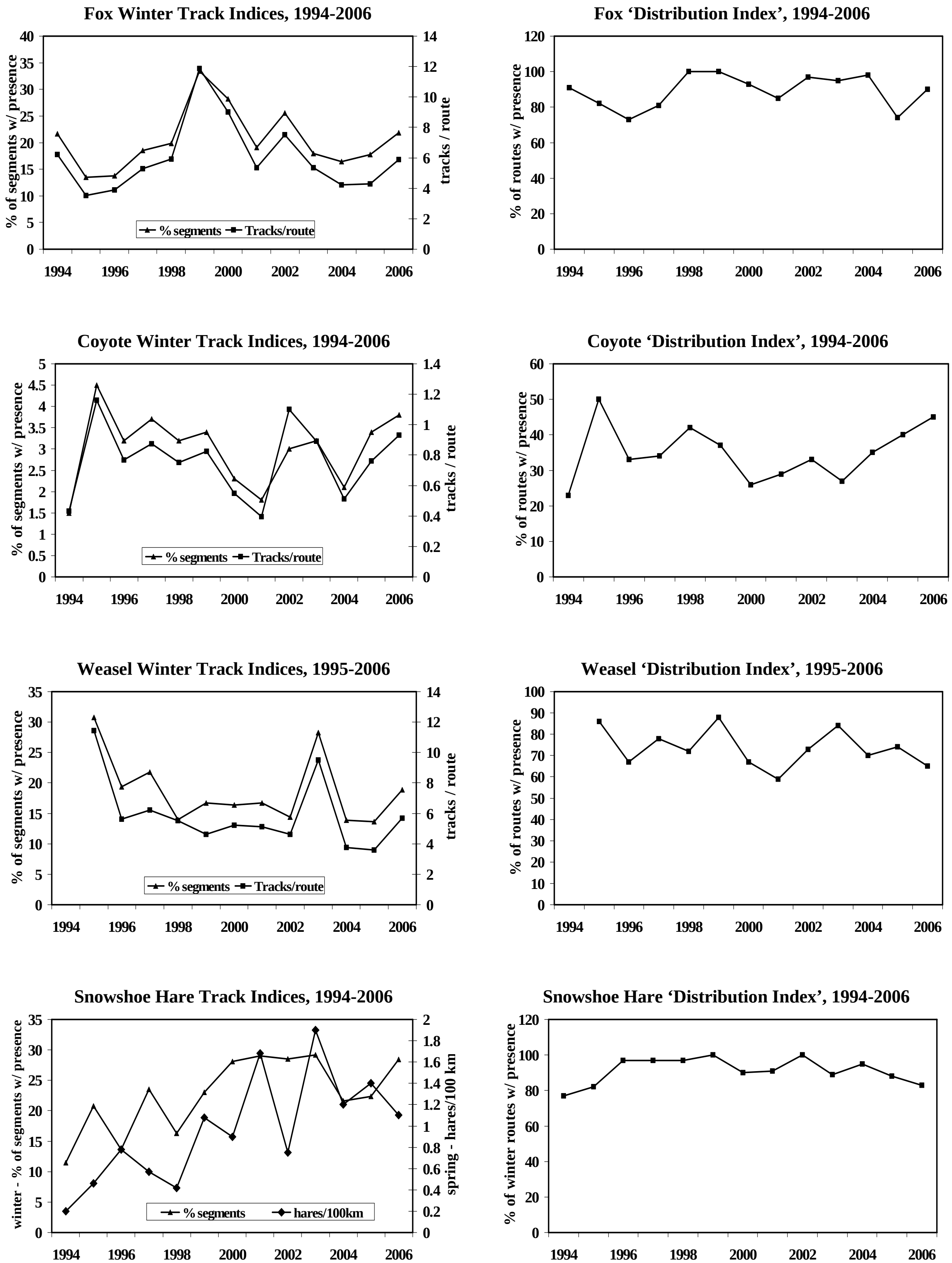

Figure 3. (Continued)

Carnivore Scent Station Survey Summary, 2006

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on these populations. However, many carnivores are highly secretive, difficult to repeatedly capture, and naturally occur at low to moderate densities, making it difficult to estimate abundance over large areas using traditional methods (e.g., mark-recapture, distance sampling, etc.). Hence, indices of relative abundance are often used to monitor such populations over time (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 31st anniversary of the carnivore scent station survey.

METHODS

Scent station survey routes are composed of tracking stations (0.9 m diameter circle) of sifted soil with a fatty-acid scent tab placed in the middle. Scent stations are spaced at 0.5 km intervals on alternating sides of a road. 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. We continue to electronically enter previous data so confidence intervals on pre-2001 can be computed.

RESULTS AND DISCUSSION

A total of 331 routes were completed this year (Figure 1). There were 3,115 operable scent stations examined on the 331 4.3 km routes. Route density varied from 1/479 km^2 in the Forest Zone to 1/1,098 km^2 in the Farmland (Figure 1).

Statewide, route visitation rates (% of routes with detection) were highest for red fox (37%), followed by domestic cat (34%), skunk (33%), raccoon (31%), coyote (21%), and dog (20%). Regionally, route visitation rates were as follows: red fox – Farmland (FA) 29%, Transition (TR) 32%, Forest (FO) 44%; coyote – FA 27%, TR 25%, FO 16%; skunk – FA 37%, TR 46%, FO 24%; raccoon – FA 60%, TR 44%, FO 14%; domestic cat – FA 65%, TR 50%, FO 13%; and dog – FA 32%, TR 32%, FO 9%. Figures 2-5 show <u>station</u> 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 interval overlap, there were no significant changes from last year, although farmland skunk indices appeared to decline appreciably.

Point estimates for the red fox index in the Farmland zone continued their steady decline that began in 1990 (Figure 2), but rebounded slightly in the Transition zone (Figure 3). The Farmland coyote index declined this year (Figure 2), but remains above the long-term average. Conversely, the coyote (and skunk) index in the Forest zone remains below its' long-term average (Figure 3). After 4 years of above-average indices for bobcat in the Forest zone, this year's index dropped to near the long-term average (Figure 5).

ACKNOWLEDGEMENTS

I wish to thank all of the cooperators who participated in the 2006 survey: DNR Division of Wildlife staff; Superior National Forest; Agassiz, Rydell, Sherburne, and Tamarac National Wildlife Refuges; USFWS Wetland Management Districts; White Earth, Red Lake, and Leech Lake Reservations; 1854 Authority; Vermillion Community College; Beltrami and Cass County Land Departments; Marshall County Central High School; St. Croix National Scenic Waterway; and Richard Nelles and Tom Stuber.

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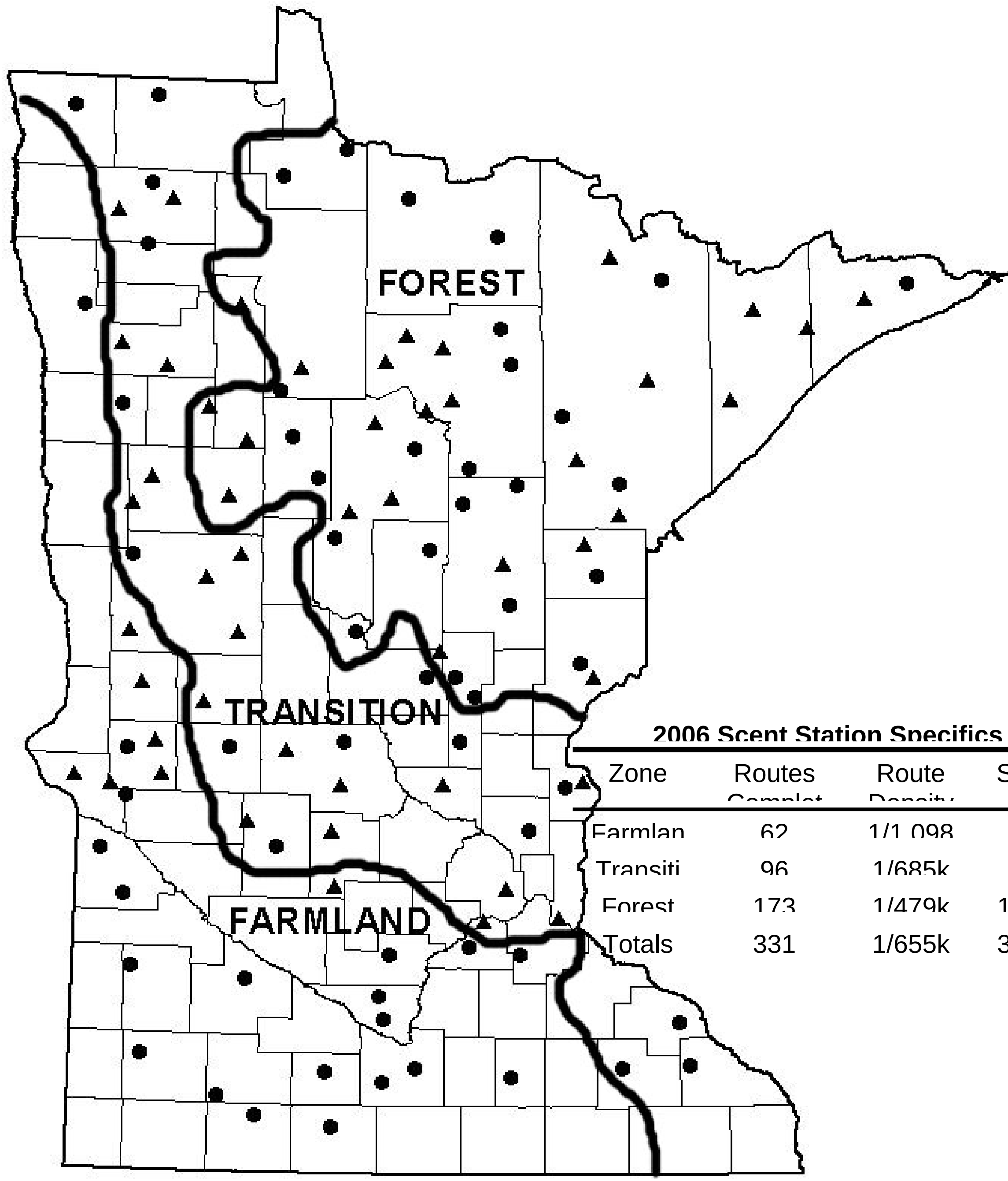


2006 Scent Station Specifics

Zone	Routes Complet	Route Density	Station
Farmlan	62	1/1,098	575
Transiti	96	1/685k	899
Forest	173	1/479k	1,641
Totals	331	1/655k	3,115

Figure 1. Approximate central locations of scent station routes conducted by Division of Wildlife (●) and interagency cooperators (▲). Each marked location may represent from 1-6 actual routes. Inset shows 2006 route specifics.

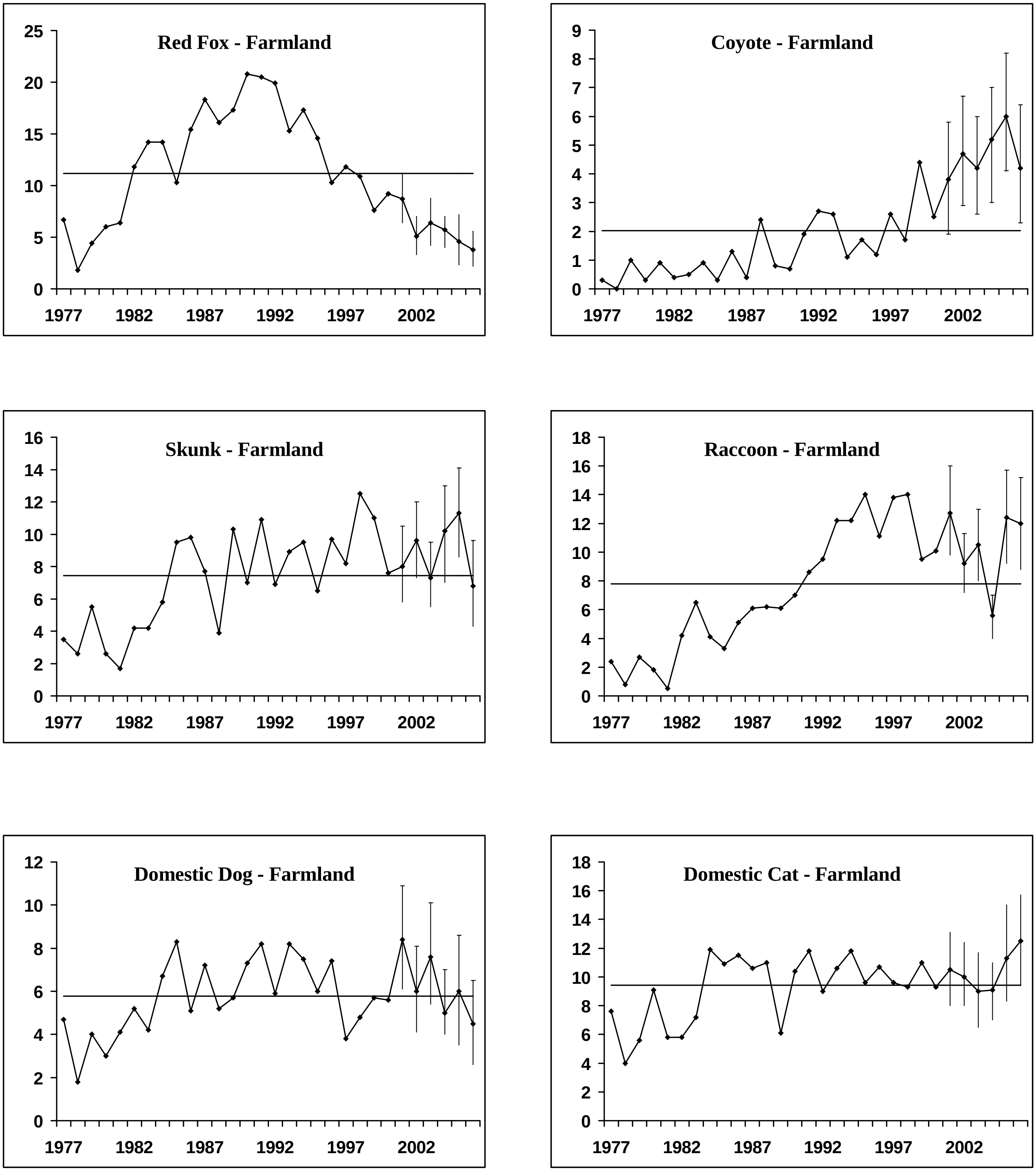


Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2006. Horizontal line represents long-term mean.

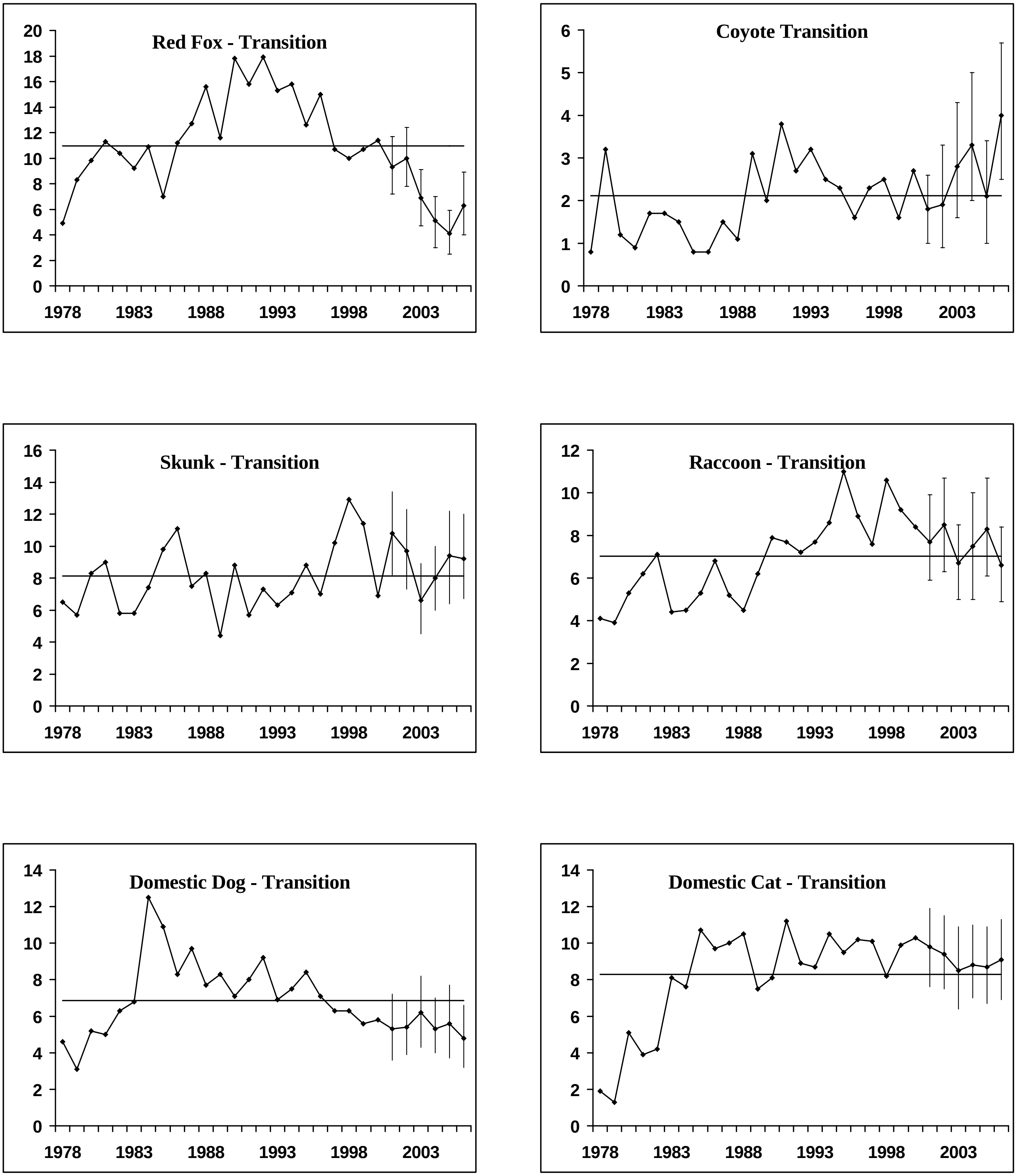


Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2006. Horizontal line represents long-term mean.

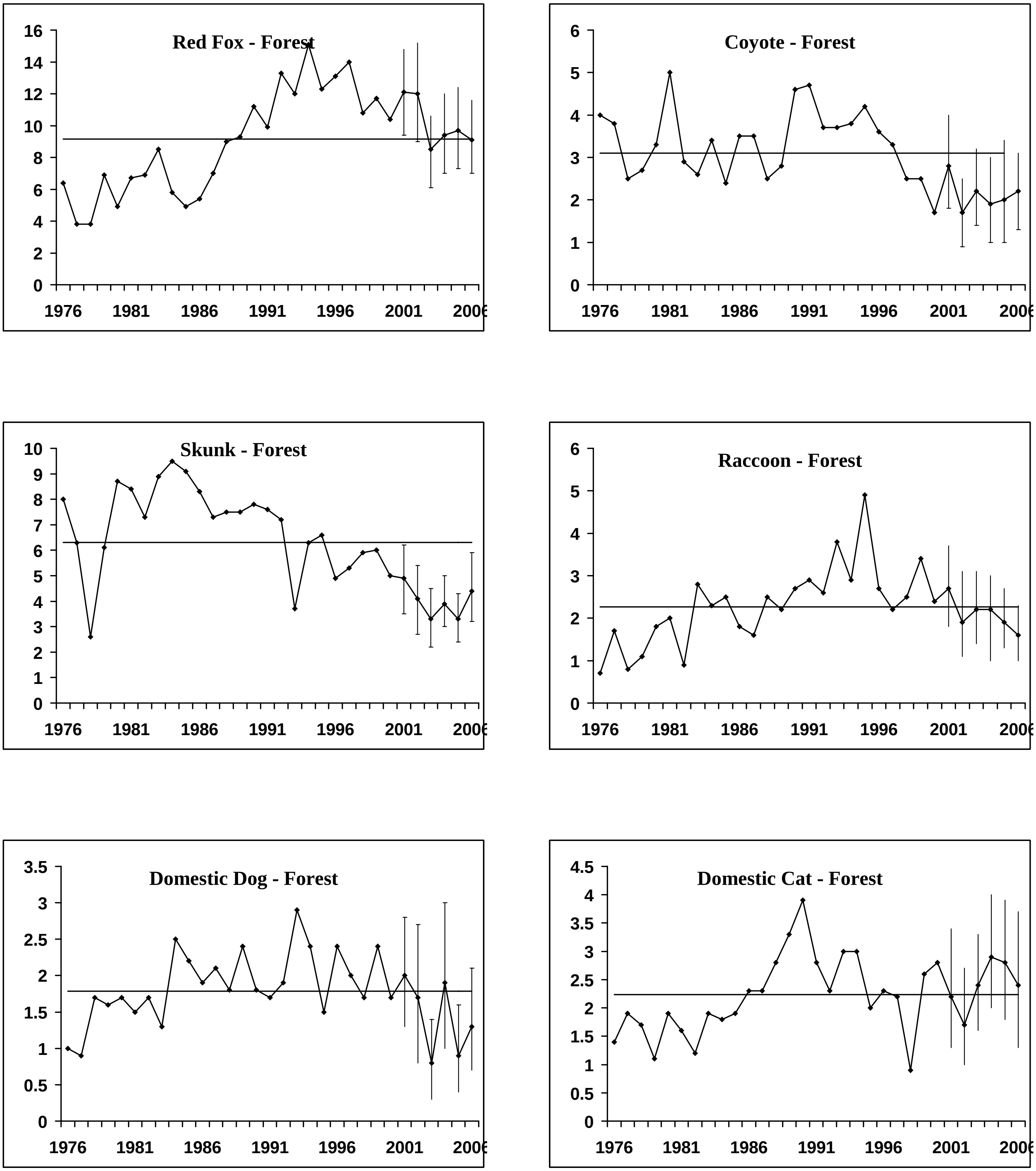
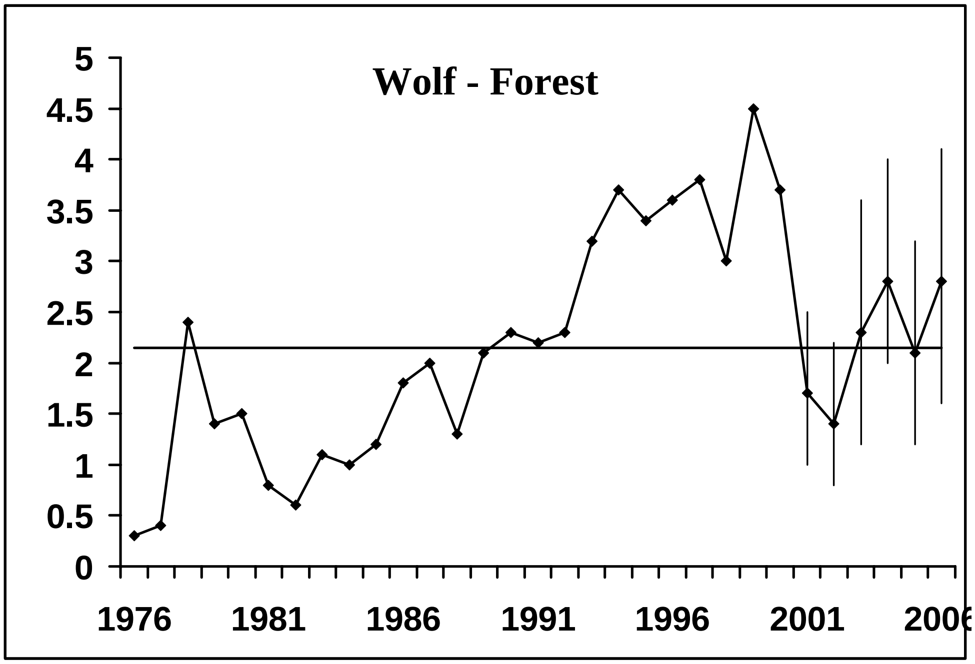


Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2006. Horizontal line represents long-term mean.



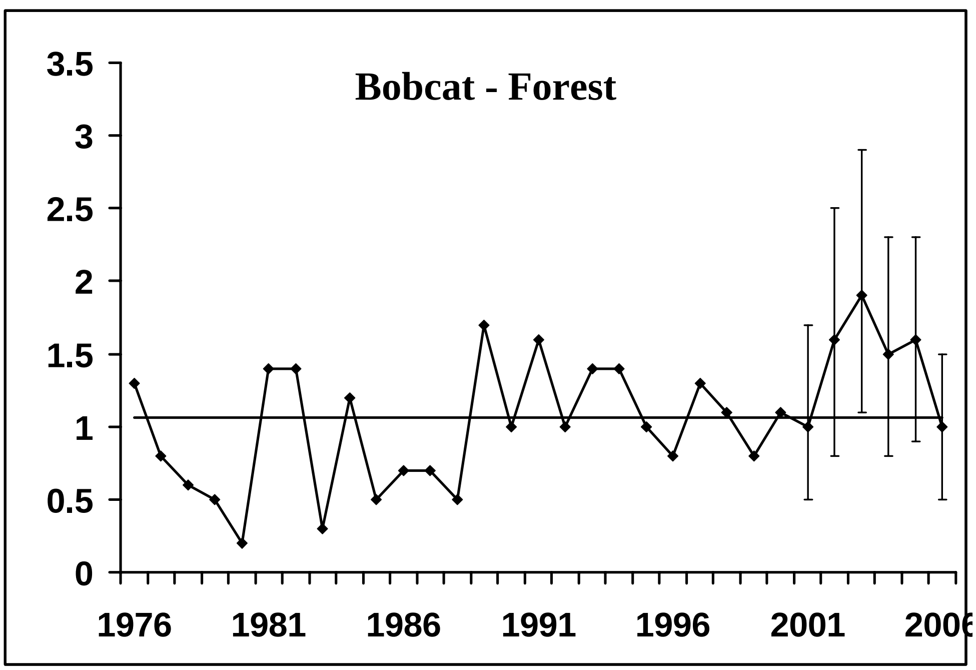


Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest Zone of Minnesota, 1976-2006. Horizontal line represents long-term mean.

FOREST WILDLIFE POPULATIONS

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Grouse Surveys In Minnesota During Spring 2007

Michael A. Larson, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Surveys for ruffed grouse (*Bonasa umbellus*), sharp-tailed grouse (*Tympanuchus phasianellus*), and greater prairie-chickens (*Tympanuchus cupido pinnatus*) were conducted during April and May 2007. Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.3 (95% confidence interval = 1.1–1.5) drums/stop (dps). That was significantly greater than the 1.0 (0.9–1.1) dps observed during 2006.

During the spring 2007 survey 2,114 sharp-tailed grouse were observed at 180 dancing grounds. The mean number of sharp-tailed grouse per dancing ground was 9.4 (8.0–11.0) in the East Central survey region, 12.9 (11.4–14.5) in the Northwest region, and 11.7 (10.6–12.9) statewide. Index values in both regions were significantly greater during 2007 than during 2006, and the statewide index value was as high as any year since 1980.

We counted 3,294 male prairie-chickens and located 263 booming grounds. Within survey blocks we observed 0.42 (0.33–0.51) leks/mi^2 and 14.5 (12.0–17.0) males/lek. Approximately 45% more leks and males were counted in survey blocks during spring 2007 than during spring 2006. Means of annual densities observed during 1993–2002 were 0.2 leks/mi^2 and 11.5 males/lek.

INTRODUCTION

Index Surveys

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

Ruffed Grouse

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

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

Sharp-tailed Grouse

Sharp-tailed grouse (*Tympanuchus phasianellus*) in Minnesota occur in brushlands, which often form transition zones between forests and grasslands. Sharp-tailed grouse are considered a valuable indicator of the availability and quality of brushlands for wildlife. Although sharp-tailed grouse habitat was more widely distributed in Minnesota during the early- and mid-1900s, the range of sharp-tailed grouse is now limited to areas in the Northwest (NW) and East Central (EC) portions of the state (Figure 1). Since 1990 annual harvest of sharp-tailed grouse by hunters has varied from 8,000 to 30,000 birds, and the number of hunters has varied from 6,000 to 13,000.

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

Greater Prairie-Chickens

During the early 1800s greater prairie-chickens (*Tympanuchus cupido pinnatus*) were present along the southern edge of Minnesota. Their range expanded and contracted dramatically during the next 150 years. Currently, most prairie-chickens in Minnesota occur along the beach ridges of glacial Lake Agassiz in the west (Figure 1). The population of prairie-chickens there was expanded southward to the upper Minnesota River valley by a series of relocations during 1998–2006. Hunters in Minnesota have harvested approximately 100 prairie-chickens annually since 2003 when a limited-entry hunting season was opened for the first time since 1942.

Like sharp-tailed grouse, prairie-chickens gather at leks during spring. The leks of prairie-chickens are also called booming grounds because males make a low-frequency, booming vocalization during their displays. From 1974 to 2003 the Minnesota Prairie Chicken Society coordinated annual counts of prairie-chickens. During 2004 the Minnesota Department of Natural Resources (DNR) began coordinating the annual prairie-chicken surveys, and a standardized survey design was adopted.

METHODS

Ruffed Grouse

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

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

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

Stops along survey routes are a small sample of all possible stops within the range of ruffed grouse in Minnesota. Survey index values based on the sample of stops are not the same as they would be if drum counts were conducted at a different sample of stops or at all possible stops. To account for the uncertainty in index values because they are based on a sample, I calculated 95% confidence intervals (CI) for each mean. A 95% confidence interval is a numerical range in which 95% of similarly estimated intervals (i.e., from different hypothetical samples) would contain the true, unknown mean. I used 10,000 bootstrap samples of route-level means to estimate percentile CIs for mean index values for survey regions and the whole state. Limits of each CI were defined as the 2.5th and 97.5th percentiles of the bootstrap frequency distribution. I calculated mean index values and CIs for 1982–2007. Data from earlier years were not analyzed because they were not available in a digital form.

Sharp-tailed Grouse

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

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

I calculated the mean number of sharp-tailed grouse per dancing ground (i.e., index value), averaged across dancing grounds within the NW and EC regions and statewide for spring 2007. The number of grouse included those recorded as males and those recorded as being of unknown sex, and only leks with ≥2 grouse were included when calculating mean index values. It was not valid to compare the full survey data and results from different years because survey effort and success in detecting and observing sharp-tailed grouse was different between years and the survey samples were not necessarily representative of other dancing grounds. To estimate differences in sharp-tailed grouse index values between 2 years, therefore, I analyzed separately sets of data that included counts of birds only from dancing grounds that were surveyed during both years. Although the dancing grounds in the separate data sets were considered comparable, the counts of birds at the dancing grounds still were not. Many factors can affect the number of birds counted, so inferences based upon comparisons of survey data between years are tenuous. I used a separate data set of comparable leks to calculate the mean difference in the number of birds counted per dancing ground between 2006 and 2007.

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

The current delineation between the NW and EC survey regions was based on ECS section boundaries (Figure 1), with the NW region consisting of the Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley sections and the EC region consisting of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior Uplands sections. The 2005 Grouse Survey Report detailed the transition from the former to the current delineation of regions.

Greater Prairie-Chickens

During the few hours near sunrise from late-March until mid-May cooperating biologists and numerous volunteers counted prairie-chickens at leks in western Minnesota. They attempted to locate and observe multiple times all prairie-chicken leks within 17 designated survey blocks (Figure 3). Each block was approximately 4 miles × 4 miles square (4,144 ha) and was selected nonrandomly based upon the spatial distribution of leks and the presence of relatively abundant grassland habitat. Ten survey blocks were located in what was considered the core of the prairie-chicken range in Minnesota. The other 7 blocks were located in the periphery of the range. The permit areas for the fall hunting season roughly coincide with the core of the range (Figure 3).

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

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

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 15 cooperating organizations surveyed 131 routes between 10 April and 14 May 2007. Most routes (52%) were run between 23 and 29 April. There was a secondary peak of survey effort (15% of routes) during 8–9 May. Cooperators included the DNR Divisions of Fish & Wildlife and Ecological Services; Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Grand Portage, Leech Lake, Red Lake, and White Earth Reservations; Agassiz and Tamarac National Wildlife Refuges (U.S. Fish & Wildlife Service); Vermilion Community College; Beltrami and Cass County Land Departments; and UPM Blandin Paper Mill. Observers reported survey conditions as Excellent, Good, and Fair on 62%, 34%, and 4% of 124 routes, respectively. Survey conditions during 2006 were Excellent, Good, and Fair on 52%, 35%, and 13% of routes, respectively.

Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.3 (95% confidence interval = 1.1–1.5) drums/stop (dps) during 2007. That was significantly greater than the 1.0 (0.9–1.1) dps observed last year and similar to the long-term mean between low and high points in the population cycle (Figure 4). The Northeast survey region was the only one in which counts increased. Drum counts during 2007 by survey region were 1.5 (1.3–1.7) dps in the Northeast (n = 107 routes), 0.9 (0.5–1.4) dps in the Northwest (n = 8), 0.8 (0.4–1.1) dps in the Southwest (n = 14), and 0.5 (0.2–0.9) dps in the Southeast (n = 8) (Figures 4 & 5). Median index values for bootstrap samples were similar to observed means, so no bias-correction was necessary.

Based upon the drum count index, ruffed grouse densities in northeastern Minnesota during spring 2007 were likely greater than spring densities during 2001–2006. It appears that this is the second year of a cyclical increase in the population. The lack of changes in drum counts in the periphery of ruffed grouse range in Minnesota, however, indicates that the increase will not be noticeable in all areas.

Sharp-tailed Grouse

A total of 2,114 sharp-tailed grouse was observed at 180 dancing grounds with ≥2 male grouse (or grouse of unknown sex) during spring 2007. The resulting index value (11.7 grouse/lek) was greater than any index value since 1980 (Figure 6). Index values in both survey regions increased from 2006 to 2007 (Table 1). Among dancing grounds visited both years, index values in the NW and EC regions increased by 37% (95% CI = 18–60%) and 17% (95% CI = 1–37%), respectively. Leks with ≥2 grouse were visited a mean of 1.8 times, and 151 historic lek sites with ≤1 male were also surveyed at least once.

Table 1. Number of sharp-tailed grouse observed per dancing ground in Minnesota during spring.

	Statewide			Northwest[a]			Eastcentral[a]		
Year[b]	Mean	95% CI[c]	n[d]	Mean	95% CI[c]	n[d]	Mean	95%CI[c]	n[d]
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	11.7	10.6–12.9	180	12.9	11.4–14.5	120	9.4	8.0–11.0	60
$\text{Difference}_{04\text{-}05}$	-1.3	-2.2– -0.3	186	-2.1	-3.5– -0.8	112	0.0	-1.0– 1.1	74
$\text{Difference}_{05\text{-}06}$	-2.5	-3.7– -1.3	126	-3.6	-5.3– -1.9	70	-1.1	-2.6– 0.6	56
$\text{Difference}_{06\text{-}07}$	2.6	1.5– 3.8	152	3.3	1.7– 5.1	99	1.2	0.1– 2.3	53

[a] Survey regions; see Figure 1.
[b] Year or consecutive years for the mean difference between comparable leks.
[c] 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.
[d] n = number of dancing grounds in the sample.

Greater Prairie-Chickens

Observers from at least 3 cooperating organizations and several unaffiliated volunteers counted prairie-chickens during spring 2007. Cooperators included the DNR Division of Fish and Wildlife, Fergus Falls and Detroit Lakes Wetland Management Districts (U.S. Fish & Wildlife Service), and The Nature Conservancy. Observers located 263 booming grounds and counted 3,294 male prairie-chickens (Table 2). Within hunting permit areas we observed 0.09 leks/mi^2 (0.03 leks/km^2) and 13.7 males/lek. Minimum counts in Table 2 and the densities calculated from them are not comparable among permit areas or years because they included surveys that were conducted outside of the survey blocks and did not follow a spatial sampling design.

Table 2. Minimum abundance of prairie-chickens within and outside of hunting permit areas in western Minnesota during spring 2007. Counts of leks and birds are not comparable among permit areas or years.

Permit Area	Area (sq. mi.)	Leks	Males	Unk.[a]
801A	233	0	0	0
802A	319	19	157	0
803A	258	11	98	0
804A	168	0	0	0
805A	103	28	474	0
806A	289	17	172	6
807A	170	32	372	33
808A	161	34	579	0
809A	287	27	466	0
810A	195	26	400	0
811A	272	16	165	54
PA subtotal[b]	2,454	210	2,883	93
Outside PAs[c]	NA[d]	53	411	51
Grand total	NA	263	3,294	144

[a] Unk. = prairie-chickens of unknown sex. It is likely that most were males.
[b] Sum among the 11 permit areas.
[c] Counts from outside the permit areas.
[d] NA = not applicable. The size of the area outside permit areas was not defined.

Each booming ground was observed on a median of 2 (mean = 1.9) different days, but 46% of leks were observed only once. Attendance of males at prairie-chicken leks varies among days and by time of day. Single counts of males at a booming ground, therefore, may be an unreliable indication of true abundance. Similar counts on multiple days, on the other hand, demonstrate that the counts may be a good indicator of true abundance. Even multiple counts, however, cannot overcome the problems associated with the failure to estimate the probability of detecting leks and individual birds at leks. Without estimates of detection probability, the prairie-chicken survey is an index to, not an estimate of, prairie-chicken abundance within the survey blocks. The credibility of the index for monitoring changes in abundance among years is dependent upon the untested assumption that a linear relationship exists between counts of male prairie-chickens and true abundance. In other words, we assume that (the expected value of) the probability of detection does not change among years.

Within survey blocks we counted 1,618 males (includes birds of unknown sex) on 114 leks (Table 3). That was 46% more males and 43% more leks than were counted in survey blocks during spring 2006 (Figure 7). Leks were defined as having ≥2 males, so observations of single males were excluded from summaries by survey block. During spring 2007 we observed 0.41 (0.30–0.53) leks/mi^2 and 17.4 (15.2–19.6) males/lek in survey blocks in the core of the range, whereas we observed 0.43 (0.28–0.58) leks/mi^2 and 10.3 (7.1–13.6) males/lek in peripheral blocks (Table 3). The densities of prairie-chickens observed during 2007 were greater than the means of 0.2 leks/mi^2 and 11.5 males/lek observed in survey blocks from 1993 until 2002.

Table 3. Counts of prairie-chickens within survey blocks in Minnesota.

		Area	2007		Change from 2006[a]	
Range[b]	Survey Block	(miles^2)	Leks	Males[c]	Leks	Males[c]
Core	Polk 2	16.2	9	143	5	78
	Norman 1	16.1	2	19	-1	-23
	Norman 3	16.0	9	154	3	64
	Clay 1	17.6	9	182	0	27
	Clay 2	16.0	4	91	2	-10
	Clay 3	16.1	9	157	0	14
	Clay 4	14.9	5	91	0	34
	Wilkin 1	15.4	9	161	0	68
	Wilkin 3	16.1	8	122	2	51
	Otter Tail 1	15.9	2	40	-1	10
	Core subtotal	160.2	66	1,160	10	313
Periphery	Polk 1	15.9	11	101	7	53
	Norman 2	16.3	9	59	4	-3
	Mahnomen	16.1	7	97	4	49
	Becker 1	16.0	10	82	7	58
	Becker 2	16.1	3	56	-1	14
	Wilkin 2	16.1	3	25	1	9
	Otter Tail 2	15.7	5	38	2	15
	Periphery subtotal	112.2	48	458	24	195
Grand total		272.4	114	1,618	34	508

[a] The 2006 count was subtracted from the 2007 count, so a negative value indicates a decline.

[b] Survey blocks were classified as either mostly within the original (i.e., 2003–2005) hunting permit areas (core) or mostly outside those permit areas (periphery).

[c] Includes birds recorded as being of unknown sex but excludes lone males not observed at a booming ground.

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

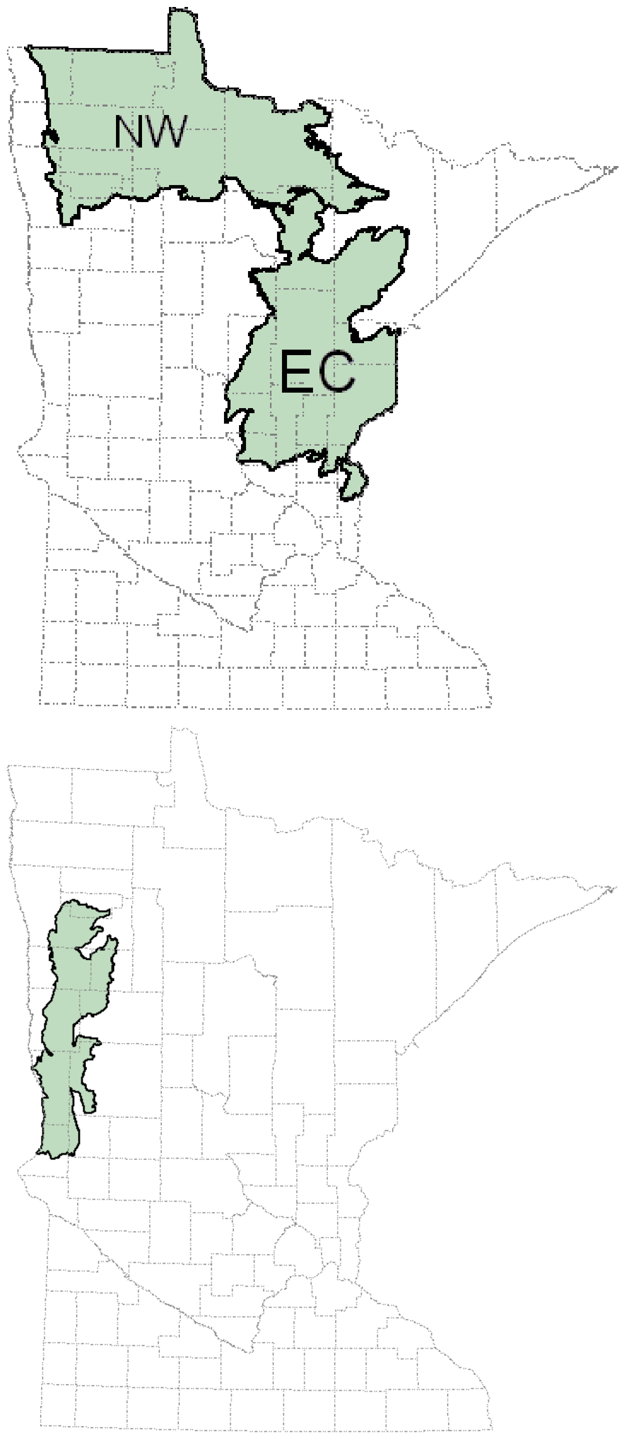


Figure 1. Northwest (NW) and East Central (EC) survey regions for **sharp-tailed grouse** (top panel) and primary range of **greater prairie-chickens** (bottom panel) relative to county boundaries in Minnesota. The sharp-tailed grouse regions were based largely on boundaries of ECS Subsections, whereas the prairie-chicken range was based on ECS Land Type Associations.

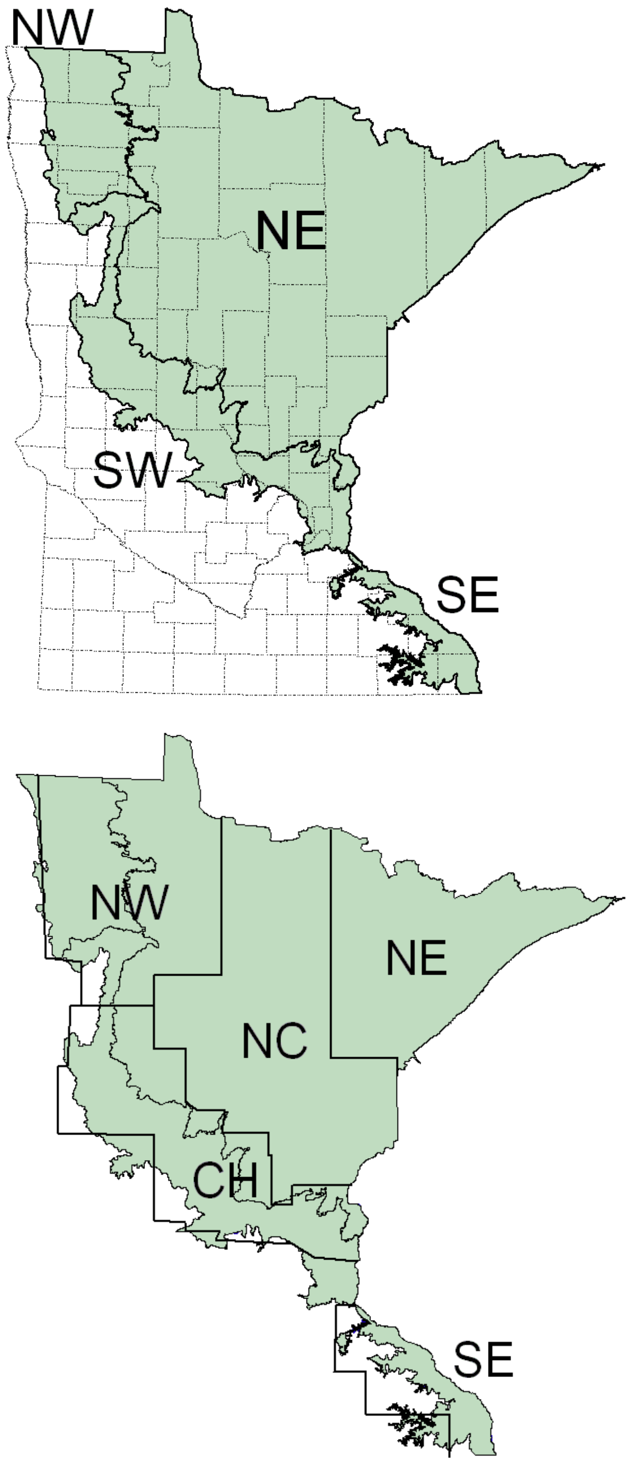


Figure 2. **Ruffed grouse** survey regions (shaded, curved boundaries) are based on the Ecological Classification System. Top panel: regions are labeled and overlaid on counties (dashed lines). Bottom panel: former survey zones (straight boundaries) are labeled and overlaid on regions.

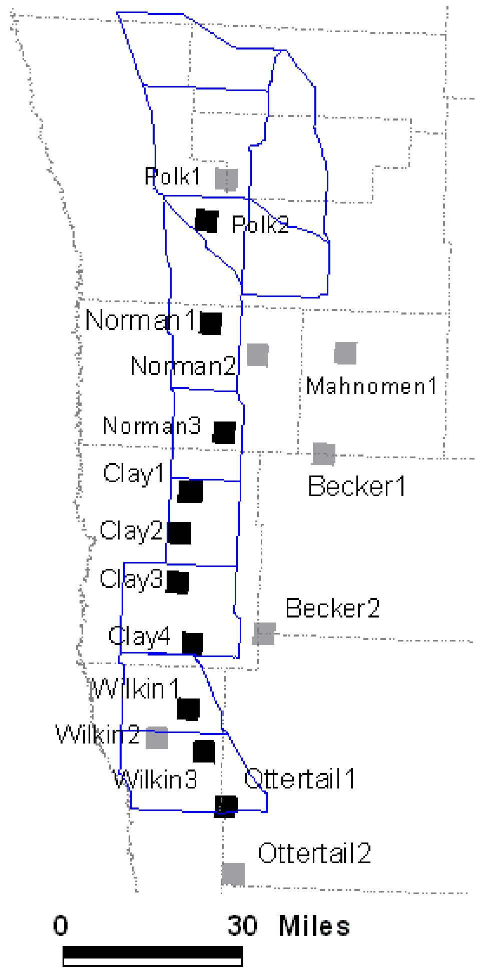


Figure 3. Survey blocks (labeled squares) and hunting permit area boundaries (solid lines) for **prairie-chickens** in western Minnesota. Survey blocks were designated as being in either the core (black) or periphery (gray) of the range. Blocks were named after the counties (dashed lines) in which they were primarily located. Permit areas were labeled sequentially from 801A in the north to 811A in the south.

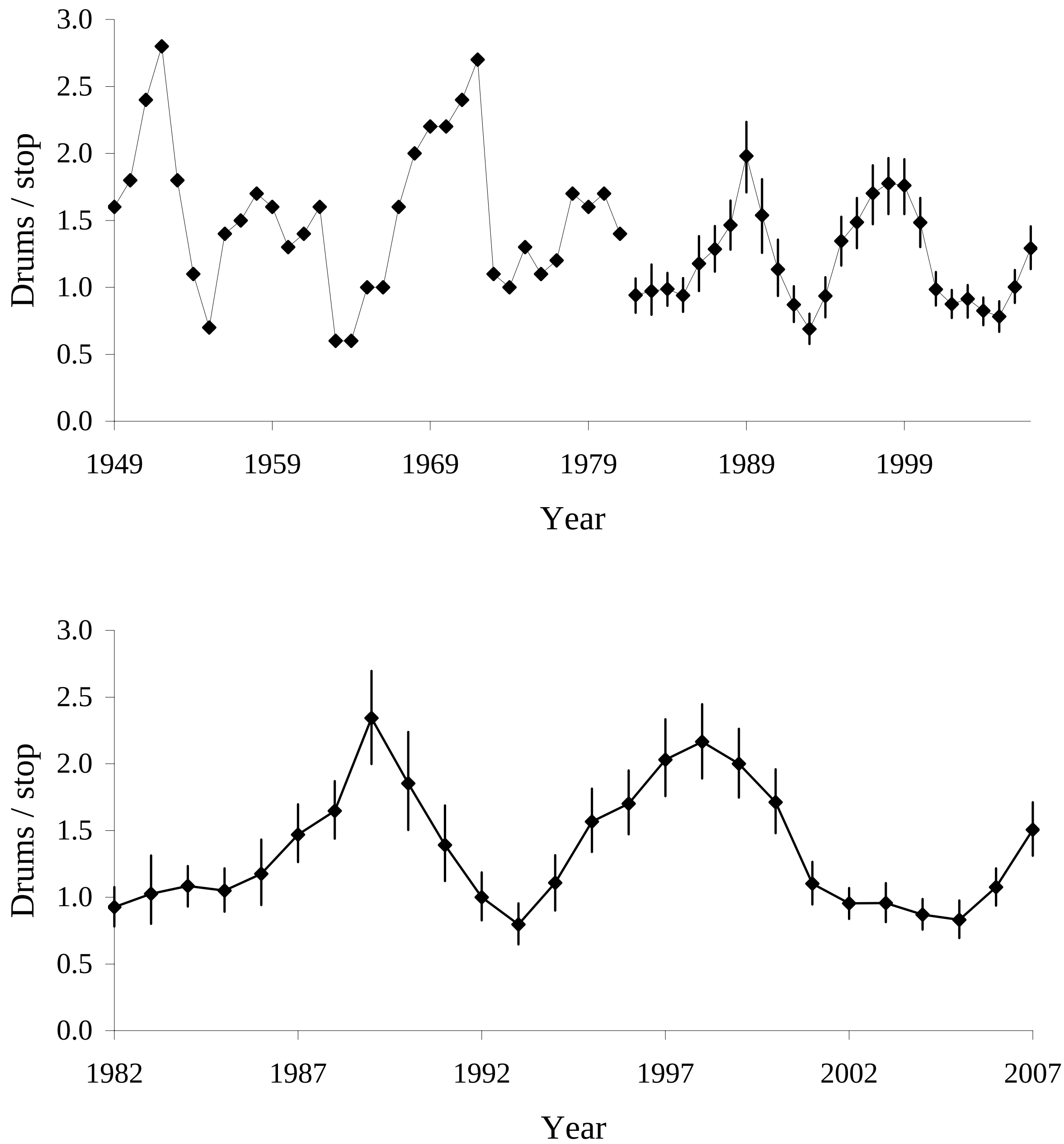


Figure 4. Ruffed grouse drum count index values in **Minnesota** (top) and just the **Northeast** region (bottom). Vertical error bars represent 95% confidence intervals based on bootstrap samples. Statewide means before 1982 were not re-analyzed with the current methods, so confidence intervals were not available. The difference in index values between 1981 and 1982 reflected a real decrease in drums counted, not an artifact of the change in analysis methods.

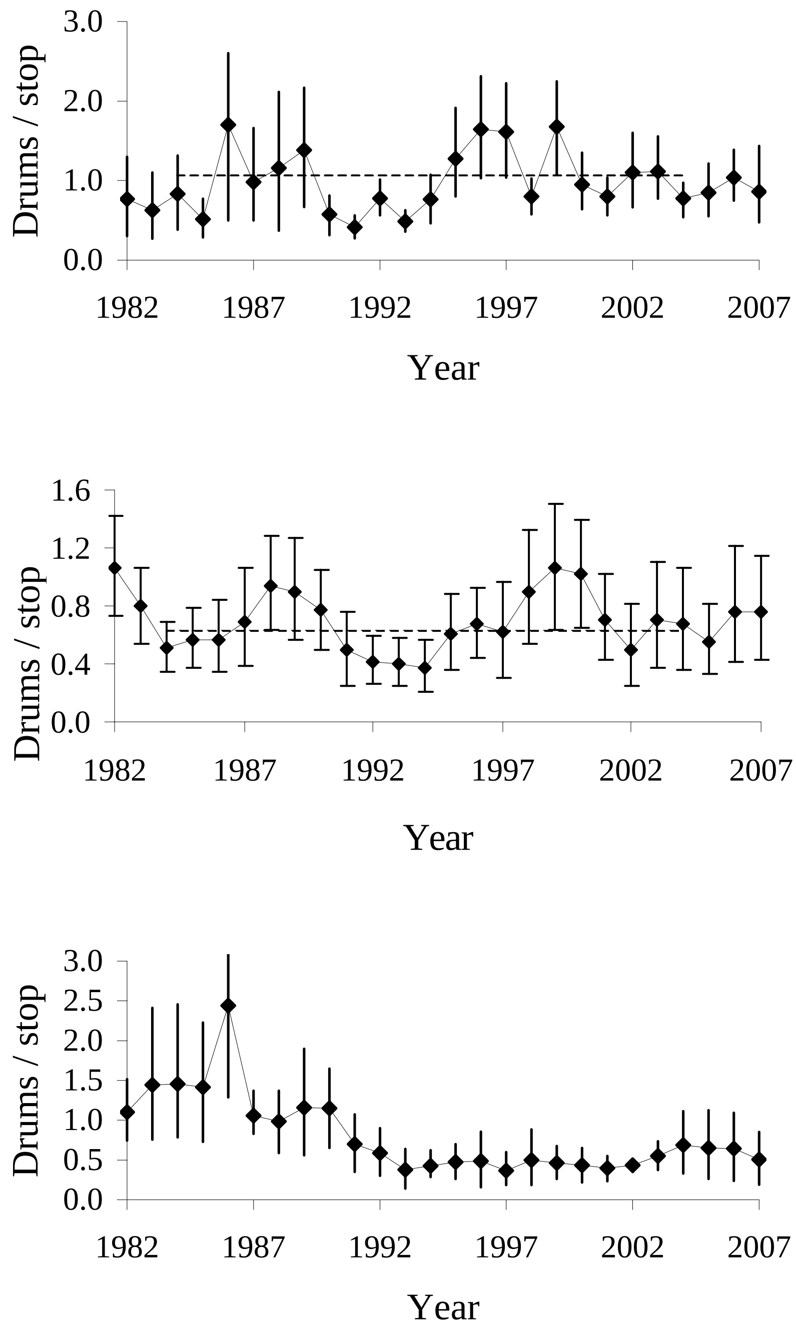


Figure 5. Ruffed grouse drum count index values in the **Northwest** (top), **Southwest** (middle), and **Southeast** (bottom) survey regions of Minnesota. Dashed horizontal lines indicate the mean from 1984 to 2004. Vertical error bars represent 95% confidence intervals based on bootstrap samples. One error bar in the bottom panel was truncated.

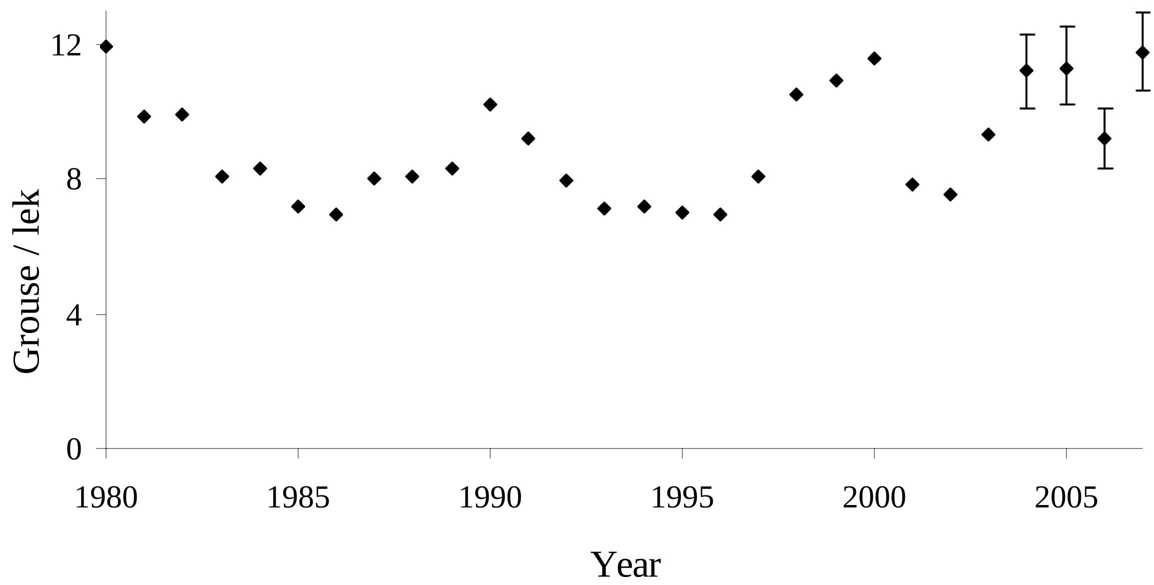


Figure 6. Mean number of **sharp-tailed grouse** observed in Minnesota during spring surveys of dancing grounds, 1980–2007. Vertical error bars, which were calculated only for recent years, represent 95% confidence intervals based on bootstrap samples. No line connects the annual means because they are not based on comparable samples of leks.

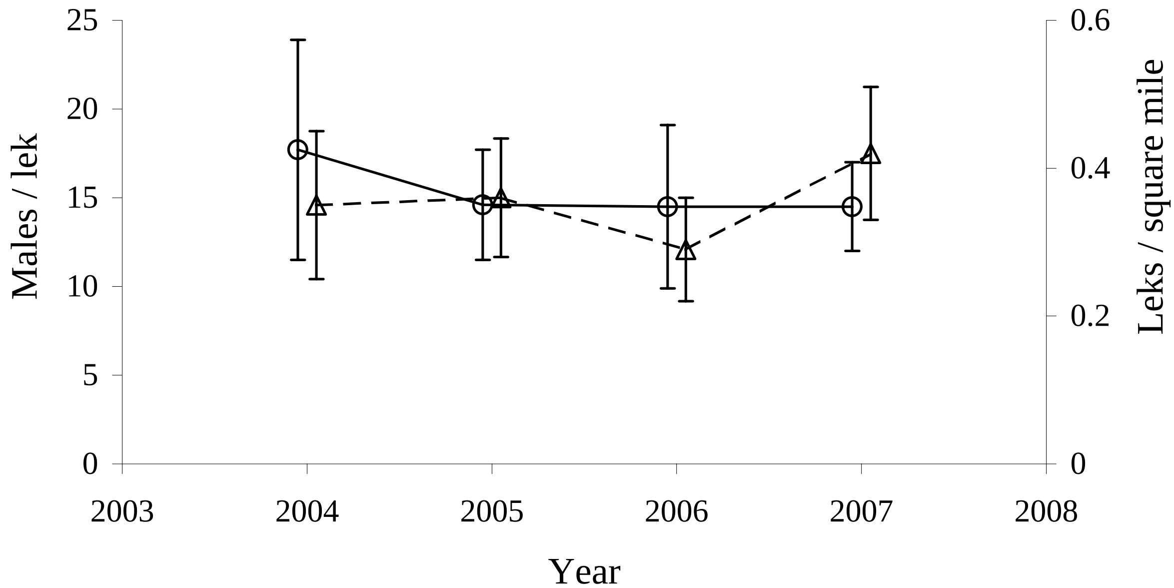
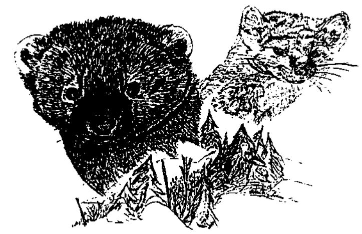


Figure 7. Number of **prairie-chicken** males/lek (circles) and leks/mi^2 (triangles) observed in western Minnesota. Vertical error bars represent 95% confidence intervals based on *n* = 17 survey blocks.



Registered Furbearer Population Modeling

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

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

In the late 1970s, Minnesota developed population models for 4 species of carnivores (fisher, marten, bobcat, and otter) to help 'estimate' population size and track population changes. All are deterministic 'accounting' models that do not currently incorporate density-dependence. However, juvenile survival adjustments are made for bobcats and fisher during cyclic lows in hare abundance and following severe winters, particularly those where northern deer populations decline. For juvenile marten, survival is adjusted downward during apparent lows in small mammal abundance. Modeling projections are interpreted in conjunction with harvest data and results from annual field-based track surveys, with the exception of otter for which no harvest-independent survey data is currently available for comparison.

METHODS

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

Harvest data is obtained through mandatory furbearer registration. A detailed summary of 2006 harvest information is available in a separate report. Bobcat and pine marten year-class data is obtained via a combination of x-ray examination of pulp cavity width and microscopic counts of cementum annuli from teeth of harvested animals. While the population models only utilize data for the 3 age-classes (juvenile, yearling, adult), marten and bobcat cementum annuli counts have been collected for all non-juveniles in recent years to facilitate interpretation of reproductive data (bobcats) and to obtain current information on year-class distribution for both species. Current harvest age proportions for fisher and otter are approximated using averages computed from carcass collections obtained during 1980-86 (otter) and 1977-1994 (fisher).

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

RESULTS AND DISCUSSION

Bobcat. The 2006 registered DNR trapping and hunting harvest was 890, up 51% from last year, and setting a new record (Table 1). Trapping harvest increased 79%, while hunting harvest decreased 25%. Modeled harvest, which includes reported tribal take, was 983. Based on population modeling estimates, 26% of the fall population was harvested. The juvenile to adult female ratio in the harvest (1.1; Table 1) was below the long-term average (1.5), but similar to the recent 10-year average (1.2). A total of 813 bobcat carcasses were examined (Table 1), with a mean age of 2.7 for both females and males, identical to the 4-year mean for both sexes. Approximately 8% of the harvested bobcats were 6.5+ years old. The 2006-07 harvest age distribution is shown in Figure 1.

Based on examination of reproductive tracts, pregnancy rate of yearlings was estimated at 25%, and has ranged from 16 to 48% the last 4 years (4-year mean = 29%). Average litter size for pregnant yearlings was 2.2. Pregnancy rate for 2+ year olds averaged 77%, with a mean litter size of 2.9.

With the record harvest, modeling predicts a 6% decline in this spring's bobcat population (Figure 2), though the estimated population remains well above pre-1998 levels. While (averaged) fall scent station indices have declined slightly the past 2 years, averaged winter track counts have increased. The estimated 2007 spring population is ~ 2,650.

Fisher: Harvest under the DNR framework was 3,250, up 33% from last year (Table 2) and setting a new record. Modeled harvest, which includes reported tribal take, was 3,500. An estimated 30% of the fisher population was harvested this past winter, the highest such estimate since 1979. Carcass collections ended in 1994, so no current age or reproductive data are available. While winter track indices improved slightly this year, the trend in population projections and averaged winter track indices is slowly downward since ~ 2001 (Figure 3). Modeling estimates a 9% decline in the spring population, currently estimated at ~7,900.

Marten: With the exception of 2005, marten harvests have increased over the past 6 years, setting a new record this year. Harvest under the DNR framework was 3,788, up 43% from last year (Table 3). Modeled harvest, which includes reported tribal take, was 4,120. A total of 1914 marten carcasses were examined this year. Although juveniles clearly predominate in the harvest, older marten are evident as well (Figure 4). However, the maximum age observed has declined slightly in each of the last 4 years for females (13, 12, 11, and 10), with a similar pattern for males (13, 12, 11, 11). Over the last 3 years, the mean age of female marten harvested has declined from 2.6 to 1.4, while the mean age of male marten harvested has declined from 2.4 to 1.3. The percent juveniles (64%) and the juvenile:adult female ratio (9.2) in the harvest both increased this year (Table 3).

Based on modeling, a record 28% of the fall population was harvested. Corresponding in time with recent record harvests, both modeling projections and averaged winter track counts suggest the population has been declining the past 5 years (mean annual decline = 5%). The current spring population is estimated to be ~10,400 (Figure 5), a decline of 6% from last year.

Otter: After several years of record harvests, the otter harvest declined the past 2 years. Harvest under the DNR framework was 2,720, down 4% from last year (Table 3). Modeled harvest, including reported tribal take, was 2,872 (Table 4). An estimated 22% of the fall population was harvested. Carcass collections ended in 1986, so no age or reproductive data are available. Modeling indicates the population has declined in each of the past 4 years (mean annual decline ~ 5%; Figure 6). No independent otter survey data are currently available for comparison. The current estimated spring population is ~ 10,300, down 4% from last year.

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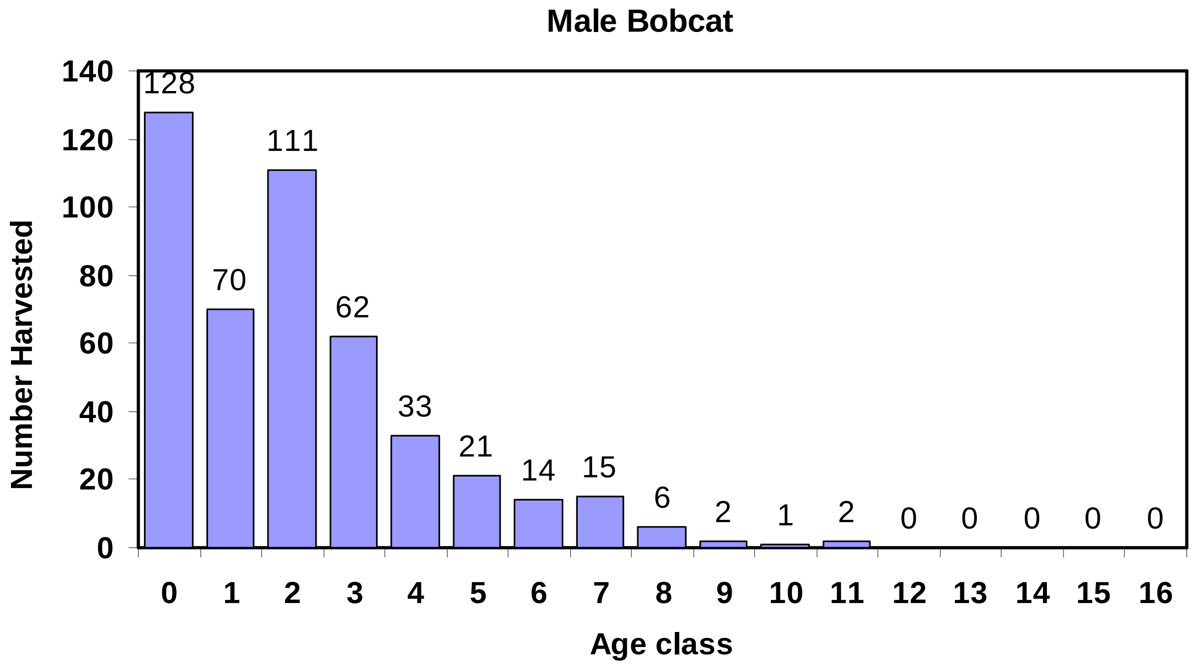
Table 1. Bobcat harvest data, 1978 to 2006.

Year	Season	Limit	DNR Harvest	Modeled Harvest[1]	% Autumn Pop. Taken[2]	Carcasses Examined	% juveniles	% yearlings	% adults	Juvs : adult female	% male juveniles	% male yearlings	% male adults	Overall % males	Mean Pelt Price[3]
1978	12/1-1/31	5	304	304	15	113	54	15	31	4.4	61	53	60	59	$164
1979	12/1-1/31	5	291	291	14	75	37	12	51	1.6	54	44	53	52	$118
1980	12/1-1/31	5	210	210	10	48	31	33	36	1.9	80	69	56	66	$79
1981	12/1-1/23	5	260	260	13	230	37	23	40	2.1	59	63	55	58	$73
1982	12/1-1/23	5	274	320	15	261	35	15	50	1.3	47	49	47	48	$66
1983	12/1-1/22	5	208	212	10	205	37	26	37	1.5	54	53	30	45	$61
1984	12/1-1/20	5	280	288	15	288	37	13	50	1.4	52	66	44	51	$76
1985	11/30-1/19	5	119	121	6	99	33	19	48	1.2	41	41	43	42	$70
1986	11/29 -1/3	5	160	160	8	132	26	17	57	0.9	53	32	51	51	$120
1987	11/28-1/3	5	214	229	12	163	33	16	51	1.4	44	52	48	48	$101
1988	11/26-1/1	5	140	143	7	114	40	18	42	1.7	58	62	46	54	$68
1989	12/2-1/7	5	129	129	6	119	39	17	44	2	49	53	56	53	$48
1990	12/1-1/6	5	84	87	4	62	20	34	46	0.8	58	80	44	59	$43
1991	11/30-1/5	5	106	110	5	93	35	33	32	3.6	59	55	70	61	$37
1992	11/28-1/3	5	167	167	7	151	28	22	50	1.2	55	45	53	53	$28
1993	12/4-1/9	5	201	210	8	161	32	20	48	1.4	51	45	52	50	$43
1994	12/3-1/8	5	238	270	11	187	26	16	58	0.8	64	43	45	50	$36
1995	12/2-1/7	5	134	152	6	96	31	15	54	2.7	57	71	79	71	$34
1996	11/30 -1/5	5	223	250	10	164	35	20	45	1.5	51	30	49	46	$33
1997	11/29-1/4	5	364	401	17	270	35	16	49	1.2	60	37	43	48	$30
1998	11/28-12/13	5	103	107	5	77	29	26	45	1.6	59	60	60	60	$28
1999	12/4-1/9	5	206	228	8	163	18	24	58	0.8	55	59	62	60	$24
2000	12/2-1/7	5	231	250	8	183	31	26	43	1.5	54	59	50	53	$33
2001	11/24-1/6	5	259	278	9	213	30	21	49	1.3	52	51	53	52	$35
2002	11/30-1/5	5	544	621	18	475	27	25	48	1	66	49	46	52	$46
2003	11/29-1/4	5	483	518	16	425	25	13	62	0.9	61	46	53	54	$96
2004	11/27 – 1/9	5	631	709	20	524	28	34	38	1.6	51	40	54	49	$99
2005	11/26-1/8	5	590	638	19	485	25	13	62	0.8	51	48	46	48	$96
2006	11/25-1/7	5	890	983	26	813	26	17	57	1.1	61	50	58	57	$102

[1] Includes DNR and Tribal harvests

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

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



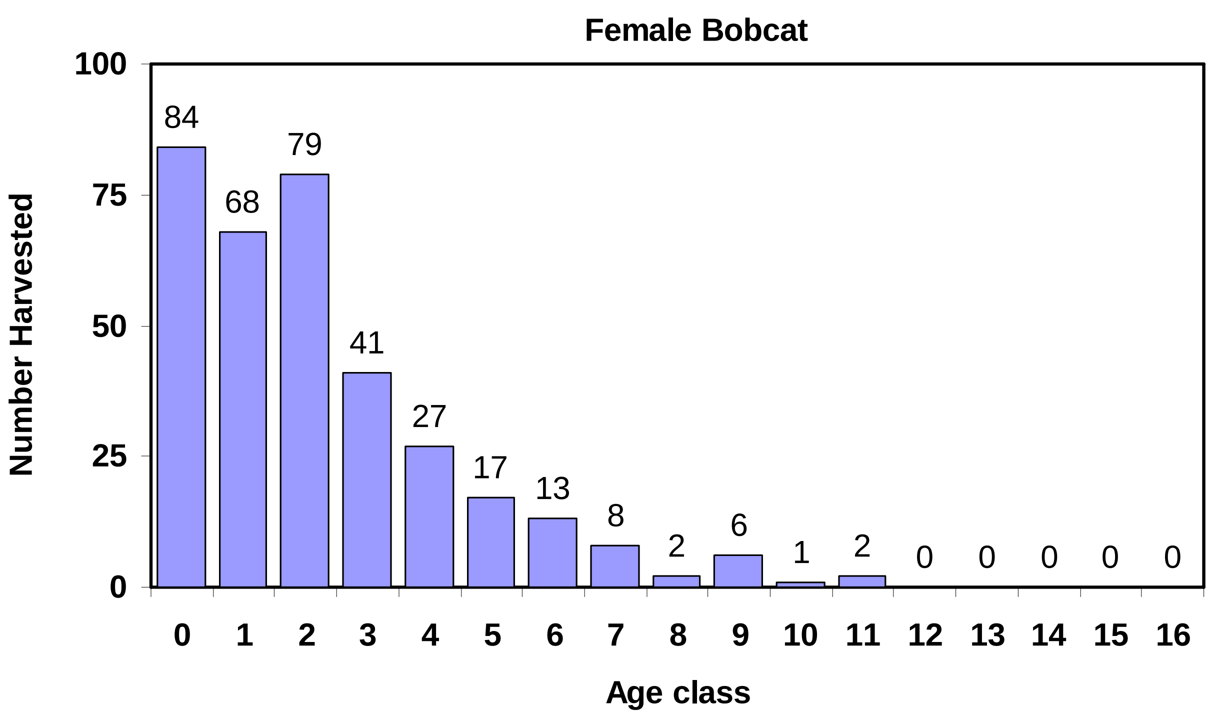


Figure 1. Age structure of male and female bobcats in the 2006-07 harvest.

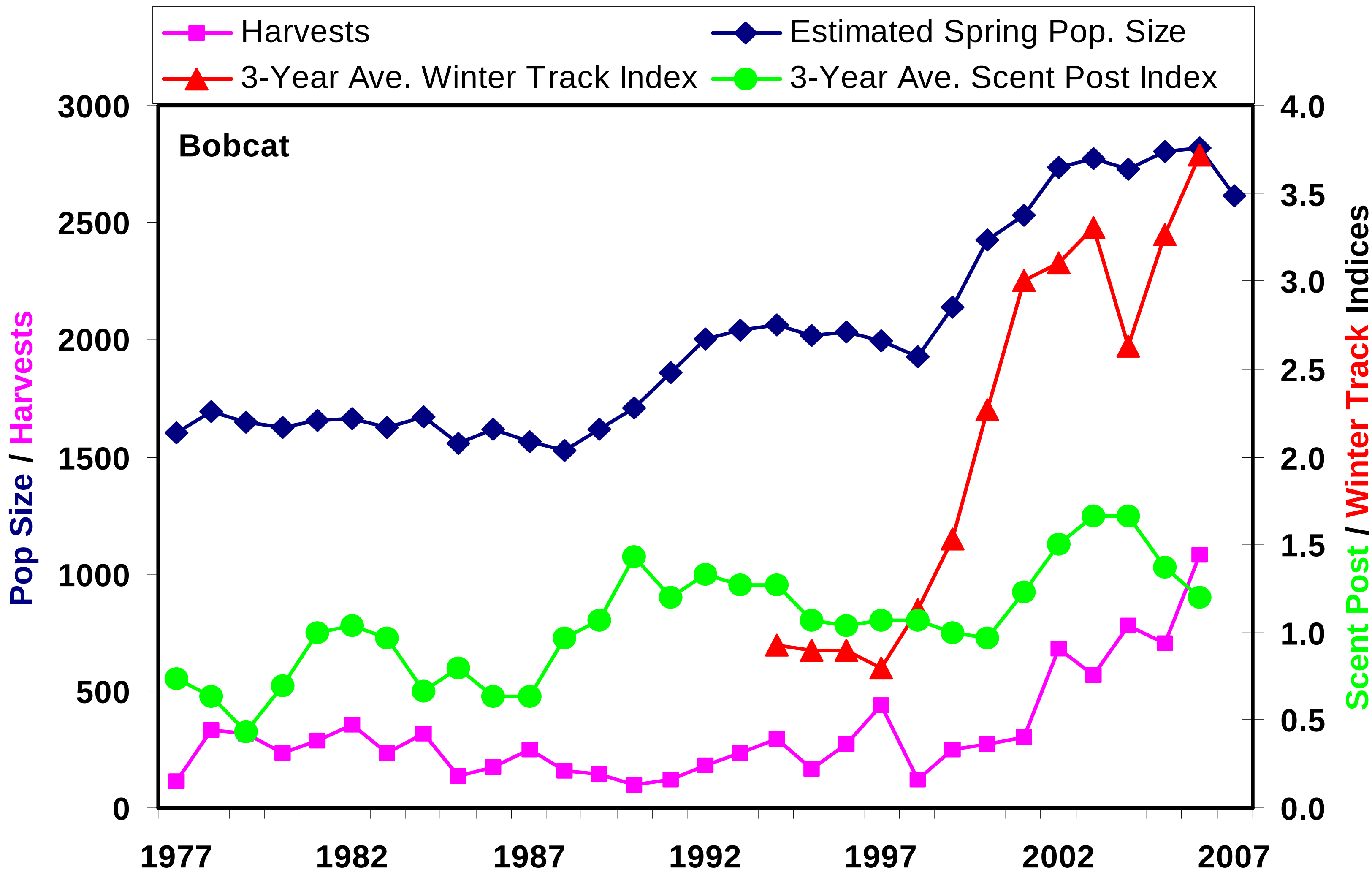


Figure 2. Bobcat populations, harvests, and survey indices, 1977-2006. Harvests include an estimate of non-reported take.

Table 2. Fisher harvest data, 1978 to 2006. Carcass collections ended in 1994.

Year	Season	Limit[1]	DNR harvest	Modeled Harvest[2]	% Autumn Pop. Harvested[3]	Carcasses examined	% juveniles	% yearlings	% adults	Juv:ad. females	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[4]	Pelt price Females[4]
1978	12/1-1/31	3	2426	2426	29	577	70	16	14	7.1	44	35	28	40	$132	$147
1979	12/1-1/31	3	3032	3032	41	467	65	15	21	5.6	54	46	44	50	$108	$128
1980	CLOSED															
1981	12/1-12/10	1	862	1022	16	843	66	24	10	10.5	48	43	37	47	$94	$110
1982	12/1-12/10	1	912	1073	16	1073	66	19	15	9.4	46	41	52	46	$70	$99
1983	12/1-12/11	1	631	735	11	662	69	18	13	8.8	45	40	40	44	$71	$121
1984	12/1-12/16	1	1285	1332	19	1270	63	20	17	7.2	52	45	45	49	$70	$122
1985	11/30-12/15	1	678	735	11	712	63	20	18	5.4	46	40	34	43	$74	$130
1986	11/29-12/4	1	1068	1186	17	1186	59	24	18	5.3	48	50	37	46	$84	$162
1987	11/28-12/13	1	1642	1749	24	1534	63	15	22	4.7	46	40	37	43	$84	$170
1988	11/26-12/11	1	1025	1050	15	805	70	15	15	6.8	48	45	33	45	$54	$100
1989	12/2-12/17	1	1243	1243	17	1024	64	19	17	5.8	47	47	36	45	$26	$53
1990	12/1-12/16	1	746	756	10	592	65	14	21	4.5	44	55	30	43	$35	$46
1991	11/30-12/15	1	528	528	7	410	66	21	13	7.8	50	52	35	48	$21	$48
1992	11/28-12/13	1	778	782	9	629	58	21	21	4.9	42	55	45	46	$16	$29
1993	12/4-12/19	2	1159	1192	11	937	59	22	19	5.3	47	37	42	44	$14	$28
1994	12/3-12/18	2	1771	1932	16	1360	56	18	26	4	47	54	44	48	$19	$30
1995	12/2-12/17	2	942	1060	9	-	-	-	-	-	-	-	-	45	$16	$25
1996	11/30-12/15	2	1773	2000	16	-	-	-	-	-	-	-	-	45	$25	$34
1997	11/29-12/14	2	2761	2974	23	-	-	-	-	-	-	-	-	45	$31	$34
1998	11/28-12/13	2	2695	2987	24	-	-	-	-	-	-	-	-	45	$19	$22
1999	12/4-12/19	2	1725	1880	16	-	-	-	-	-	-	-	-	45	$19	$20
2000	12/2-12/17	4	1674	1900	16	-	-	-	-	-	-	-	-	45	$20	$19
2001	11/24-12/9	4	2145	2362	19	-	-	-	-	-	-	-	-	54	$20	$19
2002	11/30-12/15	5	2660	3028	24	-	-	-	-	-	-	-	-	54	$23	$23
2003	11/29-12/14	5	2521	2728	23	-	-	-	-	-	-	-	-	55	$27	$26
2004	11/27-12/12	5	2552	2753	23	-	-	-	-	-	-	-	-	52	$30	$27
2005	11/26-12/11	5	2388	2454	21	-	-	-	-	-	-	-	-	52	$36	$31
2006	11/25-12/10	5	3250	3500	30	-	-	-	-	-	-	-	-	51	$77	$69

[1] Combined limit since 1999 of any combination of marten and fisher totaling the specified limit, except in 1999 where fisher portion of limit could only be 2.

[2] Includes DNR and Tribal harvests

[3] Estimated from population model, includes estimated non-reported harvest of 22% 1977-1992, and 11% in 1993-1999

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

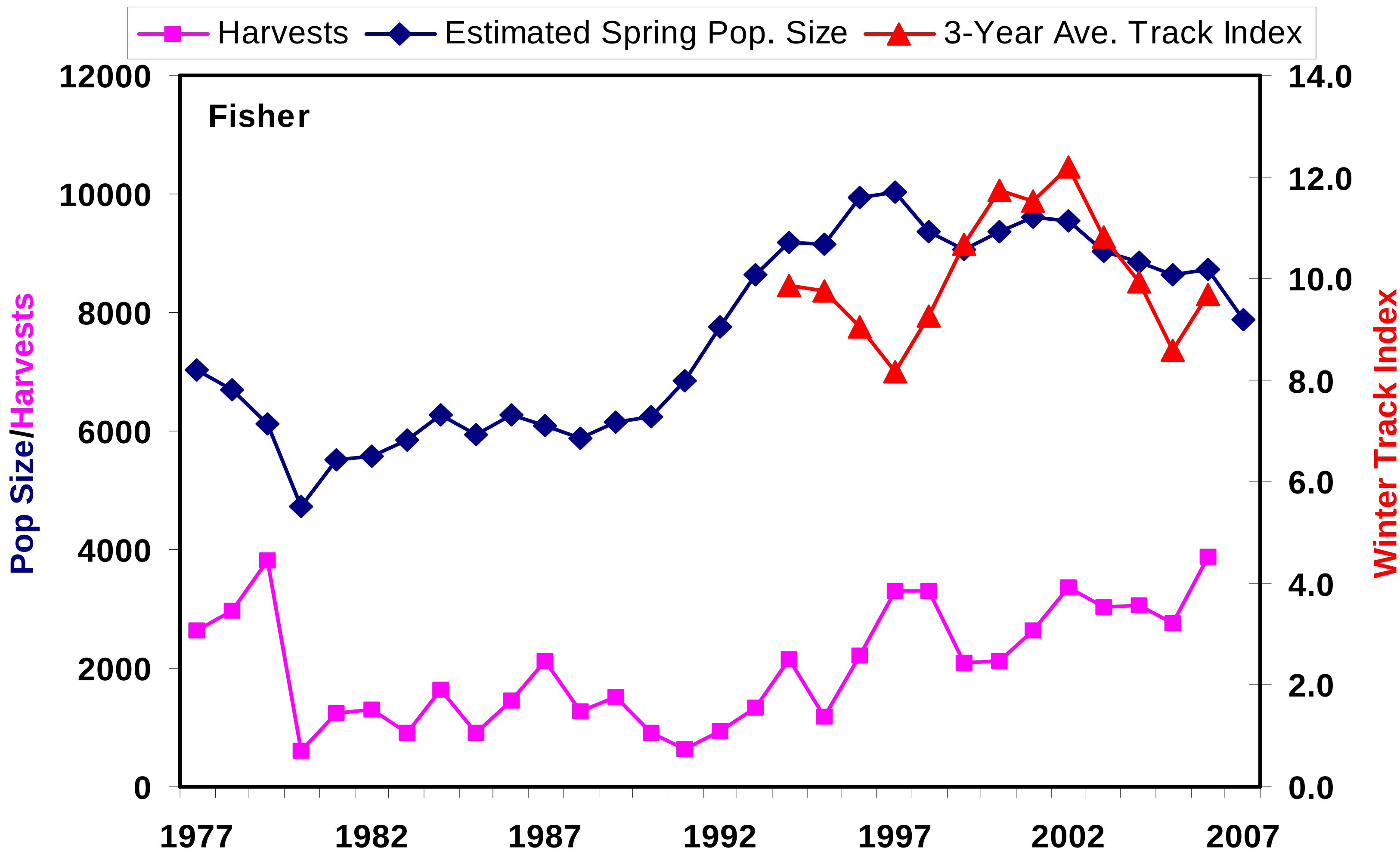


Figure 3. Fisher populations, harvests, and survey indices, 1977-2006. Harvests include an estimate of non-reported take.

Table 3. Marten harvest data, 1985 to 2006.

Year	Season	Limit[1]	DNR harvest	Modeled harvest[2]	% Autumn Pop. Taken[3]	Carcasses examined[4]	% juveniles	% yearlings	% adults	Juv:ad females	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[5]	Pelt price Females[5]
1985	11/30-12/15	1	430	430	6	507	73	18	9	17.2	69	68	82	70	$30	$28
1986	11/29-12/14	1	798	798	10	884	64	21	15	12.3	65	71	81	69	$36	$27
1987	11/28-12/13	1	1363	1363	15	1754	66	18	16	11.2	65	67	75	67	$43	$39
1988	11/26-12/11	2	2072	2072	19	1977	66	11	23	8.6	58	50	66	59	$50	$43
1989	12/2-12/17	2	2119	2119	20	1014	68	12	20	9.7	57	63	65	59	$48	$47
1990	12/1-12/16	2	1349	1447	15	1375	48	18	34	3.6	59	54	61	59	$44	$41
1991	11/30-12/15	1	686	1000	11	716	74	9	17	16.1	69	71	72	70	$40	$27
1992	11/28-12/13	2	1602	1802	15	1661	65	18	17	15.1	63	70	75	66	$28	$25
1993	12/4-12/19	2	1438	1828	15	1396	57	20	23	7.5	61	71	67	64	$36	$30
1994	12/3-12/18	2	1527	1846	15	1452	58	15	27	6.4	62	76	67	66	$34	$28
1995	12/2-12/17	2	1500	1774	13	1393	60	18	22	8.2	63	68	66	65	$28	$21
1996	11/30-12/15	2	1625	2000	16	1372	48	22	30	4.8	62	69	67	65	$34	$29
1997	11/29-12/14	2	2261	2762	20	2238	61	13	26	6.2	60	60	63	61	$28	$22
1998	11/28-12/13	2	2299	2795	20	1577	57	18	25	6.6	62	66	65	63	$20	$16
1999	12/4-12/19	4	2423	3000	20	2013	67	12	21	9.8	65	66	67	66	$25	$21
2000	12/2-12/17	4	1629	2050	14	1598	56	25	19	8.9	62	69	66	64	$28	$21
2001	11/24-12/9	4	1940	2250	14	1895	62	15	23	11	66	73	75	69	$28	$21
2002	11/30-12/15	5	2839	3192	19	2451	39	30	31	3.1	57	63	61	60	$24	$23
2003	11/29-12/14	5	3214	3548	22	2391	48	17	35	4	57	65	66	62	$30	$27
2004	11/27-12/12	5	3241	3592	24	2776	26	28	46	1.3	52	64	57	58	$31	$27
2005	11/26-12/11	5	2653	2873	20	1992	53	16	31	4.9	64	63	65	64	$37	$32
2006	11/25-12/10	5	3788	4120	28	1914	64	17	20	9.2	66	67	65	66	$74	$66

[1] Combined limit since 1999 of any combination of fisher and marten totaling the specified limit, except in 1999 where fisher portion of limit could only be 2.

[2] Includes DNR and Tribal harvests

[3] Estimated from population model; includes estimated non-reported harvest of 40% in 1985-1987 and 1991, 20% in 1988-1990 and 1992-1998, and 15% from 1999-present.

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

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

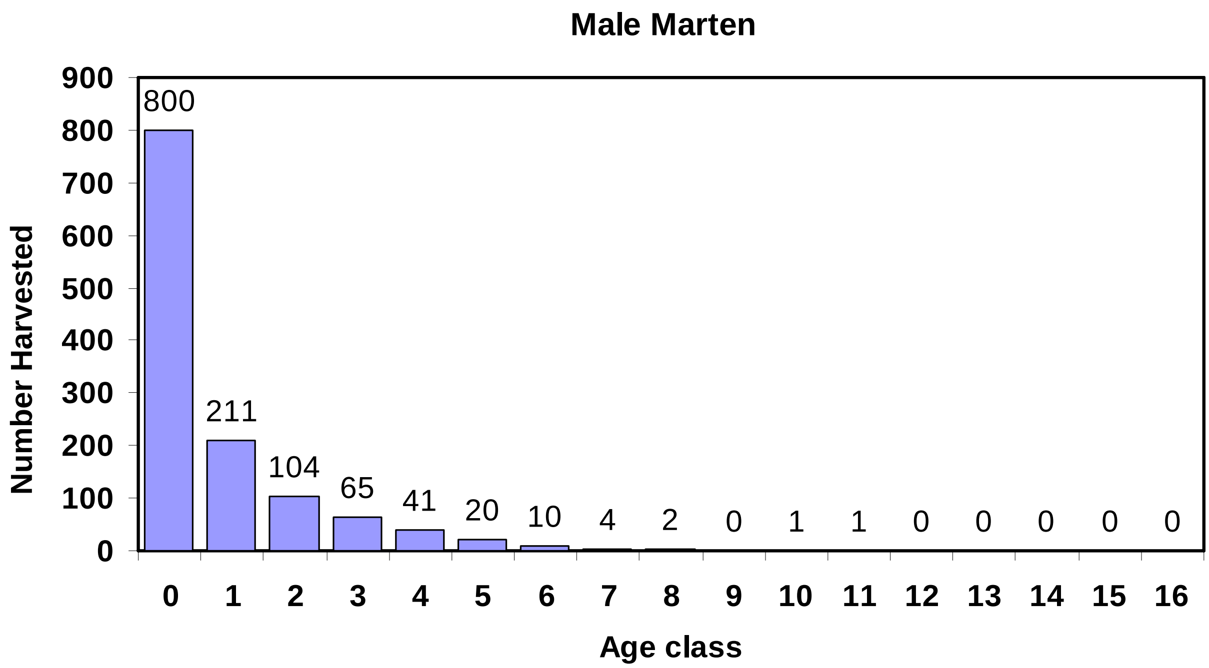


Figure 4. Age structure of male and female marten in the 2006-07 harvest.

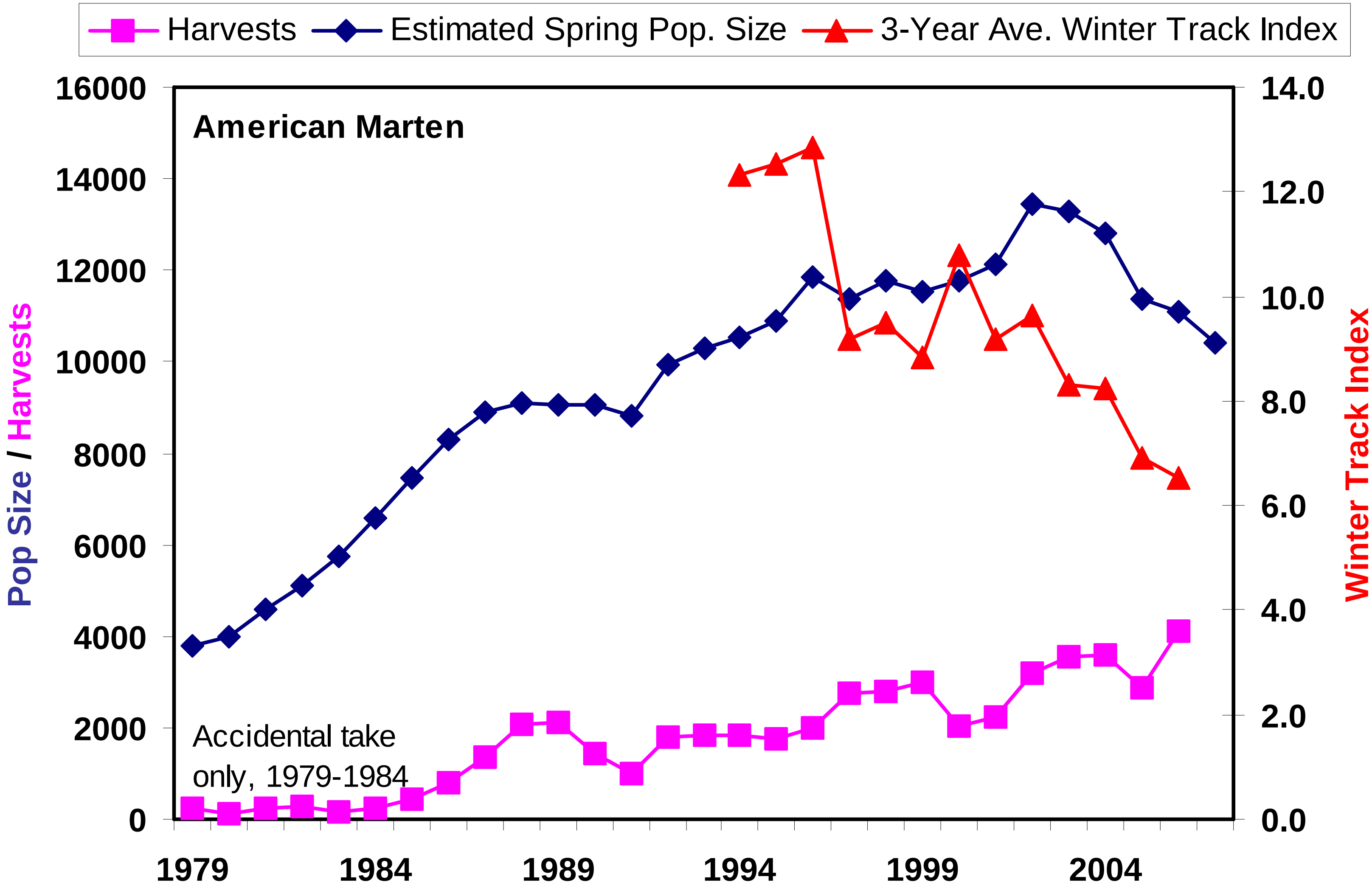


Figure 5. American marten populations, harvests, and survey indices, 1979-2007. Harvests include an estimate of non-reported take.

Table 4. Otter harvest data, 1978 to 2006. Carcasses were only collected from 1980-86.

Year	Season	Limit	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses examined	% juveniles	% yearlings	% adults	Juv:ad. females	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Otter[3]	Pelt price Beaver[3]
1978	12/1-12/15	3	636	636	10	-	-	-	-	-	-	-	-	52	$59	$22
1979	11/15-1/29	3	1186	1186	17	-	-	-	-	-	-	-	-	52	$63	$29
1980	11/15-1/29	2	1111	1111	16	88	55	15	30	3.4	40	62	56	48	$33	$18
1981	11/14-1/28	2	485	762	11	471	55	20	25	4.3	56	53	48	52	$30	$14
1982	11/13-1/27	2	385	625	9	389	51	26	23	6	57	65	65	60	$26	$11
1983	11/12-1/26	2	408	614	8	433	42	31	27	3.7	56	57	57	56	$25	$12
1984	11/17-2/01	2	513	561	7	549	48	23	29	3.2	47	50	49	49	$22	$12
1985	11/16-2/15	3	559	572	7	572	43	23	34	2.2	53	50	43	51	$21	$15
1986	10/24-1/29	3	777	777	8	745	45	23	32	2.7	45	48	46	47	$24	$20
1987	10/27-1/29	3	1386	1484	15	-	-	-	-	-	-	-	-	52	$23	$17
1988	10/29-1/27	3	922	922	9	-	-	-	-	-	-	-	-	52	$22	$14
1989	10/28-2/17	3	1294	1294	12	-	-	-	-	-	-	-	-	52	$22	$12
1990	10/27-1/6	3	888	903	8	-	-	-	-	-	-	-	-	52	$24	$9
1991	10/26-1/5	3	855	925	8	-	-	-	-	-	-	-	-	51	$25	$9
1992	10/24-1/3	4	1368	1368	10	-	-	-	-	-	-	-	-	52	$30	$7
1993	10/23-1/9	4	1459	1646	10	-	-	-	-	-	-	-	-	52	$43	$11
1994	10/29-1/8	4	2445	2708	19	-	-	-	-	-	-	-	-	52	$48	$14
1995	10/28-1/7	4	1435	1466	12	-	-	-	-	-	-	-	-	52	$38	$13
1996	10/26-1/5	4	2219	2500	18	-	-	-	-	-	-	-	-	52	$39	$19
1997	10/25-1/4	4	2145	2313	17	-	-	-	-	-	-	-	-	52	$39	$19
1998	10/24-1/3	4	1946	2139	16	-	-	-	-	-	-	-	-	52	$34	$11
1999	10/23-1/9	4	1635	1717	13	-	-	-	-	-	-	-	-	52	$41	$12
2000	10/28-1/7	4	1578	1750	13	-	-	-	-	-	-	-	-	52	$51	$15
2001	10/27-1/6	4	2323	2531	18	-	-	-	-	-	-	-	-	57	$51	$14
2002	10/26-1/5	4	2145	2390	16	-	-	-	-	-	-	-	-	59	$46	$13
2003	10/25-1/4	4	2766	2966	20	-	-	-	-	-	-	-	-	57	$85	$13
2004	10/23-1/9	4	3450	3700	25	-	-	-	-	-	-	-	-	56	$87	$14
2005	10/29-1/8	4	2846	2884	21	-	-	-	-	-	-	-	-	58	$89	$16
2006	10/28-1/7	4	2720	2872	22	-	-	-	-	-	-	-	-	56	$42	$15

[1] Includes DNR and Tribal harvests

[2] Estimated from population model. Incl. estimated non-reported harvest of 30% to 1991, 22% from 1992-2001, and 15% after 2001.

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

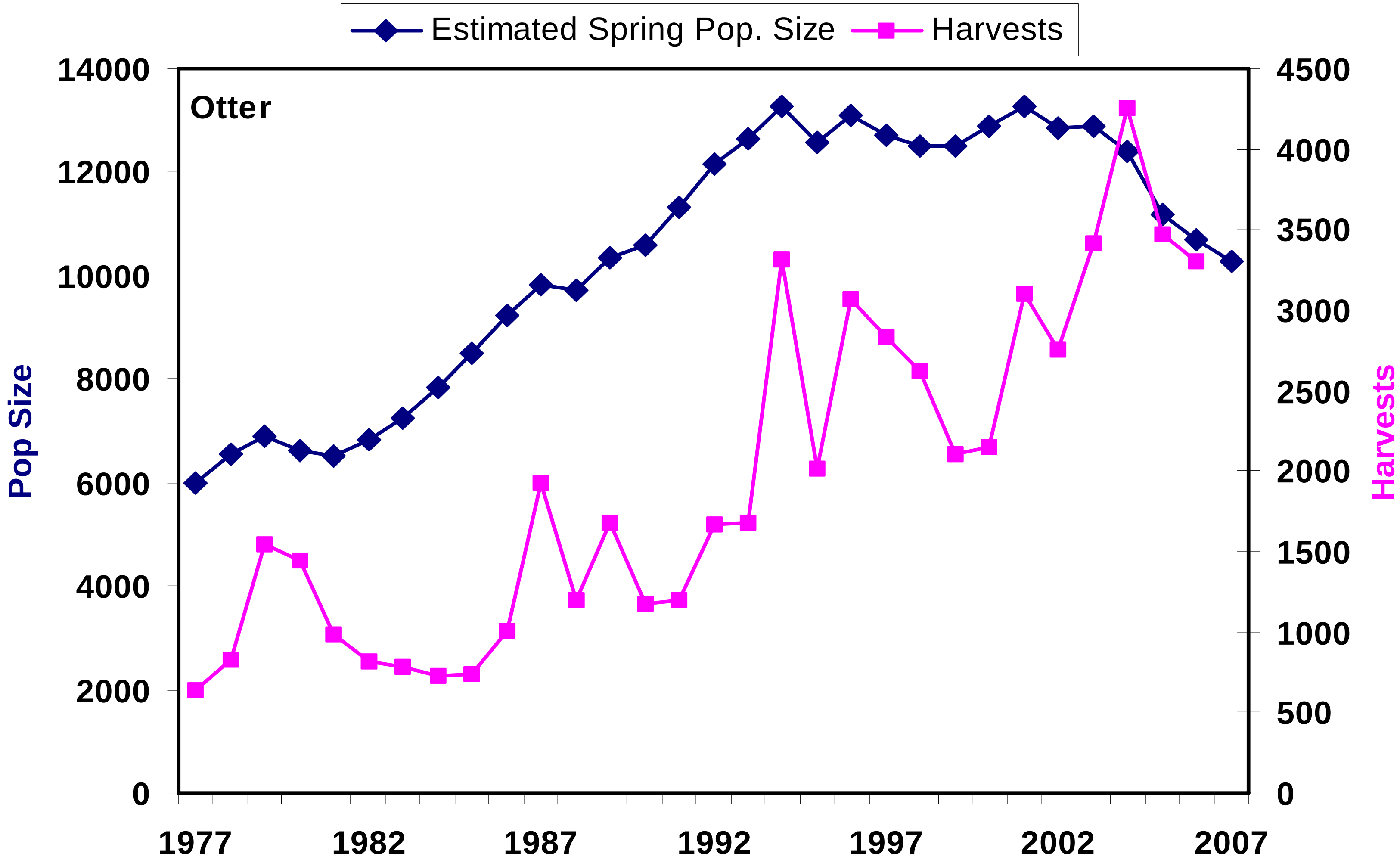


Figure 6. Otter populations and harvests, 1977-2006. Harvests include an estimate of non-reported take.

Population Trends Of White-Tailed Deer In The Forest Zone – 2007

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Deer hunters are required by regulation to register each deer they harvest within 24 hours of the close of the deer-hunting season. Data collected as part of this registration process provide important information on the sex and age of deer killed, population trends, and the effectiveness of current management regulations. The following report presents a brief analysis of the 2006 harvest registration data in the forest zone (Figure 1). This is followed by a discussion of deer population trends and projections in the forest zone based on simulation modeling.

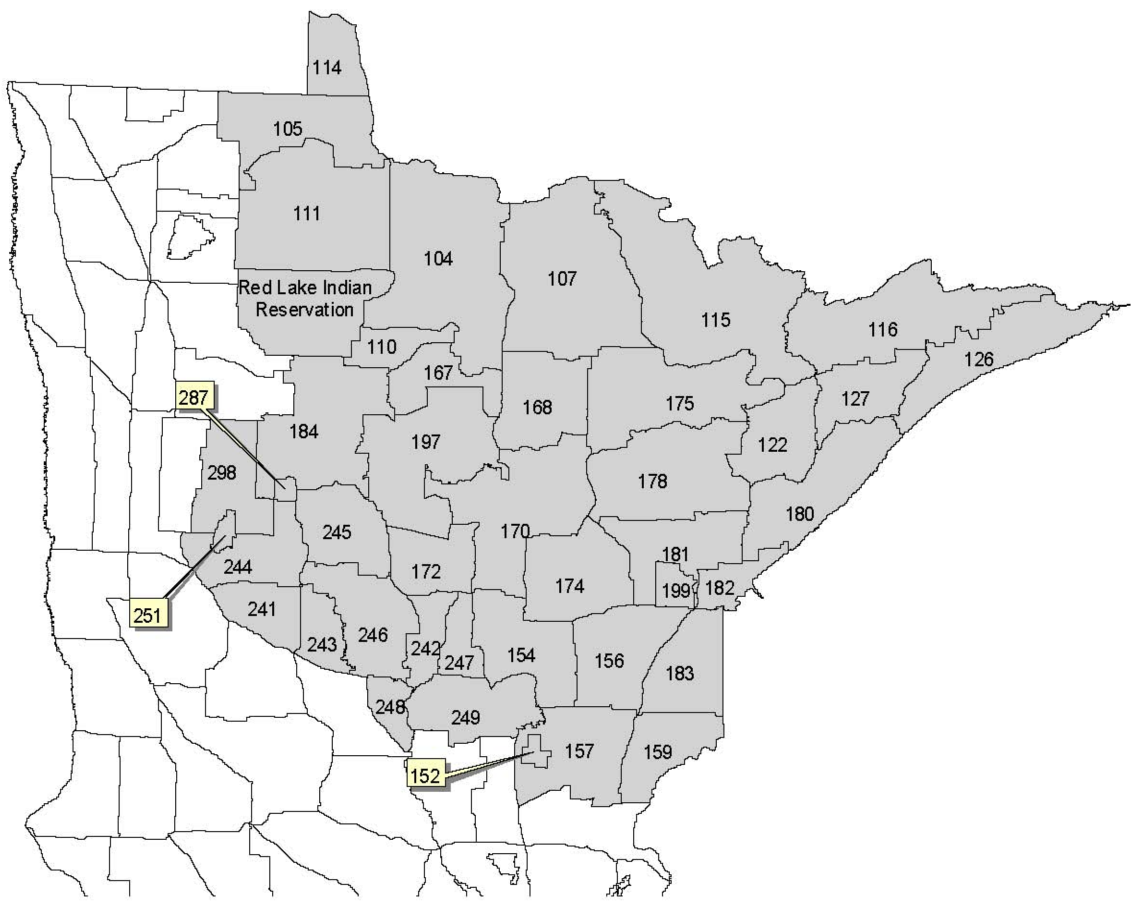


Figure 1. Permit areas in the forested zone, 2007. Permit areas 114, 152, 182, 287, and Red Lake Indian Reservation were not modeled.

HARVEST

In 2006, hunters registered 270,808 deer, the 2nd highest harvest ever recorded in Minnesota. Of that number, 51% or 137,963 deer were harvested in the forested zone (Figure 1, Table 1). The 2006 forest zone harvest increased 6% from the 2005 harvest. The following discussion applies to the subset of deer harvested in the forest zone.

The buck harvest decreased in 16 of the 42 permit areas (Table 2, Figure 2). Most of the decrease in buck harvest occurred in the northern tier of permit areas and those in the south-central portion of the forest zone. The total forest zone buck harvest declined only 1% compared with an 11% decline the previous year (Table 2).

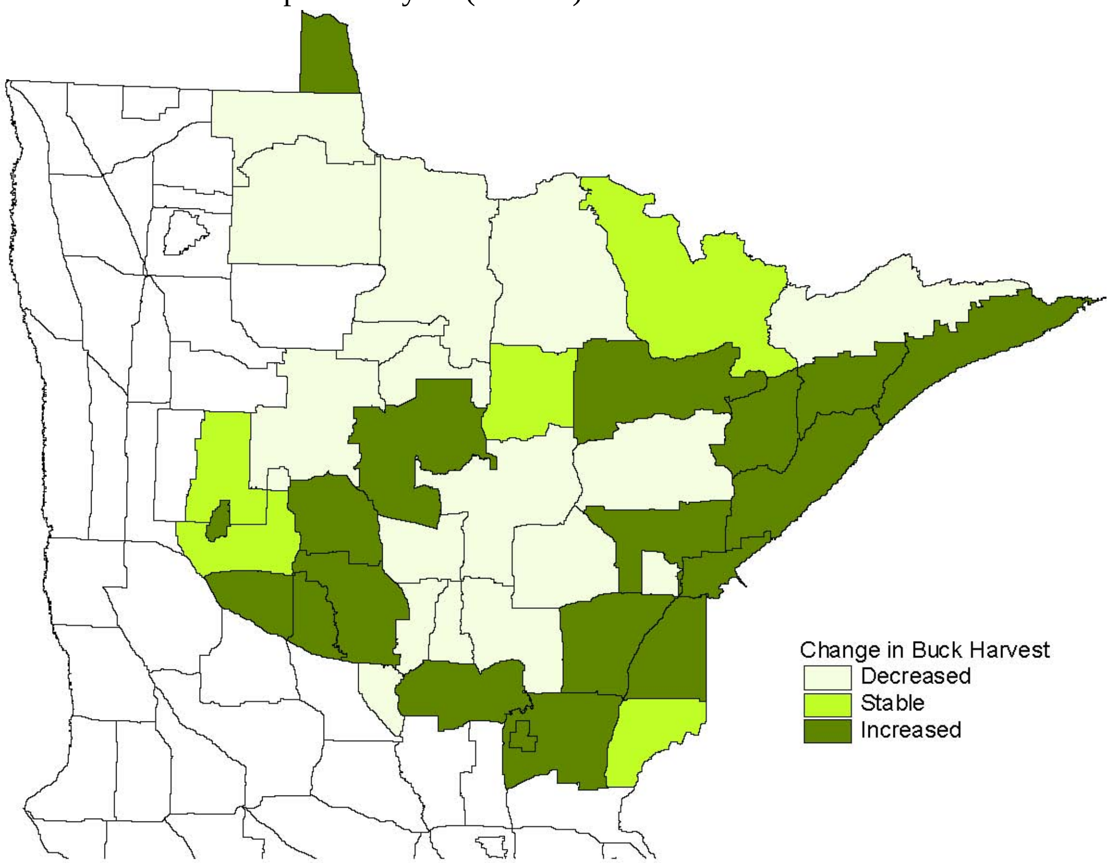


Figure 2. Change in buck harvest in forest zone permit areas between 2005 and 2006.

The antlerless harvest increased in 34 of the 42G permit areas (Table 3) and the total antlerless harvest increased 17%. The greatest increases occurred in permit areas that shifted from "lottery" into the "managed" category (mean=150%, range 91-308%), which allowed all hunters the option of harvesting 2 antlerless deer. Permit areas that shifted from "managed" into the "intensive" category, which allowed hunters to harvest up to 5 antlerless deer, also experienced increased antlerless harvests (mean = 28%, range 21-49%). Permit areas that remained in the "managed" category saw an average change of 6% (-22% to 21%) and permit areas that remained "intensive" averaged a 5% change (-21% to 26%).

The proportion of bucks in the harvest (forest-wide) dropped to 40%, the lowest proportion in recent history. This decline was expected because of the increased opportunity to harvest antlerless harvest. The buck hunter success in the forest also declined but calculation of this variable is becoming increasingly confounded by the increase in “All Season Licenses” which allows hunters the option of hunting outside Zones 1 and 2.

The archery harvest in the forest zone has steadily increased in recent years. Between 1992 and 1999, the archery harvest increased 12% to 2,954, an average of less than 2% per year. Since 1999, the archery harvest increased 225% to 9,598, an average of 32% per year. The muzzleloader harvest has made similar increases. In 1999, the muzzleloader harvest in the forest zone was only 420 deer. Since 1999, the muzzleloader harvest has increased 665% to 3,212. In both cases, the increases are the result of the introduction and steady increased sales of “All Season Licenses” that allow a hunter to kill deer during the archery, regular firearms, and muzzleloader seasons. Both the archery and muzzleloader harvests are linearly related to the number of All Season Licenses (archery: r^2=0.927, $P<0.001$; muzzleloader: r^2=0.652, $P=0.028$)

POPULATION TRENDS AND MODEL PROJECTIONS

Based on the winter severity index (WSI), the winter of 2006-07 was again mild throughout the forest zone with an average index of 45 (22 to 73). Sub zero temperatures occurred throughout the winter but were concentrated in February. Snow depths were generally below the 15” threshold until early March when 2 significant snowstorms occurred. Snow depths dropped below the threshold in mid to late March.

Simulation modeling was used in 38 permit areas (Figures 1 and Table 4) to approximate deer density, identify trends, and project the effect of the 2007-hunting season. To better summarize the results for this report, permit areas were lumped in to one of 5 regions (Figures 3 and 4). Deer density varied according to region with the lowest densities occurring in the Northeast (NE) and Northwest (NW). Highest densities occurred in the West Central (WC). The same basic trend occurred in all 5 areas; deer density was at the lowest level in 1997 following the severe winters of the mid-1990’s and then steadily increased to peak density in 2003 in response to low (or no) antlerless permits and mild winters. Since 2003, the declines in the South (S) and WC were a response to the high antlerless harvest. Although the antlerless harvest density in the central (C) permit areas increased 20% in 2006, it was well below that documented in the S and WC. This lower harvest explains, in part, why deer numbers in the central permit areas remained stable. The antlerless harvest in the NE and NW remained low and deer numbers, according to the model, are gradually increasing.

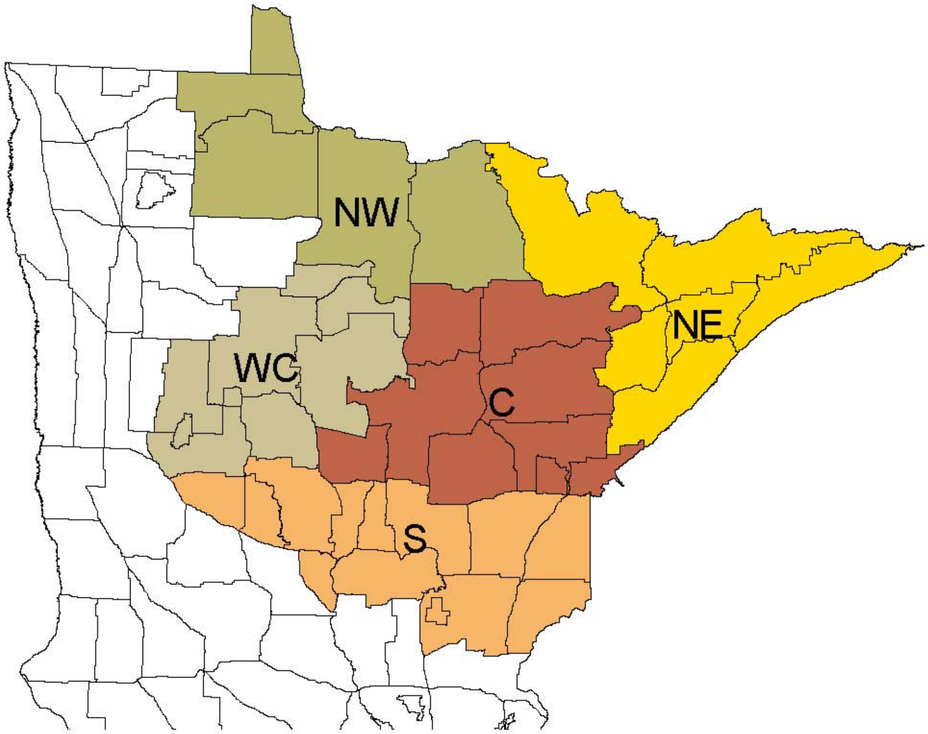


Figure 3. Permit areas grouped for summary discussion.

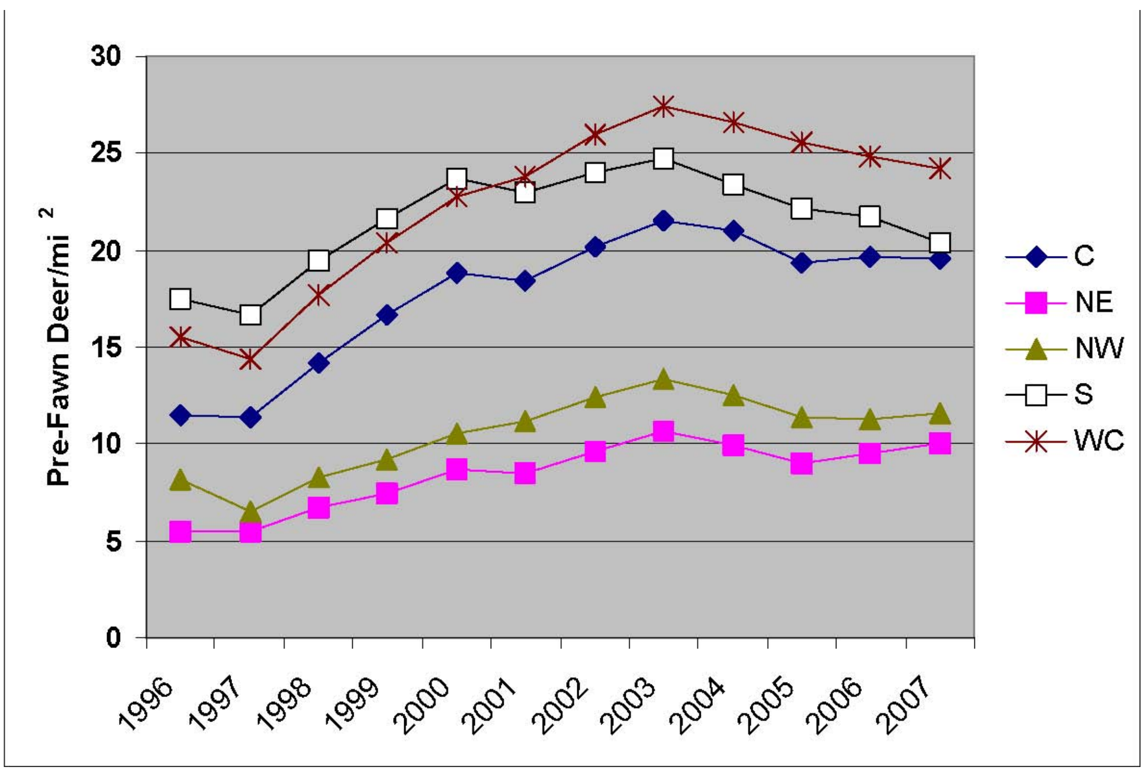


Figure 4. Population trends of deer in forest zone. Trend lines represent the groups of permit areas as illustrated in figure 3. Density represents pre-fawn density.

Based on density targets set during the 2005 and 2006 goal setting processes, the 2007 pre-fawn deer density was above goal over much of the forest zone (Figure 5). For purposes here, if deer density was within 1 deer/mi^2 of the goal, the permit area is listed as being at goal. Permit areas ranged from 2 deer/mi^2 below goal to as much as 19 deer/mi^2 above goal.

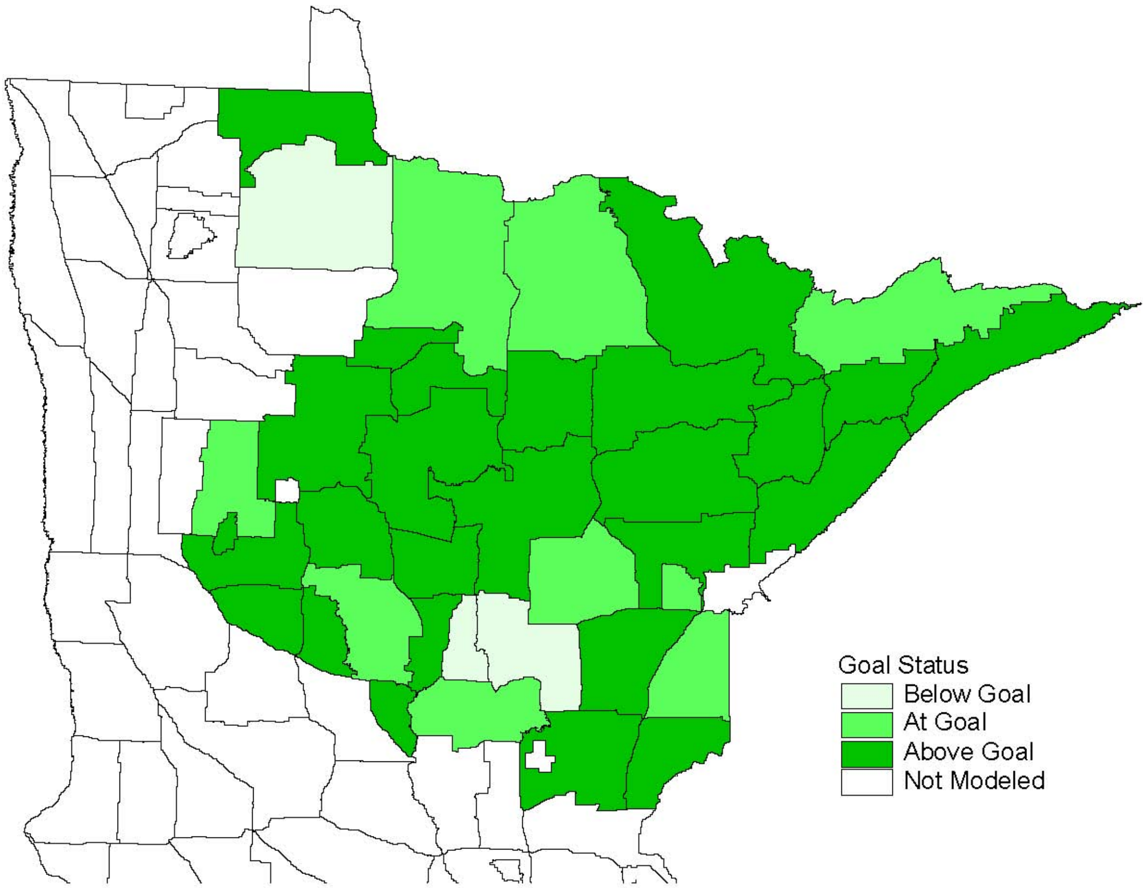


Figure 5. Deer density expressed relative to pre-fawn population goals.

Final classifications of permit areas for the 2007 season were based primarily on the absolute difference between the 2007 pre-fawn density and that prescribed by the goal setting process. Only 2 permit areas were classified as “Lottery” where hunters must apply for the limited number of antlerless permits. Twenty-one permit areas were classified as “Managed” where hunters may take up to 2 antlerless deer. Thirteen permit areas were classified as “Intensive” where hunters are allowed to harvest up to 5 antlerless deer and 6 additional permit areas were “Intensive” and include an early antlerless season in October.

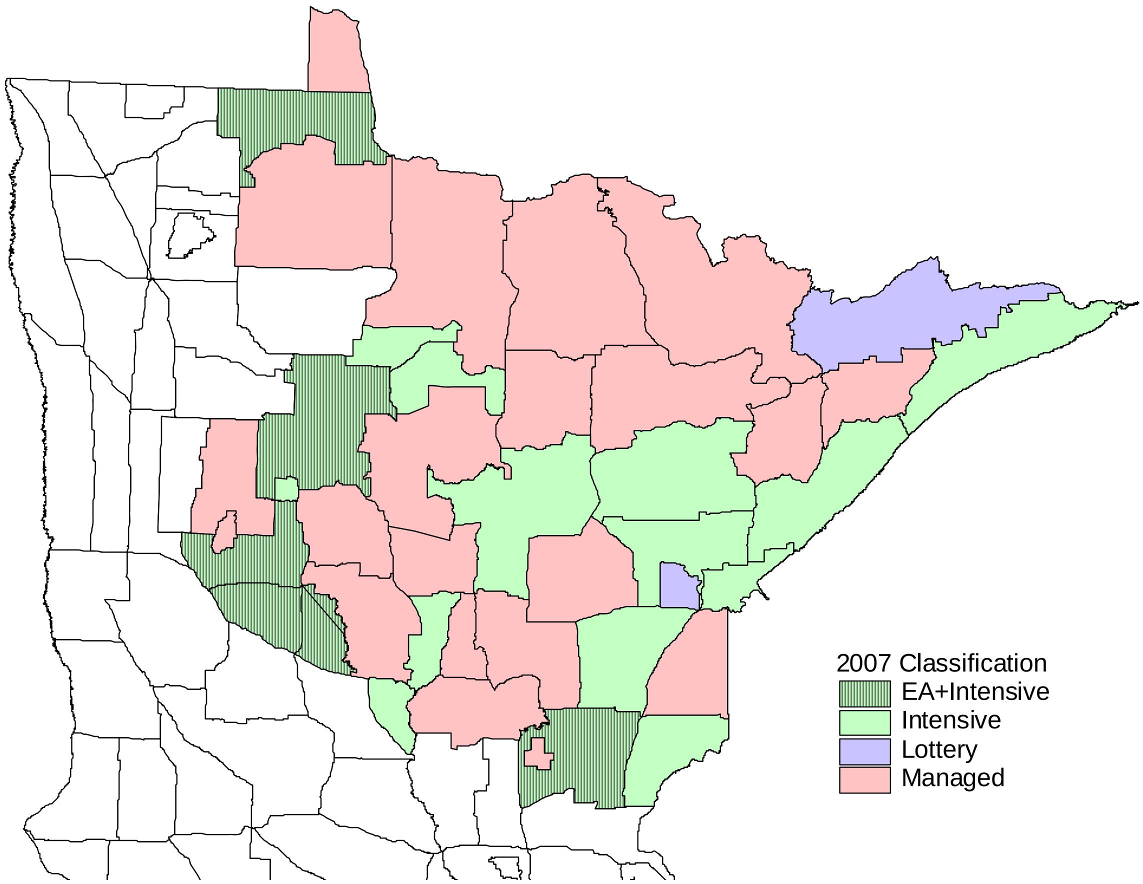


Figure 6. Final classification of permit areas in the 2007 hunting season.

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

Permit Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Change
104	567	897	1,372	1,837	1,940	2,253	3,421	2,902	2,483	2,631	6%
105	876	1153	1,389	1,821	1,962	2,385	3,740	3,106	3,557	3,196	-10%
107	948	1,176	1,994	2,846	3,550	3,499	5,206	4,027	3,936	3,825	-3%
110	397	571	1,678	1,719	1,745	1,940	2,744	2,869	1,945	1,910	-2%
111	580	733	1,198	1,861	2,353	2,264	3,064	2,621	2,687	2,814	5%
114	52	39	40	55	72	80	96	110	123	174	41%
115	1,029	1,347	2,334	3,170	3,589	3,815	5,373	4,417	4,365	4,472	2%
116	100	146	138	150	162	157	264	295	261	276	6%
122	251	457	296	551	622	564	685	716	657	1067	62%
126	197	268	306	445	470	595	690	837	901	977	8%
127	63	83	176	81	99	108	146	165	148	188	27%
152	143	213	225	283	264	217	235	246	271	330	22%
154	1,370	1,952	2,977	4,415	4,168	5,032	5,717	5,176	4,571	4,533	-1%
156	1,546	2,109	2,646	3,753	3,036	3,246	4,935	4,583	4,466	4,750	6%
157	3,293	4,709	5,385	6,985	7,196	7,727	9,001	7,606	6,901	7,989	16%
159	2,312	3,493	3,971	5,070	4,167	3,934	5,028	3,871	3,672	3,603	-2%
167	338	599	1,452	1,601	1,971	2,488	1,572	1,463	1,257	1,738	38%
168	552	988	2,410	2,686	2,379	3024	3,218	3,978	2,521	3,622	44%
170	1,143	2,220	2,857	4,938	4,833	4,716	8,460	7,154	7,221	6,951	-4%
172	979	1,443	2,960	4,253	4,624	4,910	7,004	5,490	5,227	5,359	3%
174	754	1,371	1,927	2,436	2,141	2,678	3,811	3,346	3,091	3,152	2%
175	2,685	2,686	2,320	3,029	3,339	3184	5,034	4,254	3,103	4,458	44%
178	1,532	2,190	2,344	3,064	3,343	3,650	5,486	5,267	5,363	5,473	2%
180	550	932	927	1,471	1,654	1,811	3,030	2,278	2,802	3,495	25%
181	703	1,186	1,780	2,362	2,457	2,419	3,599	3,544	3,755	4,475	19%
182	240	405	614	827	862	869	1,309	1,206	1,256	1,460	16%
183	598	1,003	2,147	2,748	2,743	2,771	3,960	3,533	3,449	4,006	16%
184	1,977	2,777	5,803	6,940	7,389	8,424	12,488	11,560	11,482	10,261	-11%
197	407	597	933	1,372	1,167	1,413	1,652	1,723	1,594	2,471	55%
199	58	87	130	169	166	164	140	172	188	167	-11%
241	3568	2919	2651	4284	3927	3857	4549	4449	4,288	4,372	2%
242	1,112	1,316	1,572	1,849	2,069	2,426	2,767	2,244	2,116	2,170	3%
243	1,268	1,602	1,908	2,634	2,864	3,238	4,131	3,684	3,165	3,429	8%
244	2,034	2,396	2,952	3,862	4,841	5,805	7,452	6,702	6,162	6,192	0%
245	1,021	1,657	3,524	4,838	5,056	5,626	8,231	6,377	5,737	6,115	7%
246	2,254	2,847	3,358	4,760	5,150	5,149	7,530	6,782	5,835	6,389	9%
247	1,139	1,348	1,611	1,894	2,119	2101	2,744	2,582	2,115	2,393	13%
248	564	943	850	1,039	881	1,352	1,897	1,864	1,670	1,280	-23%
249	1,110	1,514	2,217	2,826	3,149	3,238	4,223	3,800	3,211	3,643	13%
251	231	255	246	326	254	298	470	387	325	299	-8%
287	313	314	368	376	460	470	529	425	280	305	9%
298	326	516	704	803	826	932	1988	1733	1664	1727	4%
Forested Zone	41,179	55,458	76,689	102,429	106,060	114,829	157,619	139,544	129,821	138,137	6%

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

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

Permit Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Change
104	565	887	1,137	1,240	1,266	1,332	1,589	1,586	1,250	1,176	-6%
105	484	730	846	945	813	1,138	1,489	1,326	1,364	1,122	-18%
107	942	1,160	1,706	1,948	2,174	2,119	2,523	2,277	1,861	1,725	-7%
110	372	511	818	904	926	914	1,089	1,119	694	658	-5%
111	552	719	1,113	1,350	1,474	1,463	1,467	1,408	1,312	1,149	-12%
114	52	39	40	43	56	63	55	55	72	95	32%
115	1,009	1,316	1,898	2,036	2,145	2,371	2,894	2,663	2,254	2,235	-1%
116	100	144	138	150	156	157	238	249	230	188	-18%
122	242	447	293	415	452	441	490	567	534	565	6%
126	183	250	306	390	417	493	582	587	594	606	2%
127	62	81	176	80	82	93	126	145	126	147	17%
152	89	127	173	191	182	130	106	152	141	158	12%
154	984	1,437	2,017	2,304	2,142	2,169	2,071	2,049	1,783	1,674	-6%
156	1,081	1,531	1,836	2,066	1,680	1,645	1,989	1,996	1,793	1,871	4%
157	1,988	2,675	3,099	3,327	3,143	3,047	3,207	3,030	2,745	2,916	6%
159	1,428	1,867	1,980	2,412	1,773	1,605	1,916	1,514	1,467	1,479	1%
167	327	585	906	1,036	968	1,211	821	819	709	692	-2%
168	543	973	1,579	1,653	1,454	1,675	1,698	1,889	1,432	1,439	0%
170	1,135	2,109	1,609	3,106	2,787	2,611	3,435	3,233	2,987	2,920	-2%
172	896	1,175	1,820	2,292	2,260	2,200	2,359	2,147	1,853	1,803	-3%
174	702	1,224	1,234	1,446	1,255	1,361	1,541	1,596	1,367	1,304	-5%
175	810	1,273	1,917	2,107	2,072	2,113	2,463	2,319	2,072	2,190	6%
178	895	1,363	1,945	2,052	2,012	2,212	2,638	2,756	2,698	2,500	-7%
180	497	854	922	1,169	1,325	1,357	1,775	1,781	1,664	1,799	8%
181	625	1,060	1,351	1,596	1,562	1,590	1,943	1,940	1,779	1,998	12%
182	214	364	484	577	564	568	685	684	511	520	2%
183	537	902	1,633	1,919	1,650	1,575	1,661	1,654	1,514	1,634	8%
184	1,873	2,421	3,680	3,952	3,673	4,095	4,287	4,542	4,161	3,554	-15%
197	403	585	923	1,142	953	998	1,040	1,143	999	1,090	9%
199	58	87	91	137	123	132	104	130	151	119	-21%
241	1008	1175	1030	1382	1396	1477	1559	1621	1,460	1,507	3%
242	583	704	880	1,071	959	824	912	740	721	692	-4%
243	752	957	1,082	1,192	1,169	1,247	1,343	1,217	1,066	1,142	7%
244	1,159	1,452	1,848	2,105	2,040	2,300	2,540	2,390	2,170	2,154	-1%
245	973	1,480	2,216	2,492	2,180	2,430	2,743	2,449	2,036	2,230	10%
246	1,338	1,701	1,954	2,300	2,041	2,384	2,599	2,527	2,082	2,178	5%
247	598	722	902	1,098	982	948	1,047	955	861	848	-2%
248	176	365	541	550	430	720	694	739	641	466	-27%
249	668	1,045	1,310	1,590	1,479	1,429	1,479	1,327	1,261	1,281	2%
251	94	110	129	134	152	132	176	183	128	145	13%
287	70	127	167	189	201	184	207	182	106	104	-2%
298	326	492	601	648	685	654	952	894	810	799	-1%
Forested Zone	27,393	39,226	50,331	58,736	55,254	57,607	64,532	62,580	55,459	54,872	-1%

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

Permit Area	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Change
104	2	10	235	597	674	921	1,832	1,316	1,233	1,455	18%
105	392	423	543	876	1,149	1,247	2,251	1,780	2,193	2,074	-5%
107	6	16	288	898	1,376	1,380	2,683	1,750	2,075	2,100	1%
110	26	60	860	815	819	1,026	1,655	1,750	1,251	1,252	0%
111	28	14	85	511	879	801	1,597	1,213	1,375	1,665	21%
114	0	0	0	12	16	17	41	55	51	79	55%
115	20	31	436	1,134	1,444	1,444	2,479	1,754	2,111	2,237	6%
116	392	423	543	876	1,149	1,247	2,251	1,780	2,193	2,074	-5%
122	9	10	3	136	170	123	195	149	123	502	308%
126	14	18	0	55	53	102	108	250	307	371	21%
127	1	2	0	1	17	15	20	20	22	41	86%
152	54	86	52	92	82	87	129	94	130	172	32%
154	386	515	960	2,111	2,026	2,863	3,646	3,127	2,788	2,859	3%
156	465	578	810	1,687	1,356	1,601	2,946	2,587	2,673	2,879	8%
157	1,305	2,034	2,286	3,658	4,053	4,680	5,794	4,576	4,156	5,073	22%
159	884	1,626	1,991	2,658	2,394	2,329	3,112	2,357	2,205	2,124	-4%
167	11	14	546	565	1,003	1,277	751	644	548	1,046	91%
168	9	15	831	1,033	925	1,349	1,520	2,089	1,089	2,183	100%
170	8	111	1,248	1,832	2,046	2,105	5,025	3,921	4,234	4,031	-5%
172	83	268	1,140	1,961	2,364	2,710	4,645	3,343	3,374	3,556	5%
174	52	147	693	990	886	1,317	2,270	1,750	1,724	1,848	7%
175	1,875	1,413	403	922	1,267	1,071	2,571	1,935	1,031	2,268	120%
178	637	827	399	1,012	1,331	1,438	2,848	2,511	2,665	2,973	12%
180	53	79	5	302	329	454	1,255	497	1,138	1,696	49%
181	78	126	429	766	895	829	1,656	1,604	1,976	2,477	25%
182	26	41	130	250	298	301	624	521	745	940	26%
183	62	101	513	829	1,093	1,197	2,299	1,879	1,935	2,372	23%
184	103	356	2,123	2,988	3,716	4,329	8,201	7,018	7,321	6,707	-8%
197	4	12	10	230	214	415	612	580	595	1,381	132%
199	0	0	39	32	43	32	36	42	37	48	30%
241	2,560	1,744	1,621	2,902	2,531	2,380	2,990	2,828	2,828	2,865	1%
242	528	612	692	778	1,110	1,602	1,855	1,504	1,395	1,478	6%
243	516	645	826	1,442	1,695	1,991	2,788	2,467	2,099	2,287	9%
244	875	944	1,104	1,757	2,801	3,505	4,912	4,312	3,992	4,038	1%
245	48	177	1,308	2,346	2,876	3,196	5,488	3,928	3,701	3,885	5%
246	916	1,146	1,404	2,460	3,109	2,765	4,931	4,255	3,753	4,211	12%
247	541	626	709	796	1,137	1,153	1,697	1,627	1,254	1,545	23%
248	388	578	309	489	451	632	1,203	1,125	1,029	814	-21%
249	442	469	907	1,236	1,670	1,809	2,744	2,473	1,950	2,362	21%
251	137	145	117	192	102	166	294	204	197	154	-22%
287	243	187	201	187	259	286	322	243	174	201	16%
298	0	24	103	155	141	278	1,036	839	854	928	9%
Forested Zone	13,778	16,204	25,835	42,198	48,750	54,922	88,546	73,852	71,023	83,265	17%

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

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

Permit Area	Area (sq. mi.)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Change
104	2,078	6.3	6.4	7.3	7.8	8.7	9.4	8.6	7.9	7.9	8.1	3%
105	766	20.5	23.5	27.2	30.2	33.9	36.9	37.1	34.8	34.8	36.0	3%
107	1,895	8.9	10.5	12.0	11.9	13.0	14.0	12.6	10.9	11.1	11.5	4%
110	300	19.5	23.2	24.4	24.8	26.9	28.2	27.7	26.1	24.9	24.0	-4%
111	1,707	4.5	4.8	5.6	6.1	6.5	6.9	6.2	5.5	5.2	4.8	-8%
115	1,872	9.7	11.2	13.2	13.0	14.8	16.3	14.5	13.0	14.2	15.2	7%
116	1,158	2.2	2.2	2.6	2.4	2.8	3.2	3.2	2.8	2.8	3.2	14%
122	620	4.6	5.0	5.8	5.7	6.5	7.2	6.7	6.0	6.7	7.1	6%
126	941	8.2	8.3	9.3	8.6	9.7	10.9	10.7	9.2	8.8	9.6	9%
127	561	4.6	5.0	5.8	5.7	6.5	7.2	6.7	6.0	6.7	7.1	6%
154	760	13.3	15.5	17.2	17.0	17.7	17.4	16.1	14.9	14.2	13.1	-8%
156	826	14.2	15.6	16.9	16.6	17.8	19.0	18.2	17.5	17.0	15.7	-8%
157	889	18.4	20.3	22.6	22.5	23.2	23.2	21.6	20.7	20.7	19.2	-7%
159	568	21.3	22.6	23.4	21.1	21.2	21.7	20.2	20.1	20.2	20.1	0%
167	432	19.3	19.5	21.0	21.5	22.0	20.9	19.6	18.2	18.7	18.6	-1%
168	724	13.6	15.9	16.7	15.6	16.8	17.0	16.8	14.8	15.5	14.9	-4%
170	1,315	16.4	19.2	22.2	21.6	23.6	25.6	24.7	23.5	23.5	23.7	1%
172	451	24.2	30.5	35.2	34.4	36.8	38.3	34.8	31.5	29.9	27.4	-8%
174	836	10.7	12.3	13.7	13.3	14.7	15.5	14.8	13.6	13.6	13.5	-1%
175	1,276	10.6	12.3	13.7	13.2	14.1	14.9	14.3	12.9	13.7	13.8	1%
178	1,267	12.8	15.3	17.7	17.9	20.1	22.0	22.4	20.8	21.4	22.3	4%
180	982	7.7	8.7	10.2	10.5	11.6	12.8	12.5	12.0	12.4	12.2	-2%
181	856	16.6	19.0	21.5	21.3	23.3	25.3	25.3	23.1	23.7	23.2	-2%
183	663	18.6	21.4	23.2	22.3	23.8	25.1	23.8	21.1	20.8	19.3	-7%
184	1,232	16.7	20.4	23.4	25.0	27.9	30.3	29.3	28.3	26.4	25.5	-3%
197	975	12.1	12.9	13.8	13.6	14.8	15.3	15.7	15.5	15.7	15.1	-4%
241	417	32.4	35.2	40.1	39.8	42.4	44.7	45.4	45.2	45.9	47.4	3%
242	215	26.0	28.4	30.7	29.5	30.6	30.6	28.0	25.9	24.6	21.9	-11%
243	314	28.4	32.4	36.8	36.3	38.9	39.8	37.7	35.9	35.3	33.2	-6%
244	586	24.1	27.9	32.3	35.0	38.3	40.0	38.9	37.3	36.3	35.8	-1%
245	583	22.5	27.4	31.1	32.3	34.7	36.2	32.9	30.7	29.4	27.3	-7%
246	772	21.0	23.4	25.8	24.5	24.9	25.9	24.2	22.6	22.1	20.1	-9%
247	231	26.0	28.4	30.7	29.5	30.6	30.6	28.0	25.9	24.6	21.9	-11%
248	212	19.5	21.1	22.9	21.4	23.1	24.4	23.4	21.9	20.9	18.6	-11%
249	502	13.8	15.8	17.4	16.7	17.4	17.8	16.3	14.9	14.5	12.8	-12%
251	55	16.0	17.5	19.2	19.0	20.7	22.2	20.6	19.8	20.0	21.0	5%
298	619	16.0	17.6	19.4	20.3	22.3	25.0	25.0	24.8	25.3	26.4	4%
Forest Zone	30,456	13.1	14.9	16.7	16.7	18.1	19.2	18.3	17.1	17.1	16.8	-1%

2007 Aerial Moose Survey

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year, we conduct one or more aerial surveys in northern Minnesota in an effort to monitor moose (*Alces alces*) numbers and identify fluctuations in the status of Minnesota's largest deer species. The primary objectives of this annual survey are to estimate moose numbers and determine the calf:cow and bull:cow ratios. These data are subsequently used in simulation model(s) to identify population trends and the harvestable surplus.

NORTHEAST

METHODS

Moose numbers and age/sex ratios were estimated by flying transects within a stratified random sample of survey plots (Figure 1). As in 2006, all survey plots were rectangular (5 x 2.67 mi.) and all transects were oriented east to west. The survey was conducted using Bell Jet Ranger and Enstrom helicopters flown by DNR Enforcement pilots. Moose were sexed using the presence of antlers, size and shape of the bell, nose color and/or vulval patch (Mitchell 1970), and calves were identified on the basis of size and behavior. UTM coordinates for all moose observed within the plots were recorded. A suite of covariates was recorded each time moose were located, including environmental variables (temperature, snow depth, wind speed), group size, cover type, and the amount of visual obstruction.

Moose observations were "corrected" using a sightability model (Ackerman 1988, Anderson and Lindzey 1996, Otten et al. 1993, Quayle et al. 2001, Samuel et al. 1987). The model was based on moose that were radio-collared as part of research on the population dynamics of the northeastern moose population. These radio-collared moose were periodically located during the survey using fixed-wing aircraft. Test plots (one-half of a rectangular plot) were then identified that contained 1 or more radio-collared moose. The test plots were surveyed with the helicopter using the same protocol as on regular survey plots. If radio-collared moose known to be in the test plot were not observed from transects, they were located using telemetry following completion of the plot. Each time a radio-collared moose was located, the aforementioned suite of covariates was collected. Logistic regression was used to revise the sightability model each year between 2004 and 2007 with the incorporation of that year's data. The revised sightability model for 2007 was used to recalculate the population estimates, bull:cow and calf:cow ratios from the 2004, 2005, and 2006 surveys.

RESULTS

The survey was initiated on 8 January and completed on 24 January. Survey conditions were rated as "Good" (highest rank) on 22 plots, "Marginal" on 17 plots, and "Poor" on 1 plot. Snow conditions for the survey were marginal and only 3 plots had more than 8" of snow on the ground. During the survey flights, 420 moose were located on the 40 plots (532 mi^2) and included 166 bulls, 190 cows, 52 calves, and 12 unidentified moose.

Forty-nine radio-collared moose were located in 38 test plots; 19 were observed from transects and 30 were located using telemetry. These data were combined with data from 2004-2006 to revise the sightability model. The model with the highest predictive reliability incorporated a single covariate, the amount of visual obstruction (VOC) (Giudice and Fieberg, unpubl.). The inverse of the detection probability calculated with this model (theta) was used to "correct" the number of moose every time that moose were observed during the survey.

Based on the moose observed on the survey plots and "corrected" by the sightability model, the estimated moose population in northeastern Minnesota numbered 6,460±1,698 (Table 1). Estimates of the calf:cow and bull:cow ratio were 0.29 and 0.85, respectively (Table 1).

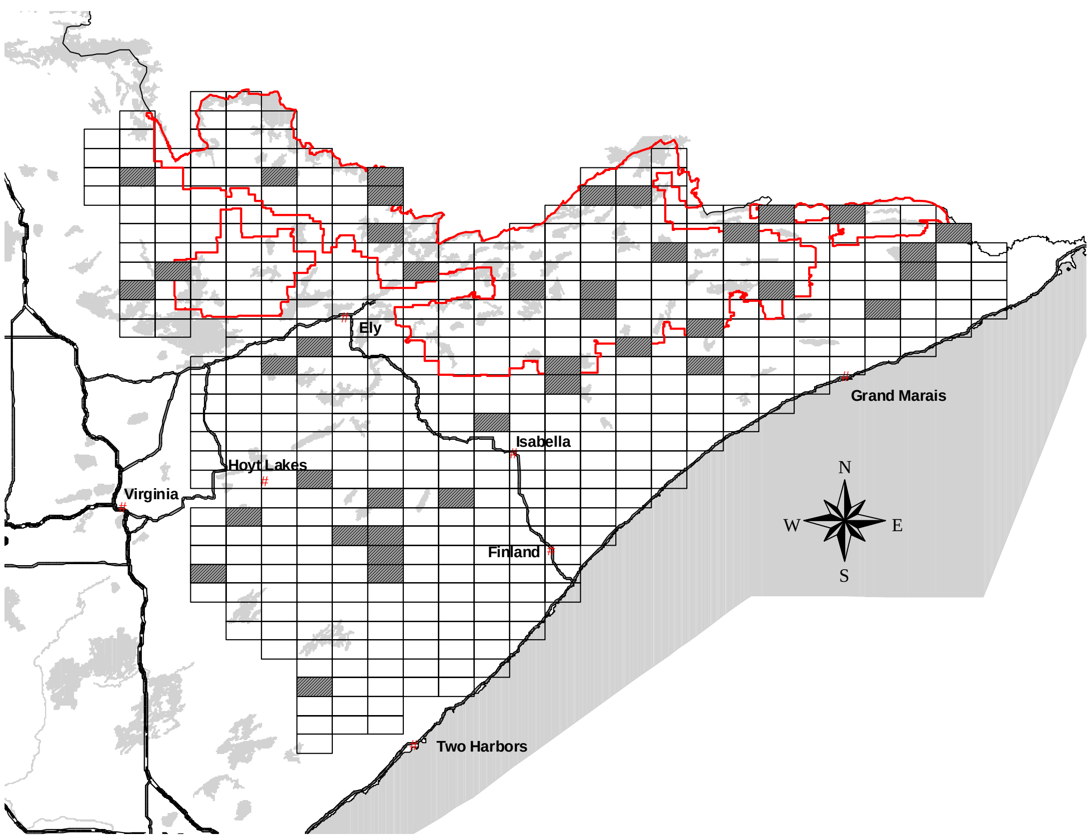


Figure 1. Northeast moose survey area and sample plots (diagonal lines) flown in the 2007 aerial moose survey.

DISCUSSION

We have used the sightability model approach for 4 years to estimate moose numbers in northeastern Minnesota. In the first year, 3 observers equated VOC to crown closure on some observations and this resulted in significantly higher estimates of VOC (Kruskal Wallis AOV, F=24.2, *P*<0.01). As a result, the 2004 population estimate was biased high (Table 1). Pairwise comparison of the remaining years indicated that mean VOC did not differ in 2005, 2006, and 2007 and as a result, population estimates were more comparable. Because of this bias, estimates for 2004 are not included in subsequent analyses.

Prior to 2004, a sightability correction factor (SCF, Gasaway et al. 1986) was used to correct the population estimates. During the period 1997-2003, SCF averaged 1.35 (1.14 to 1.87). In the last 3 years, the mean value for theta (the inverse of the detection probability and a number equivalent to SCF) averaged 1.91 (1.72-2.07). The difference between the pre-sightability model SCF values and estimates of theta implies that some portion of the moose were missed in the intensive surveys used to calculate SCF and that moose population estimates prior to 2004 were likely biased low.

Table 1. Estimated moose numbers, calves:cow, bulls:cow, and percent cows with twins from aerial surveys in northeastern Minnesota.

Survey	Estimate	**Calves:Cow**	**Bulls:Cow**	**% Cows w/ Twins**
1997	3,960 ±35%	0.49	1.57	1
1998	3,464 ±36%	0.71	0.98	0
1999	3,915 ±35%	0.57	1.30	9
2000	3,733 ±25%	0.70	1.34	7
2001	3,879 ±28%	0.61	1.05	5
2002	5,214 ±23%	0.93	1.22	20
2003	4,161 ±37%	0.70	2.01	11
2004	13,137±37%	0.41	1.24	4
2005	7,815±31%	0.52	1.05	9
2006	8,382±28%	0.34	1.09	5
2007	6,460±26%	0.29	0.85	3

The 2007 population estimate was 23% lower than the 2006 estimate. It is tempting to infer that this decline reflects the 34% annual mortality as measured in the telemetry study in 2006 (Lenarz unpublished). The overlap in confidence intervals (Table 1, Figure 2), however, indicates that there was no statistical difference between the 2006 and 2007 point estimates.

The calf:cow ratio estimated from the 2007 survey (Table 1) was significantly lower than the average estimated in the previous 21 years ($\bar{x}$ = 0.57, *t*=8.02, *P*<0.001). The calf:cow ratios since 2004 when we changed to a sightability model were significantly lower than previous estimates (*t*=2.43, *P*=0.024). This change is not likely an artifact of the sightability model. If cows without calves were located at sites with higher VOC, their numbers would be inflated relative to numbers of cows with calves and the ratio would decline. There was, however, no difference (F=1.87, *P*=0.155) in VOC between cows with or without calves in any year

The perception of reduced cow:calf ratios was likely an artifact of switching to a helicopter on the survey. The inherent maneuverability of the helicopter allows observers a much better opportunity to classify moose. As a result, the proportion of unclassified moose dropped significantly (t=8.07, P<0.001) since we began using a helicopter. Prior to 2004, an average of 13% moose were not classified; in the last 3 years, the average had dropped to only 3%. If the cow:calf ratio is recalculated under the assumption that unclassified animals were evenly split between cows and bulls, the pre-2004 estimates decline an average of 0.12. There was no difference (t=1.43, P=0.167) between pre and post 2004 recalculated values of cow:calf ratio.

The proportion of cows accompanied by twins was significantly lower ($\bar{x}$=3.2%, t =3.4, P=0.002) in 2007. Even when 50% of unclassified moose were included as cows in the calculation of the proportion twins, the values for 2007 remained significantly lower ($\bar{x}$=3.1%, t =2.8, P=0.006). Twinning rates vary widely across North America, and may be related to habitat quality and the relationship between a moose population and the carrying capacity of its habitat (Gasaway et al. 1992).

The estimated bull:cow ratio (Table 1) was significantly lower than the average estimated for the previous 21 years($\bar{x}$ = 1.19, t=4.99, P<0.001). This is true, even when recalculated after splitting the unclassified moose. The hunter harvest has been heavily biased towards bulls in recent years (Lenarz, unpubl.), but the 2006 bull harvest (169) represented less than 7% of the estimated number of bulls in the population in most years. This level of bull harvest should have little impact on estimates of bull:cow ratio at the population level. It has been speculated that reproduction would decline if the bull:cow ratio declines below some unspecified level (e.g. Rausch 1974). Thompson (1991), however, found no relationship between calf:cow and bull:cow ratios. With a bull:cow ratio consistently near 1 as has been estimated for northeastern Minnesota, it is likely that there should be sufficient numbers of bulls to breed all cows.

In the January survey, 11% of the moose exhibited hair loss, which is indicative of infestation with the winter tick (*Dermacentor albipictus*). In 2006, only 3% were observed with hair loss. Moose will often rub off patches of hair when high numbers of the tick begin to engorge. Normally, hair loss associated with winter ticks doesn't become noticeable until later in the winter.

NORTHWEST

METHODS

As in the northeast, moose numbers and age/sex ratios were estimated by flying transects within a stratified random sample of survey plots (Figure 2). All survey plots were rectangular (5 x 2.67 mi.) and transects were oriented east to west. Prior to the survey, DNR Wildlife managers identified all plots thought to contain moose and only those plots were sampled. The survey was conducted using a Cessna 185 flown by a DNR Enforcement pilot. Moose were sexed using the presence of antlers, shape of the bell, nose color and/or vulval patch (Mitchell 1970), and calves were identified on the basis of size and behavior. UTM coordinates for all moose observed within the plots were recorded. Population estimates were "corrected" using a SCF (Gasaway et al. 1986). The SCF is the ratio of moose observed during intensive surveys of 2 mi^2 subplots to moose observed during the standard search.

RESULTS

The northwest survey was delayed by a lack of snow and did not begin until 10 March and was completed on 13 March. Snow depth was moderate with at least 8 inches on the ground with 100% coverage. The survey was flown with 1 airplane and survey crew and survey conditions were classified as marginal (23 plots) to poor (2 plots). During the survey flights, only 18 moose were located on 25 plots (333 mi^2) and included 2 bulls, 6 cows, 4 calves, and 6 unidentified moose. Based on the moose density observed on these plots, the estimated population in the northwest was 84 ± 48 moose (Table 2). The survey estimated ratios of 0.67 calves/cow and 0.33 bulls/cow (Table 2). Circular subplots on 11 of 25 survey plots were re-surveyed and the estimated SCF was 1.00 ± 0%.

DISCUSSION

This year's survey estimated a total of 84 moose within the northwest survey area (Figure 2, Table 2). This estimate is down 69% from the 2003 survey. The fact that so few moose (18) were observed in plots thought to contain moose implies that this decline is real. Survey plots were fairly evenly spread throughout the area (Figure 2) and with the exception of 3 moose located on Agassiz NWR, all remaining moose were located on the western half of the survey area.

Precision of the survey estimate improved over that calculated for the 2003 survey. This improvement was likely the result of restratification prior to the survey. When so few survey plots contain moose, it would be difficult to improve precision, especially when moose are clustered onto only a few plots.

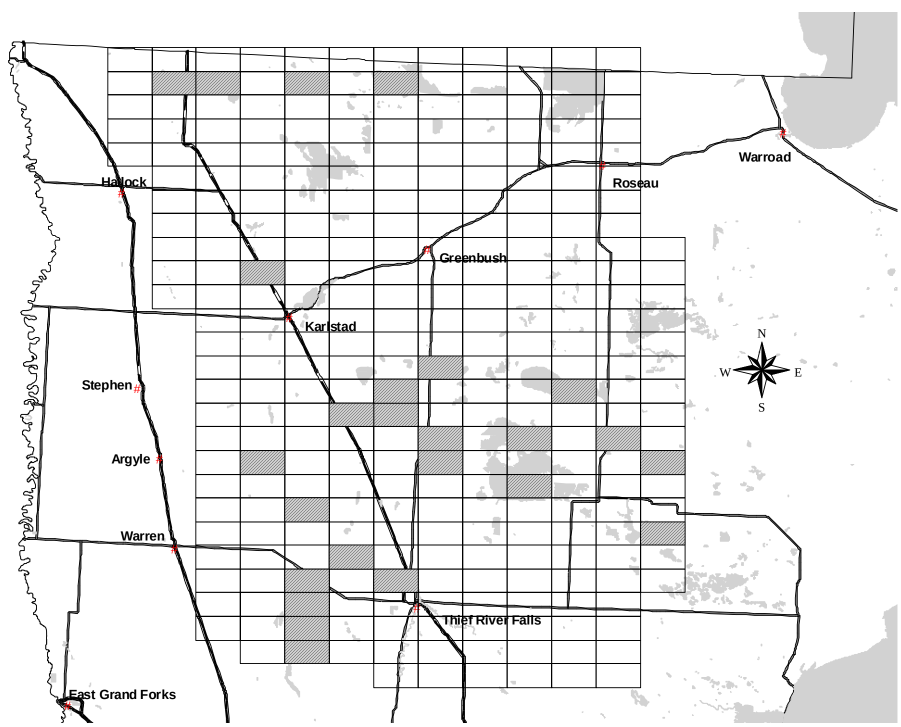


Figure2. Northwest moose survey area and sample plots (diagonal lines) flown in the 2007 aerial moose survey.

Table 2. Estimated moose numbers, calves/ cow, and bulls/cow from aerial surveys in northwestern Minnesota.

Survey	Estimate	Calves:Cow	Bulls:Cow	% Cows w/ Twins
1997	1170 ± 31%	0.80	0.87	11
1998	No Survey			
1999	1160 ± 33%	0.48	1.29	8
2000	560 ± 42%	0.48	1.18	0
2001	883 ± 29%	0.48	1.65	3
2002	No Survey			
2003	237 ± 73%	0.47	1.69	0
2004	No Survey			
2005	No Survey			
2006	No Survey			
2007	84 ± 58%	0.67	0.33	0

The calf:cow ratio (Table 2) increased from previous surveys but is likely biased high by the high proportion of moose that were not classified (33%). If we assume that half of the unclassified moose were cows, the calf:cow ratio drops to 0.44, a number very similar to previous surveys.

Over the past 13 surveys, twin calves accompanied an average of 6% of the cows observed in the northwest survey. In this year's survey, no twins were observed.

The bull:cow ratio (Table 2) in this year's survey was the lowest ever recorded for northwestern Minnesota. Even if unclassified moose were evenly split between bulls and cows, the bull cow ratio increases to only 0.55, a value well below historical estimates.

Considering the low moose population in northwestern Minnesota, I recommend that we stop conducting a formal aerial survey unless anecdotal information suggests a major increase in numbers.

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MIGRATORY BIRD POPULATIONS

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2007 Waterfowl Breeding Population Survey Minnesota

Steve Cordts, Wetland Wildlife and Populations Research

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 supplemented by 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 2007 aerial survey portion was flown from 8-26 May. Pond numbers increased 24% compared to 2006 and were 7% above the long-term average. The estimated numbers of temporary (Type 1) wetlands decreased 43% from 2006 and remained below (-55%) the long-term average. The mallard breeding population index (242,000) increased significantly (51%, P = 0.03) from 2006 (161,000). Mallard numbers remained below the 10-year average (-23%) but were above the long-term average (+9%). The blue-winged teal breeding population index (124,000) was 29% below the 2006 estimate (174,000) and both the 10-year (-45%) and long-term (-46%) averages. Populations of “other” ducks (115,000), excluding scaup, decreased 38% and remained below the 10-year average (-51%) and the long-term average (-35%). Wood ducks (33%), gadwalls (17%), ring-necked ducks (15%), canvasback (8%), and redheads (8%) accounted for most (81%) of the total population of “other” ducks. Wood duck numbers were the lowest recorded since 1984, partially due to the early leaf-out and decreased visibility this spring. The estimate of total ducks (489,000), which excludes scaup, decreased 6% compared to 2006 and was 37% below the 10-year average and 22% below the long-term average (627,000). Canada goose numbers (uncorrected for visibility) increased 30% compared to 2006, were 17% above the 10-year average and remained 140% above the long-term average. Survey timing in 2007 was fairly late and likely contributed to lower estimates of blue-winged teal and “other” duck abundance. Ice out was generally early in the southern portion of the state and near normal across the north. Spring phenology (leaf-out, duck migration) was well advanced in 2007, up to 10 days earlier than normal. Above average temperatures between mid-April and mid-May, combined with strong southerly winds during this time period likely contributed to the early spring migration for migrant ducks through the state. During most years, some migrant ducks are counted during the survey. However, few migrant ducks were likely present in the state this spring during the time when most of the survey was flown.

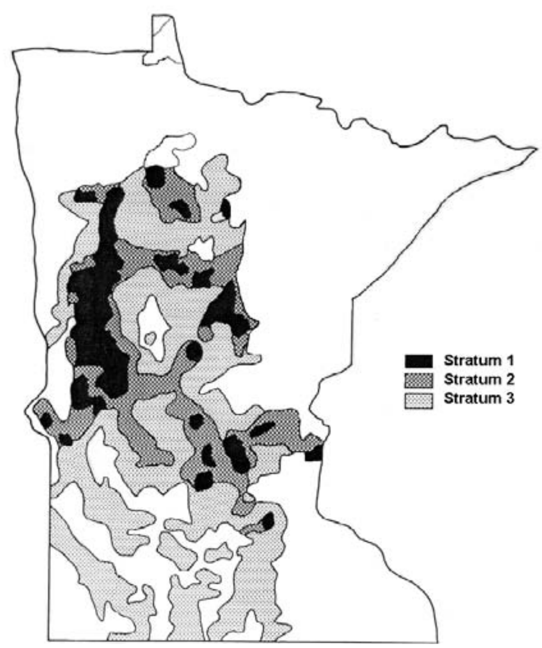

Figure 1. Location of waterfowl breeding population survey strata in Minnesota.

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 (N605NR). Wetlands were counted on the observer's side of the plane (0.125 mile wide transect) only; a correction factor obtained in 1989 was used to adjust previous data (1968-88) that was obtained when the observer counted wetlands on both sides of the plane (0.25 mile wide transect). Data were recorded on digital voice recorders for both the pilot and observer and stored as WAV files.

Visibility correction factors (VCFs) were derived from intensive ground surveys on 14 selected routes flown by the aerial crew. Many of these routes use a county road as the mid-point of the transect boundary which aids in navigation and helps ensure the aerial and ground crews survey the same area. Ground routes each originally included approximately 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. We identified an error in these estimates associated with calculating variances from stratified surveys that use correction factors to account for unobserved waterfowl. This error will be addressed and corrected in future reports but due to time constraints this year, we report variances using identical methods as in past years. We compared estimates for 2006 and 2007 using two-tailed Z-tests.

SURVEY CHRONOLOGY

The 2007 aerial survey began on 8 May in southern Minnesota and concluded in northern Minnesota on 27 May. The survey was completed in 14 days of flight time. Transects were flown on 8-12, 16-21, 24-25, and 27 May. Flights began no earlier than 7 AM and were completed by 12 PM each day. Flight delays were mostly due to excessive winds (>20 mph) and low ceilings. Most (63%) of the survey was again completed after 15 May; the entire survey spanned 20 days, which was similar to both 2005 (27 days) and 2006 (21 days) and one of the longer periods on record.

WEATHER AND HABITAT CONDITIONS

Wetland conditions in spring 2007 were similar to 2006. Ice out on most lakes across the state was near average for the northern regions of the state but 5-10 days early in the southern regions. April temperatures averaged 1.0°F below normal statewide; regional temperatures ranged from 2.7°F below average in west central Minnesota to 0.1°F below average in east central Minnesota (http://climate.umn.edu/cawap/monsum/0704.txt). April precipitation was 0.1 inches above normal statewide and ranged from 1.4 inches above normal in west central Minnesota to 1.4 inches below normal in south central Minnesota. May temperatures averaged about 3.2°F above normal statewide. May precipitation was 0.2 inches below normal statewide and ranged from 0.9 inches below normal in south central Minnesota to 0.9 inches above normal in northwest Minnesota (http://climate.umn.edu/cawap/monsum/0705.txt). From 15 April through 20 May, which would coincide with peak spring migration time for most duck species, average temperatures were 2°F to 7°F above normal each week across the state. In addition, strong southerly winds in late April and early May likely triggered migrant ducks to move through the state rapidly. Additional temperature and precipitation data are provided in Appendix A.

In late April 2007, statewide topsoil moisture indices were rated as 8 % very short or short, 79 % adequate, and 13% surplus moisture. On June 1, statewide indices were rated as 13% short, 76% adequate and 11% surplus moisture. (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, http://www.nass.usda.gov/mn/). For comparison, in late April 2006 statewide topsoil moisture indices were rated as 12% very short or short, 75% adequate, and 13% surplus moisture.

Planting dates for row crops were later in 2007 than previous years. By April 29, 28% of the corn acres had been planted statewide compared to 43% in 2006 and 38% for the previous 5-year average. By June 4, 36% of alfalfa hay had been cut compared to 51% in 2006 and a 5-year average of 21% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, http://www.nass.usda.gov/mn/).

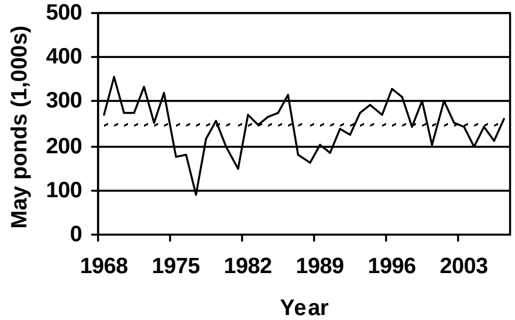

Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2007.

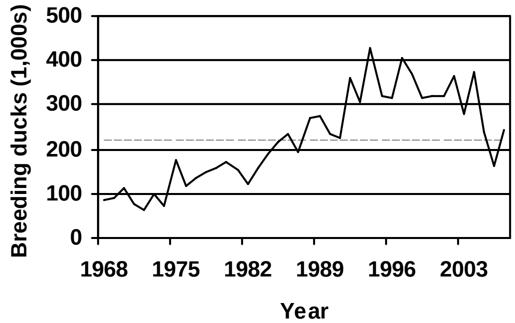

Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2007.

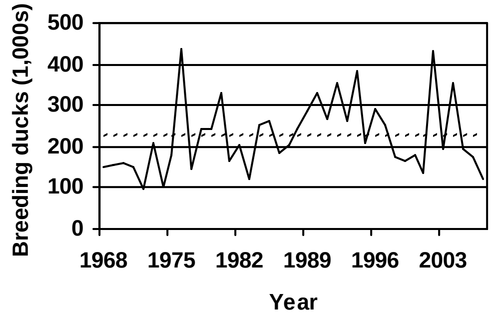

Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2007.

Wetland numbers (Type II-V) increased 24% from 2006 and were 2% above the 10-year average (Table 2) and 7% above the long-term average (Table 2; Figure 2). The numbers of temporary (Type 1) wetlands decreased 43% from 2006, were 39% below the 10-year average and 55% below the long-term average.

Leaf-out dates were considerably earlier than 2006, even during the early portion of the survey, which made visibility from the air extremely difficult throughout the entire survey. Emergent wetland vegetation also appeared more developed than previous years.

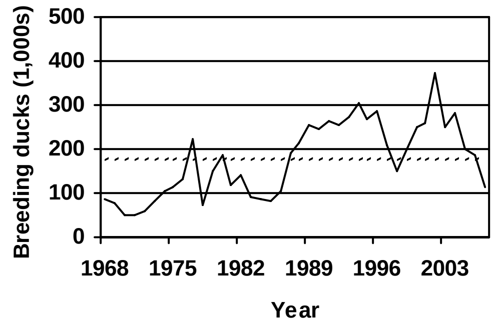

Figure 5. Other duck (excluding scaup) populations (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2007.

WATERFOWL POPULATIONS

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

The 2007 waterfowl breeding population estimate of mallards was 242,481 (SE = 30,020), which was 51% higher and significantly different from 2006 ($Z = 2.12$, $P = 0.03$) (Table 7, Figure 3). Mallard numbers were below (-23%) the 10-year average and above the long-term average (9%). In 2007, 6% of the total mallards were in flocks compared to 7 % in 2006 and 3% in 2005. Pairs comprised only 9% of the mallards observed, compared to 12% and 23% in 2004 and 2005, respectively.

The estimated blue-winged teal population was 123,588 (SE = 20,055), which was lower than 2006 (174,000) but statistically unchanged from last year ($Z = 0.79$, $P = 0.43$). Blue-winged teal numbers were 45% below the 10-year average and 46% below the long-term average (Table 7, Figure 4). In 2007, no blue-winged teal were in flocks compared to 20% and 25% of the total in 2005 and 2006, respectively. This provides some evidence that most migrant blue-winged teal had departed the state prior to the survey. Pairs comprised 64% of the blue-winged teal observed, compared to 47% and 57% in 2005 and 2006, respectively.

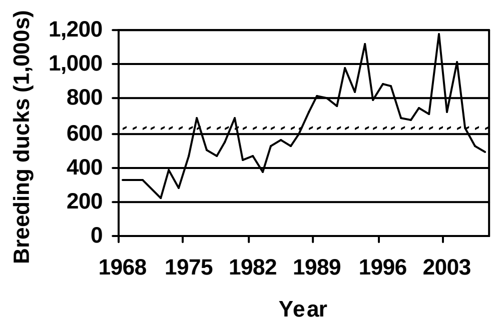

Figure 6. Total duck (excluding scaup) population estimate and long-term average (dashed line) in Minnesota, 1968-2007.

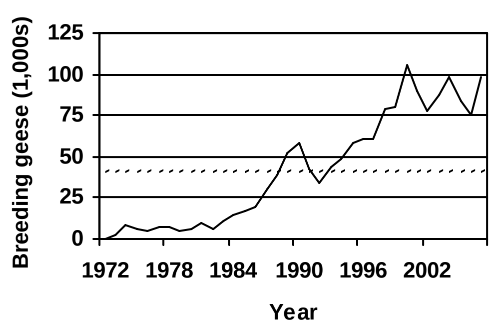

Figure 7. Canada goose population estimates (not adjusted for visibility bias) and long-term average in Minnesota, 1972-2007.

Other duck numbers (excluding scaup) declined 38% to 115,390 and were 51% below the 10-year average and 35% below the long-term average (Table 7, Figure 5). Scaup numbers (7,058) were 90% below the long-term average and the lowest estimate on record. The total duck population, excluding scaup, was 489,000, which was 6% lower than 2006, 37% below the 10-year average and 22% below the long-term average (Table 7, Figure 6). This was the lowest total duck estimate since 1983.

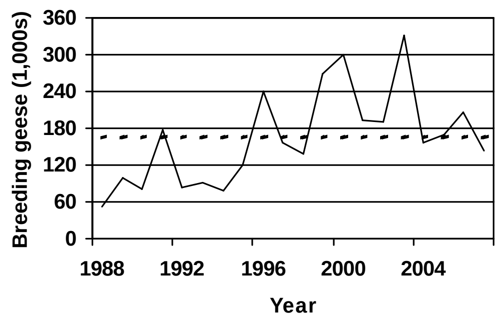

Figure 8. Canada goose population estimates (adjusted for visibility bias) and long-term average in Minnesota, 1988-2007.

Visibility Correction Factors (VCFs) were higher in 2007 for mallards (43%) but lower for blue-winged teal (-7%) and "other" ducks (-15%) compared to 2006 (Table 7). Mallard VCFs (3.15) were 49% above the long-term average and the 2nd highest estimate on record. The blue-winged teal VCF was 8% above the long-term average. The VCF for "other" ducks was 18% above the long-term average. Early leaf-out conditions decreased visibility on all transects. In addition, due to improved safety standards beginning in 2006, the pilot and observer were required to wear flight helmets, which decreases visibility rates for both. Moderate winds were encountered on almost all flight days this year, which also impacts visibility rates.

Canada goose numbers (uncorrected for visibility) increased 30% compared to 2006 and were 140% above the long-term average (Table 7, Figure 7). The VCF for Canada geese was 1.47, 46% lower than 2006 and 40% below the long-term average. The population estimate of Canada geese, adjusted for visibility, decreased 30% (Table 7, Figure 8). The number of Canada goose broods seen during the survey declined 45% from 2006. This was likely the result of well-below normal temperatures recorded the first 2 weeks in April when many geese were in the egg-laying phase and un-incubated eggs were likely frozen.

The estimated coot population was 6,300, which was 81% below the long-term average.

SUMMARY

Overall wetland conditions were improved slightly from 2006 and similar to the long-term average. Numbers of Type 1 wetlands decreased but numbers of Types II-V increased. Mallard abundance in 2007 (242,000) increased significantly (P=0.03) from 2006 (161,000) and was 9% above the long-term average (222,000) but 23% below the 10-year (315,000). Blue-winged teal abundance (124,000) was lower than 2006 (174,000) but not significantly different (P=0.43) and was 45% below the 10-year average (225,000) and 46% below the long-term average (227,000). Duck abundance for most other species declined relative to 2006. Total duck abundance (489,000), excluding scaup, declined 6% from 2006 and was 37% below the 10-year average and 22% below the long-term average. Canada goose numbers, unadjusted for visibility bias, increased 30% from 2006 and were 17% above the 10-year average.

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Table 1. Survey design for Minnesota, May 2007.[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 number of May ponds (Type 1 and Types II-V) during Minnesota waterfowl breeding population survey, 1968-2007.

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
10-year average (1996-2006)	53,192	258,000
Long-term average (1968-2006)	71,391	246,000
Change from:		
2006	-43%	24%
10-year average	-39%	2%
Long-term average	-55%	7%

[1] Type II-V, correction factor from 1989 (123,000/203,000=0.606) used to adjust 1968-88 pond numbers. Ponds counted on 0.125 mile wide transect after 1988.

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1989-2007.

	Year																		
Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Dabblers:																			
Mallard	26,659	29,686	25,854	28,770	23,327	22,160	20,494	25,104	26,992	33,157	26,576	26,604	28,742	29,297	25,937	29,381	19,050	16,829	16,357
Black Duck	0	0	56	0	0	56	0	0	0	0	0	0	0	0	0	0	56	0	0
Gadwall	722	2,694	2,721	2,777	778	444	1,055	1,083	611	1,111	1,777	833	1,333	944	1,250	2,111	1,166	1,444	889
American Wigeon	83	222	0	56	0	0	194	0	0	56	56	56	111	0	56	555	167	0	56
Green-winged Teal	0	0	56	0	111	278	0	278	56	333	0	278	56	278	222	444	56	56	167
Blue-winged Teal	14,218	23,771	15,940	15,274	10,358	9,164	7,609	6,720	6,387	8,220	6,998	11,247	7,387	14,218	9,664	23,771	9,303	5,665	5,332
Northern Shoveler	722	778	1,777	1,000	111	278	111	1,277	1,500	500	555	1,055	305	1,277	278	1,166	333	167	56
Northern Pintail	222	444	389	222	611	167	167	167	111	111	167	167	389	56	111	56	0	56	0
Wood Duck	8,303	14,468	10,775	10,941	11,636	7,359	6,831	6,498	9,497	12,302	5,582	10,219	6,720	2,888	4,499	8,081	5,498	3,555	2,666
Dabbler Subtotal	50,929	72,063	57,568	59,040	46,932	39,906	36,461	41,127	45,154	55,790	41,711	50,459	45,043	48,958	42,017	65,565	35,629	27,772	25,523
Divers:																			
Redhead	2,638	3,305	2,555	3,499	1,416	1,972	639	722	778	944	500	583	1,444	750	333	805	666	666	916
Canvasback	2,888	1,972	2,305	2,111	2,777	3,166	3,860	1,166	1,333	1,777	2,971	1,222	2,027	1,833	1,333	666	972	833	1,000
Scaup	14,024	8,970	9,858	23,854	6,748	19,661	7,192	13,829	3,416	9,247	1,750	7,415	5,832	2,444	2,055	5,971	4,110	111	555
Ring-necked Duck	1,500	1,638	1,777	4,721	2,222	3,582	1,583	3,166	2,694	2,749	2,360	4,776	2,444	2,777	1,361	5,165	1,722	2,055	1,555
Goldeneye	167	56	0	222	111	222	111	167	0	111	56	56	333	111	0	222	222	56	222
Bufflehead	583	0	333	722	0	444	56	278	0	56	111	56	111	222	111	389	167	222	56
Ruddy Duck	722	1,500	361	500	1,250	639	167	139	528	11,052	972	0	83	1,305	417	305	1,222	305	0
Hooded Merganser	0	139	0	444	222	111	278	611	555	389	722	500	722	555	333	278	333	555	111
Large Merganser	0	0	56	111	0	56	0	0	56	0	0	0	111	0	972	0	111	0	278
Diver Subtotal	22,522	17,580	17,245	36,184	14,746	29,853	13,886	20,078	9,360	26,325	9,442	14,608	13,107	9,997	6,915	13,801	9,525	4,803	4,693
Total Ducks	73,451	89,643	74,813	95,224	61,678	69,759	50,347	61,205	54,514	82,115	51,153	65,067	58,150	58,955	48,932	79,366	45,154	32,575	30,216
Other:																			
Coot	22,799	27,326	11,108	11,386	1,166	528	611	3,055	5,054	555	83	3,999	1,722	2,888	2,666	21,411	2,444	639	139
Canada Goose	14,663	16,523	9,803	10,914	13,135	12,802	14,413	12,774	10,330	16,967	19,495	22,160	24,882	24,104	22,160	23,160	22,938	21,633	29,797

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1989-2007.

	Year																		
Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Dabblers:																			
Mallard	42,896	39,682	39,215	45,585	37,111	42,896	42,896	48,507	54,643	53,942	52,247	49,559	44,650	43,773	34,715	44,474	26,883	25,130	24,779
Black Duck	0	0	0	0	0	0	0	0	0	0	0	0	117	0	0	0	0	0	0
Gadwall	1,344	2,805	1,870	2,045	1,286	1,403	1,052	935	468	584	1,519	3,039	1,636	701	584	3,565	584	1,052	234
American Wigeon	0	234	701	351	0	117	0	468	351	818	0	468	0	0	0	2,513	117	0	0
Green-winged Teal	117	0	0	0	351	117	0	935	234	351	117	117	117	468	234	234	0	117	0
Blue-winged Teal	25,189	31,208	24,663	26,766	18,818	19,227	10,636	13,851	13,792	13,208	10,578	19,637	9,701	21,390	15,955	30,624	11,513	9,000	8,416
Northern Shoveler	2,338	2,104	3,857	1,636	1,286	935	818	1,636	2,571	701	2,104	4,675	1,052	2,221	1,403	1,753	234	584	351
Northern Pintail	701	701	701	234	351	468	234	117	234	468	117	117	117	0	117	0	0	0	234
Wood Duck	10,578	14,903	8,065	11,221	9,468	9,409	6,662	8,708	11,338	10,520	19,753	13,792	7,831	5,143	4,558	8,766	3,273	1,753	2,221
Dabbler subtotal	83,163	91,637	79,072	87,838	68,671	74,572	62,298	75,157	83,631	80,592	86,435	91,404	65,221	73,696	57,566	91,929	42,604	37,636	36,235
Divers:																			
Redhead	1,636	4,325	1,519	3,097	2,279	3,799	1,403	1,110	1,987	935	1,636	2,805	2,455	234	584	1,110	292	175	935
Canvasback	584	234	117	0	584	1,052	0	234	701	117	117	935	0	468	1,052	234	0	0	1,169
Scaup	25,598	25,189	13,383	22,208	877	14,085	7,831	21,916	18,935	4,032	3,331	6,779	3,039	5,961	2,279	7,188	2,981	468	643
Ring-necked Duck	3,214	2,513	2,104	2,922	3,156	3,331	1,403	7,714	3,565	2,279	2,221	5,610	3,799	6,370	2,455	5,377	1,929	3,331	1,578
Goldeneye	935	351	818	351	584	701	701	1,753	818	234	935	584	468	234	234	351	117	117	0
Bufflehead	701	234	0	526	117	234	0	117	117	0	0	0	0	1,169	117	468	351	117	117
Ruddy Duck	3,390	1,227	4,558	1,227	3,390	409	117	58	117	0	468	0	0	1,870	2,688	0	351	58	0
Hooded Merganser	0	0	0	351	584	468	117	234	468	117	701	935	1,403	701	701	234	234	351	234
Large Merganser	0	0	0	117	0	0	0	0	0	0	0	117	117	0	0	234	351	0	0
Diver subtotal	36,058	34,073	22,499	30,799	11,571	24,079	11,572	33,136	26,708	7,714	9,409	17,765	11,281	17,007	10,110	15,196	6,606	4,617	4,676
Total Ducks	119,221	125,710	101,571	118,637	80,242	98,651	73,870	108,293	110,339	88,306	95,844	109,169	76,502	90,703	67,676	107,125	49,210	42,253	40,911
Other:																			
Coot	3,740	11,630	5,552	11,162	5,201	1,461	526	7,013	5,026	643	234	1,110	468	4,909	1,519	8,007	584	292	409
Canada Goose	10,227	11,279	8,591	7,305	9,409	12,565	12,682	13,559	16,364	19,812	18,585	25,831	24,604	20,688	22,091	28,461	20,688	26,825	25,890

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1989-2007.

	Year																		
Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Dabblers:																			
Mallard	54,807	71,511	63,246	69,771	63,333	73,425	79,166	79,862	78,993	101,873	90,390	81,690	72,642	72,121	55,156	84,561	36,539	30,884	35,843
Black Duck	0	174	0	0	0	0	0	0	0	0	0	0	0	0	0	174	0	0	174
Gadwall	5,220	8,787	2,262	2,436	1,218	2,610	3,306	3,306	2,436	3,045	2,436	2,610	10,701	3,306	1,566	6,960	2,001	5,568	4,176
American Wigeon	174	957	696	522	348	1,218	0	1,044	348	696	0	522	174	1,218	174	1,566	1,044	174	348
Green-winged Teal	522	0	348	0	348	174	0	957	348	174	0	1,218	1,392	522	174	0	174	522	0
Blue-winged Teal	50,893	52,198	50,893	51,067	35,494	41,932	29,492	36,625	25,316	26,360	18,530	29,405	20,618	56,374	21,140	39,758	27,578	23,663	15,659
Northern Shoveler	6,264	23,663	5,568	11,048	1,914	2,784	5,307	12,701	11,049	4,176	4,002	20,444	10,701	6,264	870	3,828	348	522	870
Northern Pintail	696	696	1,914	870	1,218	696	174	870	522	870	870	696	522	0	174	348	174	174	348
Wood Duck	23,141	25,055	17,747	24,185	25,229	23,228	16,355	27,926	14,268	23,837	20,531	25,055	17,225	13,572	12,702	20,705	7,482	7,308	5,394
Dabbler subtotal	141,717	183,041	142,674	159,899	129,102	146,067	133,800	163,291	133,280	161,031	136,759	161,640	133,975	153,377	91,956	157,900	75,340	68,815	62,812
Divers:																			
Redhead	2,175	3,219	2,610	6,438	1,827	2,958	7,134	1,044	1,044	2,001	3,480	2,523	3,654	1,305	174	1,740	1,479	0	522
Canvasback	174	1,044	696	0	348	696	174	1,392	0	3,306	174	3,915	522	696	1,131	2,784	0	0	348
Scaup	32,276	5,916	17,486	20,009	4,176	23,924	13,397	29,840	8,787	15,137	8,961	18,182	6,873	4,611	783	17,747	5,307	1,392	696
Ring-necked Duck	2,088	2,088	3,480	3,654	2,871	5,568	1,044	12,875	3,654	2,958	1,479	8,178	8,526	7,395	1,479	5,133	10,179	6,699	1,392
Goldeneye	870	609	696	1,044	696	783	1,479	1,914	522	696	696	1,044	1,566	3,132	1,305	696	1,044	1,044	870
Bufflehead	1,392	0	552	696	348	696	0	1,044	174	348	0	0	0	1,218	783	2,088	0	174	696
Ruddy Duck	1,305	1,218	9,396	6,786	1,218	2,175	2,349	1,740	348	0	174	0	696	18,878	87	2,262	870	696	261
Hooded Merganser	0	174	348	348	348	696	1,044	1,566	696	696	1,218	957	174	2,175	174	1,740	1,218	870	174
Large Merganser	0	0	0	348	0	174	174	0	0	0	0	0	0	522	0	0	261	957	348
Diver subtotal	40,280	14,268	35,264	39,323	11,832	37,670	26,795	51,415	15,225	25,142	16,182	34,799	22,011	39,932	5,916	34,190	20,358	11,832	5,307
Total Ducks	181,997	197,309	177,938	199,222	140,934	183,737	160,595	214,706	148,505	186,173	152,941	196,439	155,986	193,309	97,872	192,090	95,698	80,647	68,119
Other:																			
Coot	24,794	11,918	47,587	62,463	12,179	12,788	3,828	182,953	24,620	5,133	14,702	67,684	3,132	14,007	7,134	77,427	8,613	14,702	5,742
Canada Goose	27,056	30,623	23,837	15,746	21,314	23,228	30,971	34,537	33,755	42,368	41,933	57,940	39,932	33,407	43,412	46,717	39,758	27,230	42,629

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1989-2007.

	Year																		
Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Dabblers:																			
Mallard	124,362	140,879	128,315	144,126	123,771	138,481	142,556	153,473	160,628	188,972	169,213	157,853	146,034	145,191	115,974	158,416	82,472	72,843	76,979
Black Duck	0	174	56	0	0	56	0	0	0	0	0	0	117	0	0	174	56	0	174
Gadwall	7,286	14,286	6,853	7,258	3,282	4,457	5,413	5,324	3,515	4,740	5,733	6,482	13,670	4,951	3,400	12,635	3,752	8,064	5,298
American Wigeon	257	1,413	1,397	929	348	1,335	194	1,512	699	1,570	56	1,045	285	1,218	230	4,634	1,327	174	404
Green-winged Teal	639	0	404	0	810	569	0	2,170	638	858	117	1,613	1,564	1,267	630	678	230	694	167
Blue-winged Teal	90,300	107,177	91,496	93,107	64,670	70,323	47,737	57,196	45,495	47,788	36,106	60,288	37,706	91,982	46,759	94,152	48,394	38,328	29,407
Northern Shoveler	9,324	26,545	11,202	13,684	3,311	3,997	6,236	15,614	15,120	5,377	6,661	26,175	12,058	9,762	2,550	6,747	915	1,273	1,276
Northern Pintail	1,619	1,841	3,004	1,326	2,180	1,331	575	1,154	867	1,449	1,153	979	1,028	56	402	404	174	230	582
Wood Duck	42,022	54,426	36,587	46,347	46,333	39,996	29,848	43,132	35,103	46,659	45,866	49,067	31,777	21,603	21,759	37,553	16,253	12,616	10,281
Dabbler subtotal	275,809	346,741	279,314	306,777	244,705	260,545	232,559	279,575	262,065	297,413	264,905	303,502	244,239	276,030	191,704	315,393	153,573	134,222	124,568
Divers:																			
Redhead	6,449	10,849	6,684	13,034	5,522	8,729	9,176	2,876	3,809	3,880	5,616	5,911	7,552	2,289	1,092	3,656	2,438	842	2,373
Canvasback	3,646	3,250	3,118	2,111	3,709	4,914	4,034	2,792	2,034	5,200	3,262	6,072	2,549	2,996	3,516	3,684	972	833	2,517
Scaup	71,898	40,075	40,727	66,071	11,801	57,670	28,420	65,585	31,138	28,416	14,041	32,376	15,743	13,016	5,117	30,906	12,397	1,971	1,894
Ring-necked Duck	6,802	6,239	7,361	11,297	8,249	12,481	4,030	23,755	9,913	7,986	6,060	18,565	14,768	16,542	5,294	15,675	13,829	12,085	4,525
Goldeneye	1,972	1,016	1,514	1,617	1,391	1,706	2,291	3,834	1,340	1,041	1,687	1,684	2,367	3,477	1,539	1,269	1,383	1,216	1,092
Bufflehead	2,676	234	885	1,944	465	1,374	56	1,439	291	404	111	56	111	2,609	1,011	2,944	517	513	868
Ruddy Duck	5,417	3,945	14,315	8,513	5,858	3,223	2,633	1,937	993	11,052	1,613	0	779	22,054	3,192	2,567	2,443	1,060	261
Hooded Merganser	0	313	348	1,143	1,154	1,275	1,439	2,411	1,719	1,202	2,641	2,392	2,299	3,432	1,209	2,251	1,785	1,776	519
Large Merganser	0	0	56	576	0	230	174	0	56	0	0	117	228	522	972	234	723	957	626
Diver subtotal	98,860	65,921	75,008	106,306	38,149	91,602	52,253	104,629	51,293	59,181	35,031	67,173	46,396	66,937	22,942	63,186	36,487	21,253	14,675
Total Ducks	374,669	412,662	354,322	413,083	282,854	352,147	284,812	384,204	313,358	356,594	299,936	370,675	290,635	342,967	214,646	378,579	190,060	155,475	139,243
Other:																			
Coot	51,333	50,874	64,247	85,011	18,546	14,777	4,965	193,021	34,700	6,331	15,020	72,793	5,321	21,804	11,319	106,845	11,641	15,633	6,290
Canada Goose	51,946	58,425	42,231	33,965	43,858	48,595	58,066	60,870	60,449	79,147	80,012	105,932	89,418	78,200	87,663	98,339	83,384	75,688	98,316

Table 7. Estimated waterfowl populations during the Minnesota Waterfowl breeding population survey, 1968-2007.

Year	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
1968[2]	41,030	2.04	83,701		61,943	2.44	151,141		41,419	2.08	86,152
1969[2]	53,167	1.67	88,789		45,180	3.45	155,871		34,605	2.27	78,553
1970[2]	67,463	1.69	113,945		31,682	5.06	160,343		30,822	1.62	49,932
1971[2]	47,702	1.65	78,470		42,445	3.49	148,218		29,520	1.71	50,450
1972[2]	49,137	1.27	62,158		49,386	1.96	96,895		34,405	1.69	58,127
1973[3]	56,607	1.76	99,832		53,095	3.92	208,292		33,155	2.45	81,362
1974[3]	44,866	1.62	72,826		39,402	2.59	102,169		38,266	2.79	106,609
1975	55,093	3.19	175,774		45,948	3.95	181,375		34,585	3.31	114,459
1976	69,844	1.69	117,806		89,370	4.87	435,607		39,022	3.35	130,669
1977	60,617	2.21	134,164		37,391	3.86	144,187		18,633	11.95	222,748
1978	56,152	2.61	146,781		28,491	8.53	242,923		22,034	3.30	72,798
1979	61,743	2.57	158,704	28,668	46,708	5.21	243,167	62,226	39,749	3.79	150,545
1980	83,775	2.05	171,957	22,312	50,966	6.49	330,616	40,571	47,322	3.97	188,020
1981	79,562	1.95	154,844	16,402	64,546	2.59	167,258	23,835	30,947	3.80	117,667
1982	51,655	2.33	120,527	17,078	42,772	4.75	203,167	34,503	32,726	4.32	141,501
1983	73,424	2.12	155,762	15,419	42,728	2.81	119,980	20,809	32,240	2.84	91,400
1984	94,514	1.99	188,149	24,065	89,896	2.82	253,821	33,286	40,326	2.18	87,709
1985	96,045	2.26	216,908	32,935	90,453	2.91	263,607	33,369	35,018	2.35	82,383
1986	108,328	2.16	233,598	30,384	68,235	2.69	183,338	28,204	38,900	2.67	103,851
1987	165,881	1.16	192,289	23,500	102,480	1.99	203,718	32,289	76,746	2.51	192,947
1988	155,543	1.75	271,718	38,675	101,183	2.38	240,532	39,512	81,514	2.61	212,988
1989	124,362	2.19	272,968	26,508	90,300	3.16	285,760	39,834	88,109	2.89	254,887
1990	140,879	1.65	232,059	26,316	107,177	3.09	330,659	44,455	124,531	1.97	245,152
1991	128,315	1.75	224,953	28,832	91,496	2.90	265,138	42,057	93,784	2.81	263,619
1992	144,126	2.50	360,870	43,621	93,107	3.83	356,679	53,619	109,779	2.33	255,774
1993	123,771	2.47	305,838	31,103	64,670	4.02	260,070	36,307	82,612	3.28	271,263
1994	138,482	3.08	426,455	66,240	70,324	5.48	385,256	82,580	85,671	3.55	303,847
1995	142,557	2.24	319,433	48,124	47,737	4.40	210,043	40,531	66,096	4.05	267,668
1996	153,473	2.05	314,816	53,461	57,196	5.05	288,913	64,064	107,950	2.64	285,328
1997	160,629	2.54	407,413	65,771	45,496	5.57	253,408	67,526	76,095	2.72	207,316
1998	188,972	1.95	368,450	61,513	47,788	3.66	174,848	33,855	91,478	1.64	149,786
1999	169,213	1.87	316,394	51,651	36,106	4.53	163,499	36,124	80,459	2.49	200,570
2000	157,853	2.02	318,134	36,857	60,288	2.97	179,055	32,189	120,158	2.09	250,590
2001	146,034	2.20	320,560	39,541	37,706	3.60	135,742	19,631	91,152	2.85	260,051
2002	145,191	2.53	366,625	46,264	91,982	4.67	429,934	87,312	92,778	4.04	374,978
2003	115,974	2.42	280,517	34,556	46,759	4.13	193,269	36,176	46,796	5.30	248,019
2004	158,416	2.37	375,313	57,591	94,152	3.75	353,209	56,539	95,105	2.94	279,802
2005	82,472	2.89	238,500	28,595	48,394	4.01	194,125	37,358	46,797	4.26	199,355
2006	72,843	2.21	160,715	24,230	38,328	4.53	173,674	60,353	42,333	4.41	186,719
2007	76,979	3.15	242,481	30,020	29,407	4.20	123,588	20,055	30,963	3.73	115,390
Averages:											
10-year (1997-2006)	139,760	2.30	315,262	44,657	54,700	4.14	225,076	46,706	78,315	3.27	235,719
Long-term (1968-2006)	104,249	2.12	221,762	36,436	61,367	3.90	227,423	43,540	60,350	3.17	177,579
% change from:											
2006	6%	43%	51%	24%	-23%	-7%	-29%	-67%	-27%	-15%	-38%
10-year average	-45%	37%	-23%	-33%	-46%	1%	-45%	-57%	-60%	14%	-51%
Long-term average	-26%	49%	9%	-18%	-52%	8%	-46%	-54%	-49%	18%	-35%

[1] Unad. PI - unadjusted population index, VCF - Visibility Correction Factor, PI - adjusted population index, SE - standard error.
[2] Calculated from data in Waterfowl breeding ground survey reports, 1968 through 1972, from Minn. Game Res. Quarterly Reps. 1968 and 1969 other duck VCF is total duck VCF.
[3] Calculated from data in Maxson and Pace (1989).

Table 7. Cont.

Year	Scaup			Total ducks (ex. scaup)		Total Ducks		Canada geese		
	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
1968	22,834	2.08	47,495	144,392	320,994	167,226	368,488			
1969	9,719	2.27	22,062	132,952	323,213	142,671	345,275			
1970	12,105	1.62	19,610	129,967	324,219	142,072	343,829			
1971	5,713	1.71	9,764	119,667	277,137	125,380	286,901			
1972	12,062	1.69	20,379	132,928	217,181	144,990	237,560	366		
1973	10,633	2.45	26,093	142,857	389,486	153,490	415,580	1,965		
1974	18,378	2.79	51,201	122,534	281,605	140,912	332,806	8,835		
1975	9,563	3.31	31,649	135,626	471,608	145,189	503,257	5,997		
1976	22,494	3.35	75,323	198,236	684,082	220,730	759,405	5,409		
1977	2,971	11.95	35,517	116,641	501,099	119,612	536,616	7,279		
1978	14,774	3.35	48,812	106,677	462,502	121,451	511,314	7,865		
1979	92,134	3.79	348,948	148,200	552,416	240,334	901,364	4,843		
1980	12,602	3.97	50,070	182,063	690,593	194,665	740,663	6,307		
1981	19,844	3.88	75,451	175,055	439,769	194,899	515,220	10,156		
1982	21,556	4.32	93,204	127,153	465,195	148,709	558,399	6,600		
1983	9,551	2.84	27,077	148,392	367,142	157,943	394,219	11,081		
1984	15,683	2.18	34,111	224,736	529,679	240,419	563,790	14,051		
1985	7,409	2.35	17,430	221,516	562,898	228,925	580,328	16,658		
1986	6,247	2.67	16,678	215,463	520,787	221,710	537,465	19,599		
1987	10,306	2.51	25,910	345,107	588,954	355,413	614,864	29,960		
1988	10,545	2.61	27,553	338,240	725,238	348,785	752,791	39,057	1.36	53,004
1989	71,898	2.89	207,991	302,771	813,615	374,669	1,021,606	51,946	1.88	97,898
1990	40,075	1.97	78,892	372,587	807,870	412,662	886,761	58,425	1.37	80,147
1991	40,727	2.81	114,480	313,595	753,710	354,322	868,191	42,231	4.18	176,465
1992	66,071	2.33	153,939	347,012	973,323	413,083	1,127,262	33,965	2.43	82,486
1993	11,801	3.28	38,750	271,053	837,172	282,854	875,921	43,858	2.08	91,369
1994	57,670	3.55	204,536	294,477	1,115,558	352,147	1,320,095	48,595	1.68	77,878
1995	28,421	4.05	115,096	256,390	797,144	284,811	912,241	58,065	2.08	120,775
1996	65,585	2.64	173,351	318,619	889,057	384,204	1,062,408	60,870	3.92	238,708
1997	31,138	2.72	84,834	282,220	868,137	313,358	952,971	60,449	2.59	156,817
1998	28,416	1.64	46,528	328,238	693,084	356,654	739,612	79,147	1.75	138,507
1999	14,041	2.49	35,002	285,778	680,463	299,819	715,465	80,012	3.35	268,168
2000	32,376	2.10	67,520	338,299	747,779	370,675	815,299	105,932	2.84	301,298
2001	15,743	2.85	44,914	274,892	716,353	290,653	761,267	89,418	2.17	193,887
2002	13,016	4.04	52,606	327,951	1,171,537	340,967	1,224,143	78,200	2.42	189,353
2003	5,117	5.30	27,120	209,529	721,805	214,646	748,925	87,663	3.78	331,094
2004	30,906	2.94	90,926	347,673	1,008,324	378,579	1,099,250	98,339	1.58	155,859
2005	12,397	3.98	49,340	177,663	631,980	190,060	681,320	83,384	2.02	168,469
2006	1,971	4.22	8,322	153,504	521,109	155,475	529,431	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
Averages:										
10-year (1997-2006)	18,512	3.23	50,711	272,575	776,057	291,089	826,768	83,823	2.52	211,021
Long-term (1968-2006)	23,449	3.17	69,192	225,914	626,765	249,363	695,956	40,920	2.43	164,681
% change from:										
2006	-4%	-12%	-15%	-11%	-6%	-10%	-6%	30%	-46%	-30%
10-year average	-90%	16%	-86%	-50%	-37%	-52%	-40%	17%	-42%	-32%
Long-term average	-92%	18%	-90%	-39%	-22%	-44%	-29%	140%	-40%	-12%

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

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 29 April - 27 May 2007 (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
		29-April		6-May		13-May		20-May		27-May							
Region	City	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	29-April	6-May	13-May	20-May	27-May	1 Apr-27 May
NW	Crookston	54.7	7.2	56.8	5.8	60.5	6.3	58.2	1.1	53.4	-6.2	0.00	2.08	0.00	0.12	1.21	1.80
NC	Grand Rapids	54.0	7.9	54.4	5.1	59.7	7.4	53.9	-1.0	57.2	0.0	0.00	0.52	0.03	0.17	0.83	0.17
	Itasca	50.4	7.1	50.5	3.6	59.1	8.9	55.8	2.6	54.0	-1.8	0.02	0.39	0.00	0.11	2.60	2.07
WC	Alexandria	56.1	8.2	56.0	4.8	62.8	8.6	58.0	1.1	58.8	-0.5	0.00	0.61	0.00	0.27	0.16	-1.08
	Fergus Falls	53.2	4.9	57.3	5.7	61.6	6.9	60.0	2.6	57.8	-2.0	0.00	1.62	0.00	0.25	3.20	5.30
	Montevideo	56.2	6.7	59.5	6.7	64.6	8.7	62.4	3.6	61.1	-0.2	0.00	1.34	0.07	0.00	0.10	-1.81
	Morris	54.6	5.1	57.0	4.3	60.8	5.0	62.0	3.5	59.0	-2.0	0.56	1.02	0.00	0.10	0.03	0.54
C	Becker	57.2	8.5	58.2	6.4	62.1	7.5	62.8	5.6	60.8	1.4	0.00	0.41	0.44	0.00	1.03	-1.99
	Hutchinson	57.0	6.6	58.8	5.2	63.7	7.1	64.9	5.5	61.8	0.0	1.00	0.51	0.11	0.07	0.85	-0.73
	St. Cloud	57.2	8.5	56.5	4.7	62.8	8.2	58.6	1.4	61.2	1.8	0.00	0.29	0.07	0.00	1.22	-1.33
	Staples	53.0	5.8	54.7	4.4	58.9	5.8	58.6	3.0	55.5	-2.3	0.70	0.42	0.15	0.55	1.40	2.50
	Willmar	56.1	6.6	58.4	5.6	61.7	5.8	63.4	4.7	59.5	-1.7	2.71	0.79	0.24	0.00	0.10	1.23
EC	Aitkin	52.5	6.6	53.5	4.6	59.2	7.5	55.5	1.3	54.0	-2.6	1.50	0.42	0.00	0.55	0.70	0.10
	Cambridge	Missing															
	Msp Airport	60.2	8.8	60.1	5.7	66.2	9.0	61.9	2.1	64.0	1.8	0.01	0.40	0.21	0.12	0.74	-2.68
SW	Pipestone	53.5	4.0	60.4	7.8	63.8	8.3	62.2	4.0	59.4	-1.3	0.96	1.44	0.10	0.00	0.40	-0.88
	Redwood Falls	58.5	6.6	59.6	4.5	65.5	7.4	61.2	0.3	61.4	-2.0	0.00	1.53	0.25	0.47	0.17	-0.60
	Worthington	53.8	5.3	60.2	8.4	63.8	8.9	63.0	5.2	61.7	1.3	0.57	1.80	0.09	0.05	0.51	-0.63
SC	Faribault	56.0	7.0	57.5	5.4	63.7	8.6	62.2	4.3	59.3	-1.2	0.32	0.19	0.32	0.00	2.47	-1.66
	Waseca	56.0	6.1	60.8	7.7	64.0	7.8	62.6	3.6	60.8	-0.7	0.38	0.43	0.59	0.21	1.71	-1.92
	Winnebago	55.4	5.3	61.3	7.6	63.1	6.5	64.0	4.7	60.0	-1.9	0.43	0.87	0.12	0.53	1.05	-2.04
Statewide		54.6	6.4	56.7	5.4	61.6	7.3	58.7	1.8	58.3	-1.0	0.34	0.75	0.16	0.21	1.24	

[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, 2007* by Pamela R. Garrettson, Timothy J. Moser, and Khristi Wilkins. The entire report is available on the Division of Migratory Bird Management home pate (http://www.fws.gov/migratorybirds/reports/reports.html .

Table 1. Canada goose population indices (in thousands) of the eastern prairie flock, 1971-2007 (from: U.S. Fish and Wildlife Service. 2007. Waterfowl population status, 2007. U.S. Department of the Interior, Washington, D.C. U.S.A.).

Year	Population[a,b]
1971-72	125,000
1972-73	138,000
1973-74	120,000
1974-75	144,000
1975-76	216,000
1976-77	164,000
1977-78	180,000
1978-79	99,000
1979-80	n.a.
1980-81	125,000
1981-82	132,000
1982-83	155,000
1983-84	136,000
1984-85	158,000
1985-86	195,000
1986-87	203,000
1987-88	209,000
1988-89	210,000
1989-90	232,000
1990-91	212,000
1991-92	202,000
1992-93	157,000
1993-94	211,000
1994-95	205,000
1995-96	190,000
1996-97	199,000
1997-98	126,000
1998-99	207,000
1999-00	275,000
2000-01	215,000
2001-02	216,000
2002-03	229,000
2003-04	291,000
2004-05	255,000
2005-06	185,000
2006-07	218,000

[a] Surveys conducted in Spring.
[b] Indirect or preliminary estimate.

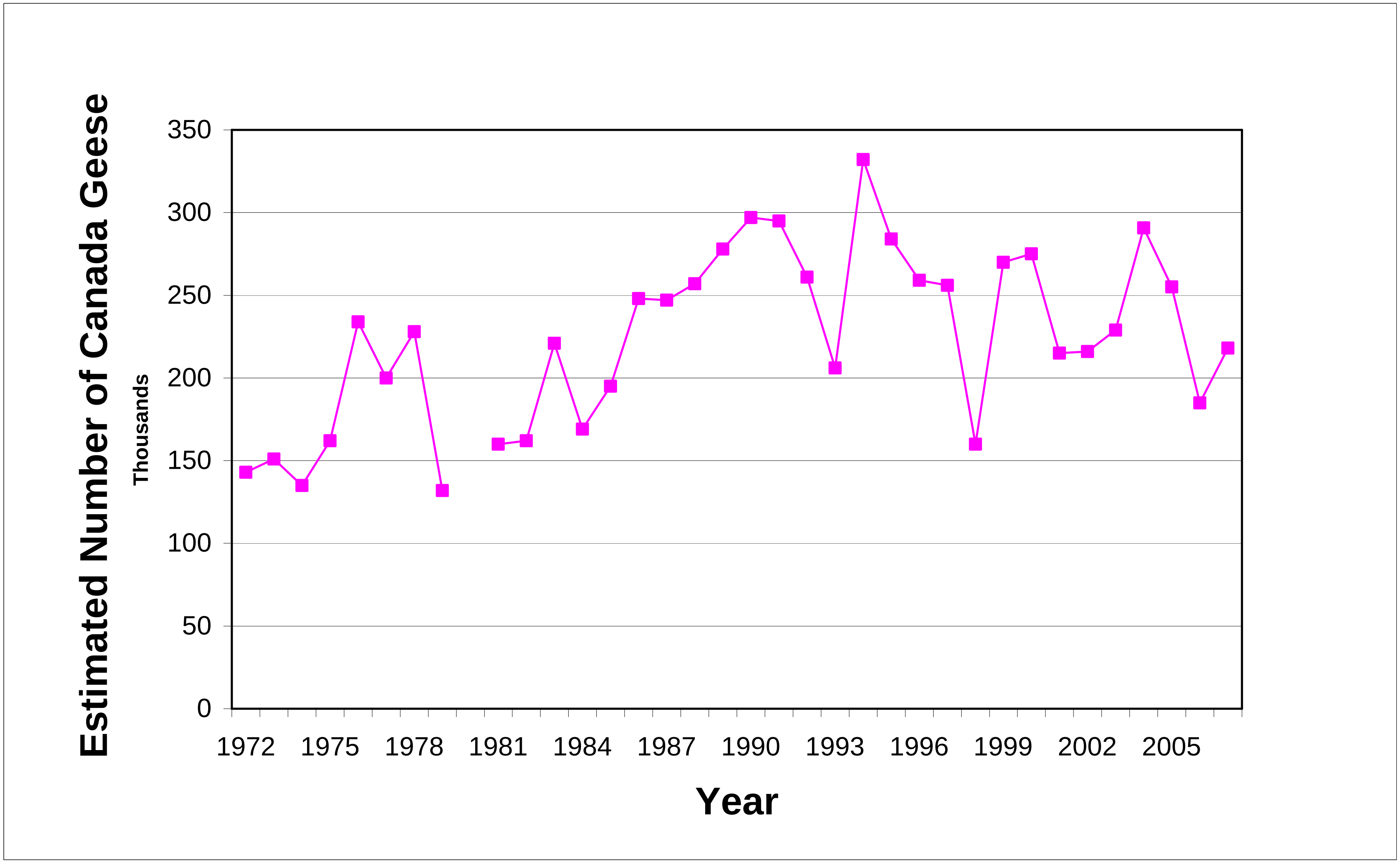

Figure 1. Breeding ground survey estimates of the Eastern Prairie Population of Canada geese, 1972-2007. (from: U.S. Fish and Wildlife Service. 2007. Waterfowl population status, 2007. U.S. Department of the Interior, Washington, D.C. U.S.A.). Surveys conducted in spring. Indirect or preliminary estimates. Data not available for 1980.

Table 2. Estimated number of May ponds (adjusted for visibility) in Prairie Canada (portions of Alberta, Saskatchewan and Manitoba) 1962-2007 and north-central U.S. (North Dakota, South Dakota and Montana) 1974-2007. (from: U.S. Fish and Wildlife Service. 2007. Waterfowl population status, 2007. U.S. Department of the Interior, Washington, D.C. U.S.A.)

	Ponds (thousands)	
Year	Prairie Canada	North Central U.S.[a]
1962	2,369	--
1963	2,482	--
1964	3,371	--
1965	4,379	--
1966	4,555	--
1967	4,691	--
1968	1,986	--
1969	3,548	--
1970	4,875	--
1971	4,053	--
1972	4,009	--
1973	2,950	--
1974	6,390	1,841
1975	5,320	1,911
1976	4,599	1,392
1977	2,278	771
1978	3,622	1,590
1979	4,859	1,522
1980	2,141	761
1981	1,443	683
1982	3,185	1,458
1983	3,906	1,259
1984	2,473	1,766
1985	4,283	1,327
1986	4,025	1,735
1987	2,524	1,348
1988	2,110	791
1989	1,693	1,290
1990	2,817	691
1991	2,494	706
1992	2,784	825
1993	2,261	1,351
1994	3,769	2,216
1995	3,893	2,443
1996	5,003	2,480
1997	5,061	2,397
1998	2,522	2,065
1999	3,862	2,842
2000	2,422	1,524
2001	2,747	1,893
2002	1,439	1,281
2003	3,522	1,668
2004	2,513	1,407
2005	3,921	1,461
2006	4,450	1,644
2007	5,040	1,963
Average	3,439	1,538
% Change in 2007 from:		
2006	+ 13	+ 19
Long term Average	+ 47	+ 28

[a] No comparable survey data available for the north-central U.S. during 1961-73.

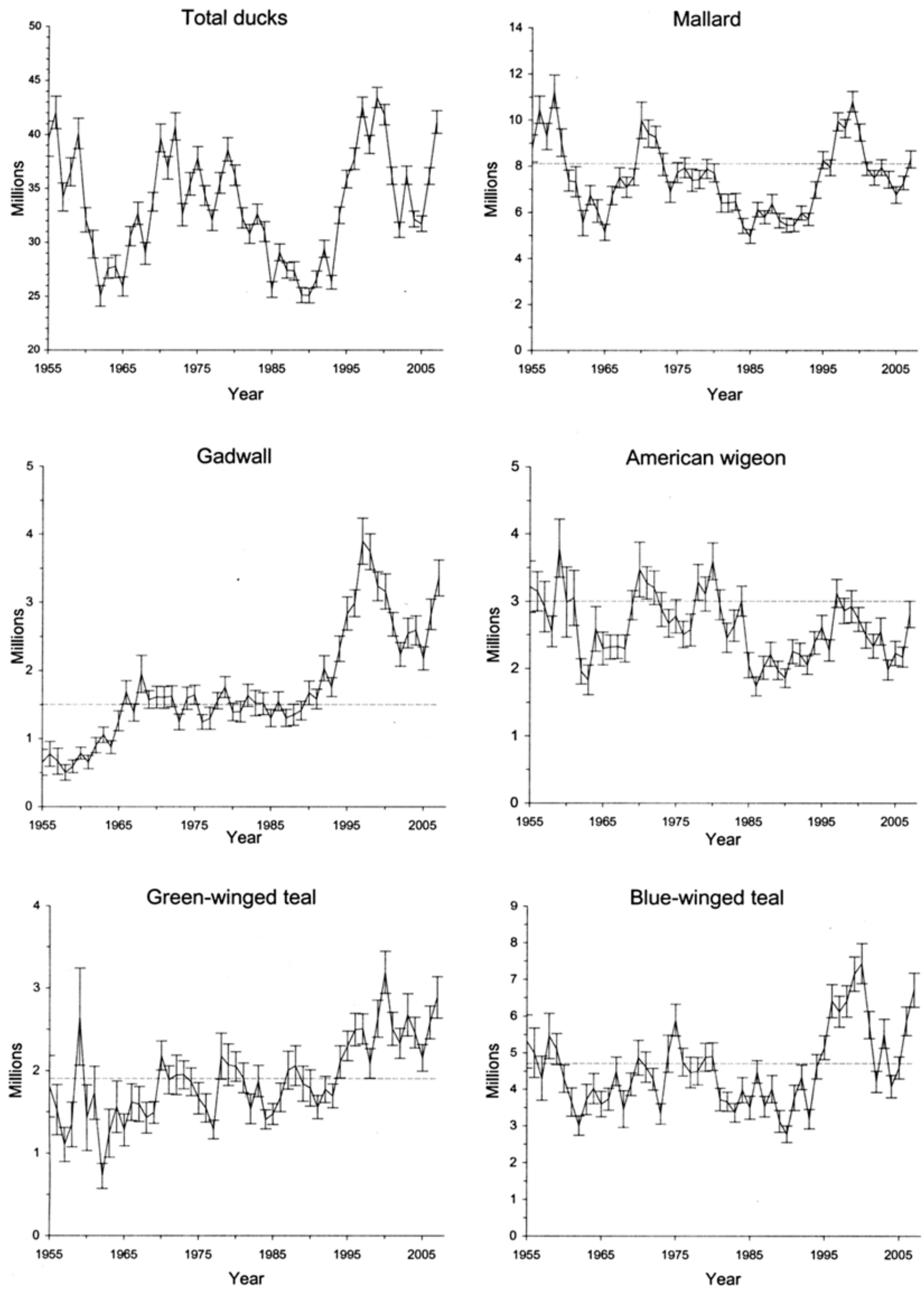

Figure 2. Estimates of North American breeding populations, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S. (from: U.S. Fish and Wildlife Service. 2007. Waterfowl population status, 2007. U.S. Department of the Interior, Washington, D.C. U.S.A.)

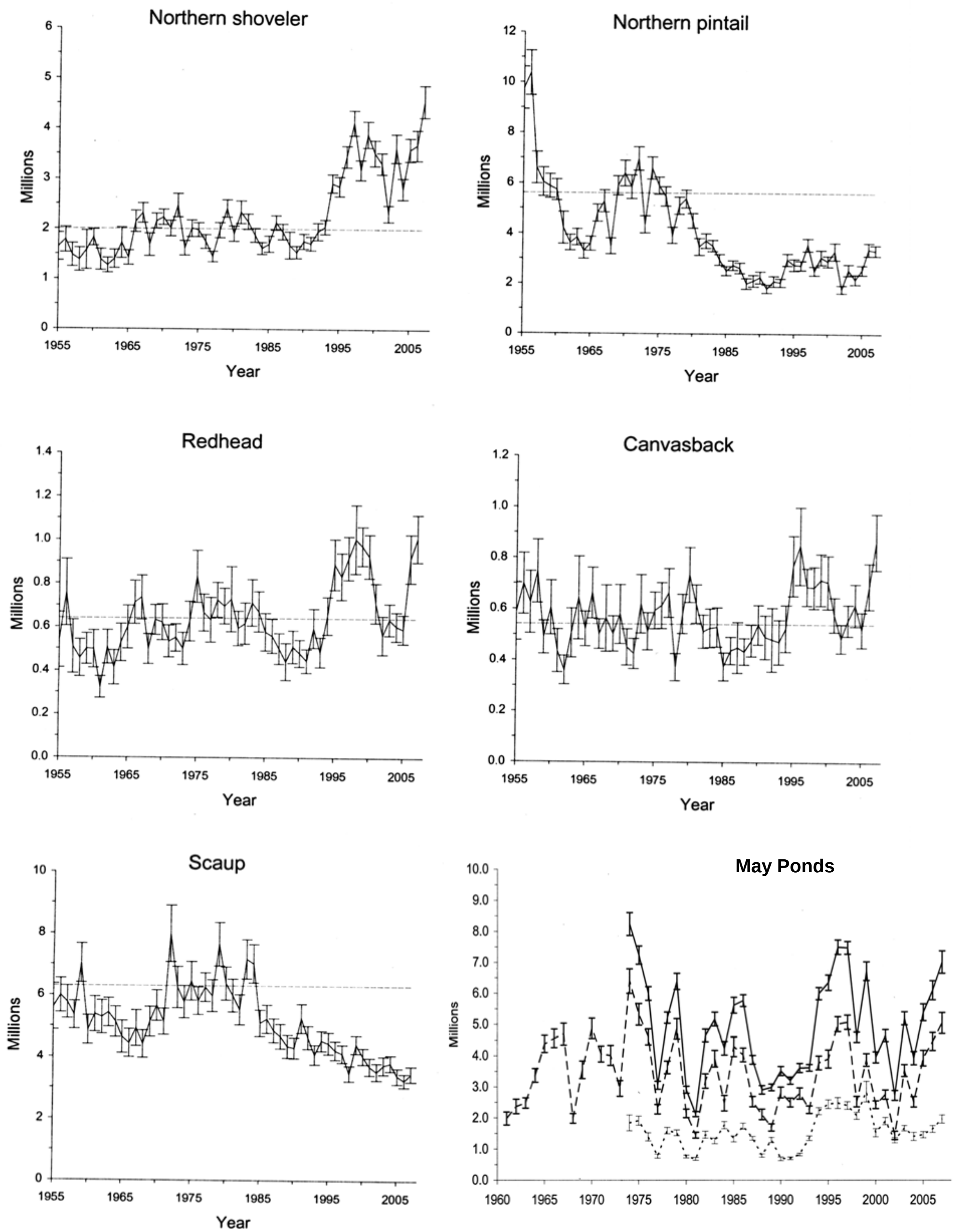

Figure 2. (continued).

Minnesota Spring Canada Goose Survey, 2007

David Rave, Wetland Wildlife Populations and Research Group

INTRODUCTION

This report presents results from the seventh year of a spring helicopter survey of resident Canada geese in Minnesota. The purpose of the survey is to produce a statewide population estimate with 95% Confidence Intervals.

METHODS

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 were excluded from the Forest ecoregion. Within each ecoregion, 900 ¼-section plots were randomly selected using ArcView.

The 900 plots in each ecoregion were divided into 3 strata based on habitat quality for resident geese. The 3 strata were defined as follows: 1) not nesting habitat – expect no geese, 2) limited nesting habitat – expect 1 or 2 pairs, 3) prime nesting habitat – expect 3 or more pairs. Stratification was based on National Wetland Inventory data and was done using ArcView. Strata were separated based on the total acres of type 3, 4, and 5 wetlands and rivers on the plot as described below:

	Prairie
No geese =	Type 3-4-5 <0.5 acres and rivers <10 acres or plot is all water. (n = 476 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 = 344 plots).
3+ pairs =	Type 3 >15 acres, but plot is not all water. (n = 80 plots).

Transition

No geese =	Type 3-4-5 <1 acre and rivers <8 acres or plot is all water. (n = 377 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 = 428 plots).
3+ pairs =	Type 3-4-5 >25 acres, but Type 3 >15 acres and plot is not all water. (n = 95 plots).

Forest

No geese =	Type 3-4-5 <2 acres and rivers <2 acres or plot all water. (n = 510 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 = 390 plots).
3+ pairs =	None.

Plots in the No geese strata are not flown. Each year 30 plots are randomly selected in each of the 5 remaining strata and these 150 plots are surveyed at low level using a helicopter. Ideally, the survey should be conducted during mid-incubation.

Pilot John Heineman and I flew the survey 23-28 April, while Jeff Lawrence flew with pilot Mike Trenholm on April 28, 2007. 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 was doubled when the total number of geese per plot was calculated (unless 2 singles were observed to associate as a pair after being flushed).

RESULTS AND DISCUSSION

The total Canada goose population estimate in the surveyed area for 2007 was 261,933 (±80,167). Adding 17,500 for the Twin Cities metro area (Cooper 2004) yields a statewide estimate of 279,433 (Table 1). Confidence Intervals were 30.6% of the estimate, which is somewhat above the target of 25.0%. The survey tallied 31.0% singles (after doubling, as noted above), 51.5% pairs, and 17.5% groups (Table 2). Typically, many of the pairs seen on this survey are not associated with nests and are likely nonbreeders. An index to nesting effort (i.e., "Productive Geese") can be obtained by combining singles (after doubling) and pairs associated with nests. In 2007, 36.2% of the geese seen were classified as Productive Geese (Table 2). While confidence intervals overlap among years, a linear trend line applied to these data suggests the population in the surveyed area has been stable to increasing over the 7 years of this survey (Figure 1).

The 2007 Canada goose estimate for the surveyed area was 27 % lower than the 2006 estimate. The largest declines in goose number estimates were from the Transition and Forest regions, whereas the Prairie region was similar to last year (Table 1). While the survey design is robust, results potentially could be influenced by other factors. While methods were the same as previous years, 2007 was the first year since the Canada goose survey was implemented that Steve Maxson was not the principle observer on the survey. The helicopter pilots were the same. We assume that essentially all the geese are observed using the helicopter and it is unlikely a change in observers had a strong influence on survey results. Weather conditions in 2007 were characterized by an early spring followed by a week of winter temperatures and storms. These conditions may have affected the distribution of breeding geese this spring, e.g. with more failed breeders off of wetlands where they may be less likely to be observed. Regardless of the reasons for the lower 2007 Canada goose population estimate, it remained 12 % above the state Canada goose population goal, and indicated that the goose population in the state is healthy.

Wetland and habitat quality were variable in the state this year. Water levels of wetlands in Prairie and Transition regions of the state appeared to be at normal to above normal levels, whereas water levels in wetlands in the Forest region were quite low. Further, a major cold front with temperatures well below freezing during the last week of March likely affected goose nests in the northern 2/3 of the state by freezing eggs in many nests. This will likely result in fewer and smaller goose broods in these parts of the state. I would expect average to above average Canada goose production in the southern 1/3, and less than average production in the rest of the state.

ACKNOWLEDGEMENTS

Frank Martin (Univ. of MN) and Steve Maxson were instrumental in the design of this survey. Steve also was the principal observer during the first 6 years, and helped with the setup and logistics of this year's survey. Tim Loesch, Christopher Pouliot, and Shelly Buitenwerf 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 Buitenwerf provided GPS coordinates of plots to the pilot, and printed out maps of the 150 plots flown this year. John Giudice wrote the SAS program to analyze the survey data.

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Cooper, J. 2004. Canada goose program report 2004. Unpublished report. 20 pp.

Table 1. Spring Canada goose population estimates in Minnesota, 2001-2007.

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**

Table 2. Percent of Canada Geese seen as singles, pairs, groups, and productive geese on the Minnesota Spring Canada Goose Survey, 2001-2006.

Year	Singles[1]	Pairs[1]	Groups	Productive Geese[2]
2001	27.0	63.9	9.1	36.4
2002	30.7	52.0	17.2	41.5
2003	27.9	58.2	13.9	29.3
2004	26.5	57.5	16.0	35.5
2005	33.0	50.2	16.8	40.7
2006	43.5	45.9	10.6	50.3
2007	31.0	51.5	17.5	36.2

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

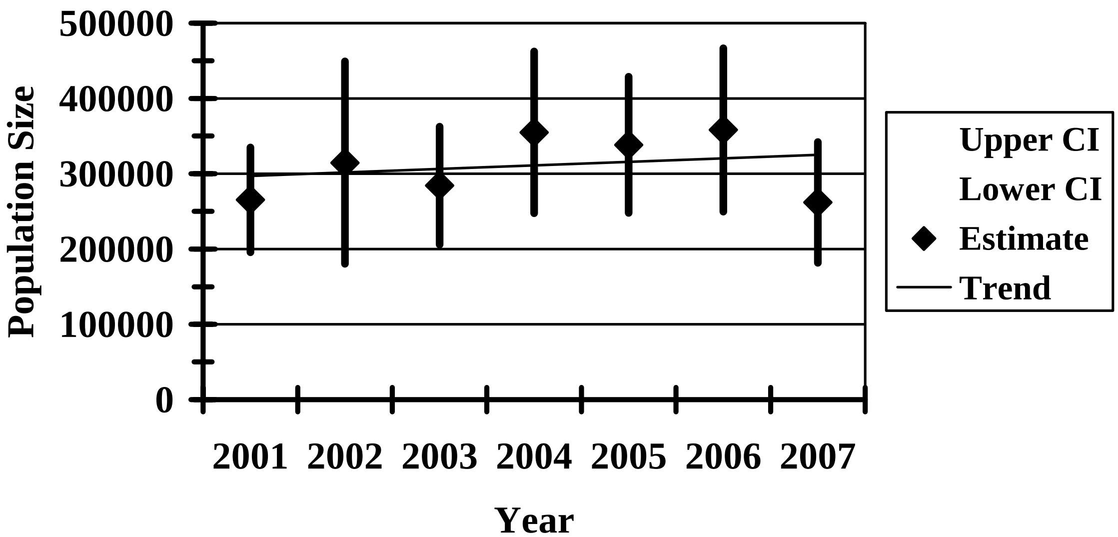


Figure 1. Spring Canada goose population estimates (±95% CI) in Minnesota, 2001-2007. (Does not include Metro area.)

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Dolton, D.D., R.D. Rau, and K. Parker. 2007. *Mourning dove population status, 2007.* U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 22 pp. The entire report is available on the Division of Migratory Bird Management home page http://www.fws.gov/migratorybirds/reports/reports.html .

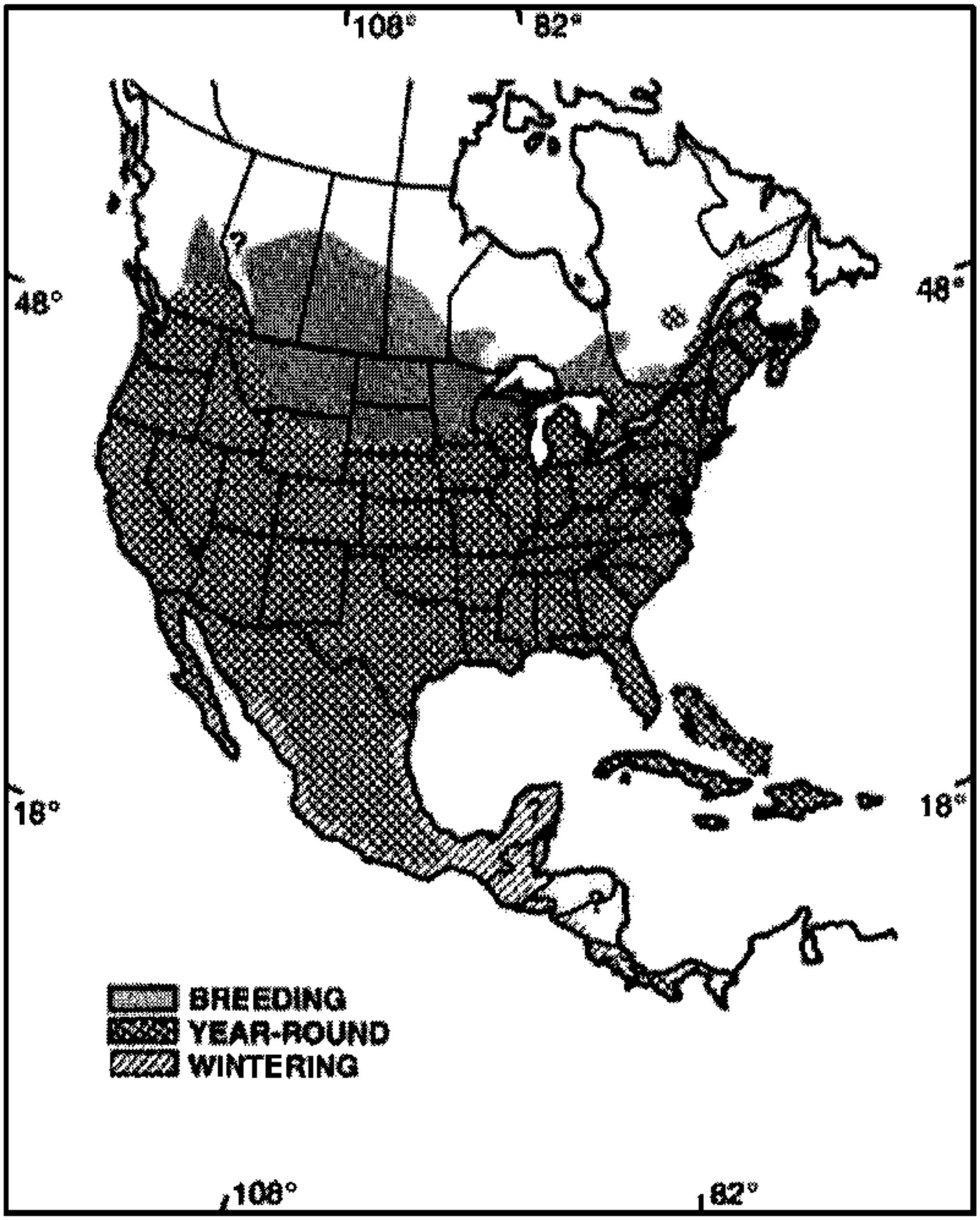


Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 22 pp.

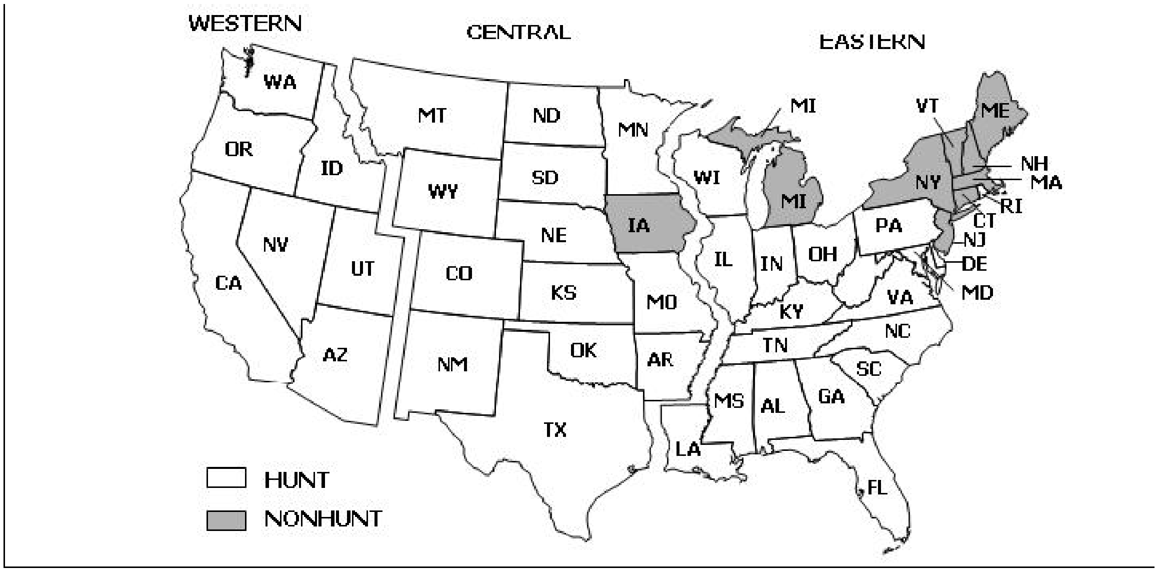


Figure 2. Mourning dove management units with 2006 hunting and nonhunting states. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 22 pp).

Table 1. Preliminary estimates of the number of hunters, days hunted, and total bag from Harvest Information Program surveys for the 2006-07 season. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 22 pp).

Management unit / State	Hunters	Days Hunted	Birds bagged
CENTRAL	470,800	1,605,900 ± 9%	8,887,000 ± 9%
AR	31,300 ± 16%	77,500 ± 18%	621,500 ± 20%
CO	19,800 ± 11%	45,700 ± 13%	270,300 ± 19%
KS	35,400 ± 8%	116,400 ± 11%	711,800 ± 12%
MN	8,000 ± 33%	24,200 ± 39%	50,000 ± 46%
MO	44,700 ± 7%	129,800 ± 12%	709,500 ± 15%
MT	1,800 ± 36%	3,900 ± 38%	14,800 ± 33%
NE	15,000 ± 12%	43,000 ± 12%	249,700 ± 12%
NM	7,100 ± 20%	33,900 ± 28%	226,900 ± 33%
ND	4,000 ± 23%	10,800 ± 24%	56,400 ± 25%
OK	36,100 ± 9%	108,300 ± 17%	704,400 ± 24%
SD	6,400 ± 16%	19,600 ± 17%	103,300 ± 18%
TX	258,900 ± 10%	986,200 ± 14%	5,138,700 ± 14%
WY	2,300 ± 29%	6,500 ± 36%	29,500 ± 37%

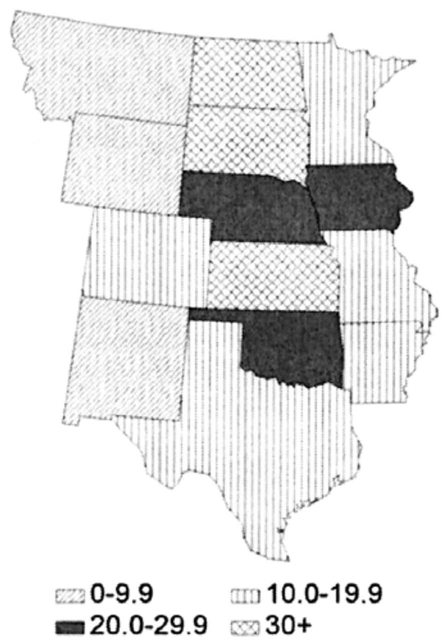


Figure 3. Mean number of mourning doves heard per route by state in the Central Management Unit, 2006-07. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

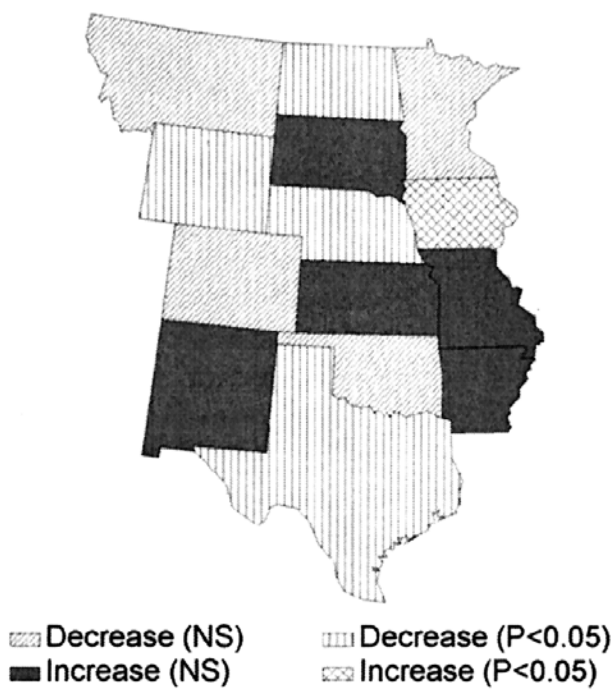


Figure 4. Trends in number of mourning doves heard per route by state in the Central Management Unit, 1998-2007. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

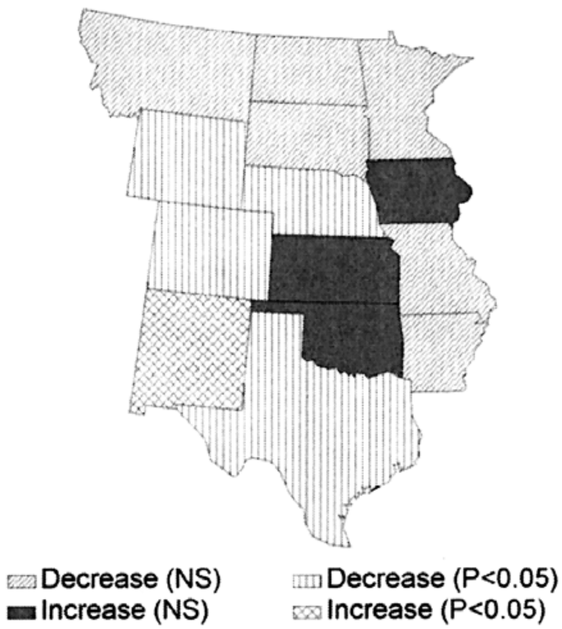


Figure 5. Trends in mourning doves heard per route by state in the Central Management Unit, 1966-2007. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

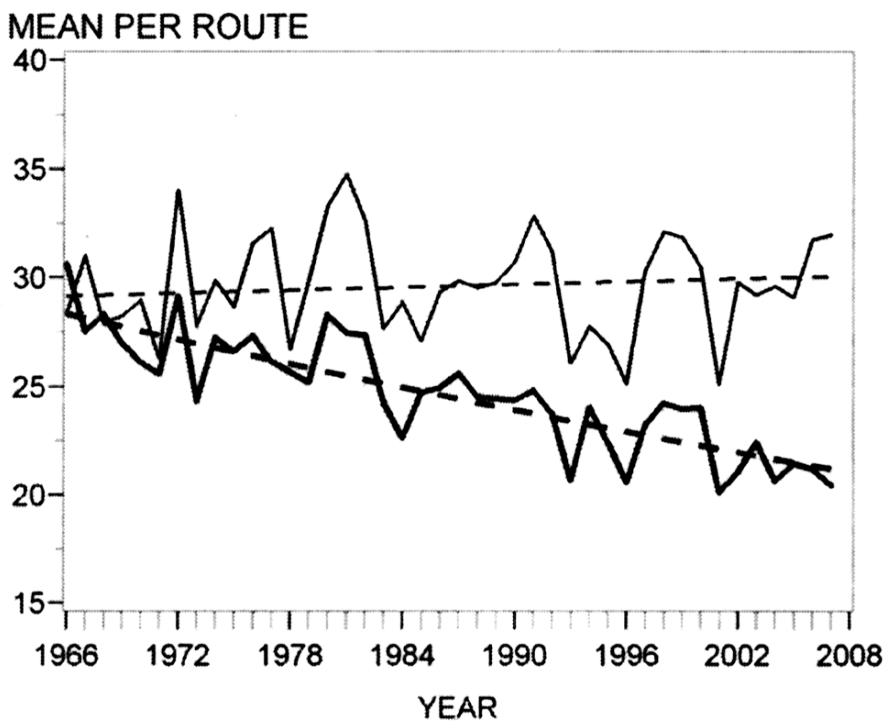


Figure 6. Population indices and trends of breeding mourning doves in the Central Management Unit, 1966-2007. Heavy solid line = doves heard; light solid line = doves seen. Light and heavy dashed lines = predicted trends. (From: Mourning dove population status, 2007. Dolton, D.D., R.D. Rau, and K. Parker. 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

American Woodcock information is taken from the U.S. Fish and Wildlife Service report *American Woodcock Population Status, 2007* by James R. Kelley, Jr., Rebecca D. Rau, and Keri Parker. The entire report is available on the Division of Migratory Bird Management home page (http://www.fws.gov/migratorybirds/reports/reports.html

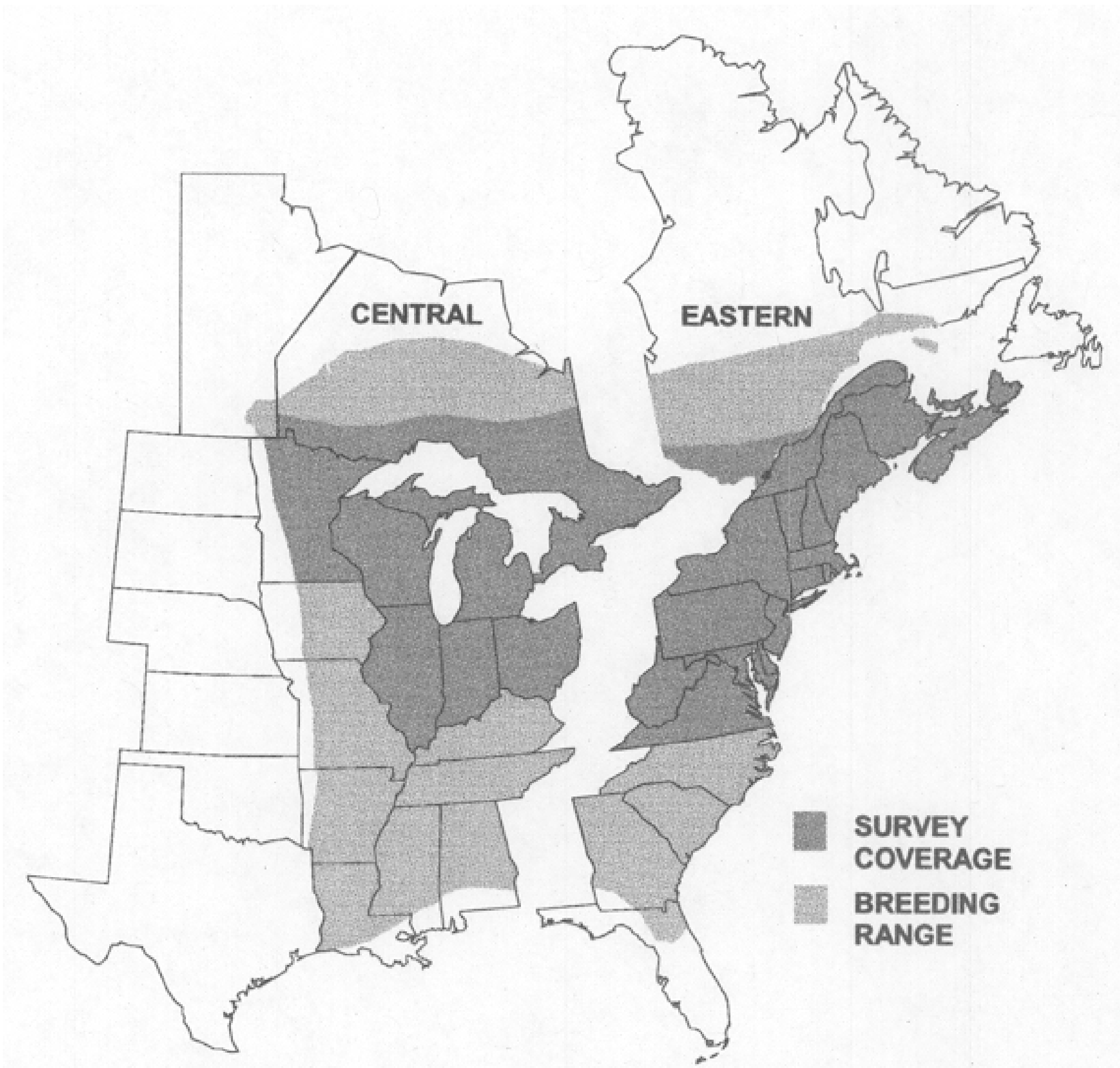


Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

Table 24. Trends (% change per year [a]) in number of American woodcock heard in singing-ground survey during 1968-2007, as determined by the estimating equations technique (Link and Sauer, 1994) (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, MD. 17pp).

Management Unit/State	2 year N[c]	(2006-07) % Change	Routes Run[b]	10 year N	(1997-07) % Change	39 year N	(1968-07) % Change
CENTRAL	172	4.7**	349	383	0.0	635	- 1.8***
IL	0		10	5	18.5	25	24.4
IN	0		20	8	- 14.0	39	- 7.4**
MB[e]	5	20.4 *	10	23	2.9	23	- 1.9
MI	71	4.5	105	111	- 1.4	148	- 1.7***
MN	37	1.6	70	77	0.6	102	- 0.9*
OH	9	-49.7**	35	26	- 1.2	57	- 6.7***
ON	9	27.8*	38	59	1.8	138	- 1.8***
WI	39	12.7	61	74	0.8	103	- 1.8***

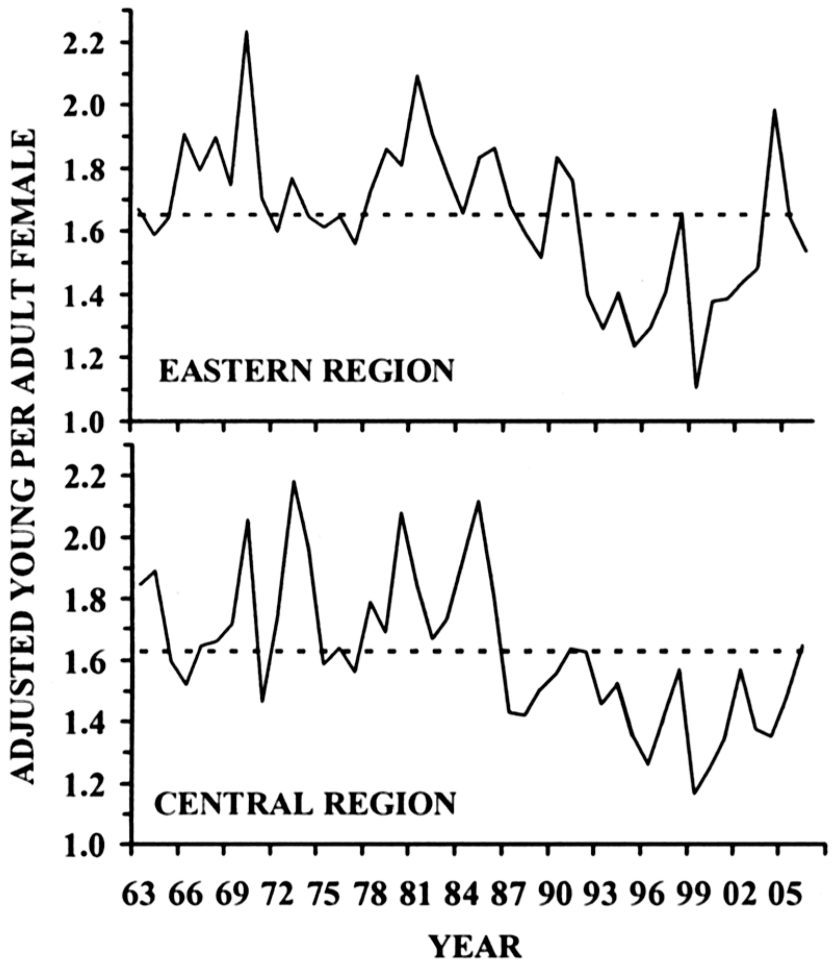
[a] Mean of weighted route trends within each State, Province, or Region. To estimate the total percent change over several years, use: $100(\%\ change/100+1)^y-100$ where y is the number of years.
Note: extrapolating the estimated trend statistic (% change per year) over time (e.g., 30 years) may exaggerate the total change over the period.

[b] Total number of routes surveyed in 2007 for which data were received by 1 June.

[c] Number of comparable routes (2006 versus 2007) with at least 2 non-zero counts.

[d] Indicates slope is significantly different from zero: * $P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$; significance levels are approximate for states where $N < 10$.

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



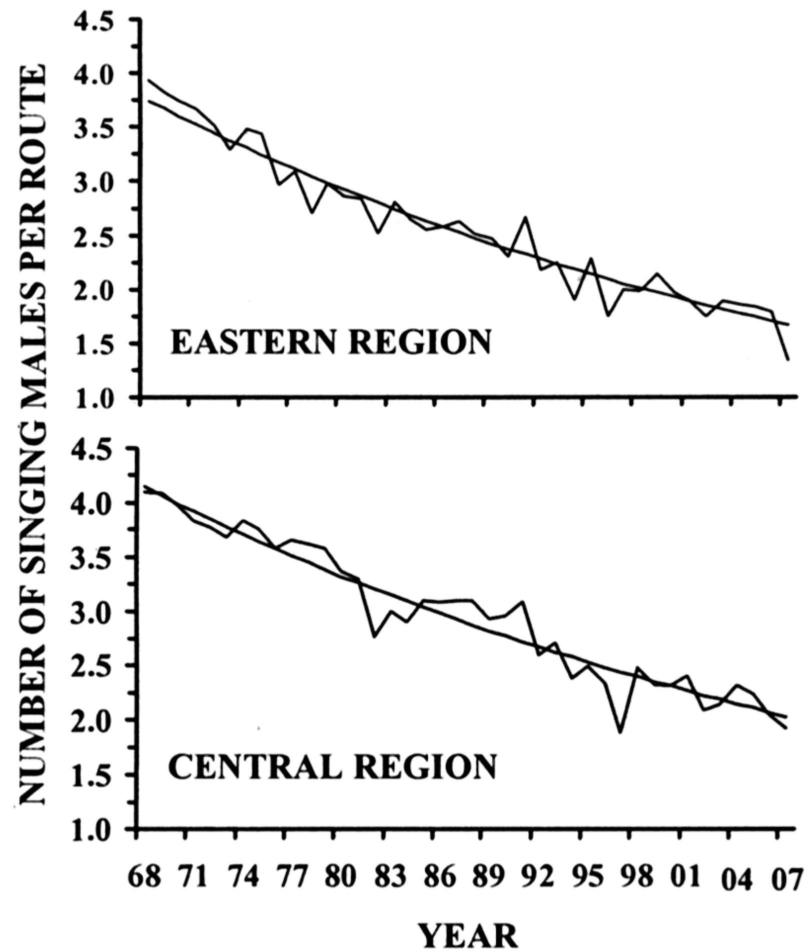


Figure 2. Adjusted index of American woodcock recruitment, 1963-2006. Dashed line is the index based on all 1963-2005 average. (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

Figure 3. American woodcock singing ground survey long term trends and annual indices, 1968-2007. (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

Table 25. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2003-04, 2004-05, 2005-06, and 2006-07. Harvest Information Program surveys. (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

Management Unit / State	Active woodcock hunters				Days afield				Harvest			
	2003-04	2004-05	2005-06	2006-07	2003-04	2004-05	2005-06	2006-07	2003-04	2004-05	2005-06	2006-07
Central Region	n.a.	n.a.	n.a.	n.a.	369,900 ± 16%	366,100 ± 15%	356,100 ± 14%	344,262 ± 12%	213,500 ± 23%	234,800 ± 20%	225,000 ± 19%	232,557 ± 17%
IL	2,400 ± 79%	1,200 ± 74%	2,100 ± 79%	1,973 ± 87	12,200 ± 112%	3,500 ± 78%	5,300 ± 89%	8,944 ± 115%	2,200 ± 90%	1,900 ± 96%	3,900 ± 196%	2,171 ± 160%
IN	700 ± 97%	1,100 ±104%	2,100 ± 55%	1,000 ±58%	6,000 ± 134%	5,300 ±124%	7,400 ± 69%	4,377 ± 75%	1,800 ± 31%	7,900 ± 145%	4,400 ± 91%	2,403 ± 69%
MI	35,100 ± 14%	31,200 ± 13%	28,000 ± 13%	30,017 ± 14%	159,000 ± 18%	147,000 ± 14%	151,200 ±17%	155,333 ± 17%	121,500 ± 30%	102,500 ± 21%	106,800 ± 27%	116,216 ± 27%
MN	14,300 ± 38%	14,500 ± 27%	12,000 ± 31%	14,934 ± 24%	48,700 ± 43%	67,000 ± 33%	60,200 ± 42%	155,333 ± 17%	29,900 ± 84%	38,500 ± 53%	42,200 ± 54%	38,738 ± 41%
OH	3,400 ± 88%	2,600 ± 82%	4,700 ± 65%	2,249 ± 68%	10,300 ± 86%	18,200 ± 126%	15,800 ± 79%	9,764 ± 67%	2,500 ± 78%	4,600 ±101%	6,900 ± 83%	4,060 ± 51%
WI	16,100 ± 30%	15,700 ± 30%	15,600 ± 25%	19,390 ± 22%	65,600 ± 33%	61,100 ± 30%	73,100 ± 31%	72,365 ± 25%	30,300 ± 35%	47,300 ±50%	37,600 ± 28%	42,958 ± 25%

[a] 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.

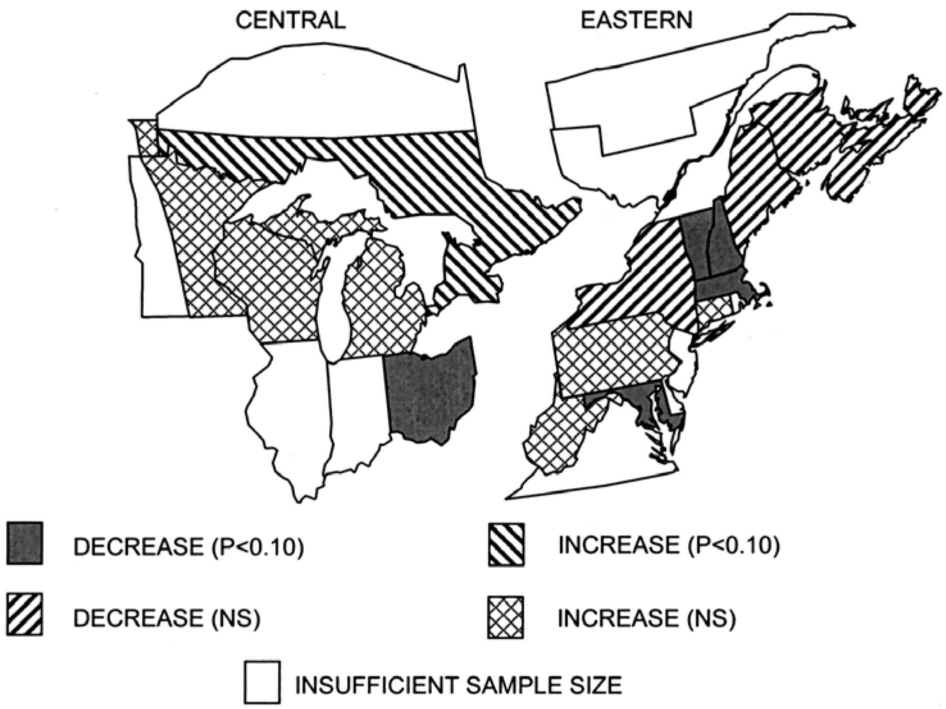


Figure 4. Short-term trends in number of American woodcock heard on the Singing-ground Survey; 2006-07. (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

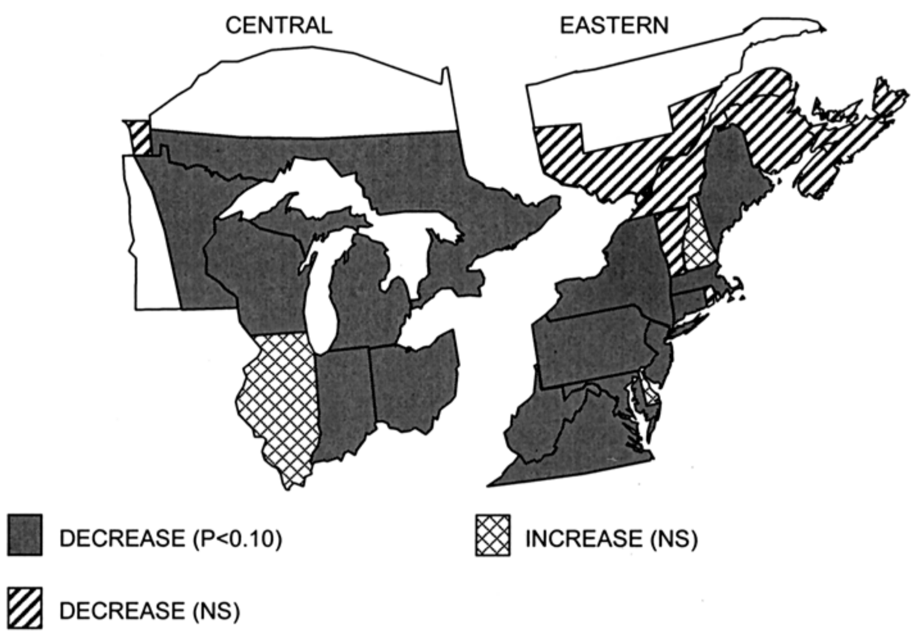


Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-07. (from: Kelley, J.R., Jr., R.D. Rau, and K. Parker. 2007. American woodcock population status, 2007. U.S. Fish and Wildlife Service, Laurel, MD. 17pp).

HUNTING HARVEST STATISTICS

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

2006 Small Game Hunter Mail Survey

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

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

METHODS

The Wildlife Research unit requests a random sample be drawn from the Electronic License System database in late February, to ensure that each license holder has an equal chance of being in the survey sample. The sample consisted of 6,000 (approximately 2%) Small Game License holders, drawn proportionately from each of the Small Game license types available.

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

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

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

RESULTS

Estimated number of hunters increased for pheasant, doves, woodcock, all 3 species grouse, snowshoe hare, and raccoon (Table 3). Number of duck and Canada goose hunters continued to decline (Table 3) although mean harvest and hunter success rates were up slightly (Table 5). Total estimated harvests increased for ducks, Canada geese, coots, woodcock, mourning doves, pheasants, grouse, snowshoe hares, and raccoons (Table 6). Estimated harvests were down for crows, cottontail rabbits, and coyotes. Note that all estimates are based on a survey of approximately 2% of all small game license holders. Data in this report may change as a result of future verification and more comprehensive analysis.

Survey results follow. All estimates are Statewide unless otherwise indicated.

Table 1. Small game hunter response to mail surveys, 1979 - 80 through 2006 - 07.

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

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

Table 2. Use of small game hunter licenses, 1996-97 through 2006-2007.

		Returns from mail survey	Projections from license sales
1996-97	Hunted	2,631 (79.6%)	237,476
	Did not hunt	674 (20.4%)	60,861
		3,305(100.0%)	298,337
1997-98	Hunted	2,604 (80.7%)	246,285
	Did not hunt	622 (19.3%)	58,901
		3,226 (100.0%)	305,186
1998-99	Hunted	2,612 (82.8%)	265,215
	Did not hunt	541 (17.2%)	55,093
		3,153 (100.0%)	320,308
1999-00	Hunted	2,689 (80.7%)	264,237
	Did not hunt	644 (19.3%)	63,194
		3,333 (100.0%)	327,431
2000-01	Hunted	2,254 (78.7%)	252,518
	Did not hunt	610 (21.3%)	68,344
		2,864 (100.0%)	320,862
2001-02	Hunted	2,849 (77.7%)	231,589
	Did not hunt	610 (21.3%)	66,466
		3,665 (100.0%)	298,055
2002-03	Hunted	2,962 (76.7%)	221,455
	Did not hunt	900 (23.3%)	67,274
		3,862 (100.0%)	288,729
2003-04	Hunted	3,085 (78.2%)	232,206
	Did not hunt	862 (21.8%)	64,733
		3,947 (100.0%)	296,939
2004-05	Hunted	2,934 (77.6%)	223,275
	Did not hunt	847 (22.4%)	64,450
		3,781 (100.0%)	287,725
2005-06	Hunted	3,035 (77.1%)	216,000
	Did not hunt	900 (22.9%)	64,156
		3,935 (100.0%)	280,156
2006-07	Hunted	2,994 (79.0%)	233,759
	Did not hunt	795 (21.0%)	62,139
		3,789 (100.0%)	295,898

Includes resident and non-resident information. Excludes duplicates.

2006 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2006 - Feb 2007)? ☐ No ☐ Yes (Please check box)
2. Indicate the **total number of days** spent hunting small game of all species listed below, in Minnesota. __________
3. For the species you hunted indicate your harvest, number of days hunted, and county in which you hunted most for each species, even if **None** were bagged. Report only game **you personally** bagged and retrieved in Minnesota. **Do not** include birds taken on shooting preserves or game farms.

		Number You bagged	Days Hunted	County
Ducks (all species)	01			
Coots (mud hens)	50			
Canada geese	40			
Other geese	41			
Snipe (jacksnipe)	51			
Rails and gallinules	52			
Crows	53			
Woodcock	60			
Mourning Dove	65			
Pheasants	70			
Ruffed grouse (Forest partridge)	71			
Spruce grouse	72			
Sharp-tailed grouse	73			
Hungarian (Gray) partridge	74			
Fox squirrel	89			
Gray squirrel	90			
Cottontail rabbit	91			
Jackrabbit	92			
Snowshoe hare	93			
Badger	35			
Coyote (brush wolf)	97			
Gray fox	96			
Raccoon (Oct 06 - Feb 07)	94			
Red fox (Oct 06-Feb 07)	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 2006-2007 small game hunting season **(March 2006-February 2007)**. We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2006 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

Dave Schad, Director
Division of Fish and Wildlife
Department of Natural Resources

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

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STATE OF MINNESOTA
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Figure 1. Sample of Small Game Hunter survey card

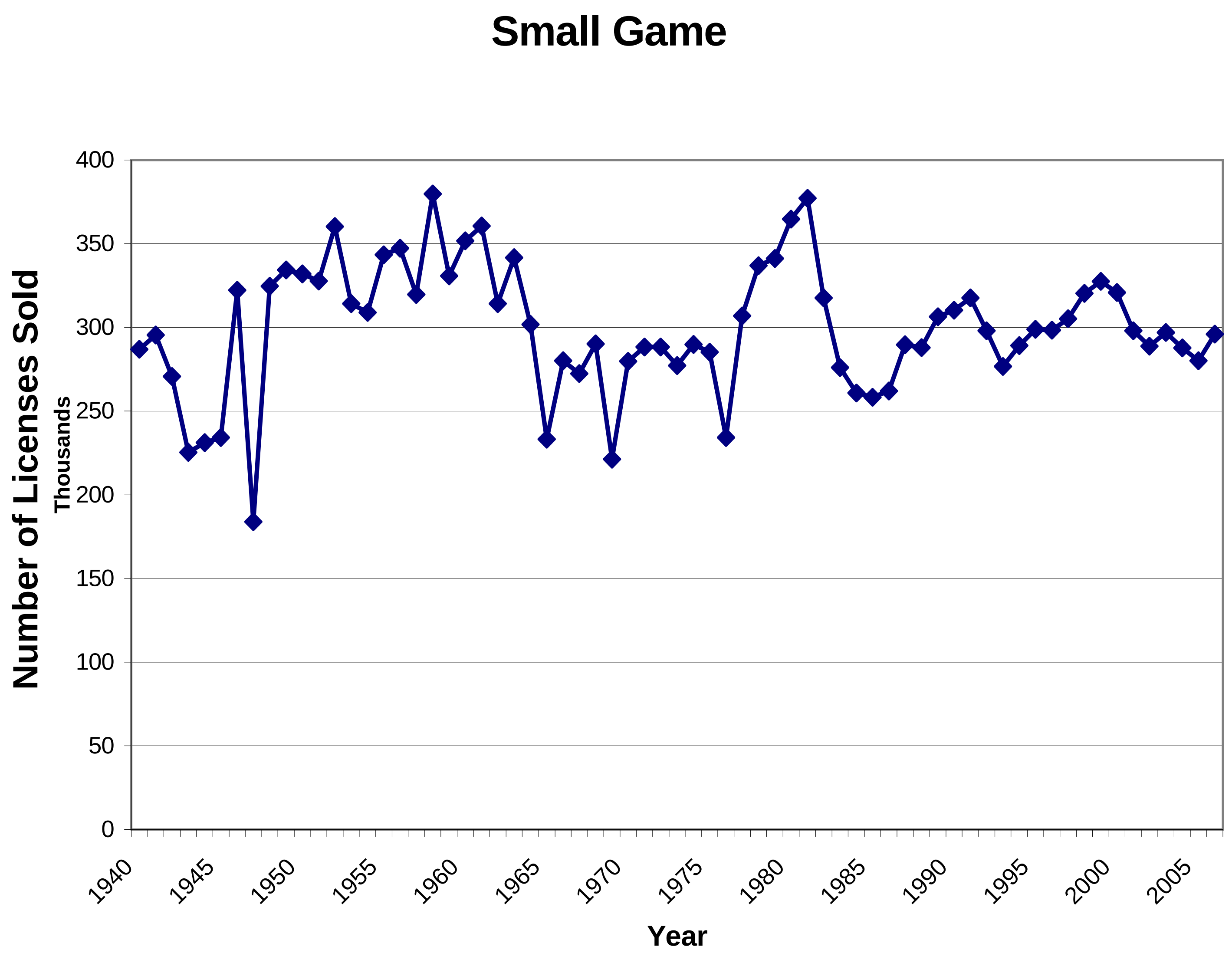


Figure 2. Number of Minnesota small game licenses sold, 1940 – 2006.

Table 3. Estimated number of hunters (thousands) for various species, 1993-94 through 2006-07.

	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Ducks	109	118	119	114	122	117	122	109	109	112	101	105	92	87
Canada goose	62	70	73	75	79	77	80	77	76	79	75	75	69	66
Other geese	9	7	10	6	5	6	5	7	7	6	7	5	5	5
American coot	6	7	9	6	7	5	6	4	4	4	4	5	4	5
Common snipe	2	2	2	2	2	2	2	2	1	2	1	2	1	2
Rails / gallinules	1	1	1	<1	<1	<1	<1	<1	<1	1	<1	<1	0	1
Crow *	10	12	15	13	11	11	14	14	11	13	12	12	12	11
American woodcock	17	21	21	18	17	19	19	16	11	12	13	12	11	14
Mourning dove $^{\gamma}$												16	11	13
Ring-necked pheasant	88	92	96	88	80	88	93	100	85	91	105	104	111	119
Ruffed grouse	102	107	116	118	127	142	139	121	101	91	94	79	76	92
Spruce grouse	11	12	14	11	11	11	11	9	9	7	9	7	7	10
Sharp-tailed grouse	8	7	8	7	8	8	8	10	8	6	7	6	5	7
Gray partridge	15	14	12	11	8	10	10	8	7	7	8	5	6	6
Gray squirrel	32	35	35	33	27	30	31	27	26	25	29	23	25	25
Fox squirrel	23	24	23	20	16	18	20	17	15	15	20	15	15	16
Eastern cottontail	21	21	23	19	14	19	18	20	17	16	21	19	20	20
White-tailed jackrabbit	4	4	5	4	3	3	3	2	3	2	3	3	2	3
Snowshoe hare	5	6	5	4	4	7	7	5	6	6	6	4	3	6
Raccoon (Sept 06 - Feb 07)	9	10	10	10	9	9	6	6	6	6	6	6	5	9
Raccoon‡ (March 05-Aug 05)		3	5	4	3	4	3	5	4	4	5	3	3	
Red fox (Sept 06-Feb 07)	16	15	15	11	9	9	8	10	6	7	7	6	6	6
Red fox‡ (March 05-Aug 05)		3	4	3	2	3	2	2	3	2	2	1	1	
Gray fox	3	2	3	n.a.	2	2	2	1	1	1	2	2	1	2
Coyote	14	11	15	13	10	11	11	16	11	12	15	16	19	17
Badger	1	1	<1	1	1	<1	<1	1	<1	1	<1	1	1	1

*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. Estimated take per hunter, for respondents reporting that they hunted a particular species, 1992-93 through 2006-07.

	Estimated take per hunter														
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Ducks	8.1	7.6	8.1	9.7	9.6	9.9	9.5	8.4	8.9	9.1	9.2	9.0	6.9	7.3	8.4
Canada geese	2.5	2.5	2.4	2.5	3.2	2.9	2.8	3.5	3.9	4.0	3.3	3.9	3.8	4.1	4.9
Other geese	0.9	1.1	0.8	0.9	1.4	2.3	1.0	1.2	2.2	1.2	1.9	1.7	1.5	1.9	1.5
American coot	4.7	2.7	3.2	3.1	3.8	4.1	4.7	4.0	2.7	4.5	4.6	2.8	4.0	3.9	5.6
Common snipe	2.9	1.9	1.3	1.6	2.8	2.6	2.9	1.6	1.3	1.3	1.5	1.8	1.1	4.4	1.9
Rails/gallinules	1.7	1.5	1.3	2.3	1.0	0.7	0.5	0.2	3.7	0.6	2.6	0.5	0.3	0	2.4
Crow *	6.2	5.0	9.4	8.5	7.3	6.6	9.3	4.4	6.9	7.7	5.6	6.7	5.8	7.8	6.4
American woodcock	4.7	4.0	3.5	3.9	3.2	3.4	3.3	2.8	2.8	2.3	2.4	2.4	3.5	2.5	3.2
Mourning dove $^{\gamma}$													6.2	7	6.7
Ring-necked pheasant	3.9	3.8	3.5	4.2	3.9	3.1	3.5	3.7	3.7	3.2	3.9	4.9	4.0	5.3	4.9
Ruffed grouse	4.4	2.8	3.5	3.9	4.5	5.2	6.7	4.9	5.1	3.3	2.8	3.8	2.5	2.9	4.5
Spruce grouse	1.7	1.2	1.9	1.8	1.4	2.3	2.4	1.8	2.5	1.1	1.6	2.1	1.3	1.4	2.7
Sharp-tailed grouse	2.0	1.4	1.2	1.3	1.2	1.7	2.6	1.6	1.6	1.2	1.3	1.7	1.7	1.3	1.8
Gray partridge	2.9	2.4	1.8	2.2	2.2	1.9	2.5	1.9	2.1	1.5	1.7	2.8	2.4	2.6	1.9
Gray squirrel	4.6	5.5	5.4	4.9	4.9	4.9	5.0	4.3	5.3	5.6	5.2	6.0	5.7	5.0	5.5
Fox squirrel	4.2	4.5	4.2	4.6	3.8	4.4	3.3	3.5	3.9	4.1	4.5	4.2	4.1	4.1	4.2
Eastern cottontail	3.1	3.6	3.6	4.3	3.4	4.5	4.6	3.2	3.9	3.6	3.3	4.3	4.6	4.5	3.9
White-tailed jackrabbit	2.1	2.4	1.5	1.5	2.6	1.6	2.5	1.9	2.8	2.6	1.6	2.4	2.3	2.7	1.6
Snowshoe hare	3.2	3.2	3.2	2.0	2.3	2.0	3.5	3.1	5.2	3.3	1.9	2.2	1.8	3.1	3.0
Raccoon (Sept 05 - Feb 06)	8.6	8.9	15.9	14.7	21.3	13.8	16.6	10.9	7.6	9.4	10.0	8.5	9.0	6.0	7.2
Raccoon[‡] (March 05-Aug 05)			8.0	11.3	24.4	5.1	5.8	6.4	7.8	4.4	5.4	4.7	6.1	2.7	
Red fox (Sept 05-Feb 06)	3.3	3.6	2.8	3.1	3.0	1.4	1.3	1.2	1.9	1.2	1.5	1.8	1.1	1.7	1.3
Red fox[‡] (March 05-Aug 05)			1.4	1.5	1.3	0.8	1.2	0.6	0.9	1.5	1.7	0.6	0.6	0.9	
Gray fox	1.3	0.8	0.6	1.0	n.a.	1.3	0.9	0.9	0.7	0.4	0.4	0.4	1.1	0.9	1.8
Coyote	1.5	1.3	1.1	1.8	2.3	1.6	1.3	1.3	1.8	1.1	1.2	1.3	1.1	2.1	1.2
Badger	0.9	0.7	1.4	1.4	2.1	0.9	4.3	1.1	0.8	0.6	1.7	0.7	1.0	1.2	1.3

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

Table 5. Mean Harvest for successful hunters and hunter success rates (%), 1996 - 97 through 2006 - 07.

	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Ducks	10.7 (90.2)	11.1 (88.4)	10.8 (87.8)	9.7 (86.2)	10.2 (84.9)	10.6 (85.6)	10.6 (86.7)	10.4 (86.7)	8.6 (81.1)	8.9 (82.5)	9.9 (84.4)
Canada geese	4.3 (75.1)	4.1 (71.2)	4.0 (70.9	4.7 (74.7)	5.3 (74.2)	5.3 (76.3)	4.6 (72.0)	5.1 (76.0)	5.2 (72.8)	5.5 (73.7)	6.3 (78.4)
Other geese	2.6 (52.2)	4.8 (47.2)	2.3 (44.6)	2.8 (38.2)	4.0 (54.1)	2.8 (43.8)	4.4 (42.5)	2.7 (65.3)	3.3 (45.7)	4.5 (43.1)	2.7 (55.2)
American coot	5.1 (75.0)	4.6 (89.2)	6.0 (78.8)	5.5 (73.0)	4.2 (64.7)	7.5 (60.4)	6.4 (71.2)	3.7 (76.9)	5.5 (73.1)	5.1 (75.9)	7.2 (77.6)
Common snipe	3.2 (89.5)	3.1 (83.3)	3.5 (83.3)	2.3 (66.7)	1.5 (85.0)	2.4 (52.9)	2.6 (60.0)	2.3 (78.9)	1.6 (68.0)	4.7 (94.1)	2.6 (75.0)
Rails / gallinules	2.0 (50.0)	2.0 (33.3)	1.0 (50.0)	1.0 (20.0)	3.7 (100.0)	1.5 (40.0)	3.8 (66.7)	1.0 (50.0)	1.0 (33.3)	0.0 (0.0) *	4.3 (57.1)
Crow	7.9 (91.8)	7.1 (93.2)	10.6 (87.6)	5.2 (85.5)	8.2 (84.0)	8.6 (89.4)	6.3 (89.0)	7.9 (85.3)	6.4 (90.8)	9.1 (85.6)	7.2 (89.1)
American woodcock	4.3 (73.5)	4.6 (73.5)	3.7 (87.3)	3.8 (74.6)	3.6 (80.3)	3.4 (68.3)	3.6 (65.6)	3.3 (71.8)	5.3 (64.6)	3.6 (70.3)	3.9 (82.7)
Mourning dove $^{\gamma}$									7.9 (78.9)	8.7 (80.1)	8.2 (81.2)
Ring-necked pheasant	5.4 (71.2)	4.5 (68.6)	5.0 (70.9)	5.2 (69.8)	5.2 (71.9)	4.7 (66.4)	5.5 (71.7)	6.3 (77.2)	5.7 (70.0)	7.0 (75.9)	6.6 (75.3)
Ruffed grouse	6.0 (75.4)	6.6 (77.9)	8.0 (82.9)	6.3 (78.9)	6.4 (80.7)	4.8 (68.5)	4.3 (63.8)	5.1 (73.5)	3.9 (63.3)	4.4 (67.5)	5.9 (77.4)
Spruce grouse	2.4 (59.1)	3.4 (67.8)	3.4 (68.8)	2.9 (62.7)	4.1 (60.7)	2.3 (47.2)	3.4 (48.0)	3.3 (62.9)	2.3 (54.2)	2.4 (60.6)	3.8 (70.6)
Sharp-tailed grouse	3.1 (39.7)	3.5 (48.2)	4.4 (60.2)	3.4 (48.2)	3.1 (52.9)	2.4 (49.5)	3.5 (38.8)	3.3 (52.2)	3.1 (54.3)	2.4 (55.1)	3.3 (56.0)
Gray partridge	3.3 (66.7)	3.3 (57.5)	3.8 (64.2)	3.1 (62.4)	3.7 (58.6)	2.5 (58.3)	2.8 (59.1)	4.1 (68.9)	3.6 (65.7)	5.0 (52.3)	2.8 (68.8)
Gray squirrel	5.8 (84.3)	5.8 (84.0)	5.8 (86.9)	5.1 (84.7)	6.7 (84.9)	6.6 (84.4)	6.1 (86.2)	7.0 (85.3)	6.9 (82.5)	5.8 (86.1)	6.4 (87.1)
Fox squirrel	4.7 (80.1)	5.3 (82.9)	3.9 (82.7)	4.5 (79.0)	4.8 (80.5)	5.3 (77.7)	5.9 (76.4)	5.1 (82.6)	4.8 (85.1)	5.0 (82.5)	5.0 (84.5)
Eastern cottontail	4.3 (79.9)	5.7 (80.0)	5.6 (83.1)	4.0 (80.0)	4.8 (82.5)	4.7 (77.7)	4.7 (70.5)	5.2 (84.2)	5.8 (79.6)	5.4 (83.4)	4.6 (84.8)
White-tailed jackrabbit	4.0 (65.1)	2.5 (65.5)	3.2 (78.6)	2.6 (72.7)	4.1 (68.2)	5.2 (50.0)	2.7 (60.6)	3.3 (72.5)	3.0 (75.0)	3.2 (82.8)	2.5 (63.6)
Snowshoe hare	3.7 (60.4)	2.8 (70.5)	4.7 (75.4)	3.9 (79.4)	6.3 (82.6)	4.4 (75.0)	2.9 (67.1)	3.5 (60.8)	3.0 (61.4)	4.6 (68.1)	3.8 (80.3)
Raccoon (Sept 06-Feb 07)	22.5 (94.4)	14.8 (92.6)	18.1 (91.8)	11.4 (95.1)	8.0 (94.8)	10.0 (93.6)	11.6 (86.3)	9.6 (88.5)	9.9 (91.6)	6.5 (92.6)	7.7 (93.8)
Raccoon[‡] (March 05-Aug 05)	29.6 (82.2)	6.3 (80.0)	6.2 (92.5)	6.6 (96.2)	8.2 (95.1)	4.9 (90.2)	5.9 (91.7)	5.6 (85.2)	6.7 (90.9)	3.1 (86.8)	
Red fox (Sept 06-Feb 07)	5.3 (57.1)	2.4 (59.8)	2.6 (52.7)	2.4 (51.9)	3.4 (56.7)	2.7 (44.9)	3.1 (49.0)	3.5 (51.0)	2.8 (38.2)	3.7 (46.4)	2.1 (60.0)
Red fox[‡] (March 05-Aug 05)	2.4 (51.6)	1.6 (52.2)	1.8 (65.4)	1.3 (47.4)	1.9 (47.1)	2.8 (54.5)	3.6 (46.7)	1.1 (51.7)	1.4 (44.4)	1.6 (55.6)	
Gray fox	n.a.	2.0 (62.5)	1.6 (53.3)	2.3 (40.0)	2.0 (33.3)	1.4 (26.3)	1.8 (23.5)	1.3 (30.0)	2.6 (40.9)	1.9 (50.0)	2.7 (65.4)
Coyote	4.1 (55.9)	2.8 (57.0)	2.9 (45.0)	2.5 (49.1)	3.4 (53.9)	2.4 (47.3)	3.2 (36.6)	2.7 (48.8)	2.5 (45.3)	4.11 (50.4)	2.4 (50.5)
Badger	2.1 (100.0)	1.0 (85.7)	6.5 (66.7)	1.3 (87.5)	1.0 (83.3)	1.0 (60.0)	2.8 (60.0)	1.0 (66.7)	1.2 (85.7)	1.2 (100.0 0	1.6 (81.8)

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

Table 6. Statewide small game hunting license sales and estimated hunter harvest, 1994-95 through 2006-07.

	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Small game license sales[a]	289,189	298,425	298,337	305,186	320,308	327,431	320,862	298,055	288,729	296,939	287,725	280,156	295,898
Federal duck stamp sales	149,428	132,546	132,738	138,331	134,098	134,138	135,884	140,980[e]	144,851[e]				
State duck stamp sales	116,346	122,092	122,634	126,009	126,488	128,245	121,709	118,590	119,677	118,757	114,003	102,143	101,792
Pheasant stamp sales	104,621	105,093	95,866	85,093	99,664	106,945	114,440	97,665	102,097	121,456	114,653	117,301	129,546
Estimated harvest[b] (thousands)													
Ducks[c]	955	1,162	1,098	1,206	1,119	1,021	969	990	1,024	914	727	677	731
Canada geese[c]	166	180	241	230	218	285	301	308	257	290	284	282	324
Other geese[c]	6	9	8	11	6	6	15	8	11	13	8	9	7
American coot [c]	22	28	23	29	25	25	10	17	20	11	20	16	25
Common snipe	2	3	5	4	5	3	3	2	3	3	2	5	4
Rails / gallinules	1	1	<1	<1	<1	<1	1	<1	2	<1	<1	0	1
Crow	114	130	96	74	106	60	96	88	72	82	72	93	69
American woodcock	74	82	58	58	63	54	45	27	28	30	41	28	43
Mourning dove[f]											97	78	86
Ring-necked pheasant	319	398	341	248	309	339	375	267	358	511	420	586	588
Ruffed grouse	371	457	533	654	946	685	619	332	249	351	194	224	417
Spruce grouse	23	25	16	25	27	19	23	9	12	18	9	10	27
Sharp-tailed grouse	9	10	8	13	22	14	16	10	9	12	10	6	12
Gray partridge	26	26	24	16	24	19	17	10	11	22	13	16	11
Gray squirrel	187	169	158	131	149	132	140	146	134	175	133	122	141
Fox squirrel	99	105	75	68	57	71	65	63	67	85	62	62	66
Eastern cottontail	77	100	65	65	89	59	78	63	52	93	87	90	78
White-tailed jack rabbit	7	7	10	4	7	6	7	8	4	7	7	5	4
Snowshoe hare	19	11	10	8	25	21	27	22	11	12	8	10	17
Raccoon (Sept 06-Feb 07)	163	155	207	124	143	65	49	59	60	50	57	29	63
Raccoon[d] (Mar 05–Aug 05)	24	55	99	17	2	16	36	18	19	22	20	7	
Red fox (Sept 06-Feb 07)	42	48	33	13	13	10	19	7	11	13	6	10	8
Red fox [d] (Mar 05–Aug 05)	4	6	4	2	3	1	2	4	4	1	1	1	
Gray fox	1	3	n.a.	3	1	2	1	1	1	1	2	1	4
Coyote	13	26	30	16	14	13	29	12	14	20	18	39	21
Badger	1	1	1	1	1	1	1	<1	1	<1	<1	1	1

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. Beginning in 1989-90 this table was changed from Resident harvest estimates to Statewide harvest estimates, which includes non-resident harvest estimates.

[a] Duplicate licenses not included.

[b] Estimates based upon response of hunters to questionnaires.

[c] U.S. Fish and Wildlife Service HIP harvest estimates for 2003 are:

Ducks . . . . 884,500 Canada geese . . . . 282,495 Other geese 0

[d] Raccoon and red fox seasons changed to year round beginning May,1994.

[e] Federal duck stamps sold have not been audited for non-hunting stamp purchasers. [f.] Mourning dove season added 2004.

Table 7. Mail survey results of nonresident small game hunters, 1993-94 through 2005-06.

	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Nonresident licenses issued[a]	3,809	4,435	4,993	5,488	6,361	7,155	7,572	7001	5,843	5,852	6,291	6,385	5,897	7,356
Questionnaires:														
Number mailed	229	182	205	51	269	200	199	98	124	130	123	182	210	185
Number not delivered	21	7	14	4	18	17	16	6	9	9	17	13	10	11
Number (percent) returned	149 (72)	128 (73)	140 (73)	32 (68)	183 (73)	117 (64)	136 (74)	56 (61)	77 (67)	75 (66)	68 (64)	114 (67)	134 (67)	115 (62)
Estimated nonresidents and (percent) of all nonresidents hunting:														
Ducks	1,789 (47)	1,975 (45)	2,354 (47)	1,209 (19)	2,331 (37)	2,874 (40)	2,505 (33)	2,375 (34)	2,727 (47)	2,263 (39)	2,498 (40)	2,394 (37)	2,040 (35)	2,344 (32)
Canada goose	792 (21)	1,005 (23)	1,248 (25)	686 (13)	1,113 (17)	1,468 (20)	1,225 (16)	1,500 (21)	1,169 (20)	1,092 (19)	1,388 (24)	1,368 (21)	1,818 (31)	2,083 (28)
Ruffed grouse	895 (24)	1,421 (32)	1,534 (31)	2,744 (50)	2,157 (34)	3,608 (50)	3,508 (46)	3,000 (43)	1,169 (20)	2,029 (35)	2,313 (40)	1,824 (29)	1,774 (30)	1,953 (26)
Ring-necked pheasant	741 (20)	832 (19)	820 (16)	515 (9)	731 (11)	612 (8)	947 (13)	625 (9)	935 (16)	1,404 (24)	2,128 (36)	2,679 (42)	2,572 (44)	3,776 (51)
Raccoon [b]	26 (1)	0 (0) [c] *	107 (2) *	172 (3)	35 (1)	0 (0)[c]	56 (1)	250 (4)	0 (0)	0 (0)	0 (0)	0 (0)	44 (0.7)	0 (0)
Estimated nonresident take:														
Ducks	13,574	15,696	26,713	6,346	15,967	26,663	26,391	18,253	42,225	17,556	17,855	19,269	12,149	12,173
Canada goose	2,122	2,287	4,173	1,544	4,905	4,587	6,960	5,001	13,400	5,852	5,736	6,214	3,946	3,580
Ruffed grouse	4,985	7,242	9,415	23,153	16,072	27,886	23,384	24,003	6,622	9,207	9,437	7,924	6,429	11,522
Ring-necked pheasant	3,042	4,366	3,638	1,887	2,505	1,712	4,844	4,001	3,740	7,647	9,344	11,174	13,656	16,079
Raccoon	26	0	3,638	8,061	70	0	724	3,375	0	0	0	0	887	0

[a] Excludes duplicate licenses and nonresident shooting preserve licenses.

[b] Nonresident raccoon hunters were required to purchase a nonresident raccoon hunting license for the first time in 1979 in addition to the nonresident small game license. The initial season bag limit of 8 was increased to 12 in 1983 and to 20 in 1985.

[c] In 1998, 2001, 2002, 2003, 2004 and 2006 no non-residents reported hunting/harvesting raccoons. * Non-resident raccoon hunting license was not required for 1994 and 1995.

Raccoon take per hunter

	Resident	Nonresident	Number of nonresident raccoon licenses
1998[c]	18	0	56
1999	11	13	48
2000	8	13	51
2001	10	0	48
2002	11	0	46
2003	10	0	44
2004	8	0	46
2005	6	20	44
2006	8	0	53

The following information has been excerpted from: U.S. Fish and Wildlife Service. Migratory bird hunting activity and harvest during the 2005 and 2006 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.htmlT

Table 1. Species composition of the Minnesota waterfowl harvest, 2004 and 2005. (from: Richkus, K.D, Moore, M.T., Padding, P.I., Williams, S.S., Spriggs, H.L., and Martin, E.M., Migratory Bird Hunting activity and harvest during the 2005 and 2006 hunting seasons: preliminary estimates. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Branch of Harvest Surveys, Laurel, Maryland. July 2007. 62 pp).**Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

	Minnesota Harvest					Mississippi Flyway Harvest		
Species	2005	% of Harvest	2006	% of Harvest	Percent change in Harvest 05-06	2005	2006	Percent change Harvest 05-06
Mallard	169,582	31.9	215,727	33.65	+ 21	2,049,383	2,286,643	+ 10
Domestic mallard	240	.04	579	0.09	+ 59	4,539	8,493	+ 47
American black duck	719	.13	1,158	0.18	+ 38	36,365	35,840	− 1
Black x mallard	0	0	290	0.05	+ 100	2,849	4,479	+ 36
Gadwall	15,090	2.84	38,802	6.05	+ 61	635,321	803,785	+ 21
American wigeon	13,174	2.48	20,849	3.25	+ 37	121,240	163,839	+ 26
Green-winged teal	27,545	5.18	47,199	7.36	+ 42	513,850	659,628	+ 22
Blue-winged /cinnamon teal	50,539	9.51	54,438	10.24	+ 7	314,079	513,876	+ 39
Northern shoveler	13,174	2.48	13,610	2.12	+ 3	195,542	225,492	+ 13
Northern pintail	9,820	1.85	7,818	1.47	− 26	107,276	104,286	− 3
Wood duck	98,204	18.48	81,658	15.36	− 20	673,507	635,053	− 6
Redhead	16,767	3.15	24,613	4.63	+ 32	62,051	69,500	+ 11
Canvasback	8,623	1.62	13,030	2.45	+ 34	32,786	45,640	+ 28
Greater scaup	1,437	0.27	1,737	0.33	+ 17	24,812	21,454	− 16
Lesser scaup	12,934	2.43	21,717	4.09	+ 40	111,357	101,219	− 10
Ring-necked duck	75,689	14.24	80,499	15.15	+ 6	240,090	353,705	+ 32
Goldeneye	7,186	1.35	3,185	0.60	− 126	23,420	19,906	− 18
Bufflehead	3,832	0.72	6,950	1.31	+ 45	42,024	78,889	+ 47
Ruddy duck	479	0.09	1,158	0.22	+ 59	4,235	20,250	+ 79
Scoters	719	0.13	0	0	0	4,921	1,882	−161
Hooded merganser	4,790	0.90	5,791	1.09	+ 17	30,454	37,241	+ 18
Other mergansers	958	0.18	0	0	0	4,164	6,197	+ 33
Total Duck Harvest (retrieved kill)	531,500 ± 12%		641,100 ± 11%		+ 17	5,270,000 ± 5%	6,257,200 ± 5%	+ 16

[a] Sum of all species does not equal total because of rounding error. [b] No percentage change.

Table 2. Top 10 states in number of **adult duck hunters**, 2005, and number of hunter-days and retrieved duck kill, in each (from: Richkus, K.D, Moore, M.T., Padding, P.I., Williams, S.S., Spriggs, H.L., and Martin, E.M., Migratory Bird Hunting activity and harvest during the 2005 and 2006 hunting seasons: preliminary estimates. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Branch of Harvest Surveys, Laurel, Maryland. July 2007. 62 pp).**Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

State	**Number of active duck hunters**	**Duck hunter days afield**	**Total duck harvest**	**Seasonal duck harvest per hunter**
Texas	84,200 ± 18%	424,900 ± 22%	1,047,800± 22%	12.4 ± 29%
Minnesota	73,800 ± 9%	407,900 ± 10%	641,100 ± 11%	8.7 ± 14%
Wisconsin	60,000 ± 10%	368,700 ± 14%	401,900 ± 12%	6.7 ± 15%
Arkansas	59,000 ± 9%	483,500 ± 11%	1,145,200 ± 13%	19.4 ± 15%
Louisiana	56,000 ± 9%	484,000 ± 12%	1,332,200 ± 14%	23.8 ±16%
California	46,400 ± 10%	521,100 ± 17%	1,480,800 ± 16%	31.9 ± 19%
Michigan	38,000 ± 10%	244,700 ± 11%	384,500 ±14%	10.1 ± 17%
Illinois	37,300 ± 9%	342,100 ± 10%	522,700 ± 11%	14.0 ± 14%
Missouri	29,900 ± 12%	211,600 ± 19%	404,000 ± 18%	13.5 ± 22%
North Dakota	29,700 ± 6%	150,000 ± 8%	378,700 ± 10%	12.8 ± 12%
Mississippi Flyway		3,364,300 ± 4%	6,257,200 ± 5%	
United States		6,788,400 ± 3%	13,808,100 ± 4%	

Table 3. Top 10 states in number of **adult goose hunters**, 2006, and number of hunter-days and retrieved goose kill, in each (from: Richkus, K.D, Moore, M.T., Padding, P.I., Williams, S.S., Spriggs, H.L., and Martin, E.M., Migratory Bird Hunting activity and harvest during the 2005 and 2006 hunting seasons: preliminary estimates. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Branch of Harvest Surveys, Laurel, Maryland. July 2007. 62 pp).**Note:** All hunter activity and harvest estimates are preliminary, pending final counts of the number of migratory bird hunters in each state and complete audits of all survey response data.

State	**Number of active goose hunters**	**Goose hunter days afield**	**Total goose harvest**	**Seasonal goose harvest per hunter**
Texas	56,500 ± 18%	193,700 ± 25%	298,400 ± 27%	5.3 ± 32%
Minnesota	60,300 ± 9%	325,500 ± 13%	243,400 ± 14%	4.0 ± 16%
Wisconsin	48,600 ± 9%	293,400 ± 15%	113,100 ± 15%	2.3 ± 18%
Michigan	37,200 ± 10%	206,000 ± 12%	157,500 ± 16%	4.2 ± 19%
Pennsylvania	34,100 ± 12%	138,300 ± 15%	171,900 ± 16%	5.0 ± 20%
California	30,500 ± 12%	258,200 ± 21%	146,200 ± 30%	4.8 ± 32%
North Dakota	24,000 ± 6%	110,200 ± 9%	153,700 ± 14%	6.4 ± 15%
Illinois	34,100 ± 10%	258,400 ± 13%	171,600 ± 15%	5.0 ± 18%
Maryland	23,400 ± 7%	135,500 ± 12%	156,800 ± 12%	6.7 ± 14%
Ohio	21,400 ± 17%	162,500 ± 27%	83,600 ± 21%	4.1 ± 27%
Mississippi Flyway		1,950,400 ± 6%	1,444,900 ± 7%	
United States [b]		4,007,100 ± 4%	3,579,100 ± 4%	

[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 2006 Canada Goose Hunt in Minnesota

Stephen J. Maxson, Wetland Wildlife Populations and Research
Margaret H. Dexter, Wildlife Policy and Research Unit

This report documents results of the 2006 September goose hunter mail questionnaire survey.

METHODS

The Canada goose season in the four zones encompassing the majority of Minnesota was 2-22 September 2006 (21 days). A 14-day (2-15 Sep) season was held in the Northwest Goose Zone (Figure. 1). The daily bag limit was 5 geese per day, except in the Southeast Goose Zone where the daily bag was 2. 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, Southeast, and Twin Cities Metro Goose Zones, in the Carlos Avery Wildlife Management Area and in the Swan Lake Area. In the Twin Cities Metro Zone and goose refuges open to goose hunting, hunting was not allowed from public road rights-of-way. Goose hunters were required to obtain a $4.00 permit to participate in the September season.

Permittees were randomly selected to receive a post-season hunter survey. Questionnaires were sent to 3,100 permittees following the season. Questionnaires were individually numbered, and up to 3 questionnaires were mailed to individuals who had not responded. Completed questionnaires were double key-punched to reduce errors.

The questionnaire asked hunters which zone they hunted, number of days they hunted, and, for the season as a whole, number of geese taken and number of geese knocked down and not retrieved. The questionnaire also asked whether hunters in the West or Remainder of State Zones had hunted over water or within 100 yards of water and if so, how many geese they had taken.

Statistical Analysis Systems (SAS Institute Inc. 1999-2001, Version 8.2) computer programs were written to summarize responses to the questionnaire survey.

RESULTS AND DISCUSSION

The DNR License Bureau reported that 39,534 Special Canada Goose Season permits were sold prior to 23 September 2006. Response rate to the survey was 72.1% and 71.8% of the respondents indicated that they hunted during the September season. Following the usual pattern, the majority of the hunters indicated they hunted in the Remainder Zone, followed by the West, Twin Cities Metro, Northwest, and Southeast goose zones (Table 1). The Remainder and West zones are the largest zones (Figure. 1). Active hunters were afield an average of 2.9 to 4.1 days, and retrieved 2.9 to 4.4 geese, when totaled according to their hunt zone. Overall, the success rate for active hunters was 66.5%.

The survey estimates that 91,439 Canada geese were harvested with approximately 58% of the harvest in the Remainder Zone and 20% in the West Zone (Table 1). This harvest pattern has remained rather consistent during the 2000-2006 September seasons (Table 2). The U.S. Fish and Wildlife Service adjusts 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 2006 harvest of 77,540.

Of those hunters who indicated that they hunted in the West or Remainder of State Zones (22,835 hunters, Table 1), 35.8% reported that they hunted over water or within 100 yards of water. Of the 71,308 geese harvested in these two Zones (Table 1), 27.0% were taken over water or within 100 yards of water. Despite a slight increase in 2006, the pattern during 2000-2006 suggests that both the proportion of hunters hunting over water and the proportion of geese harvested over water has declined (Tables 3 and 4).

LITERATURE CITED

Voelzer, J. F., E. Q. Lauxen, S. L. Rhoades, and K. D. Norman, editors. 1982. Waterfowl status report 1979. U.S.D.I. Fish Wildl. Ser. Spec. Sci. Rep. - Wildl. No. 246. 96pp.

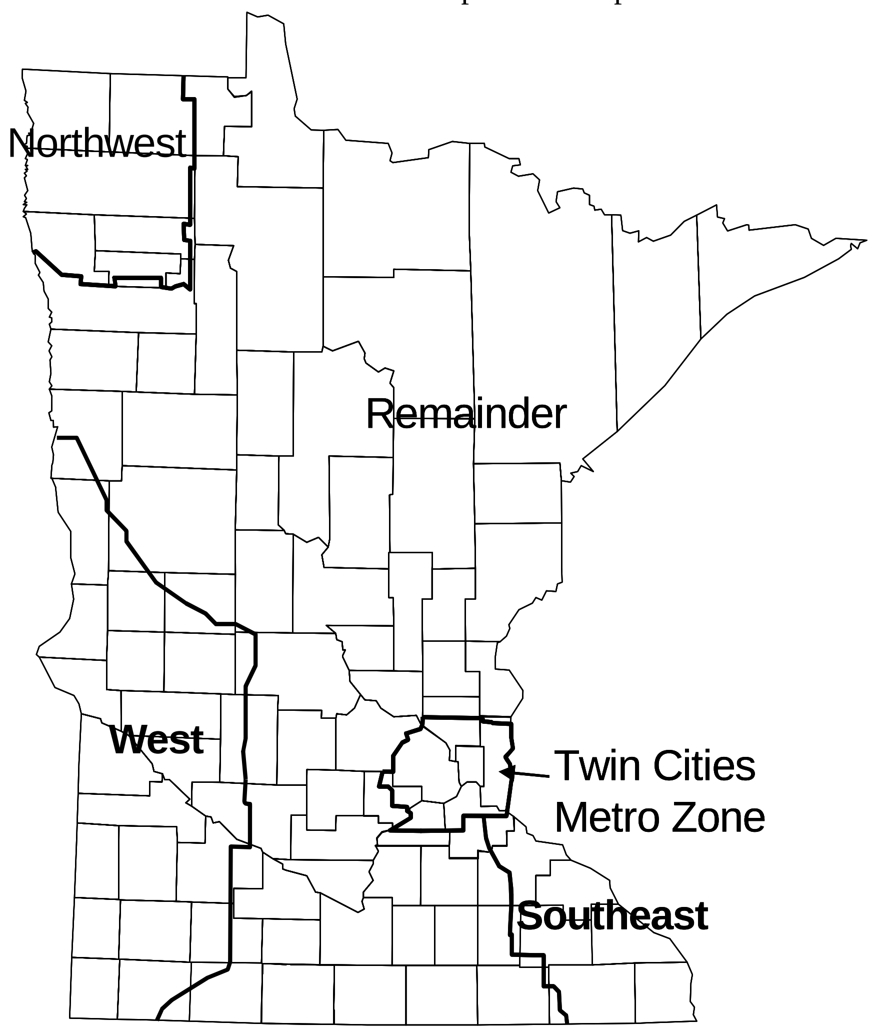


Figure 1. September season Goose Zones in Minnesota.

Table1. Permit sales, hunter activity, and harvest[a] by zone during the September Canada Goose season (2-22 September) in Minnesota, 2006.

Parameter	Northwest	West	Southeast	Twin Cities Metro	Remainder	Total
ALL ZONES						
Total permits sold						39,534
Questionnaires delivered						2,977
Useable questionnaires returned						2,146
% responding						72.1
Active hunters						1,542
% active hunters						71.85
BY ZONE						
% Distribution of hunters by primary hunt zone	5.40	21.91	1.80	12.41	58.48	100
%successful	69.4	67.0	69.0	62.5	66.9	66.5
Days/active hunter	2.92	3.56	4.07	3.90	3.81	
Geese/active hunter	4.45	2.89	2.86	3.36	3.21	
Unretrieved harvest/active	0.85	0.41	0.34	0.81	0.38	
% unretrieved harvest	16.0	12.4	10.6	19.4	10.6	
EXPANDED:						
Active hunters	1,534	6,224	511	3,525	16,611	28,405
Hunter days	4,479	22,157	2,080	13,748	63,288	105,752
Retrieved harvest	6,826	17,987	1,461	11,844	53,321	**91,439**
Est. unretrieved harvest	1,304	2,552	174	2,855	6,312	13,197
Total harvest	8,130	20,539	1,635	14,699	59,633	104,636

[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 – 2006.

Year	Northwest	West	Southeast	Twin Cities Metro	Remainder	Total
2000	2,750	18,909	1,183	15,594	51,685	**90,121**
2001	2,047	27,663	538	8,164	62,608	**101,021**
2002	1,568	22,075	848	8,504	50,769	**83,764**
2003	2,805	17,779	2,357	9,890	48,157	**80,988**
2004	4,326	16,843	1,197	11,090	56,480	**89,936**
2005	4,888	15,304	1,717	11,139	61,218	**94,266**
2006	6,826	17,987	1,461	11,844	53,321	**91,439**

Table 3. Proportion of hunters hunting over water[1] and the proportion of Canada geese taken over water in the West Zone during the September season, 2000 – 2002.

Year	% Hunting over water	% Geese taken over water
2000	46.7	30.6
2001	43.2	37.4
2002	44.9	35.1

[1]Over water or within 100 yards of water.

Table 4. Proportion of hunters hunting over water[1] and the proportion of Canada geese taken over water in the **West and Remainder Zones** during the September season 2003-2006.

Year	% Hunting over water	% Geese taken over water
2003	43.1	31.7
2004	39.6	28.9
2005	32.8	22.3
2006	35.8	27.0

[1]Over water or within 100 yards of water.

2007 Light Goose Conservation Order Harvest In Minnesota

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

INTRODUCTION

This report documents results of the 2007 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 1 March - 30 April 2007. 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 1,292 permits was issued and 921 responses (71.3%) to the questionnaire were obtained (Table 1). In calculating harvest estimates, we assumed that the 371 non-respondents participated in the conservation action and took light geese in the same manner as respondents (i.e., tallies were expanded by 1.40). Relatively few light geese were present in Minnesota again this year and harvest was again concentrated in the southwest portion of the state with some also being taken in west-central Minnesota. Five-hundred fourteen people attempted to take light geese during the 61-day conservation order period. Active participants pursued light geese for 2,302 days and 1,786 light geese were shot and retrieved. This was an average retrieved take of 3.5 geese per active participant. Another 172 light geese were reported wounded and not retrieved.

Unplugged shotguns were used by 224 (43.6%) individuals to take 1032 (57.8%) geese, of which 277 (26.8%) were taken with the 4th, 5th, or 6th shell. Electronic calls were used by 88 (17.2%) participants to take 329 (18.4%) light geese. During the 1/2 hour after sunset period, 209 (11.7%) geese were harvested by 197 (38.3%) active hunters.

Figure 1. Questionnaire mailed to Light Goose Conservation Order license holders.

MINNESOTA 2007 LIGHT GOOSE HARVEST SURVEY
For the Period of March 1 - April 30, 2007 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, 2007. 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.
Please answer only for your Minnesota 2007 hunting experience.
THANK YOU! Dave Schad, Director, Division of Fish and Wildlife, MN DNR.

1. Did you hunt light geese in Minnesota during March 1 - April 30, 2007? 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, 2007? __________
3. In what county did you hunt light geese most often during March 1 - April 30, 2007? __________
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? ____

Dear Light Goose Permit holder:

You are being asked to assist us in evaluating the March 1 - April 30, 2007 Light Goose Conservation Order. Please answer only for your Minnesota 2007 hunting experience.

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

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.

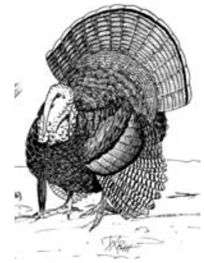
THANK YOU FOR YOUR COOPERATION

Dave Schad, Director
Division of Fish and Wildlife
Department of Natural Resources

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2000 – 2007.

Parameter	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Total permits sold	1,982	1,128	1,997	1,438	1,424	1,383	1,363	1,292
Usable questionnaires returned	1,457	769	1,375	1,071	1,095	998	955	921
% Responding	73.5	68.2	68.9	74.4	76.9	72.2	70.1	71.3
Active hunters	1,461	393	1,209	553	690	618	516	514
% Active hunters	73.7	34.8	60.5	38.5	48.5	44.7	37.3	39.8
Total hunter days	8,244	2,112	5,517	2,600	3,372	2,643	2,665	2,302
Days/active hunter	5.6	5.4	4.6	4.7	4.9	4.3	5.2	4.5
Retrieved harvest	6,290	316	3,516	2,005	2,735	1,395	1,360	1,786
Geese/active hunter	4.3	0.8	2.9	3.6	4.0	2.3	2.6	3.5
Unretrieved harvest	904	19	637	253	315	150	163	172
No. using unplugged guns	830	193	560	280	333	272	215	224
Take w/unplugged guns	4,416	129	2,137	996	1,385	777	689	1032
Take w/shell 4-5-6	1,316	68	615	401	491	269	287	277
No. using electronic calls	218	56	142	87	133	110	73	88
Take w/electronic calls	854	103	512	474	326	268	280	329
No. hunting ½ hr after sunset	696	141	550	228	265	264	223	197
Take ½ hr after sunset	1,185	43	841	267	311	242	246	209

2006 Fall Wild Turkey Harvest Report



Margaret Dexter, Wildlife Research and Policy Group

INTRODUCTION

In Minnesota, monitoring wild turkey harvest is an important component of population management, which includes setting permit levels for subsequent seasons. Wild turkey populations, permit levels available for the fall season, and harvest have all increased since Minnesota's first fall hunting season in 1990. Fall harvest is affected by wild turkey population size, by harvest pressure, and weather conditions during the fall hunting season.

METHODS

The 2006 fall turkey season took place from 18 October through 29 October (2, 5-day periods). There were 4,290 permits available in the 32 permit areas open to fall hunting, with a total of 4,167 applicants (Table 1). Available permits decreased by 120 permits from 2005 (4,410). Fall turkey hunters are required to register their bird at a designated registration station within 24 hours of harvest. Information collected at registration include turkey age, sex, and date of harvest.

RESULTS AND DISCUSSION

This year's harvest of 618 was down from 2005 (681), and from the 5-year average of 710 (Table 1). The highest harvest occurred in permit area 341 with a total of 79 turkeys registered (Table 2, Figure 1). Hunter success rate was 25% overall, which is below the long-term average of 32%. 59% of the harvest occurred during Season A (October 18-22), and 41% during Season B (October 25-29). Hunter numbers were down 176 this year reflecting a slight decrease from the 5-year average of 2,888 fall turkey hunters. Hunter effort is one factor that impacts fall turkey harvest, and could have contributed to lower harvest levels in 2006.

Females comprised 58% of the overall reported harvest, with adult females accounting for 45% of the harvest alone (Table 3 and 4). Juveniles made up 32% of the harvest (Table 4), this is lower than 2005 (35%). Harvest age ratios are biased by hunter preference for taking adult turkeys. Also, because age data are hunter reported, some juvenile birds are likely misclassified as adults (i.e., it is assumed that hunters are more likely to report shooting an adult).

Table 1. Fall wild turkey applications, permits, harvest and adjusted hunter success rates in Minnesota, 1990-2006.

Year	# Applicants	# Permits Available	# Permits Issued	# Turkeys Registered	Hunter Success (%)[1]
1990	4,522	1,000	951	326	38
1991	2,990	2,200	2,020	552	30
1992	2,782	2,200	2,028	588	32
1993	3,186	2,400	2,094	605	32
1994	3,124	2,500	2,106	601	32
1995	3,685	2,500	2,125	648	34
1996	4,453	2,500	2,289	685	33
1997	4,574	2,580	2,378	698	33
1998	4,526	2,710	2,483	828	37
1999	5,354	2,890	2,644	865	36
2000	5,263	3,090	2,484	735	33
2001	4,501	2,870	2,262	629	31
2002	5,180	3,790	2,945	594	22
2003	5,264	3,870	2,977	889	33
2004	5,878	4,380	3,277	758	26
2005	4,542	4,410	2,978	681	25
2006	4,167	4,290	2,802	618	25

[1] Success rates adjusted using a 10% non-participation rate based on hunter survey data.

Table 2. Fall wild turkey harvest and hunter success rates by permit area, 2006.

Permit Area	# Permits Available	# Permits Issued	# Turkeys Registered	Hunter Success (%)[1]
228	100	73	16	22%
236	210	141	37	26%
337	100	59	13	22%
338	140	104	24	23%
339	140	83	22	27%
341	450	305	79	26%
342	350	183	34	19%
343	200	164	27	16%
344	150	121	22	18%
345	180	88	18	20%
346	300	173	35	20%
347	100	87	21	24%
348	250	174	37	21%
349	450	251	36	14%
420	10	8	3	38%
422	10	10	3	30%
425	10	9	2	22%
431	10	9	1	11%
433	10	10	0	0%
442	250	197	44	22%
443	100	69	9	13%
446	10	5	2	40%
447	10	2	0	0%
448	10	10	3	30%
449	10	9	3	33%
450	10	2	0	0%
461	200	142	38	27%
462	200	127	35	28%
464	60	25	7	28%
465	60	34	11	32%
466	120	64	23	36%
467	80	64	13	20%

[1] Success rates not adjusted for non-participants.

Table 3. Age and sex structure of fall wild turkey harvest by permit area, 2006.
Note: Age and sex are hunter reported and subject to error.

	Male		Female			
Permit Area	Juvenile	Adult	Juvenile	Adult	Unknown	Total
228	1	8	2	5	0	16
236	0	9	8	20	0	37
337	2	4	2	5	0	13
338	3	11	3	7	0	24
339	3	4	1	14	0	22
341	14	18	12	35	0	79
342	7	3	7	17	0	34
343	3	10	3	11	0	27
344	2	3	1	16	0	22
345	2	7	4	5	0	18
346	4	7	5	19	0	35
347	3	4	2	12	0	21
348	8	6	2	21	0	37
349	5	6	8	17	0	36
420	2	1	0	0	0	3
422	0	1	0	2	0	3
425	0	0	0	2	0	2
431	0	0	0	1	0	1
433	0	0	0	0	0	0
442	7	13	8	16	0	44
443	5	3	0	1	0	9
446	0	1	0	1	0	2
447	0	0	0	0	0	0
448	0	0	0	3	0	3
449	0	0	2	1	0	3
450	0	0	0	0	0	0
461	12	10	5	11	0	38
462	15	6	1	13	0	35
464	3	2	1	1	0	7
465	0	1	3	7	0	11
466	8	4	3	8	0	23
467	3	3	0	7	0	13
Total	112	145	83	278	0	618

Table 4. Age and sex structure of fall wild turkey harvest in Minnesota, 1990-2006.
Note: Age and sex are hunter reported and subject to error.

	Male			Female				
Year	Juvenile	Adult	Unknown	Juvenile	Adult	Unknown	Unknown Age/Sex	Total
1990	67 (21%)	83 (25%)		85 (26%)	91 (28%)			326
1991	121 (22%)	80 (15%)		211 (38%)	140 (25%)			552
1992	120 (20%)	86 (15%)		208 (35%)	174 (30%)			588
1993	110 (18%)	112 (19%)		184 (30%)	196 (32%)		3(<1%)	605
1994	105 (17%)	83 (14%)		210 (35%)	203 (34%)			601
1995	131 (20%)	136 (21%)		194 (30%)	187 (29%)			648
1996	96 (14%)	141 (20%)		224 (33%)	224 (33%)			685
1997	115 (16%)	130 (19%)		215 (31%)	238 (34%)			698
1998	152 (18%)	139 (17%)		261 (32%)	274 (33%)		2(<1%)	828
1999	141 (16%)	213 (25%)		253 (29%)	258 (30%)			865
2000	101 (14%)	175 (24%)		206 (28%)	253 (34%)			735
2001	81 (13%)	119 (19%)		178 (28%)	251 (40%)			629
2002	94 (16%)	109 (18%)	2 (<1%)	169 (28%)	205 (35%)	3 (<1%)	12 (2%)	594
2003	121 (14%)	237 (27%)		164 (18%)	347 (39%)	1 (<1%)	19 (2%)	889
2004	90 (12%)	276 (37%)		82 (11%)	296 (40%)		1 (<1%)	745
2005	103 (15%)	129 (19%)		135 (20%)	309 (45%)		5(<1%)	681
2006	112 (18%)	145 (23%)		83 (13%)	278 (45%)			618

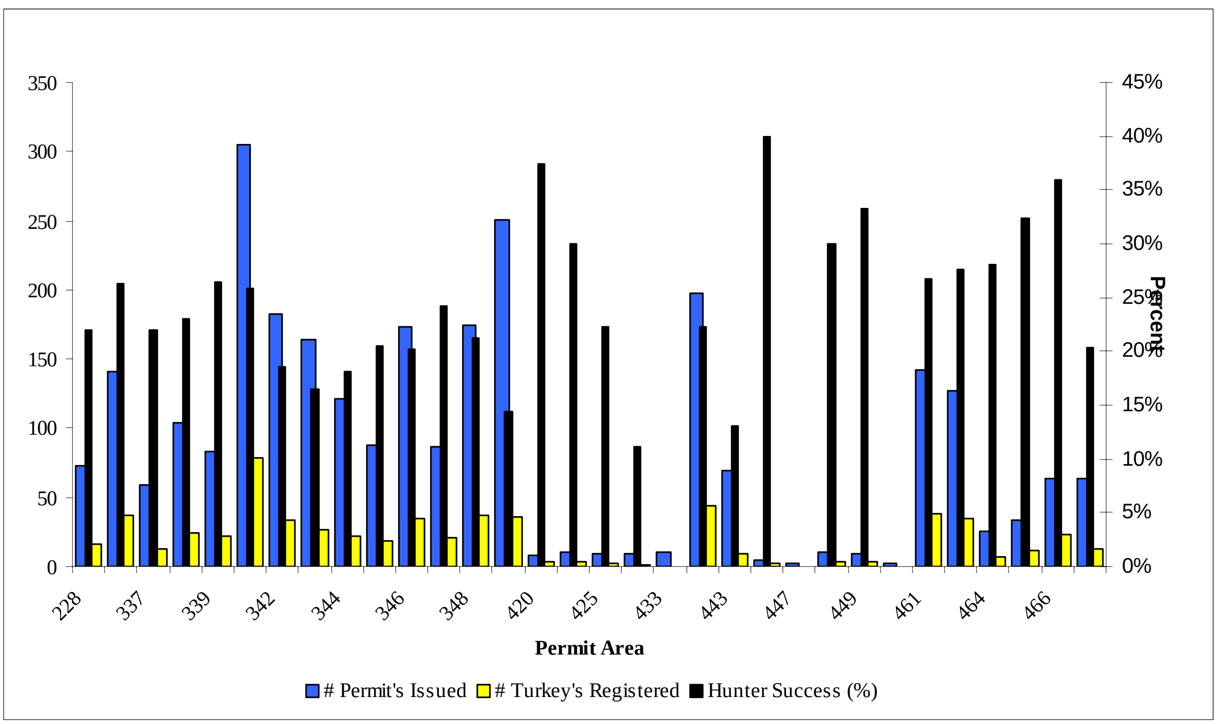


Figure 1. Total harvest, permits issued, and hunter success rate for the 2006 fall wild turkey hunting season in Minnesota.

2007 Spring Turkey Harvest Report

Angela Isackson, Farmland Wildlife Populations and Research Group

INTRODUCTION

In Minnesota, monitoring wild turkey harvest is an important component of population management, which includes setting permit levels for subsequent seasons. Wild turkey populations, permit levels available for the spring season, and harvest have all increased substantially since Minnesota's first modern hunting season in 1978. Spring harvest is affected by a variety of factors including wild turkey population size, harvest pressure, access to land for hunting, interference by other hunters, and weather conditions during the spring hunting season.

METHODS

Spring turkey hunting opportunities are now available in approximately half of Minnesota (Figure 1). The 2007 spring turkey season took place from 18 April through 31 May (6, 5-day time periods and 2, 7-day time periods). An archery permit was offered the last 2 time periods in any permit area with at least 50 permits per time period. Spring turkey hunters are required to register their bird at a designated registration station within 24 hours of harvest. During registration, sex, age, and harvest data are recorded.

RESULTS

A total of 52,566 applications were received for the 33,976 available permits (Table 1). The chance of being drawn for a permit varies by permit area (PA) and time period selected by the hunter. There were 28,320 total regular permits and 3,072 archery permits issued. Surplus permits after the initial lottery drawing accounted for 8% (2,237) of regular permit sales.

A total of 9,412 turkeys were registered in spring 2007 compared to 8,241 in 2006 (Table 1, Figure 2). Overall hunter success was 33.2%, slightly higher than last year (29.6%) and slightly higher than the 5-year average of 32.0%. The highest harvest occurred in PA 349 where 592 turkeys were registered (Table 2). Most PAs (80%) showed increased (n = 50) or identical (n = 3) harvests from 2006. Hunter success by PA ranged from 9.4% (PA 456) to 75.0% (PA 422; Table 2). Hunters in the first 2 time periods had the highest success rates (44.1% and 39.5%, respectively), with lower success rates in subsequent time periods, following the 5-year trend (Table 3).

Youth hunts were included in this year's harvest report with 53 turkeys registered. Previous reports have not included the number of turkeys registered during youth hunts. Persons participating in youth wild turkey hunts must be at least 12 years of age and under 18 years of age by the beginning hunt date. Youth hunt permittees may hunt in open PAs and special seasons as designated by the commissioner. This year youth hunt seasons took place from 14 April through 20 May (6, 2-day time periods) (Table 3). There were 160 total youth hunt permits issued with an overall youth hunter success of 33.1%.

DISCUSSION

Total harvest for spring 2007 (9,412) was slightly higher than spring 2006 (8,241). The increase occurred from increased harvests in all time periods compared to 2006. Weather conditions for spring hunting in 2007 were generally good, with rainy spells in the 7th and 8th time period (G and H), and temperatures above average. Hunters did comment on rain and wind causing problems in 26 PAs during the first 4 seasons from a survey of Spring 2007 turkey hunters.

Table 1. Spring and fall wild turkey applications, permits, and harvest in Minnesota, 1978-2007.

Year	Spring Applications	Spring Permits Available	Spring Permits Issued	% of Available Issued	Spring Harvest	% Spring Hunter Success[a]	Fall Applications	Fall Permits Available	Fall Harvest
1978	10,740	420	411	97.9	94	22.9	-	-	-
1979	11,116	840	827	98.5	116	14.0	-	-	-
1980	9,613	1,200	1,191	99.3	98	8.2	-	-	-
1981	8,398	1,500	1,437	95.8	113	7.9	-	-	-
1982	7,223	2,000	1,992	99.6	106	5.3	-	-	-
1983	8,153	2,100	2,079	99.0	116	5.6	-	-	-
1984	7,123	3,000	2,837	94.6	178	6.3	-	-	-
1985	5,662	2,750	2,449	89.1	323	13.2	-	-	-
1986	5,715	2,500	2,251	90.0	333	14.8	-	-	-
1987	6,361	2,700	2,520	93.3	520	20.6	-	-	-
1988	8,402	3,000	2,994	99.8	674	22.5	-	-	-
1989	13,007	4,000	3,821	95.5	930	24.3	-	-	-
1990	14,326	6,600	6,126	92.8	1,709	27.9	4,522	1,000	326
1991	15,918	9,170	8,607	93.9	1,724	20.0	2,990	2,200	552
1992	16,401	9,310	9,051	97.2	1,691	18.7	2,782	2,200	588
1993	17,800	9,625	9,265	96.3	2,082	22.5	3,186	2,400	605
1994	19,853	9,940	9,479	95.4	1,975	20.8	3,124	2,500	601
1995	21,345	9,975	9,550	95.7	2,339	24.5	3,685	2,500	648
1996	23,757	12,131	10,983	90.5	2,841	25.9	4,453	2,500	685
1997	25,958	12,530	11,610	92.7	3,302	28.4	4,574	2,580	698
1998	29,727	14,035	13,229	94.3	4,361	33.0	4,526	2,710	828
1999	39,957	18,360	16,387	89.3	5,132	31.3	5,354	2,890	865
2000	42,022	20,160	18,661	92.6	6,154	33.0	5,263	3,090	735
2001	41,048	22,936	21,404	93.3	6,383	29.8	4,501	2,870	629
2002	42,415	24,136	22,607	93.7	6,516	28.8	5,180	3,790	594
2003	44,415	25,016	22,770	91.0	7,666	33.7	5,264	3,870	889
2004	48,059	27,600	25,261	91.5	8,434	33.4	5,878	4,380	758
2005	49,181	31,748	27,638	87.1	7,800	28.2	4,542	4,410	681
2006	45,704	32,624	27,876	85.4	8,241	29.6	4,167	4,290	618
2007[b]	52,566	33,976	28,320	83.4	9,412	33.2	-	-	-

[a] Success rate not adjusted for non-participants.

[b] Youth hunts included in 2007 data only.

Table 2. Spring wild turkey harvest and hunter success rates by permit area in Minnesota, 2007.

Permit Area	Permits Available	Permits Issued[a]	Registered Harvest	% Hunter Success (2007)[b]	% Hunter Success (3-5 Yr Ave)[c]
157	160	140	63	45.0	38.7 (4)
159	40	40	18	45.0	36.4 (4)
213[d]	360	329	143	43.5	NA
214[e]	200	172	63	36.6	37.9 (4)
215[e]	600	516	241	46.7	40.9 (5)
218[d]	560	506	272	53.8	NA
219[e]	360	314	110	35.0	30.0 (5)
221	200	168	90	53.6	52.3 (5)
222	120	110	65	59.1	52.3 (3)
223	680	586	176	30.0	34.9 (5)
225	1,000	850	270	31.8	26.8 (5)
227	600	512	208	40.6	38.5 (5)
228	400	351	157	44.7	42.8 (5)
229[e]	280	240	70	29.2	23.9 (5)
235	120	118	48	40.7	39.0 (5)
236	1,000	892	327	36.7	39.0 (5)
239[e]	720	642	278	43.3	44.1 (5)
240[e]	560	494	213	43.1	39.0 (5)
244	280	225	76	33.8	30.2 (5)
248	80	102	51	50.0	47.1 (4)
249	200	172	67	39.0	29.6 (5)
337	440	377	154	40.8	35.4 (5)
338	680	560	221	39.5	33.3 (5)
339	640	540	189	35.0	35.3 (5)
341	1,800	1543	540	35.0	34.3 (5)
342	1,800	1374	392	28.5	26.3 (5)
343	1,320	1159	478	41.2	40.5 (5)
344	1,000	832	244	29.3	25.1 (5)
345	1,400	1014	218	21.5	20.3 (5)
346	2,600	1861	434	23.3	24.1 (5)
347	1,200	1019	294	28.9	26.7 (5)
348	1,400	1190	319	26.8	25.4 (5)
349	3,400	2626	592	22.5	23.7 (5)
412[d]	200	180	80	44.4	NA
416	80	72	29	40.3	40.2 (5)
417[d]	360	324	120	37.0	NA
420	56	46	18	39.1	42.7 (4)
422	40	28	21	75.0	50.5 (5)
424	40	32	13	40.6	46.2 (3)
425	480	431	164	38.1	40.3 (4)
426	40	34	8	23.5	19.9 (5)
427	80	69	21	30.4	35.2 (5)
428	120	109	50	45.9	38.9 (5)
431	40	39	20	51.3	50.8 (5)

Permit Area	Permits Available	Permits Issued[a]	Registered Harvest	% Hunter Success (2007)[b]	% Hunter Success (2-5 Yr Ave)[c]
433	40	37	21	56.8	50.8 (4)
440	600	517	154	29.8	33.4 (5)
442	1,280	1114	352	31.6	34.1 (5)
443	600	531	175	33.0	30.2 (5)
446	40	36	14	38.9	42.0 (3)
447	40	28	11	39.3	33.0 (3)
448	56	53	33	62.3	58.3 (4)
449	56	55	23	41.8	49.3 (4)
450	56	47	17	36.2	32.1 (5)
451	56	51	30	58.8	56.9 (5)
454	40	34	10	29.4	31.4 (3)
456	40	32	3	9.4	7.1 (3)
457	40	36	19	52.8	37.2 (5)
458	56	33	10	30.3	35.9 (3)
459	200	172	36	20.9	26.6 (5)
461	720	619	239	38.6	36.4 (5)
462	800	693	263	38.0	36.8 (5)
463	160	148	61	41.2	36.0 (5)
464	240	211	83	39.3	31.2 (5)
465	280	229	61	26.6	27.5 (5)
466	520	434	93	21.4	34.2 (5)
467	320	272	70	25.7	33.5 (5)
Unknown			9		
Total	33,976	28,320	9,412	33.2	

[a] 3,072 permits were issued to archery hunters and not included in these figures.
[b] Success rate not adjusted for non-participants.
[c] Number in parenthesis equals the number of years data was available.
[d] New permit area or boundary changes.
[e] Permit areas with name changes.

Table 3. Spring wild turkey hunter success by time period in Minnesota, 2007.

Time Period	Permits Issued	Registered Harvest	% Hunter Success (2007)[a]	% Hunter Success (5 Yr Ave)[a]
A) April 18-22	3,863	1,703	44.1	42.2
B) April 23-27	3,713	1,467	39.5	40.4
C) April 28-May 2	3,831	1,191	31.1	31.2
D) May 3-7	3,680	1,094	29.7	27.2
E) May 8-12	3,746	1,227	32.8	33.3
F) May 13-17	3,172	920	29.0	29.7
G) May 18-24	3,324	1,012	30.4	24.4
H) May 25-31	2,831	745	26.3	26.0
Youth Hunt				
U) May 19-20	1	0	0.0	-
V) May 12-13	7	1	14.3	-
W) May 5-6	3	0	0.0	-
X) April 28-29	17	0	0.0	-
Y) April 21-22	124	47	37.9	-
Z) April 14-15	8	5	62.5	-
Total	28,320	9,412	33.2	32.0

[a] Success rate not adjusted for non-participants.

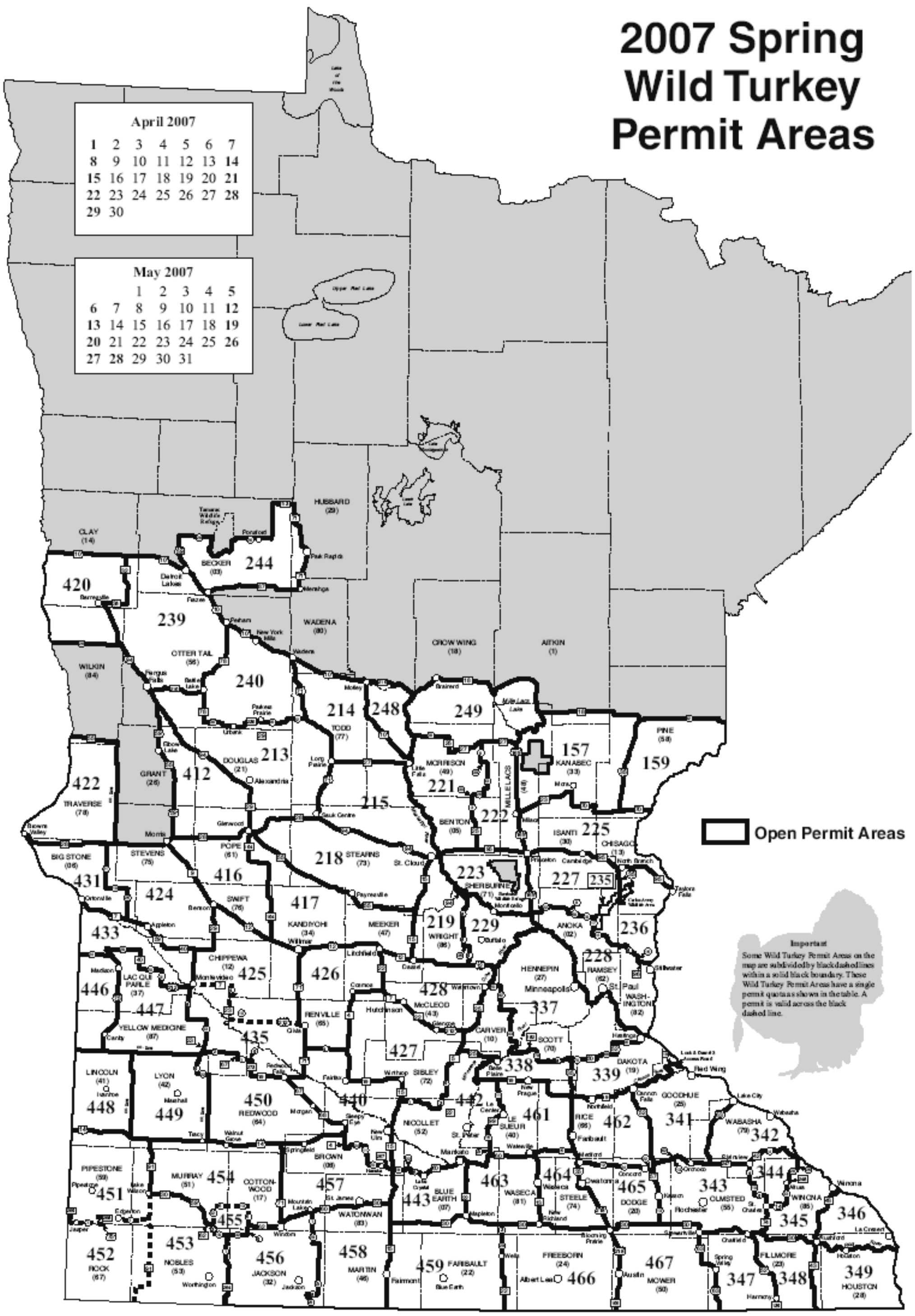


Figure 1. Turkey permit areas open to spring hunting in Minnesota, 2007.

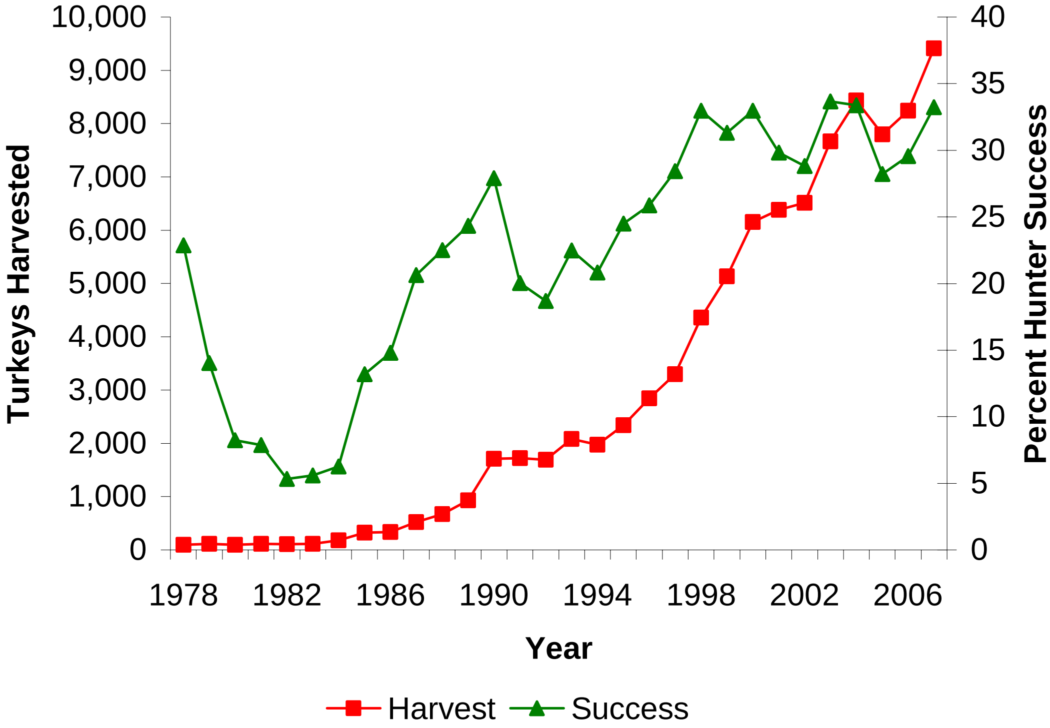


Figure 2. Total harvest and hunter success rates for the spring wild turkey hunting season in Minnesota from 1978 to 2007.

2007 Minnesota Spring Turkey Hunter Survey Report

Tonya Klinkner, Jennifer Snyders, Eric Dunton, and Richard Kimmel

INTRODUCTION

Minnesota's spring turkey hunting season uses a permit area quota system. The system is designed to distribute hunters across space (i.e., permit areas [PAs]) and time (i.e., time period), and allows for greater control of harvest and hunter satisfaction. The goal of this system is to provide quality turkey hunting opportunities where populations can sustain harvest (MDNR 2007*a*).

During the 2007 spring season, 33,976 permits were available in 66 PA's across 8 time periods, which varied from 5 to 7 days in length. The season began on April 18, 2007 and ran until May 31, 2007 representing a total of 44 turkey hunting days. Currently, the spring turkey hunting PA's represent 46,040 mi^2 or 55% of Minnesota's total land base (R. Wright, Minnesota Department of Natural Resources, personal communication).

Three types of hunting licenses were available to hunters: (1) general lottery permit in which an applicant or a party of up to 4 hunters applied for a specific PA and time period (they also had the option to apply for a second choice area and time period); (2) landowner permit in which up to 20 percent of permits for each PA and time period were reserved for landowners or tenants who lived on 40 acres or more of land with the PA, and (3) archery permits which could be purchased for the last 2 time periods of any PA with 50 or more permits per period. Only general and landowner license purchasers were included in this survey.

Licenses were made available based on a system of preference which was determined by the number of years applicants submitted a valid but unsuccessful application since last receiving a license. Successful applicants were allowed to harvest 1 bearded turkey during the spring season.

The current Wild Turkey Plan (MDNR 2007*a*) calls for surveying turkey hunters from a portion of PAs open for hunting each year in order to have reasonably current data for modeling permit numbers for future hunts. Permit allocations are adjusted inversely for hunter interference in an attempt to maintain hunt quality and safety (Kimmel 2001, Dingman et al. 2002). In addition, information on hunt quality and access to land for hunting is used to evaluate the quality of spring turkey hunting for each permit area.

METHODS

A turkey hunter survey consisting of 16 questions (Appendix A) was first mailed to a random sample of 2,774 spring turkey hunters on May 23, 2007. A total of 26 PAs were surveyed based on PA boundary changes or length of time since previous survey (Table 1). Hunter samples were drawn from only the first 4 time periods (i.e., April 18 – May 7 2007) because most turkey hunters prefer to hunt during those time periods and it was assumed that higher interference rates and inaccessibility to hunting lands would occur during those time periods. Surveyed hunters were randomly selected from the Electronic Licensing System (ELS) database of Spring 2007 turkey hunt license purchasers. Non-respondents were sent a follow-up mailing on June 20, 2007 with 1,424 surveys mailed. A third and final mailing was sent to 1,245 non-respondents on July 26, 2007. Surveys received after September 14, 2007 were not used in this analysis.

PA 456 was later added to the survey because of concern for low hunter success (i.e., 9.4% success in 2007 and 7.1% 3 year average success) (MDNR 2007*b*). There were a total of 32 permits available for all time periods; therefore, all hunters within the PA and time periods were surveyed. Surveys were mailed to 32 hunters on June 27, 2007. Non-respondents were sent a follow-up mailing on July 11, 2007 with 17 surveys mailed. A third and final mailing was sent to 10 non-respondents on July 26, 2007.

The survey was designed to determine relationship between indices of hunter crowding (i.e., hunter interference, access to land for hunting) and hunt quality for spring turkey hunting seasons in Minnesota.

RESULTS

The overall response rate across all time periods and PAs averaged 80.9% and varied among PAs from 73.7-94.4% (Table1). The majority of respondents (97.8%) reported that they hunted turkeys in 2007 (Table 2). Most spring turkey hunters (87%) possessed a general lottery hunting permit (Table 3) and hunters were evenly distributed across the 4 surveyed time periods (Table 4). All hunters (i.e., general lottery and landowner) spent an average of 2.7 days hunting (Table 5). Hunting by shotgun was far more common (92%) than by archery (4%) or shotgun and archery (4%, Table 6).

Hunters reported observing an average of 12 turkeys while hunting but this varied widely among PAs from 44 turkeys in PA 422 to 3 turkeys in PA 456 (Table 7). Most hunters (94%) reported observing at least 1 turkey while hunting (Table 7). Nearly 60% of respondents reported shooting at a turkey (Table 8), and 51% indicated they were successful in harvesting a turkey (Table 9). Most turkeys were harvested in the morning (74.9%) and nearly all (97.1%) were harvested by shotgun (Table 9).

The majority of hunters (83.6%) described access to land as either "very easy" or "somewhat easy" (Table 10). Most hunters utilized private land (82.4%, Table 11). On average hunters were denied access to private land 0.7 times (Table 11).

Most hunters (99%) reported no feeling of danger while hunting (Table 12). On average, 0.4 hunters outside the respondents hunting party were observed while hunting, and 12.6% of hunters indicated observing ≥ 1 other hunter (Table 13). Only 6% of hunters reported interference from other turkey hunters (range of 0.00 to 0.16, Table 14). 10% of hunters reported interference from non-turkey hunters (range of 0.00 to 0.22; Table 15). On a scale of 1 to 10, overall quality rating from turkey hunters for the spring 2007 hunting season averaged 7.51 (i.e., 0 represents poor quality and 10 represents high quality, range 5.68 in PA 456 to 8.68 in PA 248, Table 16).

DISCUSSION

Since Minnesota's first modern hunting season in 1978, there have always been more applications for hunting than available permits (MDNR 2004). For the 2007 spring turkey season there were a total of 52,566 applicants for 33,976 available permits (MDNR 2007). The goal of a structured spring turkey hunting season is to regulate hunter numbers in order to provide quality hunting opportunities while maintaining sustainable populations. Results from this survey indicate that hunters are experiencing a high quality hunt (7.51 quality rating), characterized by high success rates (51%), low interference (0.06 interference rate from other hunters and 0.10 from non-hunters), and good access to private land (hunters averaged < 1 time being denied access to private land). The factors most often cited as contributing to a quality hunt include ease of access to hunting lands, feeling of safety, proper distribution of hunters (i.e., lack of interference from other hunters), observing turkeys while hunting, having the opportunity to get a shot, and success in harvesting a turkey (Smith et al. 1992, Dingman 2003). Success is the most often cited factor influencing a quality hunting experience (Stankey et. al. 1973, Hende 1974, Dingman 2003).

The spring turkey hunter survey results are used in part as a tool to gauge hunter satisfaction and estimate interference rates. Hunter density and number of permits available appear to be acceptable and permit numbers likely can be increased in future hunting seasons (Dingman 2003). One contributing factor to interference is hunter density. Increased hunter density has the potential to lead to safety concerns particularly on public lands. Therefore, interference rates are a factor used in modeling when setting permit numbers. The goal is to maximize the amount of turkey hunting across each permit area while providing a safe quality hunting experience.

Quality factors reported in this survey such as hunters getting a shot at a turkey (62%), success in harvesting a turkey (51%), ease of access to hunting land (83.6% "very easy" or "somewhat easy" access), little or no feeling of danger (99% indicated "no" feeling of danger), low interference rates from turkey hunters (6%) and low interference from non-turkey hunters (10%), and an overall quality rating of 7.51 indicate that most hunters are experiencing a quality spring turkey hunt.

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Table 1. Response rates by permit area for the Minnesota 2007 Spring Turkey Hunter Survey.

Permit area	Hunters surveyed	Surveys returned	Response rate (%)
157	78	60	76.9
159	20	16	80.0
213	170	142	83.5
218	250	196	78.4
221	87	75	86.2
222	57	49	86.0
225	315	245	77.8
227	188	149	79.3
236	315	239	75.9
239	227	193	85.0
240	180	151	83.9
244	120	99	82.5
248	38	28	73.7
249	87	72	82.8
416	36	34	94.4
417	172	142	82.6
420	23	19	82.6
422	18	17	94.4
428	55	46	83.6
446	18	17	94.4
447	13	10	76.9
448	28	24	85.7
451/452/453	28	24	85.7
456	32	27	84.4
458	25	20	80.0
461	226	177	78.3
Total	2806	2271	80.9

Table 2. Participation rates of hunters by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Individuals that hunted	Individuals that did not hunt	Percentage (%) that hunted
157	60	59	1	98.3
159	16	15	1	93.8
213	142	138	4	97.2
218	196	194	2	99.0
221	75	74	1	98.7
222	49	48	1	98.0
225	245	242	3	98.8
227	149	145	4	97.3
236	239	234	5	97.9
239	193	186	7	96.4
240	151	149	2	98.7
244	99	95	4	96.0
248	28	25	3	89.3
249	72	69	3	95.8
416	34	34	0	100.0
417	142	138	4	97.2
420	19	19	0	100.0
422	17	16	1	94.1
428	45	45	0	100.0
446	18	17	1	94.4
447	9	9	0	100.0
448	24	24	0	100.0
451/452/453	24	23	1	95.8
456	27	25	2	92.6
458	20	19	1	95.0
461	177	177	0	100.0
Total	2270	2219	51	97.8

Table 3. Permit type purchased by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit Area	Respondents	Landowner	General lottery
157	60	6	54
159	16	2	14
213	142	24	118
218	196	30	166
221	75	13	62
222	49	9	40
225	245	34	211
227	149	17	132
236	239	12	227
239	193	26	167
240	151	19	132
244	99	13	86
248	28	5	23
249	72	12	60
416	34	3	31
417	142	15	127
420	19	3	16
422	17	1	16
428	45	5	40
446	18	7	11
447	9	3	6
448	24	8	16
451/452/453	24	1	23
456	27	1	26
458	20	1	19
461	177	22	155
Total	2270	292	1978

Table 4. Time period hunted by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	April 18-22	April 23-27	April 28-May 2	May 3-7
157	59	17	12	18	12
159	15	4	3	3	5
213	138	33	37	35	33
218	194	44	52	52	46
221	74	22	22	19	11
222	48	13	11	12	12
225	242	61	68	62	51
227	145	36	37	39	33
236	234	54	65	62	53
239	186	49	46	54	37
240	149	37	40	39	33
244	95	29	25	21	20
248	25	9	5	5	6
249	68	19	23	13	13
416	34	11	6	9	8
417	138	33	37	39	29
420	19	5	5	5	4
422	16	4	4	3	5
428	15	10	15	11	9
446	17	6	5	4	2
447	9	2	3	3	1
448	24	6	5	7	6
451/452/453	23	6	6	5	6
456[a]	25	5	4	3	8
458	19	7	5	4	3
461	177	49	45	40	43
Total	2188	571	586	567	489

[a] All 8 time periods were surveyed due to low sample size (i.e., 32 permits for all time periods)

Table 5. Average number of days hunted by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Hunting effort (days)
157	59	2.8
159	15	1.9
213	138	3.1
218	194	2.8
221	74	2.6
222	48	3.0
225	241	3.0
227	144	2.9
236	231	2.8
239	185	2.7
240	148	2.9
244	95	2.8
248	24	2.7
249	69	2.6
416	34	3.0
417	138	3.2
420	19	2.3
422	16	1.6
428	45	2.8
446	17	2.5
447	9	2.8
448	23	2.9
451/452/453	23	2.7
456	24	2.8
458	19	2.6
461	177	2.9
Total	2209	2.7

Table 6. Hunting method by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Shotgun	Archery	Shotgun and archery
157	59	56	2	1
159	15	14	1	0
213	138	131	3	4
218	194	179	11	4
221	74	67	5	2
222	48	45	3	0
225	242	216	10	16
227	145	131	9	5
236	233	202	13	18
239	186	172	9	5
240	147	135	5	7
244	95	88	3	4
248	25	23	0	2
249	68	66	0	2
416	34	34	0	0
417	137	129	3	5
420	19	14	4	1
422	16	14	1	1
428	45	44	0	1
446	17	15	0	2
447	9	9	0	0
448	24	23	0	1
451/452/453	23	20	1	2
456	25	25	0	0
458	19	19	0	0
461	177	166	6	5
Total	2214	2037	89	88

Table 7. Number of hunters that observed turkeys by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Hunters that observed turkeys	Average turkeys observed per hunter
157	58	55	12
159	14	12	4
213	137	126	11
218	193	180	13
221	74	71	13
222	48	47	10
225	240	224	11
227	141	136	11
236	232	226	16
239	183	178	13
240	143	135	11
244	95	82	9
248	25	24	11
249	69	63	8
416	32	31	12
417	135	129	11
420	18	15	11
422	15	15	44
428	45	43	7
446	16	15	12
447	9	8	8
448	22	22	21
451/452/453	23	21	11
456	24	17	3
458	18	16	7
461	174	165	12
Total	2183	2056	12

Table 8. Average number of hunters that got a shot at a turkey by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Hunters that got a shot	Hunters that got a shot (%)
157	59	36	61.0
159	15	10	66.7
213	138	87	63.0
218	194	124	63.9
221	74	50	67.6
222	48	37	77.1
225	242	111	45.9
227	145	83	57.2
236	233	132	56.7
239	186	128	68.8
240	149	95	63.8
244	94	51	54.3
248	24	20	83.3
249	69	38	55.1
416	33	17	51.5
417	138	62	44.9
420	19	14	73.7
422	16	16	100.0
428	45	31	68.9
446	16	11	68.8
447	9	6	66.7
448	24	21	87.5
451/452/453	23	13	56.5
456	24	4	16.7
458	19	7	36.8
461	177	97	54.8
Total	2213	1301	58.8

Table 9. Hunter success by permit area, time of day, and harvest method for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Hunters that harvested a turkey	Percentage (%)			
			Harvest Time		Harvest Method	
			AM	PM	Shotgun	Archery
157	59	31	74.2	25.8	96.8	3.2
159	15	8	75.0	25.0	100.0	0.0
213	138	72	76.4	23.6	97.2	2.8
218	194	108	63.9	36.1	95.4	2.8
221	74	47	78.7	21.3	93.6	6.4
222	48	30	73.3	26.7	93.3	6.7
225	242	93	80.2	19.8	95.7	4.3
227	145	74	73.0	27.0	95.9	4.1
236	233	109	69.2	30.8	97.2	2.8
239	186	113	74.1	25.9	98.2	1.8
240	149	85	67.9	32.1	97.6	2.4
244	94	44	79.5	20.5	97.7	2.3
248	24	18	83.3	16.7	100.0	0.0
249	69	35	74.3	25.7	100.0	0.0
416	33	15	100.0	0.0	100.0	0.0
417	138	56	71.4	28.6	98.2	1.8
420	19	12	75.0	25.0	75.0	25.0
422	16	16	75.0	25.0	93.8	6.3
428	45	30	80.0	20.0	100.0	0.0
446	16	10	50.0	50.0	100.0	0.0
447	9	5	80.0	20.0	100.0	0.0
448	24	18	66.7	33.3	100.0	0.0
451/452/453	23	12	66.7	33.3	100.0	0.0
456	25	4	75.0	25.0	100.0	0.0
458	19	7	100.0	0.0	100.0	0.0
461	177	80	65.4	34.6	100.0	0.0
Total	2214	1132	74.9	25.1	97.1	2.8

Table 10. Accessibility of hunting land by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

		Percentage (%)			
Permit area	Respondents	Very easy	Somewhat easy	Somewhat difficult	Very difficult
157	58	65.5	22.4	12.1	0.0
159	15	66.7	13.3	20.0	0.0
213	138	55.1	32.6	11.6	0.7
218	194	38.7	40.7	18.6	1.5
221	72	48.6	33.3	16.7	1.4
222	47	46.8	40.4	12.8	0.0
225	240	52.5	31.7	13.8	2.1
227	145	51.0	33.8	15.2	0.0
236	228	41.7	32.5	23.2	2.6
239	185	56.2	28.6	13.5	1.6
240	146	57.5	30.1	11.0	1.4
244	94	38.3	30.9	23.4	7.4
248	25	56.0	44.0	0.0	0.0
249	69	55.1	34.8	8.7	1.4
416	34	52.9	29.4	17.6	0.0
417	139	49.6	40.3	8.6	1.4
420	18	16.7	66.7	16.7	0.0
422	16	50.0	25.0	18.8	6.3
428	45	46.7	35.6	15.6	2.2
446	17	58.8	35.3	5.9	0.0
447	9	44.4	55.6	0.0	0.0
448	24	50.0	37.5	12.5	0.0
451/452/453	23	26.1	56.5	17.4	0.0
456	24	45.8	33.3	12.5	8.3
458	19	21.1	36.8	15.8	26.3
461	176	47.2	31.3	14.8	6.8
Total	2200	47.7	35.9	13.7	2.8

Table 11. Type of land hunted and accessibility of private land by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

		Percentage (%)			Frequency access to private land denied	
Permit area	Respondents	Public land	Private land	Public and Private	Rate	*n*
157	59	5.1	84.7	10.2	0.34	49
159	15	0	86.7	13.3	0.6	12
213	138	5.1	84.8	10.1	0.31	100
218	192	2.6	89.1	8.3	0.47	151
221	74	5.4	81.1	13.5	0.34	54
222	48	2.1	93.8	4.2	0.51	32
225	241	6.2	86.3	7.5	0.5	179
227	145	5.5	84.8	9.7	0.44	115
236	233	8.2	85	6.9	0.95	182
239	186	1.1	88.7	10.2	0.72	149
240	149	2	89.3	8.7	0.62	119
244	95	10.5	63.2	26.3	0.97	71
248	25	20	64	16	0.15	16
249	69	8.7	76.8	14.5	0.73	53
416	34	0	67.6	32.4	0.53	24
417	138	2.9	88.4	8.7	0.49	114
420	18	5.6	94.4	0	1	14
422	16	6.3	75	18.8	0.64	11
428	45	0	95.6	4.4	0.58	38
446	17	5.9	82.4	11.8	1.2	15
447	9	0	77.8	22.2	0.5	8
448	24	12.5	70.8	16.7	1	19
451/452/453	23	4.3	91.3	4.3	0.31	16
456	24	0	95.8	4.2	1.24	21
458	19	10.5	73.7	15.8	1.87	15
461	176	7.4	71.6	21	1.03	123
Total	2212	5.3	82.4	12.3	0.69	1700

Table 12. Hunters response to their feeling of being put in danger by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Feeling of Danger Yes	No
157	59	0	59
159	15	0	15
213	138	0	138
218	194	0	194
221	74	1	73
222	48	0	48
225	242	2	240
227	145	1	144
236	234	3	231
239	186	0	186
240	147	0	147
244	95	0	95
248	25	1	24
249	69	0	69
416	34	0	34
417	138	1	137
420	18	0	18
422	16	0	16
428	45	0	45
446	17	0	17
447	9	0	9
448	24	0	24
451/452/453	23	0	23
456	25	0	25
458	19	0	19
461	177	5	172
Total	2216	14	2202

Table 13. Average number of people other than members of their hunting party, observed in the field by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	Average number of people observed per hunter	Hunters observing ≥1 person (%)
157	59	0.51	5.1
159	15	0.00	0.0
213	138	0.19	14.5
218	194	0.27	14.4
221	74	0.24	4.1
222	48	0.25	8.3
225	240	0.36	20.4
227	145	0.41	11.0
236	232	0.44	11.6
239	184	0.35	17.4
240	148	0.35	20.3
244	95	0.31	20.0
248	25	1.04	12.0
249	69	0.28	17.4
416	34	0.21	5.9
417	138	0.30	8.0
420	19	0.89	36.8
422	16	2.19	25.0
428	45	0.11	0.0
446	17	0.00	0.0
447	9	0.00	0.0
448	24	0.75	33.3
451/452/453	23	0.09	0.0
456	25	0.04	4.0
458	19	0.26	10.5
461	177	0.64	28.2
Total	2212	0.40	12.6

Table 14. Hunter interference rates by other turkey hunters by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	No[a] Interference	Interference[b]	Interference rate (IR)
157	59	59	0	0.00
159	15	15	0	0.00
213	138	135	3	0.02
218	193	186	7	0.04
221	74	71	3	0.04
222	48	46	2	0.04
225	241	225	16	0.07
227	144	132	12	0.08
236	233	209	24	0.10
239	186	175	11	0.06
240	149	140	9	0.06
244	95	93	2	0.02
248	25	25	0	0.00
249	69	69	0	0.00
416	33	31	2	0.06
417	138	133	5	0.04
420	19	16	3	0.16
422	16	16	0	0.00
428	45	45	0	0.00
446	17	17	0	0.00
447	9	9	0	0.00
448	24	23	1	0.04
451/452/453	23	22	1	0.04
456	25	25	0	0.00
458	19	18	1	0.05
461	177	155	22	0.12
Total	2214	2084	124	0.06

[a] Hunters experienced no or 0 interference episodes by other turkey hunters
[b] Hunters experienced 1 or more interference episodes by other turkey hunters

Table 15. Hunter interference from non-turkey hunters by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit area	Respondents	No[a] Interference	Interference[b]	Interference rate (IR)
157	59	54	5	0.08
159	15	15	0	0.00
213	137	126	11	0.08
218	193	169	24	0.12
221	74	67	7	0.09
222	48	43	5	0.10
225	238	218	20	0.08
227	143	125	18	0.13
236	231	195	36	0.16
239	185	163	22	0.12
240	147	136	11	0.07
244	94	83	11	0.12
248	25	22	3	0.12
249	68	59	9	0.13
416	33	28	5	0.15
417	138	129	9	0.07
420	19	16	3	0.16
422	16	16	0	0.00
428	44	41	3	0.07
446	17	17	0	0.00
447	9	7	2	0.22
448	23	20	3	0.13
451/452/453	23	20	3	0.13
456	25	24	1	0.04
458	18	16	2	0.11
461	176	159	17	0.10
Total	2198	1968	230	0.10

[a] Hunters experienced no or 0 interference episodes from non-turkey hunters
[b] Hunters experienced 1 or more interference episodes from non-turkey hunters

Table 16. Rating of hunt quality by permit area for the 2007 Minnesota Spring Turkey Hunter Survey.

Permit Area	Respondents	Average hunt quality[a]
157	59	7.63
159	15	7.40
213	138	7.88
218	194	7.64
221	72	8.22
222	48	8.40
225	242	7.24
227	145	7.74
236	234	7.60
239	184	7.91
240	149	7.79
244	94	7.00
248	25	8.68
249	69	7.67
416	34	7.41
417	138	7.15
420	19	7.95
422	16	8.38
428	45	7.49
446	16	6.56
447	9	7.44
448	24	8.33
451/452/453	23	6.78
456	25	5.68
458	19	6.00
461	177	7.38
Total	2213	7.51

[a] Quality was rated from 0-10 with 0 representing poor quality and 10 representing excellent quality

Table 17. Additional Comments of spring wild turkey hunters for the 2007 Minnesota Spring Turkey Hunter Survey.

Comment	Responses
Enjoyed opportunity to turkey hunt and being in woods	85
Poor weather conditions (rainy, hot, bugs, etc…)	65
Successful in harvesting a turkey	38
Hunted private land and had no problems with interference	34
Want permit numbers increased	30
Problem accessing private land	25
Did not see enough turkeys	16
Positive comment toward DNR turkey management	14
Hunt time periods to short	12
Complaints about landowner permits (i.e., landowners get permit and hunt somewhere else)	10
Interference or harassment from non-hunters (i.e., ATV's, campers, hikers, etc…)	9
Maintain current permit numbers	7
Saw turkeys while hunting	7
More archery hunting opportunity (i.e., archery only season, more archery permits)	7
Change to Wisconsin system	6
Saw too many hens	6
Landowners should be able to buy permit over the counter with no lottery	6

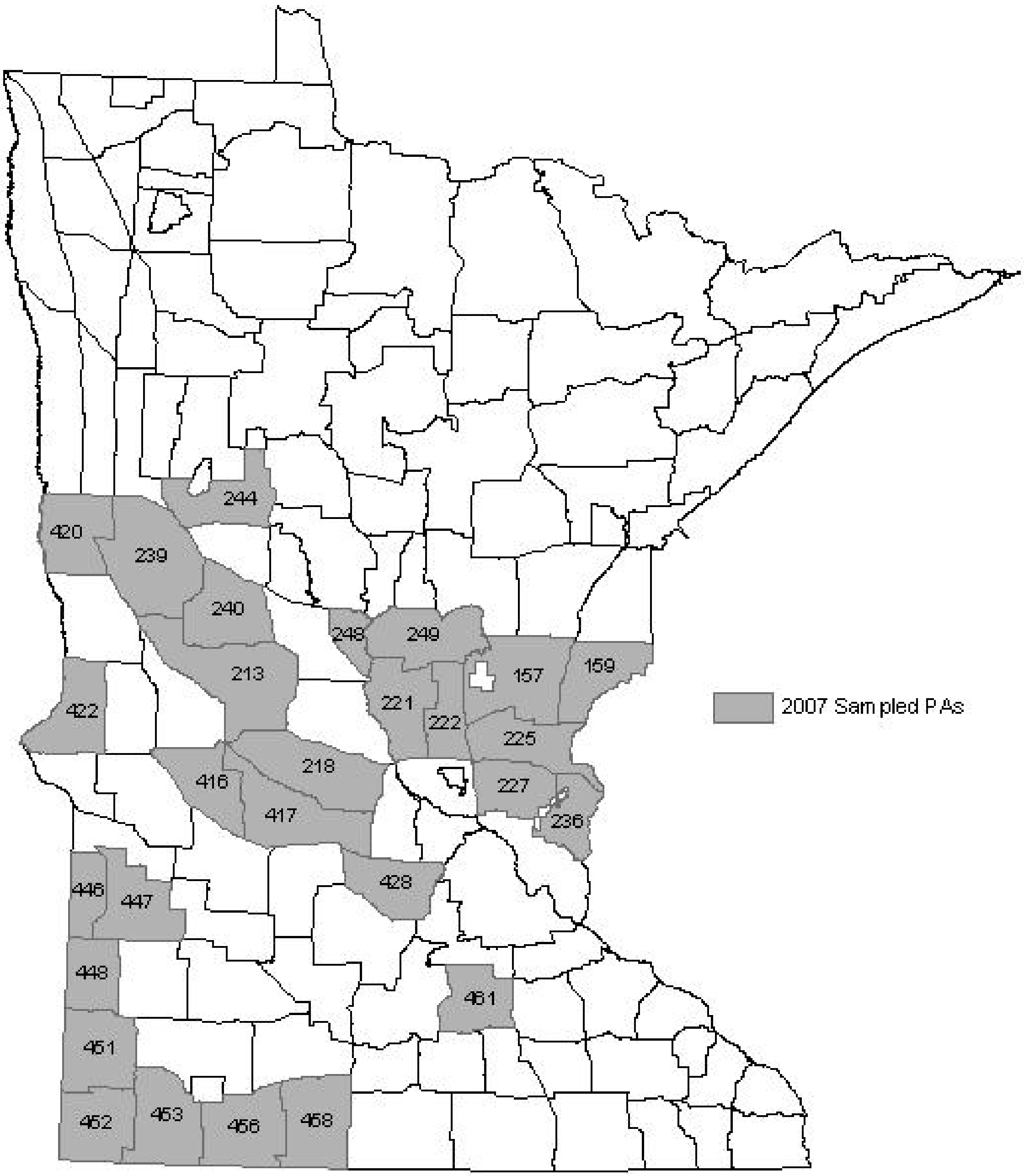

Figure 1. Permit Areas (shaded gray) used for the Minnesota 2007 Spring Turkey Hunter Survey.

Appendix A

Minnesota Spring Turkey Hunter Survey

*Please respond to all questions based on the **SPRING 2007 TURKEY SEASON**.

1. Did you hunt turkeys in Minnesota during the spring 2007 season? Yes____ No*____
   *If no, you do not need to continue but please return survey.

2. Which wild turkey permit area did you hunt in? __________

3. Did you have a landowner permit or a regular lottery permit? Landowner____ Regular Lottery____

4. Which season did you hunt? April 18-22 ___ April 23-27 ___ April 28-May 2___ May 3-7___

5. How many days did you hunt turkeys during spring 2007? __________

6. How did you hunt turkeys in 2007? Shotgun only____ Bow Only____ Shotgun and Bow____

7. How many turkeys did you see while turkey hunting in 2007? __________

8. How many turkeys did you shoot at? __________

9. Were you successful in bagging a turkey? Yes*____ No____
   *If yes, was it killed in the morning or afternoon? AM____ PM____
   *If yes, with what weapon did you harvest your turkey? Shotgun____ Bow____

10. How difficult was it for you to find a place to hunt during the spring 2007 wild turkey hunting season? (check one answer)
    Very easy____ Somewhat easy____ Somewhat difficult____ Very difficult____

11. Did you hunt on public land or private land during the spring 2007 season? Public____ Private*____ Both____
    *If you hunted on private land, how many landowners turned down your request for permission? ____

12. Did you at any time feel you were put in danger by other hunters while turkey hunting? Yes____ No____

13. On average, how many hunters, other than members of your own party, did you see each day while you were actually in the field hunting during spring 2007? __________

14. How many times did hunters, other than members of your own party, interfere with your hunting during spring 2007? __________

15. How many times did people **other than hunters** interfere with your hunting during spring 2007? _____

16. Rate the quality of your turkey hunting experience during spring 2007 on a scale of 1-10 (check one number):

Poor Quality Average Quality Excellent Quality

0____ 1____ 2____ 3____ 4____ 5____ 6____ 7____ 8____ 9 ____ 10____

Additional comments can be written on the back.

2006 Minnesota Prairie-Chicken Hunter Survey

Michael A. Larson, Forest Wildlife Populations and Research Group

INTRODUCTION

Hunting seasons for prairie-chickens (*Tympanuchus cupido pinnatus*) in Minnesota were closed from 1943 through 2002. During October 2003 a limited-entry, 5-day hunting season for prairie-chickens was held within 7 contiguous permit areas in western Minnesota. Permits were awarded through a lottery system, and each hunter could harvest a maximum of 2 prairie-chickens. The same format was implemented for prairie-chicken hunting seasons during 2004 and 2005. For the 2006 hunting season the number of permit areas was increased to 11 (Figure 1, Table 1). The objectives of the prairie-chicken hunter survey were to document several aspects of hunter satisfaction with their experience and to provide additional information upon which decisions about managing the prairie-chicken hunting season can be made.

METHODS

Results of the 2006 hunting season came from 2 sources. First, the Electronic Licensing System (ELS) recorded all permit applications, lottery results, and the mandatory registration of some prairie-chickens that were harvested. An ELS problem prevented some successful hunters from registering their prairie-chickens. After the hunting season the Department of Natural Resources License Center sent a letter to hunters who had purchased a prairie-chicken permit asking them to report their prairie-chicken harvest. Responses were then added to the ELS. The second source of information was a post-season survey that accompanied the letter from the License Center to all prairie-chicken hunters. The survey, which was identical to the one sent during 2005, however, was not linked with the ELS or other hunter information. Therefore, survey data could not be separated by permit area or landowner status, and follow-up letters could not be sent to people who did not respond to the survey.

RESULTS & DISCUSSION

One hundred eighty-two prairie-chicken hunting permits were available during 2006. One hundred sixty-seven (34%) of 498 regular applicants were awarded permits (Table 2). Although the number of applicants had been declining during 2003–2005 (Table 3), the number of applicants this year was very similar to the number who applied last year. Seventy-eight percent of people who purchased a hunting permit responded to the post-season survey. Three percent (n = 4) of the 120 respondents reported that they did not hunt; injury was the most frequently cited reason.

The amount of time spent hunting, hunting methods, and number of prairie-chickens flushed have been similar during the last 4 years (Figures 2–5). Hunters registered 92 prairie-chickens during 2006 (Table 4). Hunters killed and retrieved approximately 129, 55, and 89 prairie-chickens during 2003–2005, respectively, when 100–110 permits were awarded. Four percent of hunters (n = 116) reported knocking down a prairie-chicken and not being able to retrieve it during 2006. Approximately 40–50% of hunters harvested at least 1 prairie-chicken during 2006; success rates were 46–68% during 2003–2005. Only 18–20% of prairie-chicken hunters during the last 2 seasons reported also flushing sharp-tailed grouse (*T. phasianellus campestris*). Unlike during 2005 when no hunters reported wounding or retrieving a sharp-tailed grouse while hunting prairie-chickens, however, prairie-chicken hunters in 2006 reported harvesting 23 sharp-tailed grouse.

As during previous years, approximately 25% of survey respondents hunted only on private land, and 30–45% of them hunted either only on public land or on both public and private land. Of the 66 hunters who reported their ease of gaining access to private land, most reported it being easy, but 17% reported it being difficult (Figure 6).

Hunter satisfaction with the 2006 prairie-chicken hunting season was reported as a median of 7 (mean = 6.8) on a 1–10 scale (*n* = 115, Figure 7), and 90% of responding permit holders (*n* = 118) reported that they would apply for a prairie-chicken permit again in the future. Twenty-three prairie-chicken hunters (20% of *n* = 116) reported being interfered with by other hunters a total of 37 times during 2006.

ACKNOWLEDGMENTS

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Table 1. Changes to permit areas for prairie-chicken hunting in Minnesota.

Permit area		
2006	2003–2005	Change
801A		New for 2006
802A		New for 2006
803A		New for 2006
804A		New for 2006
805A	405A	Label only; areas identical
806A	407A	Label only; areas identical
807A	407B	Label only; areas identical
808A	407C	Label only; areas identical
809A	420A	Area enlarged and relabeled
810A	420B	Area enlarged and relabeled
811A	421A	Area enlarged and relabeled

Table 2. Results of the lottery for prairie-chicken hunting permits in Minnesota during 2006.

Permit type	Permit area	Permits avail.	No. of applicants	Lottery winners no.[a]	Lottery winners prop.[b]	Permits purchased no.	Permits purchased prop.[b]
Regular	801A	8	12	11	0.92	7	0.64
	802A	8	7	7	1.00	4	0.57
	803A	8	11	10	0.91	7	0.70
	804A	12	19	15	0.79	12	0.80
	805A	14	74	17	0.23	17	1.00
	806A	13	41	16	0.39	13	0.81
	807A	20	70	21	0.30	17	0.81
	808A	13	52	14	0.27	12	0.86
	809A	16	46	17	0.37	16	0.94
	810A	20	115	25	0.22	25	1.00
	811A	12	51	14	0.27	11	0.79
	All	144	498	167	0.34	141	0.84
Landowner	801A	2	0	0		0	
	802A	2	1	1	1.00	1	1.00
	803A	2	0	0		0	
	804A	3	0	0		0	
	805A	4	1	1	1.00	1	1.00
	806A	4	1	1	1.00	0	0.00
	807A	5	4	4	1.00	4	1.00
	808A	4	3	3	1.00	3	1.00
	809A	4	3	3	1.00	3	1.00
	810A	5	0	0		0	
	811A	3	1	1	1.00	1	1.00
	All	38	14	14	1.00	13	0.93
Both	All	182	512	181	0.35	154	0.85

[a] More permits were awarded to regular applicants than were initially available because unclaimed landowner permits were offered to regular applicants. In area 801A an extra permit was awarded because the last hunter selected in the lottery had applied as a member of a hunting party.

[b] Proportion of the previous column (i.e., lottery winners/applicants and purchasers/winners).

Table 3. Permits and applicants for hunting prairie-chickens in Minnesota during 2003–2005.

Year	Regular Permits	Regular Applicants	Landowner Permits	Landowner Applicants
2003	82	835	18	18
2004	82	734	18	25
2005	88	487	22	13

Table 4. Hunter harvest of prairie-chickens in Minnesota during 2006.

Source[a]	Permit type[b]	Permit area	No. of hunters[c]	Birds retrieved	Birds per hunter	Success rate[d]
ELS	Both	801A	7	1	0.1	0.14
ELS	Both	802A	5	2	0.4	0.20
ELS	Both	803A[e]	7	5	0.7	0.43
ELS	Both	804A[e]	12	8	0.7	0.42
ELS	Both	805A	18	10	0.6	0.44
ELS	Both	806A	13	9	0.7	0.54
ELS	Both	807A	21	9	0.4	0.29
ELS	Both	808A	15	13	0.9	0.67
ELS	Both	809A	19	14	0.7	0.37
ELS	Both	810A[e]	25	15	0.6	0.40
ELS	Both	811A[e]	12	6	0.5	0.33
ELS	Regular	All	141	86	0.6	0.42
ELS	Landowner	All	13	6	0.5	0.23
ELS	Both	All	154	92	0.6	0.40
Survey	Both	All	116	85	0.7	0.49

[a] ELS = Electronic Licensing System; Survey = questionnaire sent by mail to hunters.
[b] Landowner, non-landowner (i.e., regular applicant), or both combined.
[c] For ELS data it is the number who purchased a permit to hunt prairie-chickens; for Survey data it is the number of hunters who responded to a mail survey and reported to have hunted.
[d] Proportion of hunters who killed and retrieved at least 1 prairie-chicken.
[e] Results for these Permit Areas may not be accurate because 2 hunters with permits for area 803A registered 2 birds in area 804A and 2 birds in area 811A, and a hunter with a permit for area 810A registered a bird in area 811A.

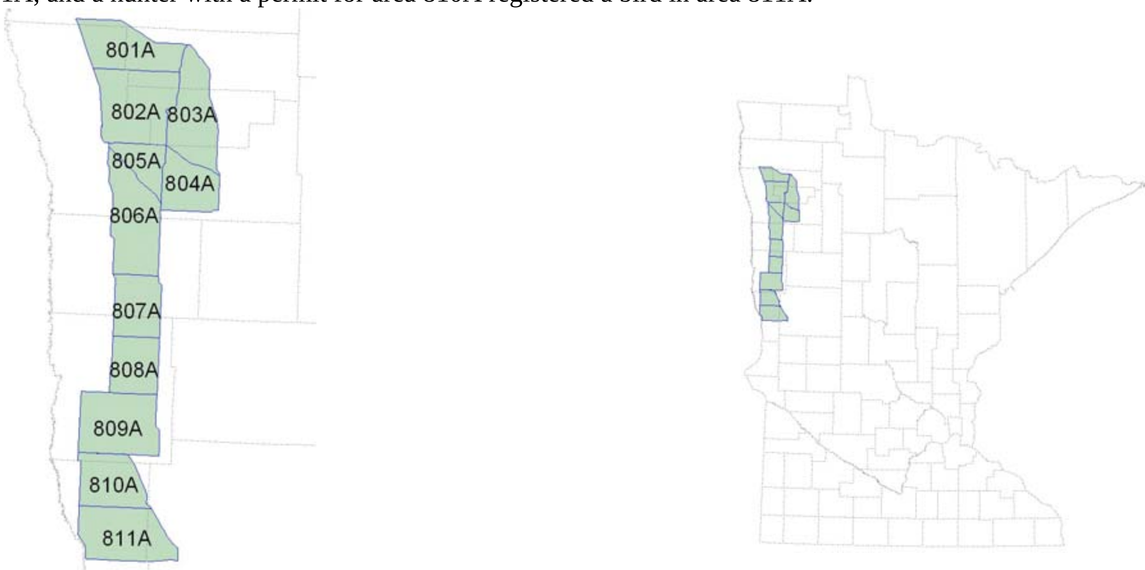


Figure 1. Map of permit areas for prairie-chicken hunting in Minnesota during 2006 (left) and their location relative to counties within the state (right).

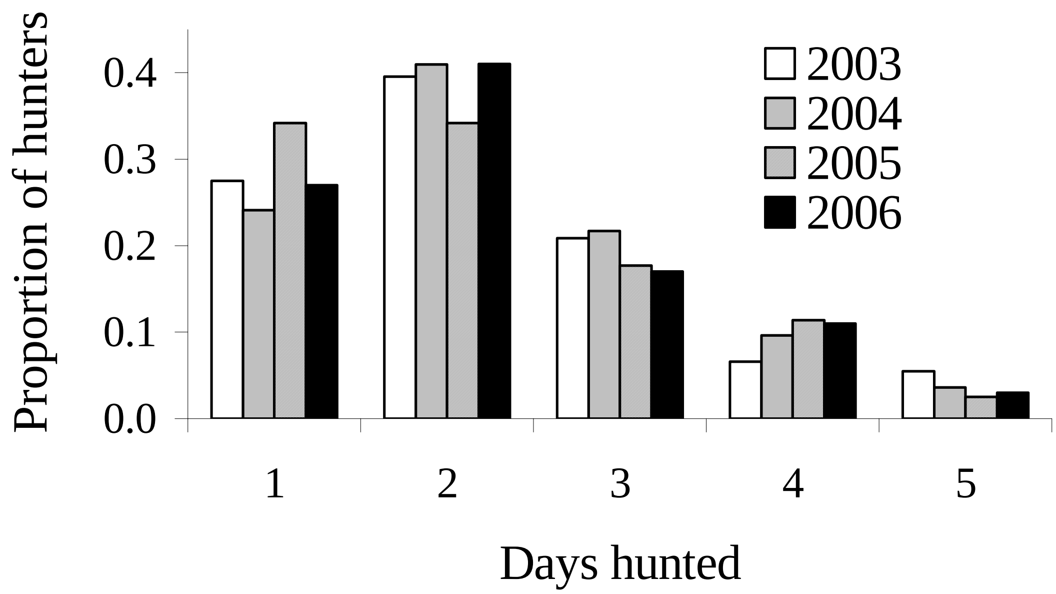


Figure 2. Number of days hunters pursued prairie-chickens in Minnesota (n = 91, 83, 79, and 116 survey respondents for 2003–2006, respectively).

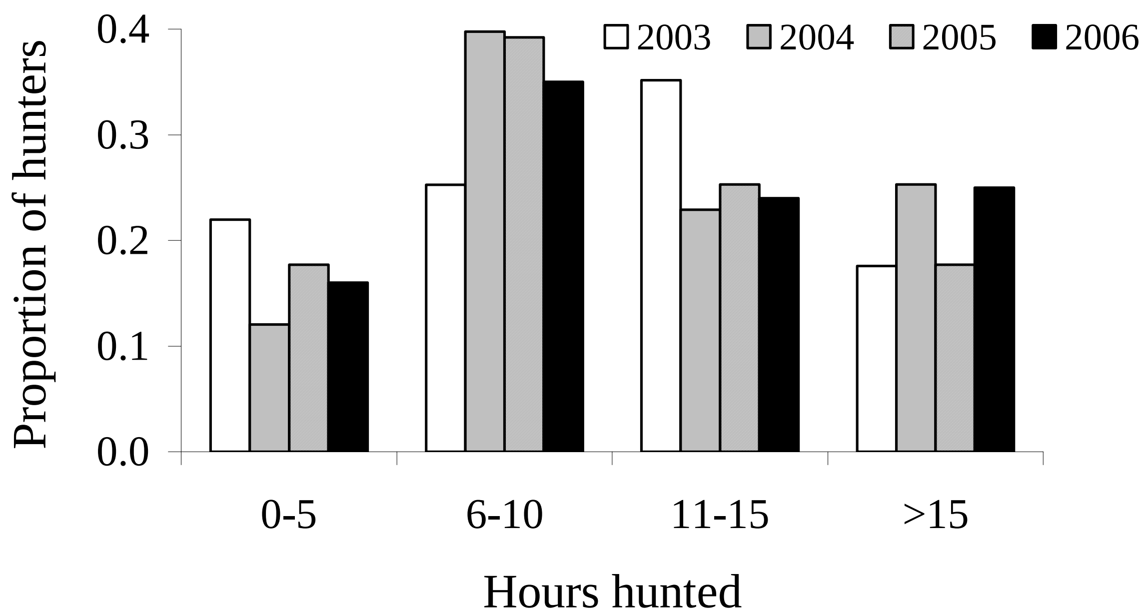


Figure 3. Number of hours hunters pursued prairie-chickens in Minnesota (n = 91, 83, 79, and 116 survey respondents for 2003–2006, respectively).

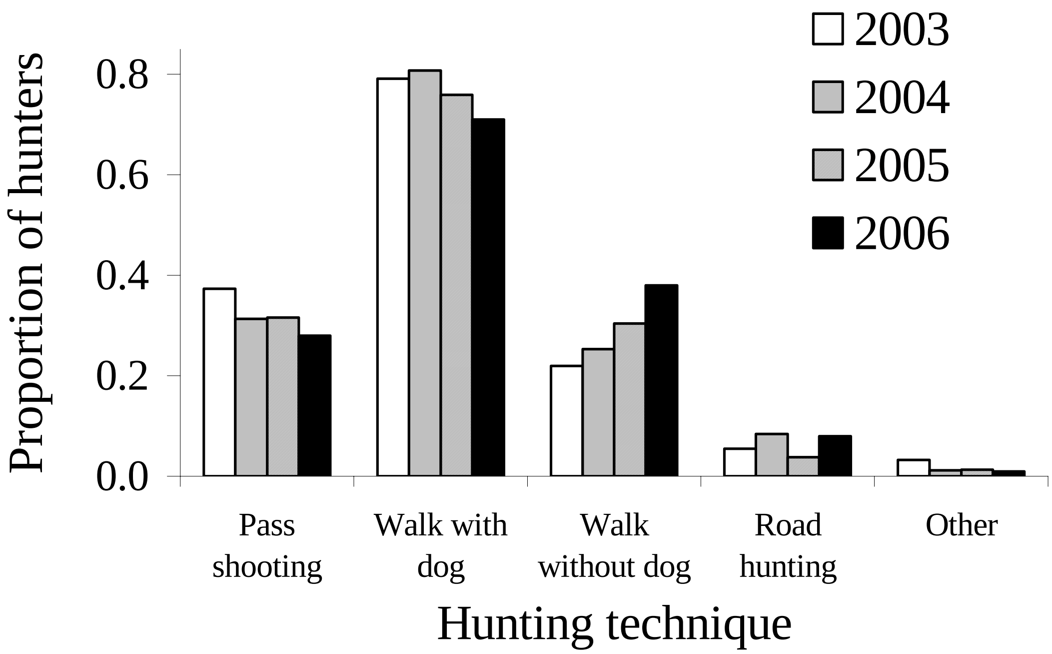


Figure 4. Methods used by prairie-chicken hunters in Minnesota (n = 91, 83, 79, and 116 survey respondents for 2003–2006, respectively). The sum of proportions may be >1.

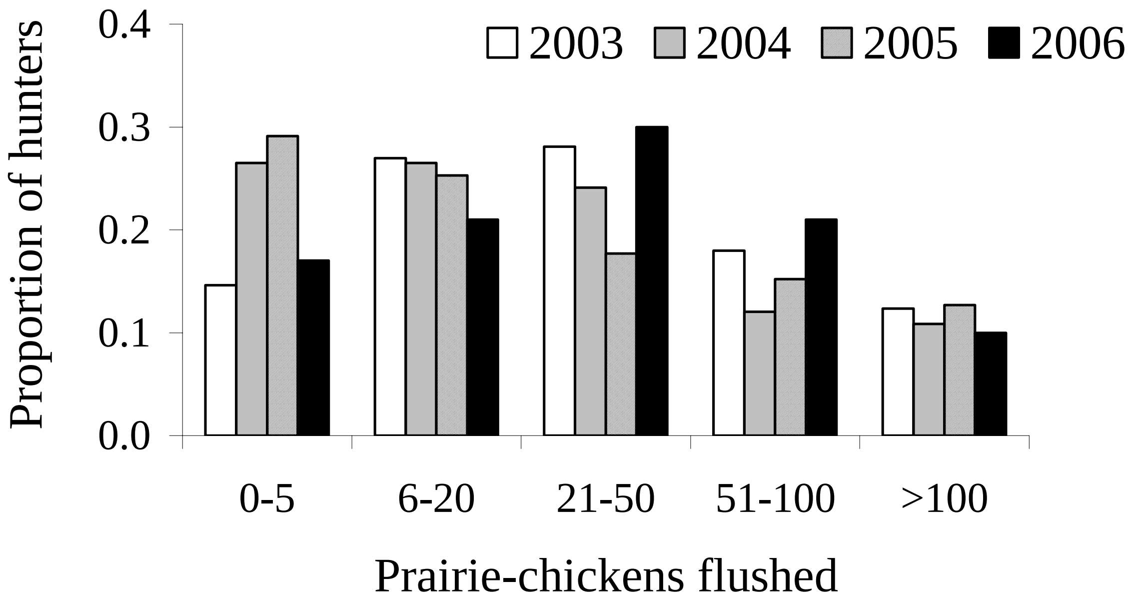


Figure 5. Number of prairie-chickens flushed by prairie-chicken hunters in Minnesota (n = 89, 83, 79, and 115 survey respondents for 2003–2006, respectively).

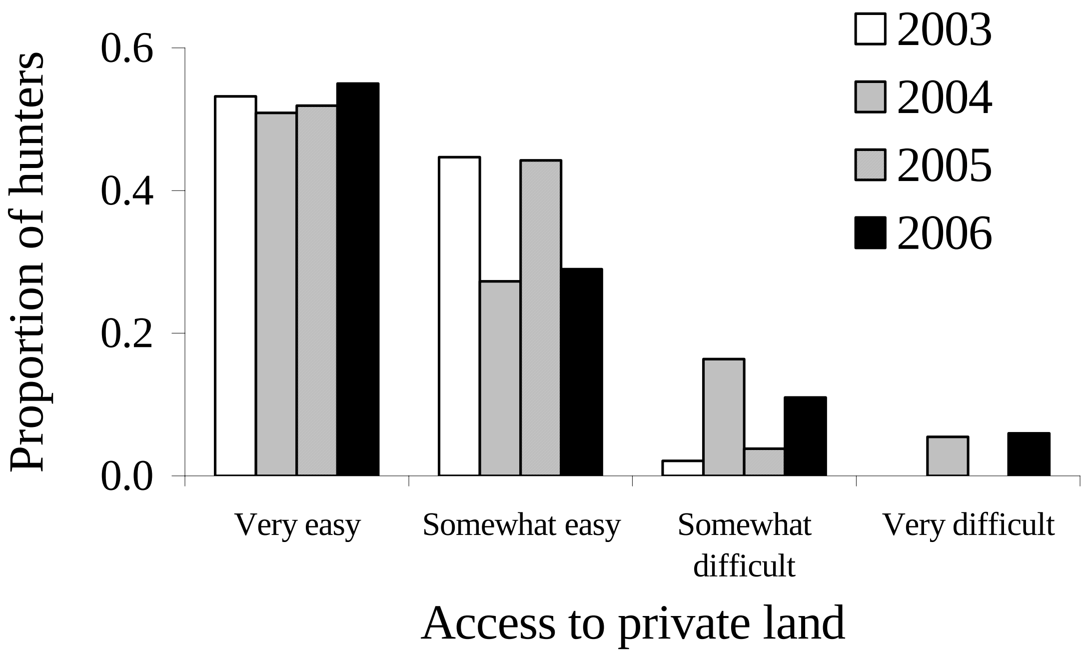


Figure 6. Ease of acquiring permission to access private land for prairie-chicken hunters in Minnesota (*n* = 47, 55, 52, and 66 survey respondents for 2003–2006, respectively).

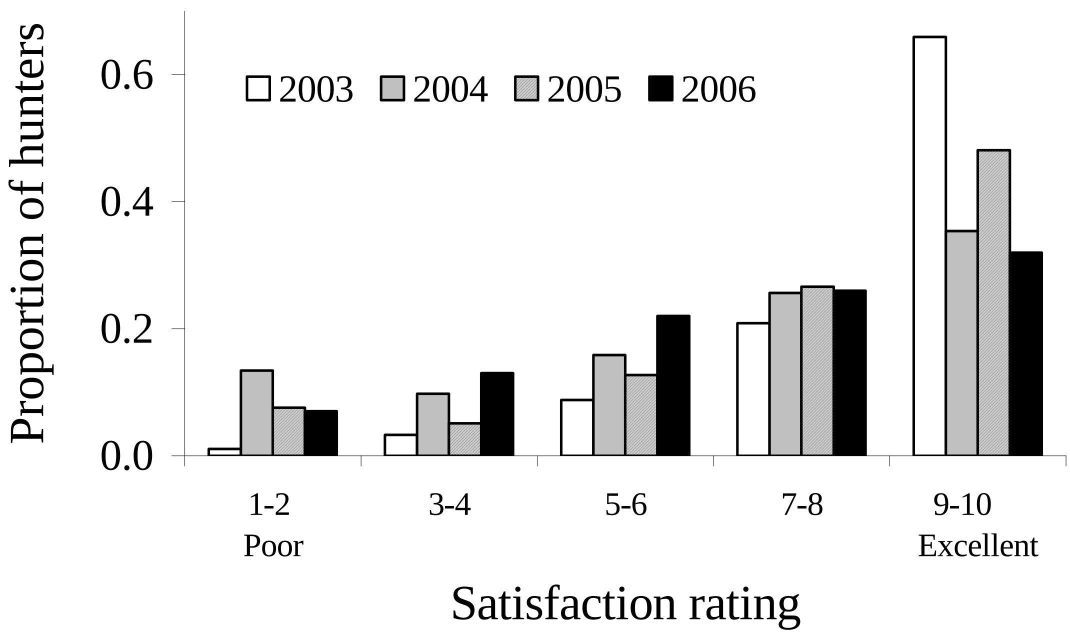


Figure 7. Degree of overall satisfaction of hunters with the prairie-chicken season in Minnesota (*n* = 91, 82, 79, and 115 survey respondents for 2003–2006, respectively).

2006 Minnesota Deer Harvest Report

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

INTRODUCTION

The white-tailed deer may be considered Minnesota's most popular wildlife species. Each year 500,000 hunters harvest over 200,000. In 2006, hunters registered 270,778 deer. This harvest marked the second highest harvest recorded in Minnesota.

METHODS

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

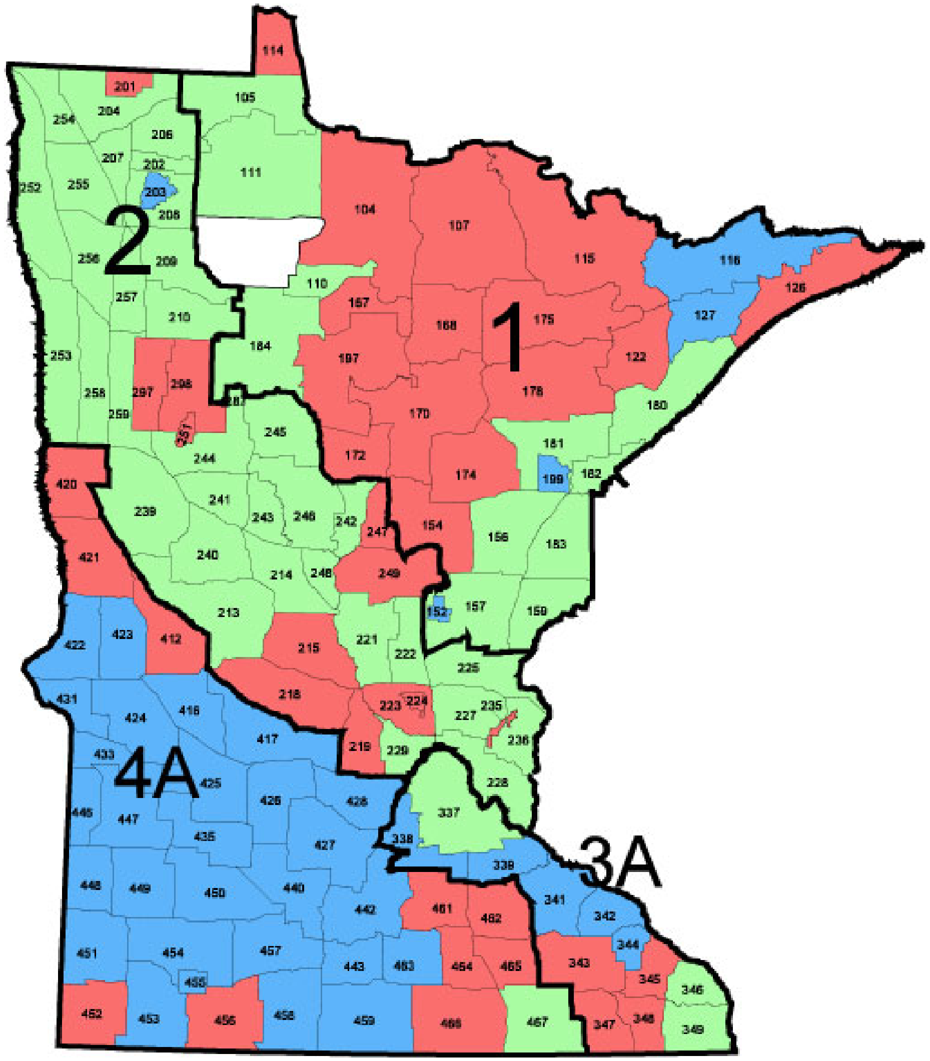
RESULTS

Outcome of the 2006 deer harvest are presented in the following tables.

Table 1. Statewide Firearms, Archery, and Muzzleloader Harvest, License Sales, and Success Rates 1995 - 2006.

REGULAR FIREARMS												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Resident License Sales	419,965	389,745	369,190	378,320	395,745	400,814	401,005	367,964	344,875	309,698	291,298	299,774
Non-Resident License Sales	9,339	8,535	7,830	8,852	9,970	10,595	10,972	10,835	11,334	12,036	12,523	12,520
Antlerless Permit Sales	22,603	27,148	32,229	20,884	23,785	34,802	59,013	105,699	194,201	183,186	184,566	167,343
Multi-Zone Buck License Sales	29,902	38,806	42,803	44,739	43,903	42,669	41,921	35,658	32,929	32,359	28,233	15,984
Resident Youth License Sales	1,835	2,964	3,844	3,445	2,038	3,215	4,011	2,884	34,463	51,347	50,501	49,599
All Season Deer License Sales						2,384	3,986	22,125	30,998	46,008	59,090	75,511
Total License Sales	483,644	467,198	455,896	456,240	475,441	495,289	519,601	545,165	648,800	634,634	626,211	620,731
Registered Buck Harvest[1]	88,997	71,242	64,867	82,921	92,584	102,961	98,894	101,333	110,440	116,612	95,594	95,695
Antlerless Permits Offered	201,525	154,195	150,195	140,280	177,380	232,595	286,540	365,667	31,625	30,760	28,830	28,830
Antlerless Permits Issued	162,761	116,650	105,481	108,016	135,852	180,490	196,603	192,907	25,386	24,111	25,656	25,656
Antlerless Permits App.	257,653	174,329	142,260	151,148	214,597	237,571	225,341	202,086	30,253	28,454	31,403	31,403
Registered AL Harvest[1]	109,196	68,106	62,038	60,475	71,681	88,492	98,169	102,280	147,420	123,278	119,363	135,981
Registered Total Harvest[1]	198,193	139,348	126,905	143,396	164,265	191,453	197,063	203,613	257,860	239,890	214,957	231,676
Registered % Successful[2]	40.1	29.8	27.8	31.4	34.8	38.6	37.9	37.3	39.7	37.8	34.3	37.3
ARCHERY												
Resident License Sales	70,056	67,058	63,499	63,826	66,226	68,947	69,608	57,532	59,339	50,601	50,293	49,595
Non-Resident License Sales	1,171	1,098	980	1,029	1,073	1,271	1,288	1,275	1,428	1,144	1,207	1,286
Youth Archery Sales									3748	7261	7,489	7,688
Mgmt Permit License Sales	15,387	15,632	17,478	15,846	16,945	20,393	22,141	18,126	N/A	N/A	N/A	N/A
Total License Sales	86,614	83,788	81,957	80,701	84,244	90,611	93,037	76,933	60,767	51,745	58,989	58,569
Registered Harvest	14,521	14,338	13,258	12,306	13,376	15,776	15,884	14,744	21,720	17,237	18,975	17,076
Registered Harvest - AS license										3,489	4,563	8,284
Total Archery Harvest	14,521	14,338	13,258	12,306	13,376	15,776	15,884	14,744	21,691	20,726	23,538	25,360
Registered % Successful [2]	16.8	17.1	16.2	15.2	15.8	17.4	17.1	19.2	31.8	29.2	24.6	24.8
MUZZLELOADER												
Total Muzzleloader License Sales						11,972	13,043	11,764	9,142	10,512	9,226	10,781
Estimated All-Season Hunters									12,020	14,168	23,293	23,293
Total Muzzleloader Harvest	2,452	3,367	3,164	3,152	2,928	4,548	4,494	3,505	9,466	9,289	15,421	13,507
Registered % Successful [2]						38	34.5	29.8	44.7	37.6	47.4	39.6
Total Registered Harvest	215,166	157,317	143,327	158,854	180,569	211,777	217,452	222,050	290,525	260,604	255,736	270,778

[1] Does not include free landowner licenses [2] Based on total license sales - does not include all-season deer



Zone	Dates
Zone 1A	Nov. 4-19
Zone 2A	Nov. 4-12
Zone 3A	Nov. 4-10
Zone 3B	Nov. 18-26
Zone 4A	Nov. 4-5
Zone 4B	Nov. 11-14
Metro Mgmt Zone	Nov. 4-26
Muzzleloader	Nov. 25-Dec. 10
Early Antlerless	Oct. 14-15

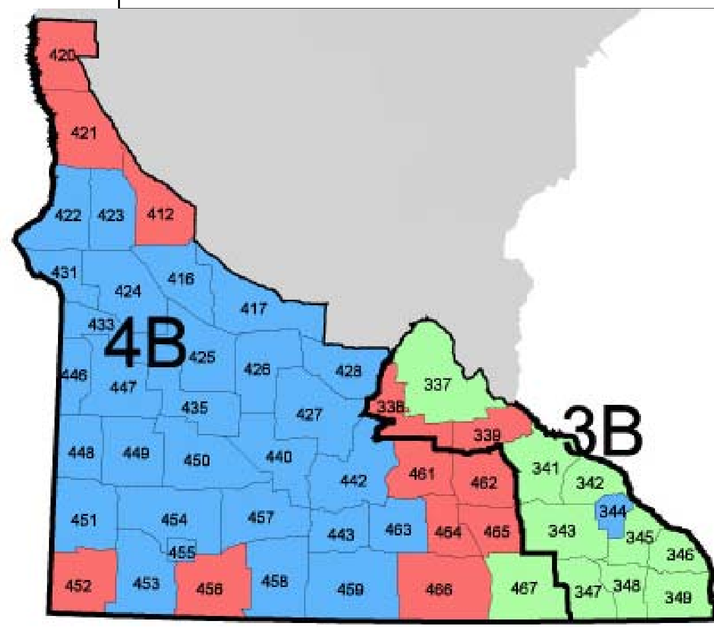


Figure 1. 2006 Firearms and Archery Deer Seasons and Permit Areas.

2006 Minnesota Archery Deer Season. **Northeast Border Zone** (Permit Areas 116 and 127): September 16-November 19. **Remainder of State:** September 16-December 31. Archery hunters can hunt statewide except in areas designated closed and Itasca State Park (P.A. 287). Archery hunters can fill both their archery license and their firearm license; however, only one buck can be taken per year.

Table 2. Deer Harvest by License Type and Zone, 2006.

Firearms/Zone	Hunters	Bucks	Harvest Antlerless	Total	Overall Success
1	171,273	39,414	52,153	91,567	43.4%
2	153,796	34,868	55,911	90,779	45.5%
3A	20,405	5,492	3,521	9,013	38.2%
3B	19,803	3,007	7,702	10,709	42.2%
4A	42,950	7,726	6,952	14,678	32.3%
4B	20,406	4,890	6,177	11,067	49.9%
Multi-Zone Buck	15,984	3,773	0	3,773	23.4%
Free Landowner[1]	4,297	0	1,444	1,444	33.6%
All-Season Deer[1]	75,511	16,715	41,546	58,261	52.8%
Muzzleloader	34,074	2,923	10,584	13,507	33.1%
Archery[2]	75,569	7,096	18,264	25,360	26.1%
TOTAL[3, 4]	**479,135**	**105,769**	**165,009**	**270,778**	42.8%

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

[2] Includes Camp Ripley and all-season harvest. Total number of people who bought only an archery license was 23,737.

[3] Due to the fact that a hunter can buy multiple licenses, hunter numbers are an estimate.

[4] Column totals do not add to 270,778 because all-season firearm harvest was placed in appropriate zone.

Table 3. Firearms Harvest and Harvest per Square Mile by Permit Area, 2006. Includes all firearms licenses.

Permit Area	Zone	Season	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
104	1	1A	1,134	203	955	183	2,475	2,078	0.55	0.55	1.19
105	1	1A	1,065	325	1,201	293	2,884	766	1.39	1.95	3.77
105	1	Youth	0	7	40	8	55	766	0.00	0.06	0.07
107	1	1A	1,672	342	1,369	246	3,629	1,895	0.88	0.85	1.92
110	1	1A	634	231	733	195	1,793	300	2.11	3.09	5.98
111	1	1A	1,102	253	1,019	231	2,605	1,708	0.65	0.73	1.53
111	1	Youth	1	5	30	1	37	1,708	0.00	0.02	0.02
114	1	1A	84	21	38	6	149	123	0.68	0.36	1.21
114	1	Youth	0	0	1	0	1	123	0.00	0.01	0.01
115	1	1A	2,161	347	1,398	283	4,189	1,872	1.15	0.90	2.24
116	1	1A	184	10	59	7	260	1,158	0.16	0.06	0.22
122	1	1A	552	95	317	52	1,016	620	0.89	0.60	1.64
126	1	1A	595	35	273	32	935	940	0.63	0.32	0.99
127	1	1A	141	3	29	3	176	562	0.25	0.06	0.31
152	1	1A	150	26	98	23	297	61	2.46	1.98	4.87
154	1	1A	1,579	530	1,625	473	4,207	760	2.08	2.76	5.54
156	1	1A	1,802	553	1,629	391	4,375	825	2.18	2.45	5.30
157	1	1A	2,753	1,005	2,696	798	7,252	889	3.10	3.93	8.16
159	1	1A	1,390	385	1,197	291	3,263	568	2.45	2.62	5.74
167	1	1A	678	167	641	179	1,665	432	1.57	1.90	3.85
168	1	1A	1,377	354	1,327	296	3,354	723	1.90	2.24	4.64
170	1	1A	2,780	758	2,328	550	6,416	1,315	2.11	2.19	4.88
172	1	1A	1,719	688	1,998	538	4,943	451	3.81	5.62	10.96
174	1	1A	1,263	362	1,055	271	2,951	835	1.51	1.59	3.53
175	1	1A	2,119	413	1,485	309	4,326	1,276	1.66	1.41	3.39
178	1	1A	2,405	543	1,794	367	5,109	1,267	1.90	1.71	4.03
180	1	1A	1,678	232	1,049	140	3,099	982	1.71	1.21	3.16
181	1	1A	1,954	447	1,390	343	4,134	708	2.76	2.45	5.84
182	1	1A	357	63	210	30	660	269	1.33	0.89	2.45
183	1	1A	1,571	445	1,364	339	3,719	662	2.37	2.57	5.62
184	1	1A	3,344	1,238	3,491	1,118	9,191	1,231	2.72	3.74	7.47
197	1	1A	1,056	219	878	189	2,342	974	1.08	1.10	2.40
199	1	1A	116	5	29	3	153	148	0.78	0.22	1.03
201	2	2A	82	21	69	20	192	161	0.51	0.55	1.19
201	2	Youth	0	2	1	1	4	161	0.00	0.01	0.02
202	2	2A	171	67	198	47	483	157	1.09	1.56	3.08
202	2	Youth	0	1	7	3	11	157	0.00	0.06	0.07
203	2	2A	70	6	24	8	108	117	0.60	0.27	0.92
204	2	2A	476	158	478	109	1,221	718	0.66	0.82	1.70
204	2	Youth	0	2	9	3	14	718	0.00	0.02	0.02
206	2	2A	452	146	509	119	1,226	471	0.96	1.33	2.60
206	2	Youth	0	6	24	8	38	471	0.00	0.07	0.08
207	2	2A	319	113	352	84	868	300	1.06	1.45	2.89
207	2	Youth	0	3	8	0	11	300	0.00	0.03	0.04
208	2	2A	242	80	267	70	659	443	0.55	0.76	1.49
208	2	Youth	0	2	7	2	11	443	0.00	0.02	0.02
209	2	2A	560	160	471	163	1,354	639	0.88	0.99	2.12
209	2	EA	0	65	171	61	297	639	0.00	0.36	0.46
209	2	Youth	0	1	2	0	3	639	0.00	0.00	0.00

Table 3. (Continued).

Permit Area	Zone	Season	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
210	2	2A	1,090	299	813	242	2,444	616	1.77	1.71	3.97
210	2	EA	0	93	278	116	487	616	0.00	0.64	0.79
213	2	2A	1,791	716	1,716	549	4,772	1,058	1.69	2.14	4.51
214	2	2A	1,402	685	1,600	550	4,237	557	2.52	3.86	7.61
215	2	2A	932	406	965	331	2,634	701	1.33	1.85	3.76
218	2	2A	685	288	730	240	1,943	885	0.77	1.10	2.20
219	2	2A	507	182	393	121	1,203	393	1.29	1.31	3.06
221	2	2A	1,009	424	980	386	2,799	642	1.57	2.13	4.36
222	2	2A	1,006	360	807	272	2,445	413	2.44	2.61	5.92
223	2	2A	461	146	360	106	1,073	376	1.23	1.24	2.85
224	2	2A	129	27	134	35	325	48	2.69	3.52	6.77
225	2	2A	1,462	421	1,127	330	3,340	619	2.36	2.35	5.40
225	2	EA	0	121	263	101	485	619	0.00	0.59	0.78
227	2	2A	865	232	578	175	1,850	472	1.83	1.60	3.92
227	2	EA	0	80	137	62	279	472	0.00	0.42	0.59
228	2	2A	213	39	128	27	407	613	0.35	0.25	0.66
228	2	Metro	65	18	65	10	158	613	0.11	0.12	0.26
229	2	2A	208	76	200	46	530	288	0.72	0.85	1.84
235	2	2A	71	23	50	21	165	33	2.15	2.15	5.00
236	2	2A	673	149	455	116	1,393	373	1.80	1.53	3.73
236	2	EA	0	48	98	33	179	373	0.00	0.35	0.48
239	2	2A	1,717	605	1,660	524	4,506	926	1.85	2.36	4.87
240	2	2A	1,815	653	1,789	652	4,909	642	2.83	3.80	7.65
241	2	2A	1,436	554	1,373	498	3,861	417	3.44	4.49	9.26
242	2	2A	600	235	599	179	1,613	215	2.79	3.62	7.50
243	2	2A	1,078	505	1,146	313	3,042	314	3.43	4.65	9.69
244	2	2A	2,041	803	1,929	771	5,544	586	3.48	4.61	9.46
245	2	2A	2,080	769	1,956	610	5,415	583	3.57	4.40	9.29
246	2	2A	2,070	859	2,146	766	5,841	772	2.68	3.77	7.57
247	2	2A	744	261	768	238	2,011	230	3.23	4.37	8.74
248	2	2A	397	143	372	129	1,041	212	1.87	2.36	4.91
249	2	2A	1,175	510	1,235	368	3,288	501	2.35	3.20	6.56
251	2	2A	143	36	76	28	283	55	2.60	1.89	5.15
252	2	2A	305	62	210	33	610	1,040	0.29	0.23	0.59
252	2	EA	0	11	111	21	143	1,040	0.00	0.13	0.14
252	2	Youth	0	1	5	0	6	1,040	0.00	0.00	0.01
253	2	2A	353	105	423	107	988	1,023	0.35	0.52	0.97
254	2	2A	320	107	349	116	892	396	0.81	1.17	2.25
254	2	Youth	0	5	4	1	10	396	0.00	0.01	0.03
255	2	2A	586	195	622	161	1,564	631	0.93	1.24	2.48
255	2	Youth	1	4	18	2	25	631	0.00	0.03	0.04
256	2	2A	560	170	637	137	1,504	654	0.86	1.18	2.30
256	2	EA	0	32	155	72	259	654	0.00	0.35	0.40
256	2	Youth	0	1	2	0	3	654	0.00	0.00	0.00
257	2	2A	459	126	383	122	1,090	412	1.11	1.23	2.65
257	2	EA	0	37	111	40	188	412	0.00	0.37	0.46
258	2	2A	555	207	622	170	1,554	618	0.90	1.28	2.51
259	2	2A	428	143	411	131	1,113	494	0.87	1.10	2.25
287	2	2A	103	41	133	27	304	46	2.24	3.48	6.61

Table 3. (Continued).

Permit Area	Zone	Season	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
297	2	2A	249	62	151	45	507	439	0.57	0.45	1.15
298	2	2A	777	188	497	166	1,628	619	1.26	1.07	2.63
337	3	3A	221	41	131	38	431	1,024	0.22	0.17	0.42
337	3	3B	92	21	82	23	218	1,024	0.09	0.10	0.21
337	3	Metro	25	10	46	6	87	1,024	0.02	0.05	0.08
338	3	3A	147	12	58	11	228	452	0.33	0.15	0.50
338	3	3B	102	38	111	20	271	452	0.23	0.29	0.60
339	3	3A	155	12	37	3	207	394	0.39	0.10	0.53
339	3	3B	67	37	93	35	232	394	0.17	0.32	0.59
341	3	3A	510	45	117	23	695	611	0.83	0.23	1.14
341	3	3B	370	209	487	153	1,219	611	0.61	1.05	2.00
342	3	3A	415	45	86	24	570	350	1.19	0.31	1.63
342	3	3B	297	149	475	139	1,060	350	0.85	1.75	3.03
343	3	3A	505	73	252	46	876	663	0.76	0.45	1.32
343	3	3B	297	194	479	129	1,099	663	0.45	0.92	1.66
344	3	3A	343	26	108	18	495	190	1.81	0.66	2.61
344	3	3B	126	69	198	46	439	190	0.66	1.28	2.31
345	3	3A	388	57	143	35	623	326	1.19	0.55	1.91
345	3	3B	208	113	370	117	808	326	0.64	1.49	2.48
346	3	3A	711	112	326	74	1,223	319	2.23	1.25	3.83
346	3	3B	353	204	607	154	1,318	319	1.11	2.39	4.13
347	3	3A	471	60	241	38	810	434	1.09	0.64	1.87
347	3	3B	281	148	429	99	957	434	0.65	1.22	2.21
348	3	3A	597	78	332	54	1,061	331	1.80	1.17	3.21
348	3	3B	298	146	539	119	1,102	331	0.90	1.99	3.33
349	3	3A	1027	131	514	120	1,792	492	2.09	1.29	3.64
349	3	3B	517	274	954	243	1,988	492	1.05	2.43	4.04
412	4	4A	290	65	239	68	662	575	0.50	0.53	1.15
412	4	4B	157	53	178	48	436	575	0.27	0.39	0.76
416	4	4A	316	45	164	22	547	543	0.58	0.34	1.01
416	4	4B	189	24	87	17	317	543	0.35	0.19	0.58
417	4	4A	616	97	324	64	1,101	814	0.76	0.48	1.35
417	4	4B	321	71	237	54	683	814	0.39	0.36	0.84
420	4	4A	164	58	165	55	442	651	0.25	0.34	0.68
420	4	4B	118	50	142	40	350	651	0.18	0.28	0.54
421	4	4A	138	27	120	32	317	749	0.18	0.20	0.42
421	4	4B	51	15	43	16	125	749	0.07	0.08	0.17
422	4	4A	124	13	43	12	192	634	0.20	0.09	0.30
422	4	4B	72	4	32	0	108	634	0.11	0.05	0.17
423	4	4A	81	12	56	13	162	531	0.15	0.13	0.31
423	4	4B	51	4	18	7	80	531	0.10	0.05	0.15
424	4	4A	160	16	59	11	246	766	0.21	0.09	0.32
424	4	4B	102	19	59	11	191	766	0.13	0.09	0.25
425	4	4A	88	11	35	9	143	779	0.11	0.06	0.18
425	4	4B	55	12	29	9	105	779	0.07	0.05	0.13
426	4	4A	132	11	70	13	226	614	0.21	0.14	0.37
426	4	4B	87	21	51	8	167	614	0.14	0.10	0.27
427	4	4A	151	5	38	6	200	837	0.18	0.05	0.24
427	4	4B	80	9	46	6	141	837	0.10	0.06	0.17

Table 3. (Continued).

Permit Area	Zone	Season	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
428	4	4A	150	31	100	20	301	549	0.27	0.22	0.55
428	4	4B	123	11	95	27	256	549	0.22	0.22	0.47
431	4	4A	104	6	42	5	157	359	0.29	0.13	0.44
431	4	4B	66	9	27	8	110	359	0.18	0.10	0.31
433	4	4A	219	34	124	33	410	402	0.54	0.39	1.02
433	4	4B	156	30	143	35	364	402	0.39	0.44	0.91
435	4	4A	263	20	113	14	410	576	0.46	0.22	0.71
435	4	4B	142	19	113	24	298	576	0.25	0.24	0.52
440	4	4A	292	38	182	43	555	662	0.44	0.34	0.84
440	4	4B	87	18	97	16	218	662	0.13	0.17	0.33
442	4	4A	357	52	163	41	613	807	0.44	0.25	0.76
442	4	4B	195	33	136	26	390	807	0.24	0.20	0.48
443	4	4A	171	36	102	15	324	386	0.44	0.30	0.84
443	4	4B	90	23	92	20	225	386	0.23	0.29	0.58
446	4	4A	135	11	59	12	217	344	0.39	0.21	0.63
446	4	4B	89	15	78	15	197	344	0.26	0.27	0.57
447	4	4A	137	23	79	17	256	674	0.20	0.14	0.38
447	4	4B	64	13	37	7	121	674	0.09	0.07	0.18
448	4	4A	179	32	148	19	378	448	0.40	0.37	0.84
448	4	4B	115	12	60	14	201	448	0.26	0.17	0.45
449	4	4A	293	24	225	20	562	626	0.47	0.39	0.90
449	4	4B	135	29	85	12	261	626	0.22	0.15	0.42
450	4	4A	125	9	54	5	193	816	0.15	0.07	0.24
450	4	4B	58	5	27	2	92	816	0.07	0.04	0.11
451	4	4A	169	23	99	17	308	686	0.25	0.17	0.45
451	4	4B	179	20	85	17	301	686	0.26	0.15	0.44
452	4	4A	127	16	93	11	247	637	0.20	0.16	0.39
452	4	4B	130	25	126	17	298	637	0.20	0.22	0.47
453	4	4A	173	18	105	9	305	729	0.24	0.16	0.42
453	4	4B	108	14	60	7	189	729	0.15	0.09	0.26
454	4	4A	257	41	177	28	503	840	0.31	0.24	0.60
454	4	4B	205	27	148	15	395	840	0.24	0.19	0.47
455	4	4A	23	6	19	6	54	96	0.24	0.26	0.56
455	4	4B	21	3	14	2	40	96	0.22	0.17	0.42
456	4	4A	220	46	179	41	486	712	0.31	0.31	0.68
456	4	4B	195	48	192	34	469	712	0.27	0.32	0.66
457	4	4A	183	16	104	24	327	667	0.27	0.19	0.49
457	4	4B	101	21	86	9	217	667	0.15	0.14	0.33
458	4	4A	166	29	72	17	284	715	0.23	0.12	0.40
458	4	4B	128	15	99	16	258	715	0.18	0.16	0.36
459	4	4A	284	31	99	27	441	975	0.29	0.13	0.45
459	4	4B	136	21	114	22	293	975	0.14	0.14	0.30
461	4	4A	250	71	200	51	572	480	0.52	0.52	1.19
461	4	4B	146	57	245	60	508	480	0.30	0.64	1.06
462	4	4A	302	83	223	44	652	506	0.60	0.53	1.29
462	4	4B	194	87	275	53	609	506	0.38	0.65	1.20
463	4	4A	151	22	102	19	294	452	0.33	0.27	0.65
463	4	4B	81	29	65	14	189	452	0.18	0.17	0.42
464	4	4A	135	33	110	10	288	377	0.36	0.32	0.76

Table 3. (Continued).

Permit Area	Zone	Season	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
464	4	4B	109	43	131	32	315	377	0.29	0.43	0.84
465	4	4A	102	24	74	16	216	389	0.26	0.23	0.56
465	4	4B	108	42	119	22	291	389	0.28	0.36	0.75
466	4	4A	273	59	194	35	561	930	0.29	0.25	0.60
466	4	4B	203	52	262	55	572	930	0.22	0.34	0.62
467	4	4A	226	58	213	29	526	774	0.29	0.31	0.68
467	4	4B	243	79	307	58	687	774	0.31	0.47	0.89
901			3	3	4	2	12				
902			62	49	116	47	274				
903			7	2	11	4	24				
904			2	1	5	0	8				
905			0	0	3	0	3				
906			7	2	7	2	18				
907			0	3	1	1	5				
908			0	4	8	3	15				
909			0	5	4	2	11				
910			0	3	5	5	13				
911			18	30	47	21	116				
912			1	0	0	0	1				
913			7	3	9	3	22				
914			0	0	5	1	6				
915			0	1	6	2	9				
916			31	22	42	27	122				
917			0	1	1	1	3				
918			1	0	4	2	7				
919			8	2	5	2	17				
920			0	2	4	3	9				
921			11	25	36	21	93				
922			9	9	22	9	49				
923			19	11	30	16	76				
924			0	3	8	0	11				
925			0	3	2	1	6				
926			11	1	22	8	42				
927			6	3	9	5	23				
928			0	4	16	4	24				
929			0	1	11	2	14				
930			4	9	25	1	39				
TOTAL			**95,695**	**28,246**	**84,803**	**22,932**	**231,676**				

Table 4a. Firearm Bonus Permit Harvest by Permit Area, 2006. Managed Permit Areas

Permit Area	A or B Season	Zone	Fawn Male	Adult Female	Fawn Female	Total
104		1	83	386	76	545
107		1	160	595	99	854
114		1	7	27	5	39
115		1	132	594	119	845
122		1	32	114	23	169
126		1	16	131	7	154
154		1	196	635	199	1,030
167		1	40	188	63	291
168		1	126	458	98	682
170		1	317	964	235	1,516
172		1	262	784	223	1,269
174		1	154	410	128	692
175		1	175	604	146	925
178		1	224	735	151	1,110
197		1	82	323	79	484
201		2	11	26	11	48
215		2	90	229	72	391
218		2	58	139	51	248
219		2	42	76	30	148
223		2	50	115	39	204
224		2	11	58	14	83
235		2	10	29	10	49
247		2	98	282	109	489
249		2	200	429	119	748
251		2	10	36	13	59
297		2	20	53	19	92
298		2	65	186	66	317

Permit Area	A or B Season	Zone	Fawn Male	Adult Female	Fawn Female	Total
338	3B	3	16	30	10	56
339	3B	3	16	28	20	64
343	3A	3	30	107	19	156
345	3A	4	19	55	14	88
347	3A	4	21	87	15	123
348	3A	4	32	159	32	223
412	4A	4	16	48	14	78
412	4B	4	10	41	14	65
420	4A	4	17	34	13	64
420	4B	4	11	32	10	53
421	4A	4	5	21	10	36
421	4B	4	3	6	4	13
452	4A	4	4	24	0	28
452	4B	4	7	28	6	41
456	4A	4	8	37	6	51
456	4B	4	8	30	5	43
461	4A	4	5	36	9	50
461	4B	4	5	40	15	60
462	4A	4	17	59	12	88
462	4B	4	18	50	12	80
464	4A	4	4	13	1	18
464	4B	4	7	25	5	37
465	4A	4	4	16	4	24
465	4B	4	7	33	5	45
466	4A	4	11	28	4	43
466	4B	4	17	53	13	83
Total			**2,989**	**9,726**	**2,476**	**15,191**

Table 4b. Firearm Bonus Permit Harvest by Permit Area, 2006. Intensive Permit Areas

Permit Area	A or B Season	Zone	Fawn Male	Adult Female	Fawn Female	Total
105		1	201	720	179	1,100
110		1	126	382	113	621
111		1	146	499	117	762
156		1	278	790	230	1,298
157		1	471	1,328	443	2,242
159		1	184	523	153	860
180		1	132	565	74	771
181		1	253	752	210	1,215
182		1	34	102	16	152
183		1	219	710	174	1,103
184		1	672	1,879	667	3,218
202		2	31	107	26	164
204		2	77	229	54	360
206		2	77	254	66	397
207		2	66	167	37	270
208		2	41	143	36	220
209		2	80	260	104	444
210		2	160	387	133	680
213		2	219	544	215	978
214		2	278	612	227	1,117
221		2	159	372	175	706
222		2	155	311	131	597
225		2	186	514	163	863
227		2	110	262	82	454
228		2	26	71	18	115
229		2	32	74	23	129
236		2	69	247	60	376
239		2	245	705	249	1,199
240		2	283	752	307	1,342
241		2	250	623	247	1,120
242		2	112	271	98	481
243		2	230	514	136	880
244		2	373	965	415	1,753
245		2	340	821	298	1,459
246		2	374	918	368	1,660
248		2	64	133	53	250
252		2	37	121	26	184
253		3	51	217	56	324
254		3	54	189	70	313
255		3	106	330	88	524
256		3	90	345	80	515
257		3	69	213	79	361
258		3	98	265	74	437
259		3	66	171	58	295
287		3	21	59	17	97
337	3A	3	27	78	21	126
337	3B	4	11	57	15	83
341	3B	4	82	232	72	386
342	3B	4	57	209	76	342
343	3B	4	111	256	74	441
345	3B	4	51	150	53	254
346	3A	4	44	170	44	258
346	3B	4	116	295	94	505
347	3B	4	79	262	59	400
348	3B	4	58	252	61	371
349	3A	4	73	294	79	446
349	3B	4	155	522	146	823
467	4A	4	22	46	8	76
467	4B	4	18	92	16	126
Total			**8,249**	**23,331**	**7,463**	**39,043**

Table 5. Multi-Zone Buck Harvest by Permit Area, 2006.

Zone 1		Zone 2		Zone 3		Zone 4	
Permit Area	Adult Male	Permit Area	Adult Male	Permit Area	Adult Male	Permit Area	Adult Male
104	21	201	2	337	18	412	99
105	25	202	2	338	7	416	78
107	14	203	2	339	11	417	139
110	7	204	10	341	8	420	70
111	42	206	21	342	13	421	26
114	1	207	5	343	14	422	52
115	25	208	9	344	12	423	32
116	1	209	12	345	2	424	42
122	4	210	41	346	7	425	28
126	6	213	66	347	9	426	31
127	3	214	28	348	5	427	47
152	6	215	54	349	6	428	42
154	27	218	20	**Zone 3 Total**	**112**	431	21
156	18	219	24			433	65
157	52	221	15			435	58
159	22	222	30			440	51
167	21	223	12			442	76
168	15	224	3			443	39
170	44	225	36			446	27
172	49	227	24			447	37
174	17	228	14			448	82
175	13	229	14			449	45
178	21	235	4			450	31
180	11	236	20			451	73
181	14	239	58			452	44
182	6	240	45			453	34
183	20	241	35			454	63
184	99	242	15			455	7
197	21	243	23			456	78
Zone 1 Total	**625**	244	30			457	45
		245	46			458	38
		246	44			459	50
		247	18			461	80
		248	5			462	85
		249	14			463	43
		251	1			464	46
		252	7			465	32
		253	10			466	84
		254	4			467	90
		255	14			**Zone 4 Total**	**2,110**
		256	18				
		257	15				
		258	22				
		259	6				
		287	7				
		297	7				
		298	14				
		Zone 2 Total	**926**				

Grand Total	**3,773**

Table 6. Summary of Firearms Special Hunts, 2006. Includes regular, youth, all-season licenses, and bonus permits.

				Harvest				
Area	**Dates**	**Zone**	**Permits Issued**	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
901 - Rice Lake Nat. Wildlife Refuge	11/11 - 11/19	1A	100*	3	3	4	2	12
902 - St. Croix State Park[1]	11/11 - 11/14	1A	550**	62	49	116	47	274
903 - Savanna Portage SP[1]	11/11 - 11/19	1A	55***	7	2	11	4	24
904 - Gooseberry Falls SP[1]	11/4 - 11/19	1A	30*	2	1	5	0	8
905 - Split Rock Lighthouse SP[1]	11/4 - 11/19	1A	30*	0	0	3	0	3
906 - Tettegouche State Park[1]	11/4 - 11/19	1A	125*	7	2	7	2	18
907 - Scenic State Park[1]	11/4 - 11/19	1A	30*	0	3	1	1	5
908 - Hayes Lake State Park[1]	11/4 - 11/19	1A	60#	0	4	8	3	15
909 - Lake Bemidji State Park[1]	11/4 - 11/7	1A	35#	0	5	4	2	11
910 - Zippel Bay State Park[1]	11/4 - 11/19	1A	55#	0	3	5	5	13
911 - Wild River State Park[1]	11/4 - 11/7	2A	150**	18	30	47	21	116
912 - Old Mill State Park[1]	11/4 - 11/7	2A	7#	1	0	0	0	1
913 - William O'Brien State Park[1]	11/4 - 11/5	2A	65*	7	3	9	3	22
914 - Lake Bronson State Park [1]	11/4 – 11/12	2A	25#	0	0	5	1	6
915 – Buffalo River State Park [1]	11/4-11/5	2A	12#	0	1	6	2	9
916 – Maplewood State Park [1]	11/4 - 11/12	2A	100**	31	22	42	27	122
917 – Rydell NWR [1]	11/4 - 11/12	2A	5#	0	1	1	1	3
918 – Lake Alexander SNA [1]	11/4 - 11/12	2A	40*	1	0	4	2	7
919 – Beaver Creek Valley SP [1]	11/4 - 11/5	3A	20*	8	2	5	2	17
920 - Zumbro Falls SNA [1]	11/4 - 11/10	3A	12#	0	2	4	3	9
921 – Forestville/Mystery Cave SP[1]	11/18 - 11/20 11/24 – 11/26	3B	110***	11	25	36	21	93
922 - Frontenac SP[1]	11/18 - 11/20	3B	50**	9	9	22	9	49
923 – Great River Bluffs SP [1]	11/18 - 11/20 11/24 – 11/26	3B	100**	19	11	30	16	76
924 – Zumbro Falls SNA [1]	11/18 - 11/26	3B	12#	0	3	8	0	11
925 - Kellogg - Weaver Dunes SNA[1]	11/18 - 11/26	3B	15#	0	3	2	1	6
926 – Elm Creek Park Reserve[1]	11/18 - 11/19	3B	145*	33	10	39	18	100
927 – Lake Rebecca Park Reserve [1]	11/25 – 11/26	3B	75*	13	5	9	9	36
928 - Whitewater Refuge	11/18 – 11/26	3B	75#	0	4	16	4	24
927 - Glacial Lakes State Park [1]	11/11 - 11/14	4B	30#	0	1	11	2	14
930 – Lake Louise SP [1]	11/11 – 11/12	4B	25**	4	9	25	1	39
TOTAL				236	213	485	209	1,143

[1] Bonus permits available *Either sex ** Earn –A-Buck ***Antler Point Restriction # Antlerless Only

Table 7. Free Landowner Firearms Harvest by Permit Area, 2006.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
104	3	10	4	17
105	3	5	1	9
107	1	0	0	1
110	1	8	2	11
111	1	4	1	6
122	0	1	1	2
154	0	2	1	3
156	2	2	0	4
157	11	27	8	46
159	0	5	1	6
167	0	2	0	2
170	1	9	5	15
172	1	3	0	4
174	2	1	0	3
175	2	7	1	10
178	1	5	1	7
180	0	2	0	2
181	1	3	2	6
182	0	3	1	4
183	0	1	1	2
184	9	31	10	50
197	0	3	1	4
201	0	1	0	1
202	1	3	0	4
204	2	5	2	9
206	1	2	1	4
207	0	8	0	8
208	2	4	1	7
209	2	5	1	8
210	3	12	3	18
213	11	34	12	57
214	14	58	27	99
215	23	19	14	56
218	1	3	4	8
219	3	4	0	7
221	7	27	7	41
222	1	10	2	13
223	1	1	0	2
225	2	11	7	20
227	3	2	0	5
228	2	0	0	2
229	1	2	1	4
236	3	1	0	4
239	11	21	6	38
240	8	22	10	40
241	11	22	5	38
242	0	0	2	2
243	5	19	3	27
244	9	21	8	38
245	3	6	1	10
246	5	15	4	24
247	0	4	1	5
248	2	5	3	10
249	10	27	13	50
252	0	2	0	2
253	4	16	1	21
254	0	2	3	5
255	3	11	1	15
256	0	10	4	14
257	8	10	3	21
258	3	13	7	23
259	5	9	1	15
297	2	1	1	4
298	2	6	2	10
337	1	0	0	1
338	0	0	2	2
339	0	3	0	3
341	11	19	8	38
342	10	21	6	37
343	5	14	7	26
345	4	18	4	26
346	14	29	5	48
347	2	13	4	19
348	3	16	5	24
349	9	46	9	64
412	1	5	2	8
420	3	9	5	17
421	0	3	0	3
452	0	6	1	7
456	1	4	2	7
461	3	9	2	14
462	3	4	1	8
465	1	1	1	3
466	1	6	2	9
467	1	6	6	13
TOTAL	286	820	274	1,380

Table 8. Archery Harvest by Permit Area, 2006. Includes regular, youth, all-season, and bonus permits.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	31	7	46	5	89
105	31	13	104	10	158
107	37	4	62	8	111
110	11	5	42	11	69
111	21	8	60	8	97
114	11	0	13	0	24
115	36	12	76	8	132
116	4	2	10	0	16
122	11	1	22	3	37
126	11	1	29	1	42
127	4	1	5	0	10
152	4	2	5	2	13
154	82	19	118	29	248
156	50	24	158	34	266
157	136	65	317	48	566
159	66	27	147	17	257
167	8	4	23	4	39
168	44	11	95	6	156
170	112	29	228	30	399
172	70	30	152	22	274
174	27	19	74	10	130
175	52	15	83	15	165
178	78	28	129	23	258
180	104	28	142	31	305
181	151	32	219	26	428
182	158	69	452	99	778
183	51	23	126	22	222
184	151	91	446	86	774
197	20	11	51	6	88
199	2	0	5	1	8
201	0	0	4	1	5
202	4	2	6	4	16
203	2	0	0	0	2
204	12	5	29	3	49
206	16	5	40	9	70
207	13	3	14	2	32
208	9	2	14	0	25
209	25	10	52	7	94
210	24	14	51	10	99
213	155	64	326	34	579
214	60	43	187	35	325
215	84	33	165	37	319
218	88	30	137	40	295
219	78	23	110	28	239
221	70	45	167	48	330
222	61	26	158	20	265
223	90	37	137	29	293
224	12	6	18	2	38
225	120	57	222	40	439
227	181	91	309	64	645
228	306	107	384	74	871
229	56	27	95	21	199
235	19	5	22	2	48
236	234	86	371	69	760
239	66	37	170	25	298
240	76	36	220	43	375
241	47	36	204	47	334
242	71	67	250	57	445
243	47	31	152	36	266
244	61	60	214	45	380
245	96	55	228	48	427
246	73	55	205	31	364
247	74	31	141	15	261
248	49	28	72	19	168
249	82	29	117	27	255
251	2	3	4	1	10
252	13	2	30	8	53
253	28	12	63	12	115
254	12	3	31	6	52
255	23	11	48	4	86
256	16	12	45	2	75
257	14	9	39	4	66
258	31	9	64	10	114
259	11	6	24	6	47
287	2	1	2	0	5
297	7	3	12	3	25
298	7	6	25	3	41
337	250	87	391	68	796
338	60	12	81	7	160
339	69	14	52	14	149
341	137	53	225	36	451
342	103	31	143	32	309
343	227	75	406	51	759
344	48	6	40	10	104
345	81	30	154	37	302
346	141	50	243	50	484
347	97	33	187	31	348
348	81	23	159	42	305
349	173	53	288	55	569
412	23	12	51	8	94
416	29	11	35	5	80
417	112	34	170	28	344
420	27	9	51	4	91
421	17	5	17	3	42
422	12	4	13	1	30
423	10	2	15	1	28
424	8	5	20	4	37
425	6	1	13	0	20
426	27	2	19	0	48
427	19	3	27	4	53
428	56	17	62	9	144
431	11	4	35	2	52
433	42	13	43	10	108
435	23	12	26	3	64

Table 8. Continued

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
440	33	13	61	14	121
442	115	19	125	16	275
443	39	10	50	7	106
446	7	2	15	2	26
447	15	3	23	1	42
448	16	2	28	2	48
449	36	8	59	7	110
450	19	0	15	0	34
451	21	2	38	5	66
452	24	3	24	7	58
453	24	3	22	2	51
454	41	7	69	4	121
455	4	1	11	3	19

* Camp Ripley First Hunt
** Camp Ripley Second Hunt

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
456	44	11	55	2	112
457	24	4	34	4	66
458	28	2	36	3	69
459	38	9	60	8	115
461	41	12	96	2	151
462	70	22	113	14	219
463	27	1	23	3	54
464	25	6	33	10	74
465	41	9	53	9	112
466	41	12	61	5	119
467	66	22	141	15	244
953*	81	28	133	31	273
954**	86	26	107	27	246
Total	**7,096**	**2,682**	**13,268**	**2,314**	**25,360**

Table 9. Archery Harvest using Bonus Permits by Permit Area, 2006.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
104	0	18	3	21
105	6	50	4	60
107	0	20	3	23
110	2	22	7	31
111	3	26	4	33
114	0	5	0	5
115	8	34	4	46
122	0	5	3	8
126	0	11	1	12
154	6	50	13	69
156	15	92	16	123
157	42	192	27	261
159	15	93	7	115
167	1	6	2	9
168	6	22	3	31
170	7	79	11	97
172	6	68	8	82
174	8	28	2	38
175	5	34	12	51
178	8	52	8	68
180	13	90	20	123
181	17	136	18	171
182	54	375	82	511
183	11	78	13	102
184	50	274	59	383
197	0	20	1	21
201	0	2	0	2
202	2	2	2	6
204	4	12	2	18
206	1	17	5	23
207	2	9	1	12
208	1	8	0	9
209	4	35	1	40
210	8	24	8	40
213	25	108	8	141
214	13	94	13	120
215	9	46	11	66
218	13	36	13	62
219	12	34	10	56
221	22	64	30	116
222	14	80	13	107
223	14	60	10	84
224	2	11	1	14
225	30	137	27	194
227	54	175	43	272
228	77	297	60	434
229	19	56	13	88
235	3	11	1	15
236	62	274	54	390
239	16	64	11	91
240	16	84	17	117
241	15	71	23	109
242	43	161	42	246
243	13	58	17	88
244	30	114	25	169
245	30	130	24	184
246	21	106	18	145
247	9	61	7	77
248	14	40	10	64
249	14	43	14	71
251	1	3	0	4
252	2	20	3	25
253	7	41	12	60
254	1	13	4	18
255	6	27	2	35
256	3	29	1	33
257	6	20	2	28
258	5	28	5	38
259	4	11	4	19
287	1	0	0	1
297	1	3	0	4
298	2	12	0	14
337	58	291	55	404
338	7	39	4	50
339	8	22	7	37
341	36	164	28	228
342	20	91	24	135
343	53	287	32	372
345	24	104	23	151
346	38	184	44	266
347	23	122	20	165
348	17	109	31	157
349	36	197	44	277
412	5	10	4	19
420	5	20	1	26
421	2	6	0	8
452	1	9	4	14
456	7	16	2	25
461	1	37	1	39
462	8	40	6	54
464	1	13	3	17
465	2	31	3	36
466	8	22	2	32
467	9	81	5	95
TOTAL	**1,303**	**6,506**	**1,241**	**9,050**

Table 10. Summary of Archery Special Hunts, 2006. Includes regular, youth, and bonus permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
Camp Ripley	10/19-10/20	2,250	81	28	133	31	273
Camp Ripley	10/28-10/29	2,250	86	26	107	27	246
Cleary Lake	11/10-11/12	55	3	1	1	1	6
Crow-Hassan Park Reserve	11/10-11/12	130	6	2	12	2	22
Murphy-Hanrahan Park Reserve	11/10-11/12	185	12	6	5	4	27
City of New Ulm	10/14-12/31	50	No data				
City of Mankato	10/21-12/31	40	No data				
City of Red Wing	9/16-12/31	85**	4	6	26	1	37
Camp Ripley - Youth	10/6 - 10/8	150	5	2	6	0	13
Lake Alexander Preserve	10/6-10/8	20	0	1	1	0	2
Arden Hills - Site A	10/19-10/20	30	0	0	0	0	6
Arden Hills - Site B	10/21-10/22	30	0	0	0	0	5

*Total permits for this hunt was 50 and hunters could use either firearms or archery equipment.
**Total number of hunters. Permits were unlimited.

Table 11. Free Landowner Archery Harvest by Permit Area, 2006.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
104	0	1	0	1
110	0	1	0	1
154	0	1	0	1
181	0	1	0	1
184	0	1	0	1
209	0	1	0	1
213	1	1	0	2
214	0	1	0	1
215	0	1	0	1
218	0	1	0	1
221	0	1	0	1
223	0	1	0	1
239	0	1	0	1
243	0	2	0	2
244	0	1	0	1
245	0	1	0	1
246	0	1	0	1
248	0	0	1	1
249	0	2	0	2
341	0	1	1	2
342	0	1	0	1
343	3	5	3	11
345	0	0	1	1
462	0	1	0	1
TOTAL	4	28	6	38

Table 12. Muzzleloader Harvest by Permit Area, 2006. Includes regular muzzleloader, youth, and bonus permits.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	11	6	43	7	67
105	26	6	55	12	99
107	16	11	48	10	85
110	13	9	24	2	48
111	25	4	38	6	73
115	38	16	82	15	151
122	2	0	12	0	14
127	2	0	0	0	2
152	4	2	6	8	20
154	13	10	44	11	78
156	19	6	71	12	108
157	27	32	91	21	171
159	23	9	43	8	83
167	6	2	17	9	34
168	18	8	78	8	112
170	28	24	68	16	136
172	14	15	92	21	142
174	14	11	39	7	71
175	19	6	37	5	67
178	17	17	62	10	106
180	17	11	55	8	91
181	12	9	50	9	80
182	5	3	12	2	22
183	12	8	37	7	64
184	59	35	159	42	295
197	14	8	13	6	41
199	1	2	2	1	6
201	0	0	2	0	2
202	7	4	9	2	22
203	2	0	0	0	2
204	25	9	46	10	90
206	29	8	39	11	87
207	20	5	32	7	64
208	10	1	19	1	31
209	13	1	32	2	48
210	26	18	40	8	92
213	52	34	129	23	238
214	24	21	79	25	149
215	30	25	70	18	143
218	31	30	64	16	141
219	39	21	58	17	135
221	23	17	64	16	120
222	24	18	56	9	107
223	29	8	41	12	90
224	1	1	2	0	4
225	33	16	83	10	142
227	33	19	64	16	132
228	5	2	16	5	28
229	12	7	17	8	44
235	1	2	6	1	10
236	28	25	65	9	127
239	43	30	87	21	181
240	36	36	71	26	169
241	23	29	93	29	174
242	21	18	58	15	112
243	17	19	64	21	121
244	52	46	123	47	268
245	54	42	130	45	271
246	35	32	90	27	184
247	30	18	57	16	121
248	18	9	25	10	62
249	24	16	43	17	100
251	0	0	5	1	6
252	27	20	44	6	97
253	36	13	60	21	130
254	25	9	43	10	87
255	36	17	45	8	106
256	19	10	45	5	79
257	21	3	25	1	50
258	31	11	66	18	126
259	14	6	40	6	66
287	0	0	2	0	2
297	7	6	21	12	46
298	15	5	35	3	58
337	9	5	20	4	38
338	13	13	30	5	61
339	6	4	21	3	34
341	34	28	76	20	158
342	55	27	142	35	259
343	33	28	128	23	212
344	21	18	45	12	96
345	17	18	67	14	116
346	26	26	96	19	167
347	35	22	141	20	218
348	30	27	96	24	177
349	54	46	162	24	286
412	23	9	50	3	85
416	32	21	90	14	157
417	73	42	174	20	309
420	30	9	47	3	89
421	16	4	16	5	41
422	13	4	26	5	48
423	16	2	13	2	33
424	22	15	62	13	112
425	12	6	21	3	42
426	10	11	35	6	62
427	15	9	39	6	69
428	17	12	59	11	99
431	23	16	56	15	110
433	46	28	119	36	229
435	31	9	67	15	122
440	33	20	78	19	150

Table 12. (continued)

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
440	33	20	78	19	150
442	57	32	129	24	242
443	26	26	77	20	149
446	18	18	54	12	102
447	17	6	31	4	58
448	22	11	54	12	99
449	41	22	124	14	201
451	49	22	102	23	196
452	20	5	47	2	74
453	36	19	74	14	143
454	76	23	155	20	274
455	8	4	18	3	33
456	33	6	102	5	146
457	18	15	55	9	97
458	20	14	54	12	100
459	49	30	138	17	234
461	17	21	75	16	129
462	25	29	79	17	150
463	12	11	29	5	57
464	13	5	28	2	48
465	15	12	39	9	75
466	19	29	89	17	154
467	36	21	93	21	171
TOTAL	**2,923**	**1,823**	**7,247**	**1,514**	**13,507**

Table 13. Muzzleloader Harvest using Bonus Permits by Permit Area, 2006.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
104	0	1	1	2
105	0	14	3	17
110	3	6	1	10
111	1	7	0	8
115	1	6	1	8
154	3	1	2	6
156	2	14	2	18
157	12	14	7	33
159	2	7	2	11
167	0	0	2	2
168	0	6	0	6
170	3	6	0	9
172	1	9	1	11
174	0	1	2	3
178	1	1	1	3
180	1	8	3	12
181	2	8	2	12
182	1	2	1	4
183	0	7	2	9
184	8	38	6	52
197	1	2	0	3
202	0	1	0	1
204	1	12	5	18
206	2	9	5	16
207	3	6	1	10
208	0	2	0	2
209	0	1	0	1
210	3	9	2	14
213	3	20	3	26
214	4	16	3	23
215	2	0	4	6
218	1	6	0	7
219	2	3	0	5
221	3	10	1	14
222	3	10	1	14
223	1	3	0	4
224	0	1	0	1
225	6	20	5	31
227	6	13	3	22
228	1	5	2	8
229	1	3	3	7
236	7	11	2	20
239	5	17	6	28
240	4	5	7	16
241	9	26	9	44
242	6	12	8	26
243	3	16	6	25
244	10	27	11	48
245	13	34	10	57
246	7	24	9	40
247	1	9	1	11
248	2	5	2	9
249	3	2	1	6
252	2	8	0	10
253	0	19	7	26
254	3	6	2	11
255	3	16	0	19
256	1	6	2	9
257	1	6	0	7
258	3	13	7	23
259	2	13	0	15
297	3	2	2	7
298	0	5	0	5
337	1	6	2	9
338	2	1	1	4
339	0	3	0	3
341	8	14	6	28
342	8	39	11	58
343	5	26	5	36
345	1	16	4	21
346	5	18	4	27
347	6	27	3	36
348	8	27	4	39
349	6	49	8	63
412	2	4	0	6
420	1	1	0	2
421	0	1	0	1
452	0	6	1	7
456	1	6	0	7
461	2	5	2	9
462	5	5	3	13
464	1	2	0	3
465	0	4	0	4
466	3	7	1	11
467	7	25	5	37
TOTAL	**244**	**882**	**229**	**1,355**

Table 14. Summary of Muzzleloader Special Hunts, 2006. Includes regular, youth, all-season, and bonus permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
931 - Jay Cooke SP[1]	11/25 - 11/29	120*	26	7	35	7	75
932 - Crow Wing SP[1]	12/1 - 12/3	40*	4	3	12	5	24
933 - Lake Shetek SP[1]	12/2 - 12/5	25**	0	5	14	3	22
934 - Sibley SP	12/2 - 12/3	40**	0	3	6	4	13
935 – Rice Lake SP[1]	11/25 - 11/27	15**	0	1	4	5	10
936 - Interstate SP [1]	11/25 - 11/29	10**	0	0	1	1	2
TOTAL			30	29	72	25	146

[1]Bonus permits available *Either Sex **Antlerless Only

Table 15. Free Landowner Muzzleloader Harvest by Permit Area, 2006.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
105	0	1	0	1
157	0	1	0	1
170	0	1	0	1
181	0	1	0	1
208	0	1	0	1
210	0	0	1	1
213	0	1	0	1
215	0	1	0	1
221	0	1	0	1
241	0	1	2	3
243	0	1	0	1
244	0	1	0	1
256	0	1	0	1
343	1	0	0	1
346	0	2	0	2
347	1	0	1	2
349	1	2	1	4
462	0	1	0	1
467	0	1	0	1
Total	**3**	**18**	**5**	**26**

Table 16. Firearms All-Season Deer Harvest by Permit Area, 2006.

Zone 1					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	105	28	165	21	319
105	96	41	204	48	389
107	152	37	196	33	418
110	68	29	121	31	249
111	131	54	198	49	432
114	5	3	4	0	12
115	194	61	204	55	514
116	7	2	9	1	19
122	40	13	38	2	93
126	38	8	39	8	93
127	5	1	6	0	12
152	20	7	13	7	47
154	132	71	275	71	549
156	115	62	216	46	439
157	208	144	390	125	867
159	99	37	145	28	309
167	81	25	117	37	260
168	147	47	212	50	456
170	254	97	383	93	827
172	207	125	356	101	789
174	104	44	134	31	313
175	109	45	169	31	354
178	132	64	187	42	425
180	97	21	95	15	228
181	125	59	156	39	379
182	23	8	18	2	51
183	115	38	166	37	356
184	382	214	684	211	1491
197	126	45	184	42	397
199	7	0	2	0	9
Zone 1	**3,324**	**1,430**	**5,086**	**1,256**	**11,096**

Zone 3					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
337	51	7	40	16	114
338	37	6	20	3	66
339	33	4	13	0	50
341	72	9	41	8	130
342	83	14	26	8	131
343	69	22	80	11	182
344	48	5	24	3	80
345	58	12	36	9	115
346	92	28	89	19	228
347	84	25	109	19	237
348	96	20	94	14	224
349	133	27	117	16	293
Zone 3 Total	**856**	**179**	**689**	**126**	**1,850**

Zone 2					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
201	10	4	11	4	29
202	20	11	43	11	85
203	9	1	6	0	16
204	55	29	122	23	229
206	54	32	111	26	223
207	30	21	65	13	129
208	24	16	63	13	116
209	66	33	100	29	228
210	104	41	163	44	352
213	269	212	538	155	1174
214	215	197	445	143	1000
215	150	101	322	122	695
218	127	99	273	86	585
219	190	77	181	47	495
221	134	104	249	86	573
222	119	66	191	53	429
223	65	31	94	28	218
224	16	7	27	9	59
225	160	64	180	43	447
227	99	50	127	41	317
228	40	7	41	9	97
229	32	22	63	11	128
235	7	3	5	6	21
236	77	19	83	24	203
239	238	169	469	139	1015
240	246	173	489	171	1079
241	198	144	396	108	846
242	64	33	112	22	231
243	137	104	260	77	578
244	238	184	378	160	960
245	225	147	428	128	928
246	218	174	439	132	963
247	96	54	149	38	337
248	55	27	99	35	216
249	127	78	241	84	530
251	22	11	13	4	50
252	43	9	45	5	102
253	49	21	92	15	177
254	37	20	80	12	149
255	60	27	134	39	260
256	62	39	130	20	251
257	54	19	80	23	176
258	84	60	202	59	405
259	55	39	105	28	227
287	13	3	22	2	40
297	28	14	44	10	96
298	98	34	116	45	293
Zone 2 Total	**4,519**	**2,830**	**8,026**	**2,382**	**17,757**

Table 16. (Continued).

Zone 4					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
412	106	42	173	48	369
416	144	19	66	13	242
417	302	48	187	42	579
420	69	48	134	37	288
421	42	19	71	22	154
422	52	3	18	4	77
423	29	5	22	9	65
424	75	7	23	3	108
425	38	5	13	3	59
426	68	9	34	4	115
427	59	2	11	3	75
428	91	10	53	11	165
431	40	3	18	2	63
433	113	16	77	23	229
435	97	13	51	10	171
440	95	12	96	7	210
442	175	24	86	19	304
443	76	17	55	4	152
446	62	7	26	3	98
447	41	4	21	7	73
448	58	10	46	3	117
449	126	18	88	6	238
450	47	1	18	4	70
451	89	9	40	8	146
452	48	11	77	7	143
453	88	6	45	4	143
454	116	17	91	10	234
455	20	0	13	1	34
456	111	43	160	43	357
457	74	10	45	6	135
458	57	14	26	4	101
459	122	12	55	9	198
461	107	69	218	51	445
462	177	81	250	43	551
463	71	14	54	12	151
464	89	41	122	22	274
465	75	37	84	18	214
466	136	48	218	34	436
467	143	64	230	33	470
Zone 4 Total	**3,528**	**818**	**3,115**	**592**	**8,053**

Special Hunts					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
901	1	0	1	0	2
902	19	12	31	8	70
903	3	1	4	1	9
906	1	1	0	0	2
907	0	1	0	1	2
908	0	1	1	0	2
909	0	1	1	0	2
910	0	1	0	0	1
911	11	6	17	6	40
913	1	0	1	0	2
914	0	0	1	0	1
915	0	0	4	0	4
916	14	9	17	13	53
918	1	0	1	0	2
919	2	0	1	0	3
929	0	0	7	0	7
930	4	6	13	0	23
956	0	0	1	0	1
959	0	0	1	0	1
Special Hunts Total	**57**	**39**	**102**	**29**	**227**

GRAND TOTAL	**12,284**	**5,296**	**17,018**	**4,385**	**38,983**

Table 17. Archery All-Season Deer Harvest by Permit Area, 2006.

Zone 1					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	10	4	18	2	34
105	11	4	39	3	57
107	12	0	27	2	41
110	6	3	16	3	28
111	11	4	22	3	40
114	3	0	6	0	9
115	13	2	23	2	40
116	1	0	2	0	3
122	2	0	8	0	10
126	1	0	13	0	14
127	1	0	2	0	3
152	1	2	0	0	3
154	25	6	35	9	75
156	9	3	37	14	63
157	28	12	76	12	128
159	7	7	28	7	49
167	3	0	11	0	14
168	17	1	40	2	60
170	31	10	112	12	165
172	21	16	62	8	107
174	3	5	29	4	41
175	12	1	20	1	34
178	20	8	39	7	74
180	17	10	32	7	66
181	20	9	49	5	83
182	15	7	43	10	75
183	12	6	25	4	47
184	39	27	130	14	210
197	7	5	19	5	36
199	1	0	2	1	4
Zone 1 Total	**359**	**152**	**965**	**137**	**1,613**

Zone 3					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
337	40	18	54	7	119
338	13	3	30	3	49
339	10	4	17	6	37
341	20	6	34	4	64
342	17	6	34	6	63
343	38	10	85	9	142
344	11	0	20	3	34
345	18	3	43	10	74
346	25	4	49	5	83
347	20	4	57	9	90
348	14	3	40	7	64
349	30	8	73	7	118
Zone 3 Total	**256**	**69**	**536**	**76**	**937**

Zone 2					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
201	0	0	0	1	1
202	1	0	4	2	7
204	4	1	12	1	18
206	8	2	15	0	25
207	8	1	2	1	12
208	5	1	6	0	12
209	10	1	11	2	24
210	4	1	20	2	27
213	40	20	151	20	231
214	19	23	83	16	141
215	37	17	98	23	175
218	35	11	82	18	146
219	48	9	64	13	134
221	18	19	89	15	141
222	20	8	61	7	96
223	24	19	49	13	105
224	1	2	3	1	7
225	16	20	57	9	102
227	40	23	96	12	171
228	34	15	49	8	106
229	17	7	29	3	56
235	2	0	3	0	5
236	30	13	59	9	111
239	32	19	97	11	159
240	36	16	124	19	195
241	23	17	120	16	176
242	19	12	61	7	99
243	18	15	76	14	123
244	20	24	84	17	145
245	29	21	83	18	151
246	23	25	77	10	135
247	17	15	51	5	88
248	17	7	24	6	54
249	22	10	46	11	89
251	0	1	1	0	2
252	4	0	9	4	17
253	8	3	21	0	32
254	5	0	16	2	23
255	5	3	14	2	24
256	3	6	13	1	23
257	4	2	19	2	27
258	11	4	30	4	49
259	5	2	12	2	21
287	1	0	2	0	3
297	4	1	8	3	16
298	4	3	11	3	21
Zone 2 Total	**731**	**419**	**2,042**	**333**	**3,525**

Table 17. (Continued).

Zone 4					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
412	11	7	33	2	53
416	17	8	29	4	58
417	63	29	141	19	252
420	13	4	24	3	44
421	3	3	9	3	18
422	4	4	9	0	17
423	7	0	9	1	17
424	4	2	16	2	24
425	4	1	9	0	14
426	17	2	16	0	35
427	10	3	22	3	38
428	35	10	53	5	103
431	7	2	21	0	30
433	25	11	39	8	83
435	7	7	19	1	34
440	23	8	43	10	84
442	59	14	106	12	191
443	26	8	41	6	81
446	5	1	9	2	17
447	8	3	22	1	34
448	10	2	26	2	40
449	16	6	43	5	70
450	11	0	12	0	23
451	12	0	32	5	49

Zone 4					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
452	9	1	13	2	25
453	7	3	18	2	30
454	17	5	65	4	91
455	1	1	9	3	14
456	16	3	33	0	52
457	14	3	27	4	48
458	11	2	22	2	37
459	25	7	47	5	84
461	15	6	50	1	72
462	25	11	61	7	104
463	13	0	15	3	31
464	10	4	18	3	35
465	18	5	14	2	39
466	19	2	28	2	51
467	23	8	50	6	87
Zone 4 Total	**620**	**196**	**1,253**	**140**	**2,209**

GRAND TOTAL	**1,966**	**836**	**4,796**	**686**	**8,284**

Table 18. Muzzleloader All-Season Deer Harvest by Permit Area, 2006.

Zone 1					
Permit Area	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
104	7	6	41	6	60
105	18	6	38	8	70
107	16	11	48	10	85
110	12	6	16	1	35
111	20	2	30	6	58
115	31	14	74	13	132
122	2	0	9	0	11
127	1	0	0	0	1
152	4	1	5	8	18
154	11	6	39	9	65
156	14	4	49	9	76
157	24	19	69	14	126
159	18	7	30	5	60
167	6	2	15	7	30
168	17	7	68	8	100
170	25	20	57	16	118
172	13	14	74	17	118
174	12	10	34	4	60
175	16	6	34	5	61
178	16	13	61	8	98
180	14	7	44	4	69
181	11	6	39	7	63
182	3	2	9	1	15
183	11	7	25	4	47
184	54	25	110	35	224
197	14	6	11	6	37
199	1	2	2	1	6
Zone 1 Total	**391**	**209**	**1,031**	**212**	**1,843**

Zone 2					
Permit Area	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
201	0	0	2	0	2
202	5	4	8	2	19
203	2	0	0	0	2
204	21	6	31	5	63
206	22	6	29	6	63
207	19	2	26	6	53
208	10	1	16	1	28
209	10	1	31	2	44
210	20	11	27	4	62
213	48	30	105	20	203
214	24	16	62	19	121
215	29	20	67	14	130
218	27	28	55	16	126
219	35	19	55	16	125
221	23	12	49	15	99
222	22	14	43	8	87
223	24	6	37	10	77
224	1	0	1	0	2
225	25	8	59	5	97
227	28	13	45	12	98
228	4	1	10	3	18
229	9	6	13	3	31
235	1	2	4	1	8
236	22	17	49	6	94
239	40	24	63	15	142
240	31	31	64	18	144
241	20	17	61	17	115
242	16	10	43	7	76
243	17	14	46	14	91
244	47	34	93	35	209
245	46	26	90	33	195
246	32	24	62	16	134
247	25	16	44	12	97
248	18	6	20	8	52
249	21	10	38	14	83
251	0	0	5	1	6
252	22	17	29	4	72
253	25	12	37	14	88
254	21	6	34	6	67
255	23	13	27	7	70
256	13	8	37	3	61
257	14	2	18	1	35
258	28	8	50	11	97
259	14	4	26	6	50
287	0	0	1	0	1
297	6	2	18	8	34
298	15	4	28	3	50
Zone 2 Total	**925**	**511**	**1,758**	**427**	**3,621**

Zone 3					
Permit Area	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
337	7	4	11	2	24
338	9	11	22	4	46
339	6	2	16	3	27
341	17	16	58	11	102
342	17	14	75	17	123
343	25	20	91	16	152
344	15	17	38	9	79
345	13	17	48	10	88
346	23	19	71	15	128
347	26	14	108	15	163
348	22	15	58	17	112
349	37	34	103	15	189
Zone 3 Total	**217**	**183**	**699**	**134**	**1,233**

Table 18. (Continued).

Zone 4					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
412	17	7	42	3	69
416	30	19	86	14	149
417	64	40	159	18	281
420	23	8	46	3	80
421	16	4	15	5	40
422	13	3	25	5	46
423	13	2	13	2	30
424	18	12	56	10	96
425	11	6	20	3	40
426	7	9	29	5	50
427	15	9	36	5	65
428	16	11	54	11	92
431	20	15	47	12	94
433	39	23	114	28	204
435	26	9	64	14	113
440	27	14	69	18	128
442	42	27	114	22	205
443	21	22	70	16	129
446	18	16	50	10	94
447	11	4	29	4	48
448	18	10	47	12	87
449	35	19	114	14	182
450	13	6	40	3	62
451	37	17	90	18	162
452	9	3	33	0	45
453	28	15	63	12	118
454	56	20	130	15	221
455	8	4	18	2	32
456	27	5	87	2	121
457	18	14	47	9	88
458	9	12	35	10	66
459	30	18	96	14	158
461	15	15	63	12	105
462	18	22	68	14	122
463	9	10	28	5	52
464	10	4	24	2	40
465	12	12	31	8	63
466	14	20	72	14	120
467	18	13	61	14	106
Zone 4 Total	**831**	**499**	**2,285**	**388**	**4,003**

Special Hunts					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
931	20	5	24	4	53
932	3	1	6	4	14
933	0	1	5	0	6
934	0	0	4	1	5
935	0	0	1	2	3
936	0	0	0	1	1
Special Hunts Total	**23**	**7**	**40**	**12**	**82**

GRAND TOTAL	**2,387**	**1,409**	**5,813**	**1,173**	**10,782**

Table 19. Total All-Season Deer Harvest by Permit Area, 2006.

Zone 1					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	122	38	224	29	413
105	125	51	281	59	516
107	180	48	271	45	544
110	86	38	153	35	312
111	162	60	250	58	530
114	8	3	10	0	21
115	238	77	301	70	686
116	8	2	11	1	22
122	44	13	55	2	114
126	39	8	52	8	107
127	7	1	8	0	16
152	25	10	18	15	68
154	168	83	349	89	689
156	138	69	302	69	578
157	260	175	535	151	1,121
159	124	51	203	40	418
167	90	27	143	44	304
168	181	55	320	60	616
170	310	127	552	121	1,110
172	241	155	492	126	1,014
174	119	59	197	39	414
175	137	52	223	37	449
178	168	85	287	57	597
180	128	38	171	26	363
181	156	74	244	51	525
182	41	17	70	13	141
183	138	51	216	45	450
184	475	266	924	260	1,925
197	147	56	214	53	470
199	9	2	6	2	19
Zone 1 Total	**4,074**	**1,791**	**7,082**	**1,605**	**14,552**

Zone 3					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
337	98	29	105	25	257
338	59	20	72	10	161
339	49	10	46	9	114
341	109	31	133	23	296
342	117	34	135	31	317
343	132	52	256	36	476
344	74	22	82	15	193
345	89	32	127	29	277
346	140	51	209	39	439
347	130	43	274	43	490
348	132	38	192	38	400
349	200	69	293	38	600
Zone 3 Total	**1,329**	**431**	**1,924**	**336**	**4,020**

Zone 2					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
201	10	4	13	5	32
202	26	15	55	15	111
203	11	1	6	0	18
204	80	36	165	29	310
206	84	40	155	32	311
207	57	24	93	20	194
208	39	18	85	14	156
209	86	35	142	33	296
210	128	53	210	50	441
213	357	262	794	195	1,608
214	258	236	590	178	1,262
215	216	138	487	159	1,000
218	189	138	410	120	857
219	273	105	300	76	754
221	175	135	387	116	813
222	161	88	295	68	612
223	113	56	180	51	400
224	18	9	31	10	68
225	201	92	296	57	646
227	167	86	268	65	586
228	78	23	100	20	221
229	58	35	105	17	215
235	10	5	12	7	34
236	129	49	191	39	408
239	310	212	629	165	1,316
240	313	220	677	208	1,418
241	241	178	577	141	1,137
242	99	55	216	36	406
243	172	133	382	105	792
244	305	242	555	212	1,314
245	300	194	601	179	1,274
246	273	223	578	158	1,232
247	138	85	244	55	522
248	90	40	143	49	322
249	170	98	325	109	702
251	22	12	19	5	58
252	69	26	83	13	191
253	82	36	150	29	297
254	63	26	130	20	239
255	88	43	175	48	354
256	78	53	180	24	335
257	72	23	117	26	238
258	123	72	282	74	551
259	74	45	143	36	298
287	14	3	25	2	44
297	38	17	70	21	146
298	117	41	155	51	364
Zone 2 Total	**6,175**	**3,760**	**11,826**	**3,142**	**24,903**

Table 19. (Continued)

Zone 4					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
412	134	56	248	53	491
416	191	46	181	31	449
417	429	117	487	79	1,112
420	105	60	204	43	412
421	61	26	95	30	212
422	69	10	52	9	140
423	49	7	44	12	112
424	97	21	95	15	228
425	53	12	42	6	113
426	92	20	79	9	200
427	84	14	69	11	178
428	142	31	160	27	360
431	67	20	86	14	187
433	177	50	230	59	516
435	130	29	134	25	318
440	145	34	208	35	422
442	276	65	306	53	700
443	123	47	166	26	362
446	85	24	85	15	209
447	60	11	72	12	155
448	86	22	119	17	244
449	177	43	245	25	490
450	71	7	70	7	155
451	138	26	162	31	357
452	66	15	123	9	213
453	123	24	126	18	291
454	189	42	286	29	546
455	29	5	40	6	80
456	154	51	280	45	530
457	106	27	119	19	271
458	77	28	83	16	204
459	177	37	198	28	440
461	137	90	331	64	622
462	220	114	379	64	777
463	93	24	97	20	234
464	109	49	164	27	349
465	105	54	129	28	316
466	169	70	318	50	607
467	184	85	341	53	663
Zone 4 Total	**4,979**	**1,513**	**6,653**	**1,120**	**14,265**

Special Hunts					
Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
901	1	0	1	0	2
902	19	12	31	8	70
903	3	1	4	1	9
906	1	1	0	0	2
907	0	1	0	1	2
908	0	1	1	0	2
909	0	1	1	0	2
910	0	1	0	0	1
911	11	6	17	6	40
913	1	0	1	0	2
914	0	0	1	0	1
915	0	0	4	0	4
916	14	9	17	13	53
918	1	0	1	0	2
919	2	0	1	0	3
929	0	0	7	0	7
930	4	6	13	0	23
931	20	5	24	4	53
932	3	1	6	4	14
933	0	1	5	0	6
934	0	0	4	1	5
935	0	0	1	2	3
936	0	0	0	1	1
950	1	0	2	0	3
953	36	7	56	12	111
954	41	5	44	8	98
956	0	0	1	0	1
959	0	0	1	0	1
Special Hunts Total	**158**	**58**	**244**	**61**	**521**

GRAND TOTAL	**16,715**	**7,553**	**27,729**	**6,264**	**58,261**

Table 20. Total Deer Harvest by Permit Area, 2006.
Includes all license types, permits, and special hunts.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
104	1,176	216	1,044	195	2,631
105	1,122	351	1,400	323	3,196
107	1,725	357	1,479	264	3,825
110	658	245	799	208	1,910
111	1,149	270	1,147	246	2,812
114	95	21	52	6	174
115	2,235	375	1,556	306	4,472
116	188	12	69	7	276
122	565	96	351	55	1,067
126	606	36	302	33	977
127	147	4	34	3	188
152	158	30	109	33	330
154	1,674	559	1,787	513	4,533
156	1,871	583	1,858	437	4,749
157	2,916	1,102	3,104	867	7,989
159	1,479	421	1,387	316	3,603
167	692	173	681	192	1,738
168	1,439	373	1,500	310	3,622
170	2,920	811	2,624	596	6,951
172	1,803	733	2,242	581	5,359
174	1,304	392	1,168	288	3,152
175	2,190	434	1,605	329	4,558
178	2,500	588	1,985	400	5,473
180	1,799	271	1,246	179	3,495
181	2,117	488	1,659	378	4,642
182	520	135	674	131	1,460
183	1,634	476	1,527	368	4,005
184	3,554	1,364	4,096	1,246	10,260
197	1,090	238	942	201	2,471
199	119	7	36	5	167
201	82	23	76	22	203
202	182	74	220	56	532
203	74	6	24	8	112
204	513	174	562	125	1,374
206	497	165	612	147	1,421
207	352	124	406	93	975
208	261	85	307	73	726
209	598	237	728	233	1,796
210	1,140	424	1,182	376	3,122
213	1,998	814	2,171	606	5,589
214	1,486	749	1,866	610	4,711
215	1,046	464	1,200	386	3,096
218	804	348	931	296	2,379
219	624	226	561	166	1,577
221	1,102	486	1,211	450	3,249
222	1,091	404	1,021	301	2,817
223	580	191	538	147	1,456
224	142	34	154	37	367
225	1,615	615	1,695	481	4,406

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
227	1,079	422	1,088	317	2,906
228	589	166	593	116	1,464
229	276	110	312	75	773
235	97	33	85	27	242
236	935	308	989	227	2,459
239	1,826	672	1,917	570	4,985
240	1,927	725	2,080	721	5,453
241	1,506	619	1,670	574	4,369
242	692	320	907	251	2,170
243	1,142	555	1,362	370	3,429
244	2,154	909	2,266	863	6,192
245	2,230	866	2,314	703	6,113
246	2,178	946	2,441	824	6,389
247	848	310	966	269	2,393
248	466	180	475	158	1,279
249	1,281	555	1,395	412	3,643
251	145	39	85	30	299
252	345	96	400	68	909
253	417	130	546	140	1,233
254	357	124	427	133	1,041
255	646	227	733	175	1,781
256	595	225	884	216	1,920
257	494	175	558	167	1,394
258	617	227	752	198	1,794
259	453	155	475	143	1,226
287	105	42	137	27	311
297	263	71	184	60	578
298	799	199	557	172	1,727
337	597	164	670	139	1,570
338	322	75	280	43	720
339	297	67	203	55	622
341	1,051	335	905	232	2,523
342	870	252	846	230	2,198
343	1,062	370	1,265	249	2,946
344	538	119	391	86	1,134
345	694	218	734	203	1,849
346	1,231	392	1,272	297	3,192
347	884	263	998	188	2,333

Table 20. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
348	1,006	274	1,126	239	2,645
349	1,771	504	1,918	442	4,635
412	493	139	518	127	1,277
416	566	101	376	58	1,101
417	1,122	244	905	166	2,437
420	339	126	405	102	972
421	222	51	196	56	525
422	221	25	114	18	378
423	158	20	102	23	303
424	292	55	200	39	586
425	161	30	98	21	310
426	256	45	175	27	503
427	265	26	150	22	463
428	346	71	316	67	800
431	204	35	160	30	429
433	463	105	429	114	1,111
435	459	60	319	56	894
440	445	89	418	92	1,044
442	724	136	553	107	1,520
443	326	95	321	62	804
446	249	46	206	41	542
447	233	45	170	29	477
448	332	57	290	47	726
449	505	83	493	53	1,134
450	217	20	138	10	385
451	418	67	324	62	871
452	301	49	290	37	677
453	341	54	261	32	688
454	579	98	549	67	1,293
455	56	14	62	14	146
456	492	111	528	82	1,213
457	326	56	279	46	707
458	342	60	261	48	711
459	507	91	411	74	1,083
461	454	161	616	129	1,360
462	591	221	690	128	1,630
463	271	63	219	41	594
464	282	87	302	54	725
465	266	87	285	56	694
466	536	152	606	112	1,406
467	571	180	754	123	1,628
901	3	3	4	2	12
902	62	49	116	47	274
903	7	2	11	4	24
904	2	1	5	0	8
905	0	0	3	0	3
906	7	2	7	2	18
907	0	3	1	1	5
908	0	4	8	3	15
909	0	5	4	2	11
910	0	3	5	5	13
911	18	30	47	21	116
912	1	0	0	0	1
913	7	3	9	3	22
914	0	0	5	1	6
915	0	1	6	2	9
916	31	22	42	27	122
917	0	1	1	1	3
918	1	0	4	2	7
919	8	2	5	2	17
920	0	2	4	3	9
921	11	25	36	21	93
922	9	9	22	9	49
923	19	11	30	16	76
924	0	3	8	0	11
925	0	3	2	1	6
926	11	1	22	8	42
927	6	3	9	5	23
928	0	4	16	4	24
929	0	1	11	2	14
930	4	9	25	1	39
931	26	7	35	7	75
932	4	3	12	5	24
933	0	5	14	3	22
934	0	3	6	4	13
935	0	1	4	5	10
936	0	0	1	1	2
950	5	2	6	0	13
953	81	28	133	31	273
954	86	26	107	27	246
955	0	1	1	0	2
956	4	0	5	1	10
957	2	1	3	2	8
958	1	2	1	0	4
959	4	0	11	2	17
960	1	1	4	2	8
TOTAL	**105,769**	**32,780**	**105,434**	**26,795**	**270,778**

Table 21. Estimated firearm hunter numbers, density, and harvest by permit area, 2006.

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ $mile^2$	Harvest/ $mile^2$
104	4,589	2,078	2.2	1.2
105	3,867	766	5.0	3.8
107	7,183	1,895	3.8	1.9
110	2,509	300	8.4	6.0
111	4,481	1,708	2.6	1.5
114	163	123	1.3	1.2
115	8,588	1,872	4.6	2.2
116	651	1,158	0.6	0.2
122	1,991	620	3.2	1.6
126	1,899	940	2.0	1.0
127	514	562	0.9	0.3
152	1,023	61	16.8	4.9
154	9,111	760	12.0	5.5
156	8,681	825	10.5	5.3
157	12,619	889	14.2	8.2
159	7,243	568	12.8	5.7
167	3,674	432	8.5	3.9
168	7,586	723	10.5	4.6
170	12,783	1,315	9.7	4.9
172	9,357	451	20.7	11.0
174	6,571	835	7.9	3.5
175	8,503	1,276	6.7	3.4
178	9,014	1,267	7.1	4.0
180	6,032	982	6.1	3.2
181	6,450	708	9.1	5.8
182	1,494	269	5.6	2.5
183	7,352	662	11.1	5.6
184	13,738	1,231	11.2	7.5
197	4,663	974	4.8	2.4
199	458	148	3.1	1.0
201	303	161	1.9	1.2
202	904	157	5.8	3.1
203	270	117	2.3	0.9
204	2,420	718	3.4	1.7
206	1,858	471	3.9	2.7
207	1,449	300	4.8	2.9
208	1,255	443	2.8	1.5
209	2,274	639	3.6	2.6
210	4,041	616	6.6	4.8
213	9,114	1,058	8.6	4.5
214	6,679	557	12.0	7.6
215	5,992	701	8.5	3.8
218	4,900	885	5.5	2.2

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ $mile^2$	Harvest/ $mile^2$
219	2,938	393	7.5	3.1
221	4,609	642	7.2	4.4
222	4,231	413	10.2	5.9
223	2,537	376	6.7	2.9
224	761	48	15.8	6.8
225	6,367	619	10.3	6.2
227	4,133	472	8.8	4.5
228	1,087	613	1.8	0.9
229	1,279	288	4.4	1.8
228	1,087	613	1.8	0.9
229	1,279	288	4.4	1.8
235	557	33	16.9	6.1
236	3,292	373	8.8	4.2
239	7,283	926	7.9	4.9
240	6,833	642	10.6	7.6
241	5,206	417	12.5	9.3
242	2,565	215	11.9	7.5
243	5,030	314	16.0	9.7
244	7,795	586	13.3	9.5
245	9,041	583	15.5	9.3
246	9,457	772	12.3	7.6
247	3,615	230	15.7	8.7
248	1,967	212	9.3	4.9
249	5,332	501	10.6	6.6
251	594	55	10.8	5.1
252	927	1,040	0.9	0.7
253	1,518	1,023	1.5	1.0
254	973	396	2.5	2.3
255	2,278	631	3.6	2.5
256	2,393	654	3.7	2.7
257	1,739	412	4.2	3.1
258	2,345	618	3.8	2.5
259	1,674	494	3.4	2.3
287	612	46	13.3	6.6
297	1,222	439	2.8	1.2
298	3,201	619	5.2	2.6
337	1,286	1,024	1.3	0.7
338	1,672	452	3.7	1.1
339	1,578	394	4.0	1.1
341	4,628	611	7.6	3.1
342	3,693	350	10.6	4.7
343	4,271	663	6.4	3.0
344	2,688	190	14.1	4.9

Table 21 (Continued).

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
345	2,909	326	8.9	4.4
346	4,055	319	12.7	8.0
347	3,286	434	7.6	4.1
348	4,017	331	12.1	6.5
349	5,898	492	12.0	7.7
412	2,774	575	4.8	1.9
416	3,134	543	5.8	1.6
417	5,993	814	7.4	2.2
420	1,517	651	2.3	1.2
421	1,159	749	1.5	0.6
422	985	634	1.6	0.5
423	1,031	531	1.9	0.5
424	1,895	766	2.5	0.6
425	890	779	1.1	0.3
426	1,390	614	2.3	0.6
427	1,482	837	1.8	0.4
428	2,070	549	3.8	1.0
431	929	359	2.6	0.7
433	2,526	402	6.3	1.9
435	2,389	576	4.1	1.2
440	2,320	662	3.5	1.2
442	3,734	807	4.6	1.2
443	1,711	386	4.4	1.4
446	1,101	344	3.2	1.2
447	1,415	674	2.1	0.6
448	1,584	448	3.5	1.3
449	2,102	626	3.4	1.3
450	984	816	1.2	0.3
451	1,443	686	2.1	0.9
452	1,094	637	1.7	0.9
453	1,170	729	1.6	0.7
454	2,234	840	2.7	1.1
455	276	96	2.9	1.0
456	1,822	712	2.6	1.3
457	1,699	667	2.5	0.8
458	1,361	715	1.9	0.8
459	2,217	975	2.3	0.8
461	2,668	480	5.6	2.3
462	2,690	506	5.3	2.5
463	1,361	452	3.0	1.1
464	1,282	377	3.4	1.6
465	1,051	389	2.7	1.3
466	2,611	930	2.8	1.2
467	2,081	774	2.7	1.6
Total	441,798	79,009	5.6	2.9

Table 22. Antlerless Lottery Distribution Report, 2006.

Permit Area Numbers	Preference Level	Applications					
		Total	Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
116	1 2 3	107 73 1 **181**	6 1 0 **7**	6 0 0 **6**	101 73 1 **175**	**175**	**0.0 %**
127	1 2 3	80 25 1 **106**	2 0 1 **3**	0 0 0 **0**	80 25 1 **106**	**150**	**29.3 %**
152	1 2 3 4 5	321 20 1 1 1 **287**	8 6 1 1 0 **16**	0 0 0 0 0 **0**	321 20 1 1 1 **343**	**350**	**2.0 %**
199	1 2 3	121 4 1 **126**	3 1 1 **5**	0 0 0 **0**	121 4 1 **126**	**150**	**16.0%**
203	1 2 9 (military)	81 2 1 **84**	5 3 0 **8**	0 0 0 **0**	81 2 1 **84**	**150**	**44.0%**
338A	1 2 3	166 17 2 **185**	8 3 1 **12**	35 0 0 **35**	131 17 2 **150**	**150**	**0.0%**
339A	1 2 3	147 2 0 **149**	6 2 1 **9**	0 0 0 **0**	147 2 0 **149**	**150**	**0.7%**
341A	1 2 3 4	457 7 0 0 **464**	21 3 1 2 **27**	0 0 0 0 **0**	457 7 0 0 **464**	**425**	**-9.2%**
342A	1 2 3 4	375 3 2 2 **382**	15 5 2 2 **24**	82 0 0 0 **82**	293 3 2 2 **300**	**300**	**0.0%**
344A	1 2 3	432 10 2 **444**	22 5 5 **32**	44 0 0 **44**	38 10 2 **400**	**400**	**0.0%**
344B	1 2 3 9 (military)	600 6 1 1 **608**	25 12 2 0 **39**	0 0 0 0 **0**	600 6 1 1 **608**	**800**	**24.0%**
416A	1 2 3	586 21 3 **610**	32 2 0 **34**	0 0 0 **0**	586 21 3 **607**	**750**	**19.1%**
416B	1 2 3 4	311 7 1 0 **319**	20 1 0 1 **22**	228 0 0 0 **228**	83 7 1 0 **91**	**700**	**87.0%**

Table 22. (Continued).

Permit Area Numbers	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	**Rejected**				
417A	1	1,287	74	228	1,059	**1,100**	**0.0%**
	2	36	16	0	36		
	3	4	3	0	4		
	4	1	0	0	1		
		1,328	**93**	**228**	**1,100**		
417B	1	731	41	0	731	**1,100**	**33.0%**
	2	6	6	0	6		
		737	**47**	**0**	**737**		
422A	1	199	9	101	98	**100**	**0.0%**
	2	2	3	0	2		
		201	**12**	**101**	**100**		
422B	1	199	9	101	98	**100**	**0.0%**
	2	2	3	0	2		
		201	**12**	**101**	**100**		
423A	1	174	11	29	145	**150**	**0.0%**
	2	5	1	0	5		
		179	**12**	**29**	**150**		
423B	1	87	4	0	87	**150**	**41.3%**
	2	1	0	0	1		
		88	**4**	**0**	**88**		
424A	1	350	13	331	19	**150**	**0.0%**
	2	124	6	0	124		
	3	3	1	0	3		
	4	1	1	0	1		
	5	1	0	0	1		
	6	1	0	0	1		
	9 (military)	1	0	0	1		
		481	**21**	**331**	**150**		
424B	1	286	7	164	122	**150**	**0.0%**
	2	25	3	0	25		
	3	1	0	0	1		
	4	1	1	0	1		
	5	0	2	0	0		
	6	1	0	0	1		
		314	**13**	**164**	**150**		
425A	1	140	3	86	54	**75**	**0.0%**
	2	21	2	0	21		
	3	0	1	0	0		
	4	0	1	0	0		
		161	**7**	**86**	**75**		
425B	1	114	1	46	68	**75**	**0.0%**
	2	6	0	0	6		
	6	1	0	0	1		
		121	**1**	**46**	**75**		
426A	1	295	8	84	211	**225**	**0.0%**
	2	9	5	0	9		
	3	2	3	0	2		
	4	2	0	0	2		
	5	1	1	0	1		
		309	**17**	**84**	**225**		
426B	1	196	5	31	165	**175**	**0.0%**
	2	9	3	0	9		
	3	1	1	0	1		
		206	**9**	**31**	**175**		

Table 22. (Continued).

Permit Area Numbers	Preference Level	Applications					
		Total	Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
427A	1	149	17	149	0	**50**	**0.0 %**
	2	109	4	109	0		
	3	90	4	43	47		
	4	1	2	0	1		
	5	1	1	0			
	6	1	0	0	1		
		351	**28**	**301**	**50**		
427B	1	124	4	124	0	**50**	**0.0 %**
	2	64	4	22	42		
	3	7	1	0	7		
	4	1	0	0	1		
		196	**9**	**146**	**50**		
428A	1	362	11	0	362	**500**	**0.0 %**
	2	34	5	0	34		
	3	6	2	0	6		
	4	0	3	0	0		
		402	**21**	**0**	**402**		
428B	1	280	12	0	280	**500**	**40.0 %**
	2	16	3	0	16		
	3	2	1	0	2		
	4	2	1	0	2		
		300	**17**	**0**	**300**		
431A	1	89	6	89	0	**50**	**0.0 %**
	2	85	0	57	28		
	3	22	0	0	22		
	4	0	1	0	0		
		196	**7**	**146**	**50**		
431B	1	73	4	73	0	**50**	**0.0 %**
	2	65	3	15	50		
		138	**7**	**88**	**50**		
433A	1	508	19	258	250	**400**	**0.0%**
	2	143	5	0	143		
	3	4	6	0	4		
	4	2	1	0	2		
	5	1	2	0	1		
		658	**33**	**258**	**400**		
433B	1	358	9	0	358	**400**	**0.2%**
	2	37	6	0	37		
	3	1	1	0	1		
	4	1	3	0	1		
	5	1	0	0	1		
	6	1	0	0	1		
		399	**19**	**0**	**399**		
435A	1	489	21	290	199	**300**	**0.0 %**
	2	99	14	0	99		
	3	2	7	0	2		
	4	0	5	0	0		
	5	0	1	0	0		
		590	**48**	**290**	**300**		
435B	1	323	10	42	281	**300**	**0.0 %**
	2	17	2	0	17		
	3	0	2	0	0		
	4	2	2	0	2		
		342	**16**	**42**	**300**		
440A	1	481	20	276	205	**450**	**0.0 %**
	2	236	5	0	236		
	3	7	5	0	7		
	4	1	3	0	1		
	5	1	0	0	1		
		726	**33**	**276**	**450**		

Table 22. (Continued).

Permit Area Numbers	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
440B	1	241	4	0	241	**300**	**10.0 %**
	2	27	6	0	27		
	3	2	1	0	2		
	4	1	1	0	1		
		271	**12**	**0**	**271**		
442A	1	687	27	479	208	**550**	**0.0%**
	2	321	12	0	321		
	3	17	6	0	17		
	4	1	2	0	1		
	5	2	1	0	2		
	6	1	0	0	1		
		1,029	**48**	**479**	**550**		
442B	1	441	23	0	441	**550**	**8.7%**
	2	57	13	0	57		
	3	3	5	0	3		
	5	1	0	0	1		
		502	**41**	**0**	**502**		
443A	1	339	11	174	165	**275**	**0.0%**
	2	107	7	0	107		
	3	3	2	0	3		
		449	**20**	**174**	**275**		
443B	1	199	8	0	199	**275**	**20.7 %**
	2	18	1	0	18		
	3	1	6	0	1		
	4	0	1	0	0		
	6	1	0	0	1		
		219	**16**	**0**	**218**		
446A	1	187	12	101	86	**150**	**0.0 %**
	2	62	7	0	62		
	3	1	2	0	1		
	4	0	2	0	0		
	5	1	0	0	1		
		251	**23**	**101**	**150**		
446B	1	170	5	49	121	**150**	**0.0 %**
	2	27	3	0	27		
	3	2	1	0	2		
	5	0	1	0	0		
		199	**10**	**49**	**150**		
447A	1	222	11	152	70	**150**	**0.0 %**
	2	79	3	0	79		
	3	0	5	0	0		
	4	1	1	0	1		
		302	**20**	**152**	**150**		
447B	1	147	3	10	137	**150**	**0.0 %**
	2	11	1	0	11		
	3	1	1	0	1		
	5	1	0	0	1		
		160	**5**	**10**	**150**		
448A	1	431	13	17	414	**425**	**0.0 %**
	2	8	6	0	8		
	3	2	3	0	2		
	4	1	1	0	1		
	5	0	1	0	0		
		442	**24**	**17**	**425**		
448B	1	155	5	13	142	**150**	**0.0 %**
	2	6	2	0	6		
	3	2	0	0	2		
	5	0	1	0	0		
		163	**8**	**13**	**150**		

Table 22. (Continued).

Permit Area Numbers	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
449A	1	567	26	95	472	**500**	**0.0 %**
	2	17	17	0	17		
	3	6	4	0	6		
	4	3	3	0	3		
	5	1	0	0	1		
	6	1	0	0	1		
		595	**50**	**95**	**500**		
449B	1	243	10	23	220	**225**	**0.0 %**
	2	2	5	0	2		
	3	2	0	0	2		
	6	1	0	0	1		
		248	**15**	**23**	**225**		
450A	1	231	11	195	36	**50**	**0.0 %**
	2	9	9	0	9		
	3	3	0	0	3		
	4	0	3	0	0		
	9	2	0	0	2		
		245	**23**	**195**	**50**		
450B	1	118	2	46	72	**75**	**0.0 %**
	2	3	2	0	3		
		121	**4**	**46**	**75**		
451A	1	222	5	0	222	**250**	**7.6 %**
	2	7	4	0	7		
	3	1	2	0	1		
	4	1	1	0	1		
	5	0	1	0	0		
		231	**13**	**0**	**231**		
451B	1	171	8	0	171	**225**	**20.9 %**
	2	5	2	0	5		
	4	2	3	0	2		
	6	0	1	0	0		
		178	**14**	**0**	**178**		
453A	1	255	6	14	241	**250**	**0.0 %**
	2	7	4	0	7		
	3	1	7	0	1		
	4	1	1	0	1		
		264	**18**	**14**	**250**		
453B	1	115	3	0	115	**150**	**22.7 %**
	2	1	1	0	1		
		116	**4**	**0**	**116**		
454A	1	478	14	0	478	**500**	**1.0 %**
	2	12	9	0	12		
	3	3	3	0	3		
	4	0	3	0	0		
	5	1	0	0	1		
	9 (military)	1	0	0	1		
		495	**29**	**0**	**495**		
454B	1	338	5	18	320	**325**	**0.0 %**
	2	4	3	0	4		
	3	1	3	0	1		
		343	**11**	**18**	**325**		
455A	1	56	0	12	44	**50**	**0.0 %**
	2	6	0	0	6		
	3	0	2	0	0		
		62	**2**	**12**	**50**		
455B	1	53	0	6	47	**50**	**0.0 %**
	2	3	1	0	3		
		56	**1**	**6**	**50**		
457A	1	213	2	33	180	**200**	**0.0 %**
	2	16	4	0	16		
	3	3	3	0	3		
	4	1	1	0	1		
		233	**10**	**33**	**200**		

Table 22. (Continued).

Permit Area Numbers	Preference Level	Applications					
		Total	**Rejected**	**Unsuccessful**	**Winners**	**Permits Available**	**% Under-Subscribed**
457B	1 2 3 4	213 16 3 1 **233**	2 4 3 1 **10**	33 0 0 0 **33**	180 16 3 1 **200**	**200**	**0.0 %**
458A	1 2 3 4	249 14 0 0 **263**	4 6 3 2 **15**	0 0 0 0 **0**	249 14 0 0 **263**	**400**	**34.3 %**
458B	1 2 3 4 5	232 26 4 2 1 **265**	6 2 1 0 1 **10**	65 0 0 0 0 **65**	167 26 4 2 1 **200**	**200**	**0.0 %**
459A	1 2 3 4 5	438 13 0 1 1 **453**	12 13 4 0 0 **29**	253 0 0 0 0 **253**	185 13 0 1 1 **200**	**200**	**0.0 %**
459B	1 2 3 4	325 0 1 0 **326**	8 7 2 0 **17**	126 0 0 0 **126**	199 0 1 0 **200**	**200**	**0.0 %**
463A	1 2 3 5	326 10 2 1 **339**	8 7 2 0 **17**	0 0 0 0 **0**	326 10 2 1 **339**	**350**	**3.1 %**
463B	1 2 3	193 4 0 **197**	5 2 1 **8**	0 0 0 **0**	193 4 0 **197**	**350**	**43.7 %**
TOTAL		**21,680**	**1,244**	**4,911**	**16,764**	**19,125**	

Table 23. 2006 Special Permit Areas for Firearms Hunters.

Permit Area Number	Preference Level	Applications			Winners	Permits Available	Bonus Permits
		Total	Rejected	Unsuccessful			
901 - Rice Lake Nat. Wildlife Refuge	1	79	0	0	79	**100**	**No**
	2	5	0	0	5		
	3	1	0	0	1		
		85	**0**	**0**	**85**		
902 - St. Croix State Park	1	624	0	144	480	**550**	**Yes**
	2	71	0	0	71		
		695	**0**	**144**	**551**		
903 - Savanna Portage State Park	1	117	0	69	48	**55**	**Yes**
	2	7	0	0	7		
		124	**0**	**69**	**55**		
904 - Gooseberry Falls State Park	1	20	0	0	20	**30**	**Yes**
	2	1	0	0	1		
	3	1	0	0	1		
		22	**0**	**0**	**22**		
905 - Split Rock Lighthouse State Park	1	28	0	0	28	**30**	**Yes**
	2	1	0	0	1		
		29	**0**	**0**	**29**		
906 - Tettegouche State Park	1	60	0	0	60	**125**	**Yes**
	2	1	0	0	1		
		61	**0**	**0**	**61**		
907 - Scenic State Park	1	33	0	1	32	**30**	**Yes**
		33	**0**	**1**	**32**		
908 - Hayes Lake State Park	1	21	0	0	21	**60**	**Yes**
		21	**0**	**0**	**21**		
909 - Lake Bemidji State Park	1	27	0	0	27	**35**	**Yes**
		27	**0**	**0**	**27**		
910 - Zippel Bay State Park	1	44	0	0	44	**55**	**Yes**
		44	**0**	**0**	**44**		
911 - Wild River State Park	1	246	0	171	75	**150**	**Yes**
	2	75	0	0	75		
	3	1	0	0	1		
		322	**0**	**171**	**151**		
912 - Old Mill State Park	1	2	0	0	2	**7**	**Yes**
		2	**0**	**0**	**2**		
913 -William O'Brien State Park	1	8	0	43	46	**65**	**Yes**
	2	19	0	0	19		
		108	**0**	**43**	**65**		
914 - Lake Elmo Park Reserve	1	9	0	0	9	**25**	**Yes**
		9	**0**	**0**	**9**		

Table 23. (Continued).

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available	Bonus Permits
915 – Buffalo River State Park	1	18	0	7	11	**12**	**Yes**
	2	1	0	0	1		
		19	**0**	**7**	**12**		
916 – Maplewood State Park	1	232	0	232	0	**100**	**Yes**
	2	135	0	35	100		
		367	**0**	**267**	**100**		
917 – Rydell National Wildlife Refuge	1	3	0	1	2	**5**	**Yes**
	2	4	0	0	4		
		7	**0**	**1**	**6**		
918 – Lake Alexander SNA	1	38	0	0	38	**40**	**Yes**
		38	**0**	**0**	**38**		
919 – Beaver Creek Valley State Park	1	41	0	26	15	**20**	**Yes**
	2	5	0	0	5		
		46	**0**	**26**	**20**		
920 – Zumbro Falls SNA-3A	1	13	0	0	13	**12**	**Yes**
		13	**0**	**0**	**13**		
921 – Forestville/Mystery Cave State Park	1	121	0	17	104	**110**	**Yes**
	2	6	0	0	6		
		127	**0**	**17**	**110**		
922 – Frontenac State Park	1	75	0	32	43	**50**	**Yes**
	2	7	0	0	7		
		82	**0**	**32**	**50**		
923 – Great River Bluffs State Park	1	15	0	51	99	**100**	**Yes**
		1	0	0	1		
		1	0	0	1		
		152	**0**	**51**	**101**		
924 - Zumbro Falls SNA-3B	1	8	0	0	8	**12**	**Yes**
	2	4	0	0	4		
		12	**0**	**0**	**12**		
925 – Kellog-Weaver Dunes SNA	1	11	0	0	11	**15**	**Yes**
		11	**0**	**0**	**11**		
926 – Elm Creek Park Reserve	1	149	0	25	124	**145**	**Yes**
	2	22	0	0	22		
		171	**0**	**25**	**146**		
927 – Lake Rebecca Park Reserve	1	36	0	0	36	**75**	**Yes**
	2	4	0	0	4		
		40	**0**	**0**	**40**		
928 – Whitewater State Game Refuge	1	46	0	0	46	**75**	**No**
		46	**0**	**0**	**46**		
929 – Glacial Lakes State Park	1	39	0	16	23	**30**	**Yes**
	2	7	0	0	7		
		46	**0**	**16**	**30**		
930 – Lake Louise State Park	1	65	0	50	15	**25**	**Yes**
	2	8	0	0	8		
	3	2	0	0	2		
		75	**0**	**50**	**25**		
TOTAL		**2,788**	**0**	**920**	**1,868**	**2,143**	

Table 24. 2006 Special Permit Areas for Muzzleloader Hunters.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available	Bonus Permits
931 - Jay Cooke SP	1	171	0	131	40	**120**	**Yes (4)**
	2	73	0	0	73		
	3	7	0	0	7		
		251	**0**	**131**	**120**		
932 - Crow Wing SP	1	145	0	145	0	**40**	**Yes (4)**
	2	81	0	56	25		
	3	15	0	0	15		
		241	**0**	**201**	**40**		
933 - Lake Shetek SP	1	53	0	53	0	**25**	**Yes (1)**
	2	23	0	1	22		
	3	3	0	0	3		
		79	**0**	**54**	**25**		
934 - Sibley SP	1	79	0	53	26	**40**	**No**
	2	15	0	0	15		
	3	1	0	0	1		
		95	**0**	**5**	**42**		
935 - Rice Lake SP	1	47	0	47	0	**15**	**Yes (1)**
	2	21	0	9	12		
	3	3	0	0	3		
		71	**0**	**56**	**15**		
936 - Interstate SP	1	13	0	10	3	**10**	**Yes (4)**
	2	8	0	0	8		
		21	**0**	**10**	**11**		
TOTAL		**758**	**0**	**505**	**253**	**250**	
Grand Total		**25,226**	**1,244**	**6,336**	**18,885**	**21,518**	

2006 Minnesota Bear Harvest Report

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INTRODUCTION

In 1982, out of concern that the Minnesota bear population was being overharvested, a quota on hunting licenses was implemented. Eleven bear management units (BMUs) have been designated (Figure 1), with separate quotas for each. Outside the primary bear range, where bear depredation to crops is a primary concern, license sales are unlimited (no-quota area). In recent years, hunters in this area could harvest two bears, and beginning in 2005 hunters could purchase both a quota and no-quota license. In all areas, hunters may purchase licenses either before or during the bear season, and 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 structure.

METHODS

Successful hunters must register their bears at designated registration stations. Harvest data are a simple tally of these registrations, partially corrected for non-compliance (and in some cases, lost registration data). Hunters also were required to submit a tooth from harvested bears (compliance $\approx$ 70%) from which an age estimate was obtained. Bear food abundance, which impacts hunting success, was measured qualitatively by DNR and other field personnel.

RESULTS

The number of permits that were made available to hunters steadily increased through the 1980s and 1990s (Table 1) in response to increasing bear numbers and nuisance complaints. Permit availability was capped at just over 20,000 from 1999–2003, whereas during this period permit applications declined. Concomitantly, since 2001, a diminishing proportion of permittees bought licenses, resulting in 7 of 11 BMUs being undersubscribed by 2003. Permits were reduced in 2004 and again in 2005 and 2006 (Table 2) in accordance with the diminishing level of interest and hunter complaints of overcrowding in some BMUs, but 6 BMUs remained undersubscribed (Table 3). Harvests, while variable due to natural food abundance, showed no trend over the past 10 years, averaging about 3,400 bears, with hunting success averaging 26%. Harvests during the past 4 years have been remarkably similar (3,300–3,600), and hunting success has been steady at 26% (Table 1). Harvest sex ratios, uncorrected for misreporting (Table 1, footnote e) averaged 58% male, but varied by BMU (Table 4). In 2006, harvests and hunting success were below average in the northwestern part of the state (BMUs 11, 12, 13, see Figure 1; Tables 4 & 5), whereas the southeastern portion of the bear range had a record high harvest (no-quota BMU 52). As typical for a year with overall average food abundance, ~70% of the harvest occurred during the first week of the season (Table 6).

The number of bears killed by hunters each year is largely explained by 2 factors: fall food abundance and hunter numbers (Figure 2). Bear numbers, which increased dramatically until about 1997 but have since stabilized at 20–30,000, are no longer an important factor in year-to-year variations in harvest. Nevertheless, diminishing median age, caused by an increasing proportion of yearlings in the harvest (Figures 3 & 4), indicate changes in the composition of the living population. In 2006 a slight dip in the proportion of harvested yearlings may suggest a change in this long-term trend.

DISCUSSION

Interest in hunting bears seems to have waned as permit availability peaked, corresponding with complaints by hunters of overcrowding and thus less hunting enjoyment. Another contributing factor may have been the availability of electronic licenses, enabling hunters to delay purchase until they assessed bear visitation to their baits and hence probable hunting success.

Despite some concern over this trend, harvests have remained sufficiently high to stabilize the bear population at an acceptable level (nuisance complaints have remained low). A declining harvest age structure, however, suggests that despite relative stability in overall population size, population composition continues to change, which may inevitably lead to unpredictable changes in bear numbers. Continued monitoring of this population and the factors impacting it are hence warranted.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1986–2006.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Permit applications	20694	19687	25879	24096	24861	25890	26428	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725
Permits available	4730	4810	5310	5520	6370	7140	7920	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850
Licenses purchased (total) [a]	4188	6054	5643	5901	7094	7757	8485	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164
Quota area [a]	4188	4213	4297	4628	5568	6257	6845	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169
Quota surplus/military [a]																235	209	2554	1356	1591	1561
No-quota area [a]		1841	1346	1273	1526	1500	1640	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434
% Licenses bought [b]																					
Of permits available [b]	88.5	87.6	80.9	83.8	87.4	87.6	86.4	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3
Of permits issued [b]													84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9
Estimated no. hunters [c]	3900	5600	5100	5500	6600	7200	7900	8600	9100	11600	11500	10300	14500	15900	16800	15500	13700	13500	12800	12400	12400
Harvest	1438	1577	1509	1930	2381	2143	3175	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340[d]	3290[d]
Harvest sex ratio (%M) [e]	59	60	58	57	52	59	50	56	62	47	62	55	55	53	58	56	61	58	57	59	58
Success rate (%) [f]																					
Total harvest/hunters	37	28	30	35	36	30	40	35	26	43	16	31	28	23	23	29	14	26	26	26	26
Quota harvest/licenses		33	28	36	35	30	41	34	26	42	15	29	25	20	20	28	14	25	26	25	25

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

[b] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued (permits issued more relevant for years when some areas were undersubscribed; see Table 3).

[c] 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%), and 2001(93.9%).

[d] Harvest estimated from tallied registration + lost registration data (ascertained from tooth envelopes received without matching registration data)..

[e] 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.

[f] Success rates in 2001–2004 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because hunters could take 2 bears. This was complicated even more in 2005 and 2006 because the total harvest was estimated (footnote d), and hunters could take 1 bear in the quota area plus 2 bears in the no-quota area. From the registration tally and tooth envelopes received in 2006, 50 hunters took more than 1 bear (45 took 2 bears on NQ license, 2 hunters took 1 quota and 1 NQ bear, and 3 hunters took 2 bears on a quota license [illegally]): thus, there were 3290-50 = 3240 successful hunters.

Table 2. Number of bear hunting permits available per year, 2002–2006 (aligned with permit applications in Table 3 below; highlighted numbers show drop from previous year).

BMU	2006	2005	2004	2003	2002
12	550	550	700	700	700
13	800	900	900	1100	1100
22	150	150	150	250	250
24	1000	1200	1200	1500	1500
25	1900	1900	1900	2400	2400
26	1500	1500	1500	1500	1500
31	2100	2100	2100	2660	2660
41	450	450	500	500	500
44	1700	1700	2000	2500	3000
45	1200	1500	1500	2000	2000
51	3500	4000	4000	5000	5000
Total	14850	15950	16450	20110	20610

Table 3. Number of bear hunting license applicants, and number and percent of available surplus licenses bought, 2002–2006[a].

BMU	2006			2005			2004			2003			2002		
	Apps	Surplus bought		Apps	Surplus bought		Apps	Surplus bought		Apps	Surplus bought		Apps	Surplus bought	
12	1005			864			808			837			1061		
13	680	120	100%	714	186	100%	670	129	56%	668	167	39%	831	41	18%
22	92	58	100%	65	46	54%	73	47	61%	88	26	16%	124	5	4%
24	624	367	98%	749	270	60%	766	259	60%	756	193	26%	979	40	8%
25	1789	112	100%	1923			1793	111	100%	1716	317	46%	1985	41	11%
26	1915			1997			2110			2280			2873		
31	2290			2097	4	100%	2006	92	100%	1996	412	62%	2503	26	23%
41	683			653			601			688			810		
44	2838			2884			2934			2855			4043		
45	840	360	100%	927	346	60%	1092	332	81%	1069	461	50%	1535	56	14%
51	2969	531	100%	3276	726	100%	3613	386	100%	3467	978	64%	5141		
None	0			0			0			2			1		
Total	15725	1548	~100%	16149	1578	78%	16466	1356	78%	16431	2554	50%	21886	209	12%

[a] Surplus licenses available beginning in 2001, but restricted to permit applicants in 2001 & 2002.

Undersubscribed | Nearly undersubscribed

Table 4. Minnesota bear harvest tally[a] for 2006 by Bear Management Unit (BMU) and sex compared to harvests during 2001-2005 and record high harvests.

	2006											
BMU	M	(%M)	F	U	Total	**2005**	**2004**	**2003**	**2002**	**2001**	**5 year mean**	**Record high harvest** (yr)
Quota												
12	48	(69)	22	0	70	165	165	174	104	263	174	263 (01)
13	98	(65)	53	0	151	205	197	185	116	241	189	258 (95)
22	6	(40)	9	0	15	8	10	3	7	6	7	41 (89)
24	102	(53)	92	0	194	144	212	163	101	273	179	288 (95)
25	196	(47)	225	0	421	404	546	510	328	584	474	584 (01)
26	189	(60)	124	1	314	285	320	303	171	397	295	513 (95)
31	320	(66)	162	0	482	445	484	436	301	697	473	697 (01)
41	27	(68)	13	0	40	104	83	100	51	201	108	201 (01)
44	120	(62)	72	0	192	273	283	444	183	553	347	643 (95)
45	60	(51)	57	1	118	107	118	143	36	178	116	178 (01)
51	411	(57)	308	2	721	505	544	667	300	895	582	895 (01)
Total	1577	(58)	1137	4	2718	2759[b]	2962	3128	1698	4288	2967	4288 (01)
No Quota[c]												
11	87	(72)	33	0	120	335	177	200	112	321	229	351 (05)
52	216	(54)	183	1	400[d]	223	252	270	105	327	235	382 (93)
Total	303	(58)	216	1	520	581[b]	429	470	217	648	469	678 (95)
State	1880	(58)	1353	5	**3290**[b]	3340[b]	3391	3598	1915	4936	3436	4956 (95)

[a] Harvest data were obtained from registration slips electronic registration, and tooth envelopes. The following table shows the number of tooth envelopes that had no corresponding registration slip or e-registration.

Year	Quota area	No-quota area
2001	56	7
2002	46	7
2003	84	13
2004	96	39
2005	179	31
2006	63	15

[b] The estimated registered harvest, including those in which registration data were lost and no tooth envelope was received. Value for 2006 does not match column or row total because other data on table are uncorrected for estimated lost registration data.

[c] Some hunters with no-quota licenses hunted in the quota area. Some were drawn for the quota area but received NQ licenses. Others hunted in the wrong area purposefully or out of ignorance (n = 48 in 2006).

[d] Record high harvest in area 52 in 2006. Last column on this line shows previous record.

Table 5. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2001–2006.

BMU	Mean success 2001-2005	2006		2005[b]		2004		2003		2002		2001	
		% Success	**% Taking** 2 bears[c]	% Success	**% Taking** 2 bears[c]	% Success	**% Taking** 2 bears[c]	% Success	**% Taking** 2 bears[c]	% Success	**% Taking** 2 bears[c]	% Success	**% Taking** 2 bears[c]
Quota	24	25	—	25	—	26	—	25	—	14	—	28	(11)
12	35	19	—	41	—	33	—	35	—	22	—	44	(17)
13	29	24	—	32	—	33	—	31	—	19	—	31	(9)
22	8	14	—	10	—	11	—	4	—	8	—	7	(0)
24	23	25	—	20	—	27	—	25	—	15	—	28	(8)
25	32	30	—	30	—	38	—	34	—	23	—	34	(11)
26	29	30	—	34	—	31	—	29	—	17	—	32	(10)
31	28	33	—	31	—	33	—	25	—	17	—	34	(15)
41	27	13	—	31	—	23	—	29	—	14	—	40	(16)
44	21	16	—	24	—	20	—	26	—	9	—	23	(10)
45	11	14	—	13	—	12	—	13	—	4	—	13	(7)
51	18	28	—	18	—	19	—	21	—	9	—	24	(10)
No Quota	19	22[d]	(9)	23	(9)	18	(7)	21	(10)	10	(7)	23	(9)
Statewide	23	25	—	25	—	25	—	25	—	13	—	27	(11)

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

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

[c] Percent of successful hunters that shot 2 bears; 2nd bear is not included in the calculation of hunting success. The taking of 2 bears was legal statewide in 2001, but only in the no-quota area in 2002–2006.

[d] Although BMU 52 had a record harvest (see Table 1), there is no way to split BMUs 11 and 52 to examine hunting success because the number of hunters in each area is unknown (a single NQ license covers both BMUs).

Table 6. Cumulative bear harvest (% of total harvest) by date, 1990–2006.

Year	Day of week for opener	Aug 22/23 – Aug 31 (9–10 days)	Sep 1 – Sep 7 (7 days)	Sep 8 – Sep 14 (7 days)	Sep 15 – Sep 30 (16 days)
1990	Sat		69	82	96
1991	Sun		64	76	93
1992	Tue		72	86	96
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56	70	87[a]
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	69	90[a]
2003	Mon		72	84	96
2004	Wed		68	82	95
2005	Thu		72	81	94
2006	Fri		69	83	96

[a] The large proportion of the harvest taken late in the season in 1996 and 2002 (e.g., >10% in October) was related to the high abundance of food in those years.

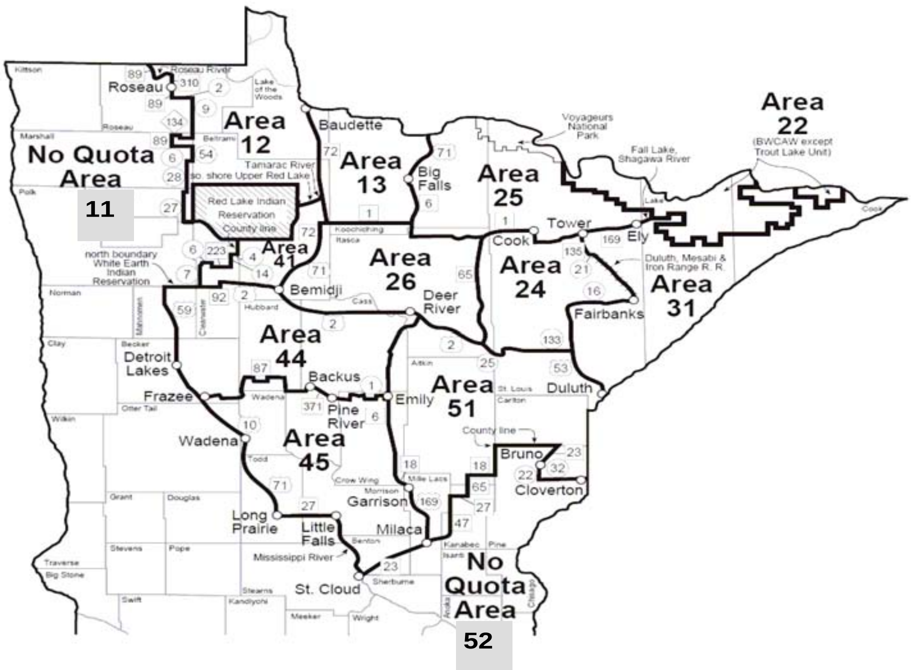

Figure. 1. Bear management units (BMUs or areas) within the Minnesota bear range. Within the primary bear range (shown in white) license numbers are limited by a quota. Hunters can hunt in only one area, except with a no-quota license they can hunt anywhere in the shaded zone (and beginning in 2005 hunters could posses both a no-quota and quota area license).

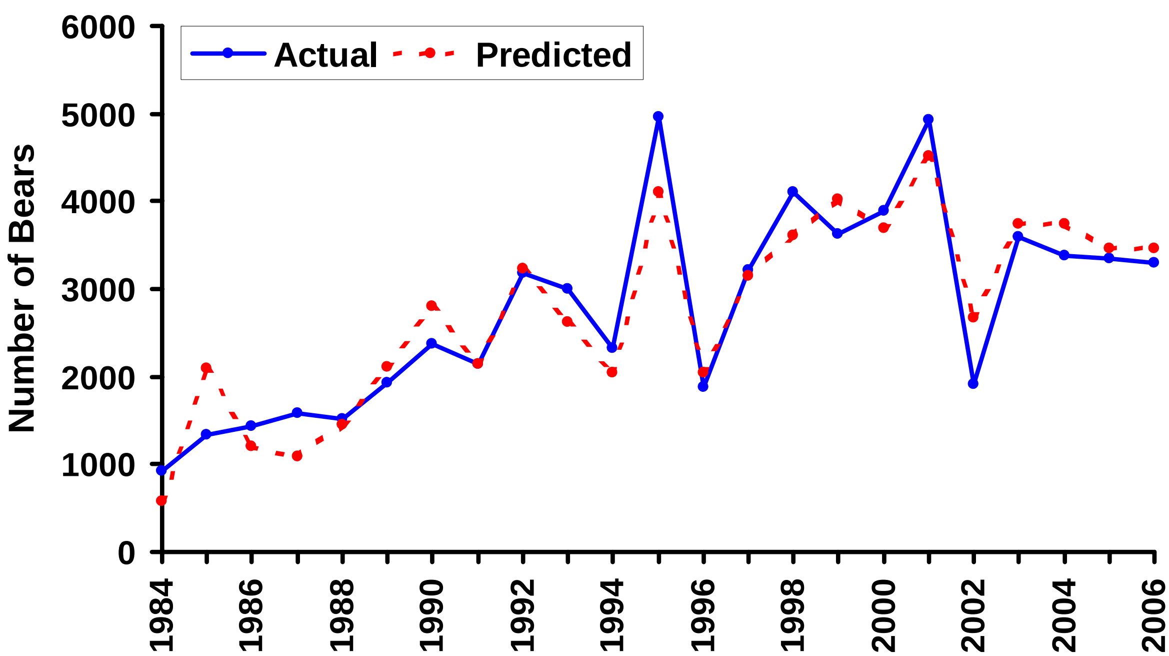

Figure 2. Number of bears killed vs. number predicted, based on fall food abundance and hunter numbers. Prediction for 2006 based on regression from 1984–2005 ($R^2 = 0.88$).

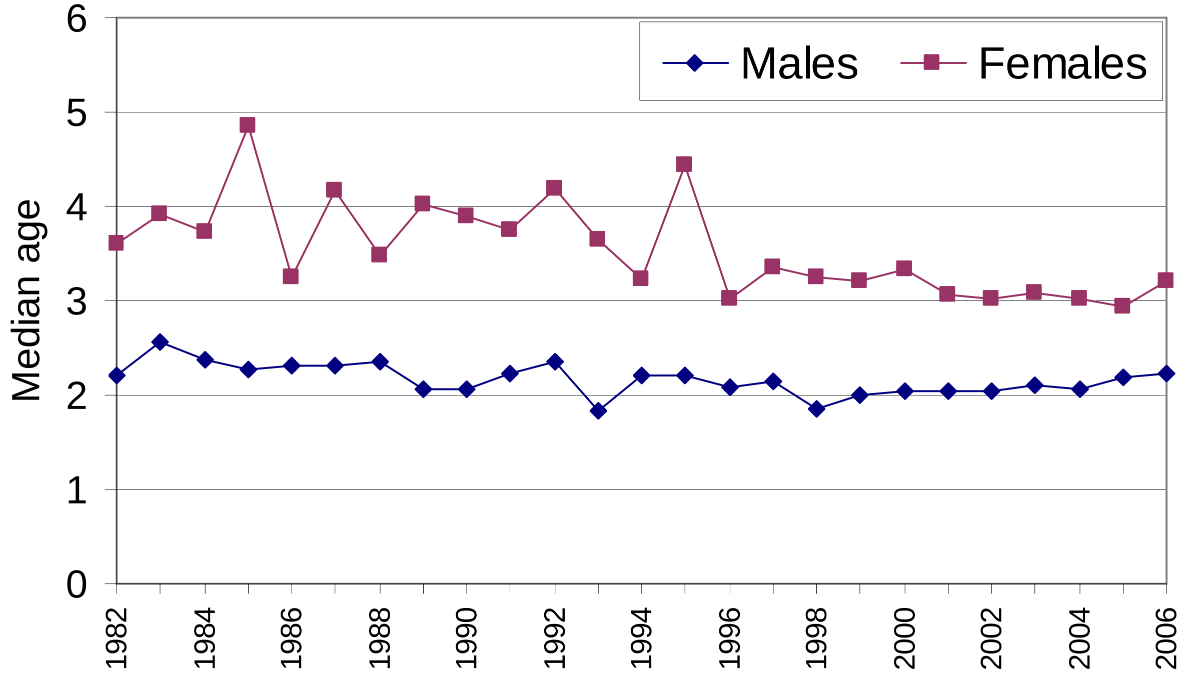

Figure 3. Statewide harvest age structure: median ages by sex, 1982–2006.

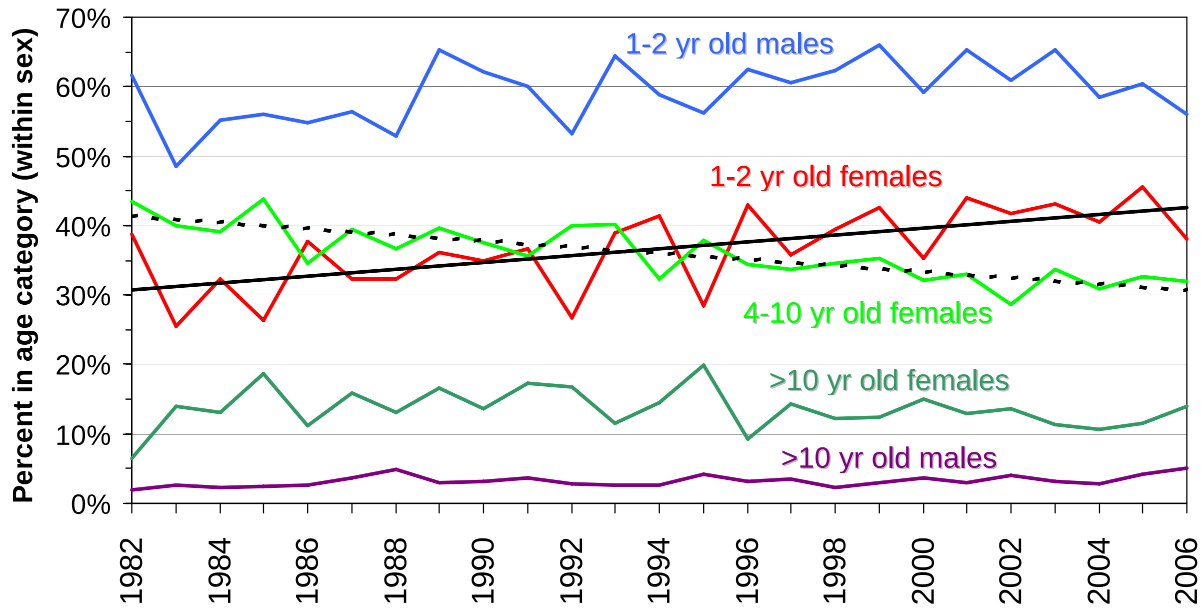

Figure 4. Statewide harvest age structure: proportion of each sex in age category sex, 1982–2006. A regression trend line is superimposed over the 1-2 year old females.

2006 Minnesota Moose Harvest

Mark S. Lenarz, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year, a limited number of permits are issued that allow Minnesota residents to hunt moose. The following report is intended to document the number of hunters applying for permits, the number of permits issued, a hunting party's chance of receiving a permit, hunter success rate, and a breakdown of the harvest by hunting zone. Information on permit numbers and moose harvested by members of the 1854 Treaty Authority or Fond du Lac band of Lake Superior Chippewa within the 1854 Ceded Territory is also provided.

METHODS

All successful State hunters are required to register their moose at one of 8 registration stations and provide information on the location where they killed their moose, date of kill, and sex of moose harvested.

RESULTS

In 2006, 208 moose were harvested in northeastern Minnesota. No season was held in northwestern Minnesota. The State of Minnesota sold licenses to 269 hunting parties and hunters killed 161 moose including 133 bulls and 28 cows (Table 1). This table also lists the number of permits offered, chance of being selected for a permit, hunter success, and percent bulls in the harvest. The 1854 Treaty Authority issued 51 hunter permits and 4 subsistence permits. Band members killed 19 moose (13 bulls and 6 cows). The Fond du Lac band issued a total of 85 permits and the preliminary harvest (as of 11/21/2006) was 28 moose (24 bulls and 4 cows). The Fond du Lac season closes 12/3/2006.

DISCUSSION

The success rate of State hunters in 2006 was 60%, an increase of 1% over 2005 (Tables 1 and 2). This is the first year since 1999 that hunter success has increased. A survey was distributed to all licensed hunters this year to help identify cause(s) for the recent decline in hunter success. Results of this survey will be available later this year. The success rate for members of the 1854 Treaty Authority was 35%. The preliminary success rate for the Fond du Lac band was 33%, as of 11/21/2006.

Table 1. Breakdown by sex, permit numbers, party success, and percent bulls in 2006 moose harvest by State hunters in northeastern Minnesota.

Zone	Bulls	Cows	Total	Licenses Offered	Licenses Sold*	Party** Applications	Chances for Permit	Party Success	% Bulls
20	4	1	5	15	14	103	15%	36%	80%
21	3	0	3	6	6	50	12%	50%	100%
22	6	0	6	8	8	71	11%	75%	100%
23	3	0	3	6	6	63	10%	50%	100%
24	7	0	7	10	10	275	4%	70%	100%
25	6	1	7	7	7	163	4%	100%	86%
26	2	0	2	10	9	40	25%	22%	100%
27	1	1	2	10	9	30	33%	22%	50%
28	6	2	8	8	8	60	13%	100%	75%
29	6	1	7	8	8	149	5%	88%	86%
30	7	0	7	11	10	203	5%	70%	100%
31	12	2	14	19	18	362	5%	78%	86%
32	1	1	2	7	7	32	22%	29%	50%
33	3	2	5	8	8	71	11%	63%	60%
34	0	0	0	6	6	63	10%	0%	-
35	2	0	2	5	5	43	12%	40%	100%
36	5	1	6	15	14	48	31%	43%	83%
60	4	0	4	6	6	39	15%	67%	100%
61	5	1	6	10	10	42	24%	60%	83%
62	9	2	11	18	18	98	18%	61%	82%
63	1	3	4	9	8	36	25%	50%	25%
64	5	1	6	12	8	26	46%	75%	83%
70	4	1	5	5	5	126	4%	100%	80%
72	3	1	4	9	8	92	10%	50%	75%
73	4	2	6	8	8	103	8%	75%	67%
74	5	2	7	9	10	78	12%	70%	71%
76	5	0	5	8	9	127	6%	56%	100%
77	7	3	10	14	14	187	7%	71%	70%
79	3	0	3	8	8	75	11%	38%	100%
80	4	0	4	4	4	97	4%	100%	100%
Total	133	28	161	279	269	2952	9%	60%	83%

* Application error resulted in 1 extra license sold in each of zones 74 and 76

**Number of 2, 3, and 4 person parties.

Table 2. Applicants, permit numbers, licenses purchased, moose harvested, and success of State moose hunters since 1993.

	Northwest				Northeast				
Year	Party Applicants	Licenses Offered	Moose Harvested	Party Success	Party Applicants	Licenses Offered	Licenses Sold	Moose Harvested	Party Success
1993	6,558	446	422	95%	2,934	315	315	264	84%
1994	8,208	262	244	93%	3,022	189	189	155	82%
1995	7,622	191	171	90%	3,181	188	188	156	83%
1996	2,476	39	38	97%	3,830	207	207	156	75%
1997		No Season			3,958	198	198	152	77%
1998		No Season			4,157	182	182	125	69%
1999		No Season			3,919	189	189	136	72%
2000		No Season					No Season		
2001		No Season			3,164	182	176	125	71%
2002		No Season			2,580	208	202	141	70%
2003		No Season			2,328	224	217	144	66%
2004		No Season			3,062	246	240	151	63%
2005		No Season			3,060	284	276	164	59%
2006		No Season			2,952	279	269	161	60%

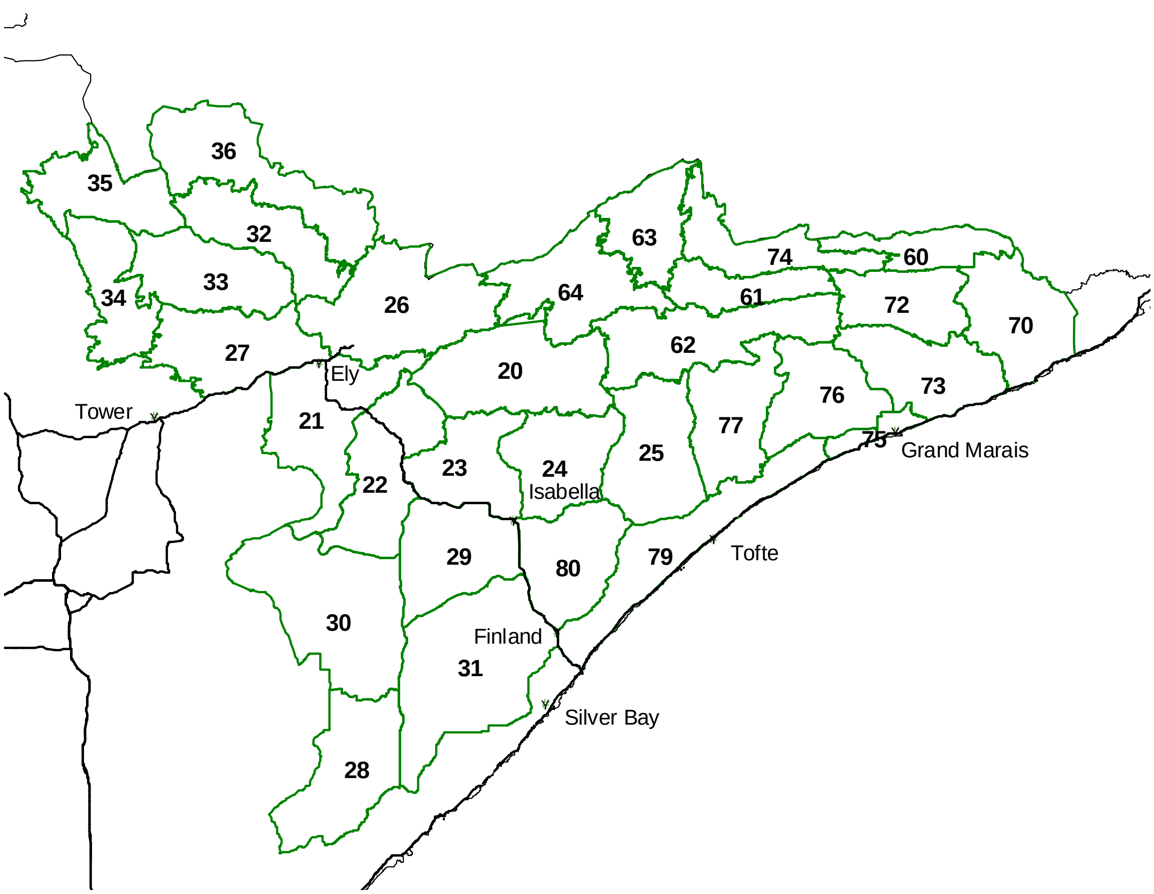

Figure 1. 2006 moose hunting zones in northeastern Minnesota.

2006 Elk Population and Harvest Report

Joel Huener, Thief Lake WMA

INTRODUCTION

Minnesota has two populations of elk. The first herd lives in the area north of Grygla on a combination of public and private lands, and can trace its origins back to re-introduction efforts in the area in 1935 (Figure 1). The second herd lives along the Manitoba/Kittson County border, and is comprised of animals that have moved in from Canada.
The Minnesota Legislature provided for the opportunity for sport hunting of elk in 1987 to help alleviate depredation concerns in the Grygla herd range, and to provide for the unique recreational opportunity this affords. Hunting this population is permitted whenever the pre-calving population exceeds 20 animals.

METHODS

Population estimates for these two herds are based on helicopter surveys done between December and March, when snow conditions and the lack of leaf cover permits good visibility of elk. Surveys are undertaken with DNR – Wildlife personnel from Thief Lake WMA and the Karlstad area office with DNR aircraft and pilots. Areas are covered using transects at 1/5 mile intervals in the Grygla herd range, and 1/3 mile intervals in the Border herd range. Transects are programmed into GPS based systems on the aircraft.

Further information on herd composition is derived from ground surveys driven during early morning hours in the respective elk ranges. Because the Border herd winters on both sides of the border, coordination between the Province of Manitoba and Minnesota DNR is necessary, and has not been possible in all years.

When the pre-calving population in the Grygla herd is above 30, a recommendation for hunting seasons and permit numbers is forwarded to the Region and St. Paul based on herd composition. Elk hunting in Minnesota is a once-in-a-lifetime opportunity, and hunters may apply for permits singly or in parties of two (receiving one permit between them). Permits are distributed based on a lottery. Successful applicants must attend a mandatory orientation at Thief Lake WMA, and animals taken must be registered there, where biological samples are taken.

RESULTS

The pre-calving population for the Grygla elk herd in 2006 was 53 animals (see Figure 2). Based on the survey and herd composition information, a bull season with two permits was authorized for September 16-24, 2006. Two different antlerless hunts with three permits each were authorized for November 18-26, and December 2-10, 2006. The Border herd is not hunted at this time in the U.S., and their survey information is presented in Figure 3.

Harvest statistics for this season and a comparison with previous years is presented in Table 1. The elk rut was going on during the bull hunt, and both parties were able to fill their tags with 6X6 bulls on opening day. No snow was present for the majority of the first antlerless elk hunt, which made location of the animals difficult, and no elk were taken during this hunt.

Snow was present during the second antlerless hunt, and hunters were able to take two animals. A female calf was taken on the 4th day of the season, and a spike bull was shot on the last day of the hunt (enforcement action was taken). Biological samples to examine elk health and screen for bovine tuberculosis were collected from all animals.

Table 1. Minnesota elk harvest by year including 2006.

	Bulls		**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*
Total	17(3 alternate)	9	28	13*

*One of two elk taken was actually a spike bull

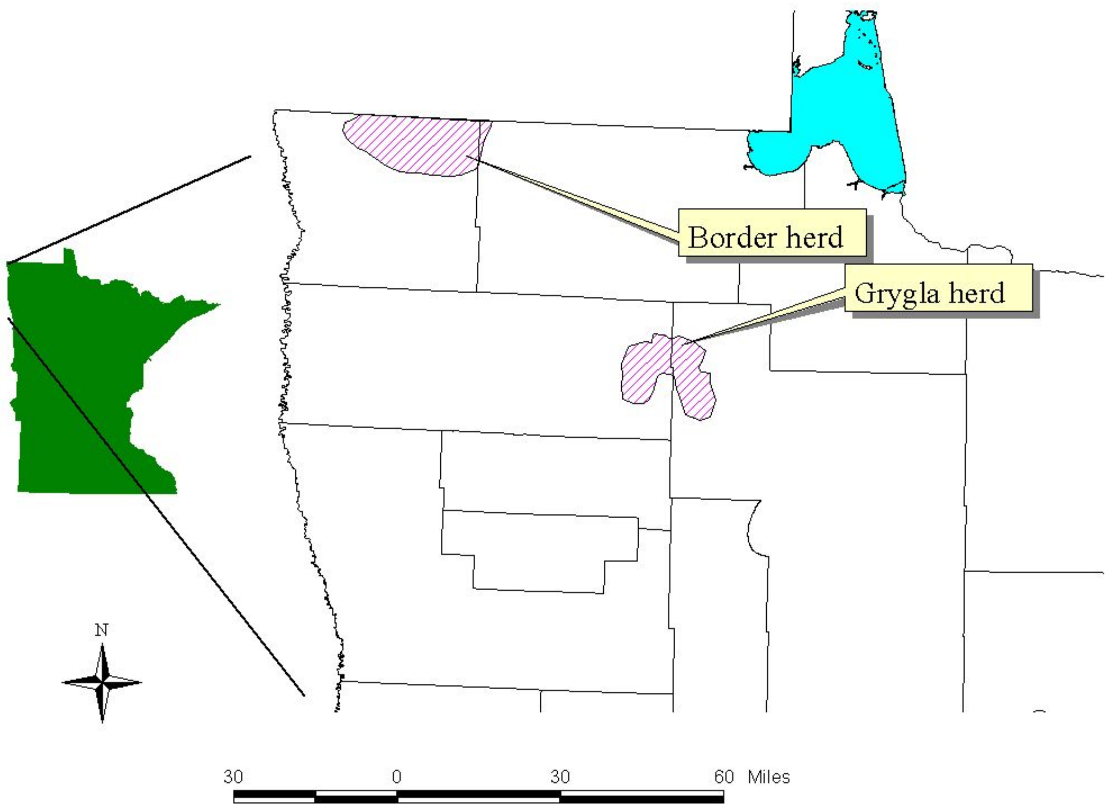

Figure 1. Current elk range in Minnesota, 2006.

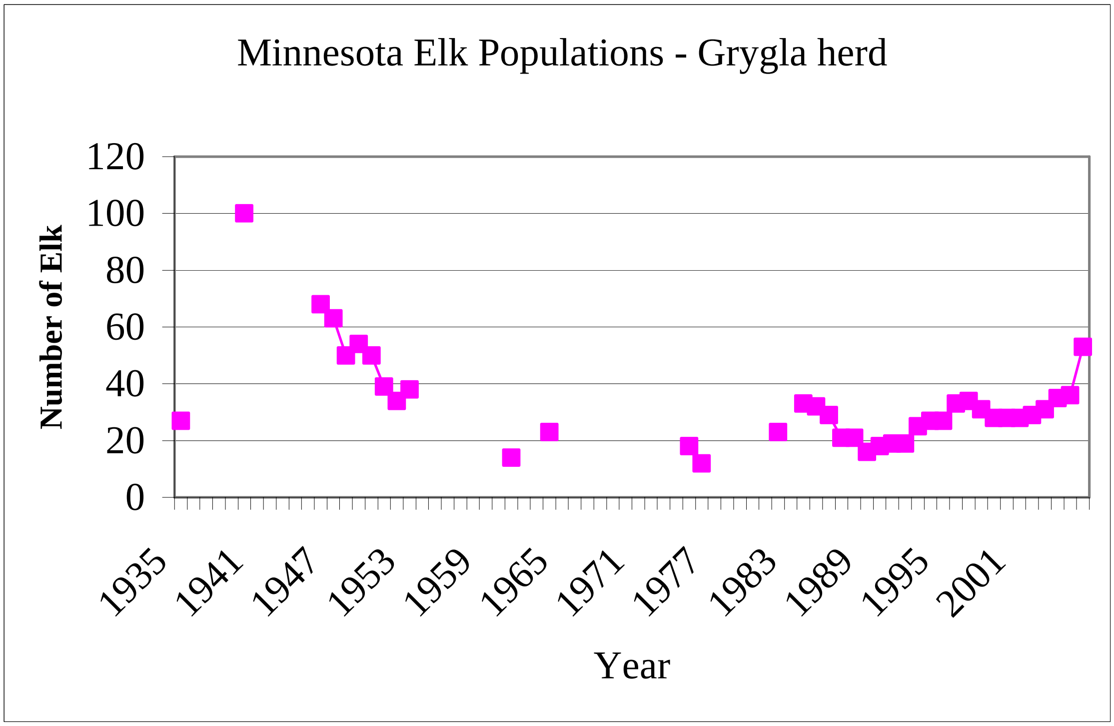

Figure 2. Pre-calving elk numbers in the Grygla herd, 2006.

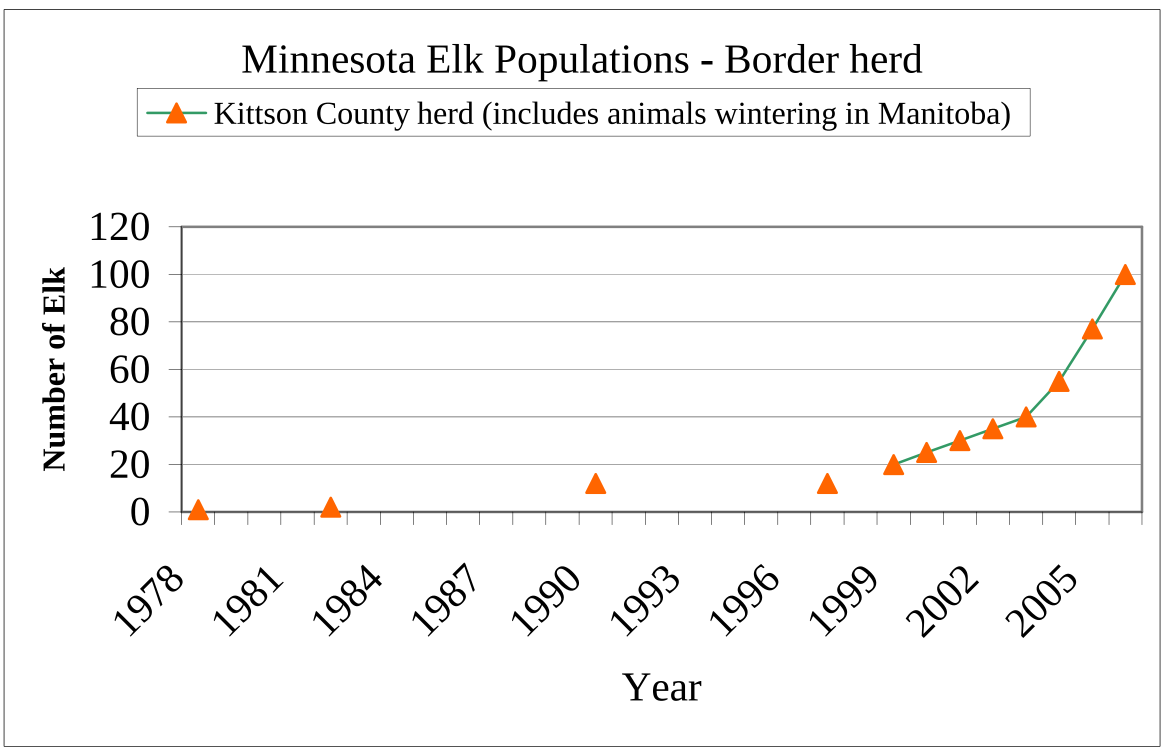

Figure 3. Pre-calving elk numbers in the Border herd, 2006.

TRAPPING HARVEST STATISTICS

Division of Fish and Wildlife
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2006 Trapper Harvest Survey

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources, Research Surveys and Statistics unit annually conducts a survey of trapper license holders. Annual harvest estimates from survey data provide the basis for future trapping regulations and season structure.

METHODS

The Research Surveys and Statistics unit requests a list of all active trapper license holders from the Electronic License System database in late February. The sample consisted of all valid Regular, Junior and Non-resident Trapper License holders. For the 2006-07 trapping season there were 7,472 Resident Regular Trappers, 1,081 Resident Junior Trappers, and 4 Nonresident (MN landowners) Trappers surveyed. Of the 8,557 valid licenses, 8,508 had usable addresses for purposes of the survey.

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

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

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

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

RESULTS

Attached are the survey results for Harvest Statewide and by License type, in tabular form (Tables 1 – 5).

Table 1. Trapper response to mail surveys, 1981-82 through 2006-07.

Year	Number mailed	Number not delivered	Delivered questionnaires completed and returned	
			Number	Percent
1981-82	1,345	36	1,167	89.2
1982-83	925	28	794	88.5
1983-84	770	10	663	87.2
1984-85	556	9	495	90.5
1985-86	581	13	506	89.1
1986-87	582	8	514	89.5
1987-88	721	11	607	85.5
1988-89	852	25	727	87.9
1989-90	3,302	120	2,804	88.1
1990-91	2,294	102	1,875	85.5
1991-92	2,643	149	2,062	82.7
1992-93	2,080	76	1,681	83.9
1993-94	2,828	100	2,194	80.4
1994-95	2,382	76	1,876	81.5
1995-96	3,244	118	2,467	80.3
1996-97	4,071	132	3,017	76.6
1997-98	3,500	96	2,629	77.2
1998-99	3,900	117	2,878	76.4
1999-00	3,110	74	2,313	76.2
2000-01	5,262	146	3,941	77.0
2001-02	5,482	127	4,132	78.6
2002-03	5,655	210	4,148	76.0
2003-04	5,812	197	4,234	75.4
2004-05	6,267	235	4,547	75.4
2005-06	6,060	88	4,396	73.6
2006-07	8,508	139	5,835	69.9

Table 2. Use of trapper licenses, 1994-95 through 2006-07.

		Return from mail survey	Projections from license sales
1994-95	Trapped	1,647 (87.8%)	6,054
	Did not trap	228 (12.2%)	841
		1,875 (100.0%)	6,895[a]
1995-96	Trapped	2,053 (83.2%)	4,684
	Did not trap	414 (16.8%)	946
		2,467 (100.0%)	5,630[a]
1996-97	Trapped	2,505 (84.8%)	5,660
	Did not trap	450 (15.2%)	1,015
		2,955 (100.0%)	6,675[a]
1997-98	Trapped	2,310 (88.6%)	6,198
	Did not trap	296 (11.4%)	798
		2606 (100.0%)	6,996[a]
1998-99	Trapped	2,398 (88.6%)	5,541
	Did not trap	480 (16.7%)	1,111
		2,878 (100.0%)	6,652[a]
1999-00	Trapped	1,927 (83.5%)	4,122
	Did not trap	381 (16.5%)	814
		2,308 (100.0%)	4,936[a]
2000-01	Trapped	2,897 (75.9%)	4,051
	Did not trap	920 (24.1%)	1,286
		3,817 (100.0%)	5,337[a]
2001-02	Trapped	3,332 (81.5%)	4,510
	Did not trap	754 (18.5%)	1,024
		4,086 (100.0%)	5,534[a]
2002-03	Trapped	3,344 (80.6%)	4,615
	Did not trap	804 (19.4%)	1,111
		4,148 (100.0%)	5,726[a]
2003-04	Trapped	3,412 (81.1%)	4,737
	Did not trap	793 (18.9%)	1,104
		4,205 (100.0%)	5,841[a]
2004-05	Trapped	3,697 (81.9%)	5,136
	Did not trap	815 (18.1%)	1,135
		4,512 (100.0%)	6,271[a]
2005-06	Trapped	3,495 (80.0%)	4,930
	Did not trap	875 (20.0%)	1,233
		4,370 (100.0%)	6,163[a]
2006-07	Trapped	4,782 (81.9%)	7,008
	Did not trap	1,053 (18.1%)	1,549
		5,835 (100.0%)	8,557[a]

[a] excludes duplicates.

Table 3. Estimated number of trappers of various furbearers, 1992-93 through 2006-07.

	Estimated number of trappers (thousands)														
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Muskrat	3	3	4	3	4	4	3	2	2	2	2	2	2	2	4
Mink	3	3	3	2	3	3	3	2	2	2	2	2	2	2	3
Short-tailed weasel	<1	<1	1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	1
Long-tailed weasel	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	1
Raccoon (Sept 06-Feb 07)	2	3	3	2	3	3	3	2	2	2	2	2	3	2	4
Raccoon (Mar 05-Aug 05)[a]			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Striped skunk	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Eastern spotted skunk	<1	<1	<1	<1	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Opossum	1	1	1	1	1	1	1	<1	<1	1	1	1	1	1	2
Red fox (Sept 06-Feb 07)	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2
Red fox (Mar 05-Aug 05)[a]			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Gray fox	<1	<1	<1	<1	n.a.	<1	<1	<1	<1	<1	<1	<1	<1	<1	1
Coyote	1	1	1	1	1	1	1	1	<1	1	1	1	1	1	1
Beaver (Oct 06- Feb 07)	2	2	3	2	2	3	3	2	2	2	2	2	2	2	3
Beaver (Mar 06- Apr 06)	1	1	2	1	2	2	2	1	1	1	1	1	1	1	2

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

Table 4. Estimated take per trapper of various furbearers, 1992-93 through 2006-2007.

	Estimated take per successful trapper reporting that species														
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Muskrat	36	64	90	70	55	58	42	46	42	42	35	33	32	39	58
Mink	12	12	12	11	11	11	13	14	12	14	10	9	10	10	9
Short-tailed weasel	5	6	12	10	9	10	7	5	8	10	7	7	6	6	9
Long-tailed weasel	4	4	6	5	5	5	5	5	5	7	4	5	3	3	5
Raccoon (Sept 06-Feb 07)	16	5	20	23	23	24	23	20	20	27	25	22	23	21	21
Raccoon (Mar 05Aug 05)[a]			15	15	13	14	15	14	11	19	12	15	12	11	
Striped skunk	8	9	8	8	10	10	9	8	8	8	8	8	8	7	7
Eastern spotted skunk	2	6	4	5	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1
Opossum	10	8	9	9	9	9	11	13	11	8	11	12	14	12	14
Red fox (Sept 06-Feb 07)	11	11	11	9	7	7	5	6	6	6	6	5	4	4	4
Red fox (Mar 05-Aug 05)[a]			9	5	4	4	3	4	4	5	5	6	3	3	
Gray fox	4	3	2	2	n.a.	3	3	2	2	2	2	2	2	2	2
Coyote	5	5	4	5	4	3	3	4	4	4	4	5	4	5	4
Beaver (Oct 06-Feb 07)	13	16	18	14	16	16	16	16	15	18	13	12	13	13	13
Beaver (Mar 06 - Apr 06)	29	29	37	29	31	32	29	27	26	31	26	21	26	24	24

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

Table 5. Minnesota trapper license sales and estimated annual harvest, 1992-93 through 2006-2007[a]

	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Trapper license sales[b]	5,763	5,601	6,895	5,630	6,675	6,996	6,652	4,936	5,337	5,534	5,725	5,841	6,271	6,163	8,557
Estimated harvest[c] (thousands)															
Muskrat	92	202	355	195	202	194	131	97	86	101	75	69	72	91	243
Mink	32	33	40	26	35	34	36	27	23	29	20	17	21	18	26
Short-tailed weasel	1	2	6	4	4	4	2	2	3	4	3	4	3	2	8
Long-tailed weasel	1	1	3	2	2	2	2	2	1	2	1	2	1	1	3
Raccoon (Sept 06- Feb 07)	34	56	58	53	69	66	64	37	32	60	61	54	57	49	79
Raccoon (Mar 05-Aug 05)[f]			1	5	5	5	7	4	4	6	4	5	5	4	
Striped skunk	7	9	9	8	11	11	9	5	5	7	8	8	9	7	11
Eastern spotted skunk[g]	<1	<1	<1	<1	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	1	1	1	<1	1	1	<1	<1	<1	<1	<1	1	<1	<1	<1
Opossum	6	5	5	6	6	6	7	6	5	5	8	11	14	12	20
Red fox (Sept 06- Feb 07)	23	22	24	14	13	12	6	7	6	7	8	7	5	4	7
Red fox (Mar 05-Aug 05)[f]			1	1	1	1	<1	<1	<1	<1	1	1	<1	<1	
Gray fox	1	1	1	1	n.a.	1	1	1	<1	1	1	1	1	1	2
Coyote	4	4	5	3	3	3	2	2	2	2	4	4	4	4	5
Beaver (Oct 06- Feb 07)	22	29	49	25	38	36	39	31	25	36	24	23	29	26	34
Beaver (Mar 06-Apr 06)	34	32	64	41	48	47	55	36	37	42	34	26	38	35	42
Registered harvest															
Otter	1,368	1,459	2,445	1,435	2,219	2,145	1,946	1,635	1,578	2,301	2,145	2,766	3,450	2,846	2,720
Lynx[g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Bobcat[e]	168	201	238	134	223	359	103	206	231	250	544	483	631	590	890
Fisher	778	1,159	1,771	942	1,773	2,761	2,695	1,725	1,674	2,119	2,660	2,517	2,552	2,388	3,251
Marten	1,602	1,438	1,527	1,500	1,625	2,261	2,299	2,423	1,629	1,928	2,839	3,214	3,241	2,653	3,788

[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. As of March 3, 2007 8,557 trapping licenses were sold in 2006 1,081 (12.6%) were juvenile licenses and 7,472 (87.3%) were adult licenses 4 (<1%) were Nonresident (MN Landowner) licenses. Duplicate licenses excluded.

[c] Based upon trappers' responses to mail surveys. [d] 1 is any number which rounds to 1. <1 is any number which is <0.5.

[e] Registered harvest for bobcat includes animals taken by hunting. [f] Raccoon and red fox season continuous May 1994 thru March 15, 2006.

[g] Lynx (1984) and Eastern spotted skunk (1996) listed as Special Concern and threatened species (respectively) and are fully protected.

Minnesota Fur Buyers Survey For the 2006-2007 Hunting and Trapping Season

Jason Abraham, Wildlife Furbearer Program Consultant
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 July 2007, questionnaires were mailed to the 32 licensed furbuyers in Minnesota. The survey asked them to report the number and type of fur purchased from Minnesota trappers and hunters in 2005-06 and the “average price” paid to those hunters and trappers based on all furs purchased. A total of 28 usable surveys were received, for a return rate of 87.5 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 2006-07 was $1,865,741, an increase of about 14 percent from 2005-06.

RESULTS

Survey summaries are presented in the following tables.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2006-07.

Species	Number Buyers	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	22	81406	$2.00	$7.00	$5.79
Mink, female	21	4238	$5.00	$18.00	$13.18
Mink, male	20	4623	$6.00	$20.00	$18.04
Raccoon	23	44771	$6.50	$14.90	$11.92
Red fox	22	1907	$9.00	$22.00	$17.68
Gray fox	15	376	$15.00	$30.00	$22.36
Coyote	22	3799	$8.00	$49.00	$17.76
Bobcat	12	340	$43.33	$110.00	$101.07
River Otter	12	679	$30.00	$60.00	$42.85
Beaver, fall	23	9858	$7.00	$22.00	$18.35
Beaver, spring	16	8311	$8.00	$16.00	$14.81
LT weasel	6	193	$3.00	$5.00	$4.35
ST weasel	12	751	$1.00	$8.00	$3.58
Striped skunk	13	432	$2.00	$6.57	$4.46
Badger	15	187	$8.52	$26.00	$15.71
Opossum	12	906	$0.40	$3.00	$1.52
Fisher, male	14	771	$25.00	$90.00	$76.33
Fisher, female	11	501	$45.00	$80.00	$67.82
Marten, male	8	312	$40.00	$80.00	$74.04
Marten, female	8	179	$35.00	$75.00	$66.09
Deer Hides	19	22966	$2.50	$7.50	$4.51
Bear Hides	8	75	$25.00	$53.00	$43.03

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 1992-93 through 2006-07.

		Average pelt prices paid hunters and trappers in Minnesota (dollars)													
Species	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Muskrat	1.35	1.35	1.61	1.53	3.49	2.24	1.11	1.57	1.83	2.32	2.11	2.05	1.90	2.81	$5.79
Mink (male)	24.74	21.89	14.90	11.75	20.82	13.52	9.83	11.61	11.15	9.34	9.55	11.41	11.34	14.29	$13.18
Mink (female)	15.02	12.18	11.43	8.56	13.71	9.65	6.11	8.22	7.70	6.76	6.52	7.23	10.22	10.23	$18.04
S.T. Weasel	1.31	1.72	1.73	1.84	2.32	2.33	1.72	2.16	2.30	2.41	2.63	2.53	2.52	2.60	$3.58
L.T. Weasel	1.06	1.05	2.05	1.24	3.33	2.67	2.05	2.34	1.80	2.98	1.94	3.34	3.05	2.56	$4.35
Raccoon	7.29	8.26	9.02	9.40	15.16	13.92	7.25	5.09	8.86	9.53	10.33	11.45	10.49	9.61	$11.92
Striped Skunk	2.69	3.70	3.52	3.21	2.11	3.18	4.72	4.40	4.79	3.91	5.81	4.66	3.95	3.77	$4.46
Badger	4.20	4.62	6.12	6.33	8.49	6.53	6.30	7.30	10.15	9.39	13.18	14.23	12.94	13.40	$15.71
Opossum	0.78	0.89	0.98	0.97	1.04	1.10	0.58	0.96	0.97	1.19	1.22	1.23	1.51	1.40	$1.52
Red Fox	8.88	10.59	13.42	14.21	14.81	11.23	8.04	11.82	14.45	17.07	22.08	20.02	17.28	16.96	$17.68
Gray Fox	6.73	6.55	9.69	7.49	9.00	7.69	5.63	7.06	7.52	8.36	9.05	13.64	12.58	15.00	$22.36
Coyote	15.55	14.68	13.55	10.89	12.25	10.12	5.57	9.42	12.40	13.37	16.12	18.37	15.24	13.57	$17.76
Bobcat	28.18	43.42	36.36	31.81	32.82	30.39	27.66	24.23	33.09	46.00	71.54	95.90	98.99	95.74	$101.07
Beaver (fall-winter)	7.10	11.24	13.80	12.56	19.24	16.48	11.40	11.51	14.66	12.74	10.05	12.57	13.62	14.48	$18.35
Beaver (spring)	7.89	9.41	14.48	10.96	19.14	17.39	14.06	11.02	12.80	12.47	9.99	11.09	13.80	16.49	$14.81
Otter	29.90	43.14	47.50	38.76	38.75	39.81	34.03	41.41	50.52	46.19	61.16	85.33	87.23	88.89	$42.85
Fisher (male)	15.73	14.17	19.06	16.17	25.48	31.09	18.92	19.45	20.14	23.18	26.70	27.15	30.02	36.03	$76.33
Fisher (female)	28.79	28.40	29.93	24.90	34.47	33.65	21.76	19.91	19.01	22.86	25.44	25.71	27.47	31.46	$67.82
Marten (male)	27.87	35.86	34.07	28.30	34.47	27.82	19.70	24.89	27.56	24.10	28.00	30.09	30.65	37.47	$74.04
Marten (female)	24.96	29.58	28.34	21.42	29.26	21.79	16.12	21.27	21.25	22.52	27.30	26.70	27.42	31.53	$66.09
Deer Hides	5.67	5.27	7.17	6.92		6.97	6.40	6.32	6.46	2.86	3.48	5.41	3.95	4.14	$4.51
Bear Hides	30.21	46.77	38.93	50.72		37.27	36.23	33.87	39.81	36.10	40.56	41.55	46.61	39.30	$43.03

REGISTERED FURBEARER HARVEST STATISTICS

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Registered Furbearer Harvest Statistics
2006-07 Report

John Erb, Forest Wildlife Populations and Research Group
Drawing by Gilbert Proulx

INTRODUCTION

Monitoring harvest is an important component of population management for many wildlife populations. For many species, harvest represents a large proportion of overall mortality. Obtaining harvest information can be useful for documenting changes in the distribution and abundance of animals, as well as the effects of changes in harvest seasons, harvest techniques, and habitat. The level of detail or accuracy necessary in harvest information may vary across species, depending on such factors as density, harvest pressure, habitat sensitivity of the species, and reproductive potential.

In Minnesota, detailed harvest information is collected on 4 carnivores – fisher, marten, bobcat, and river otter. These species have lower reproductive potential, naturally occur at low to moderate densities, have comparatively 'restricted' distributions, and/or may be more subject to effects of habitat change. Hence, detailed harvest information is desirable to help ensure sustainable populations. For approximately the past 29 years, such data has been collected for these species.

METHODS

Currently, harvest of these species is allowed in approximately the northern 60% of the state. Fur-harvesters are required to bring pelts from harvested animals (fisher, marten, bobcat, otter) in to fur registration stations within 48 hours of the close of the season. Upon registration, information is collected on the sex, date, and location (township) of the harvested animal, and the pelt is tagged to verify it has been registered.

RESULTS

All harvest summaries are provided in the following tables.

Table 1. Registered furbearer harvests and total permits[a] issued, 1982-2006.

	Bobcat		Fisher		Marten		Otter	
Year	Permits	Harvest	Permits	Harvest	Permits	Harvest	Permits	Harvest
1982-83	--	274	--	912	--	--	--	385
1983-84	--	208	--	631	--	--	--	408
1984-85	--	280	--	1,289	--	--	--	529
1985-86	--	119	--	678	746	430	--	559
1986-87	--	160	3,302	1,067	2,171	798	3,198	777
1987-88	--	212	4,952	1,641	3,025	1,363	4,708	1,386
1988-89	--	141	4,419	1,025	3,369	2,072	4,070	922
1989-90	--	129	3,712	1,243	3,074	2,119	3,549	1,294
1990-91	--	84	2,385	746	2,090	1,349	2,199	888
1991-92	--	106	2,360	528	2,020	686	2,282	855
1992-93	--	168	2,420	778	2,050	1,602	3,440	1,368
1993-94	--	201	2,299	1,159	1,925	1,438	2,254	1,459
1994-95	--	238	2,186	1,772	2,477	1,527	2,964	2,445
1995-96	--	134	2,520	942	2,268	1,500	2,579	1,435
1996-97	--	223	1,557	1,773	1,392	1,625	1,623	2,219
1997-98	--	359	2,517	2,761	2,517	2,261	2,543	2,145
1998-99	–	103	2,808	2,695	2,808	2,299	2,749	1,946
1999-00	–	206	1,984	1,725	1,984	2,423	1,918	1,635
2000-01	–	231	3,226	1,674	3,226	1,629	3,116	1,578
2001-02	--	250	--	2,119	--	1,928	--	2,301
2002-03	--	544	--	2,660	--	2,839	--	2,145
2003-04	--	483	--	2,521	--	3,214	--	2,766
2004-05	--	631	--	2,552	--	3,241	--	3,450
2005-06	--	590	--	2,388	--	2,653	--	2,846
2006-07	--	890	--	3,251	--	3,788	--	2,720

[a] Prior request tags and permits were required beginning in 1985 for marten and in 1986 for fisher and otter. No possession tags or prior permits have been required for bobcat, and prior request tags and permits were no longer required for fisher, marten, or otter starting in 2001-02.

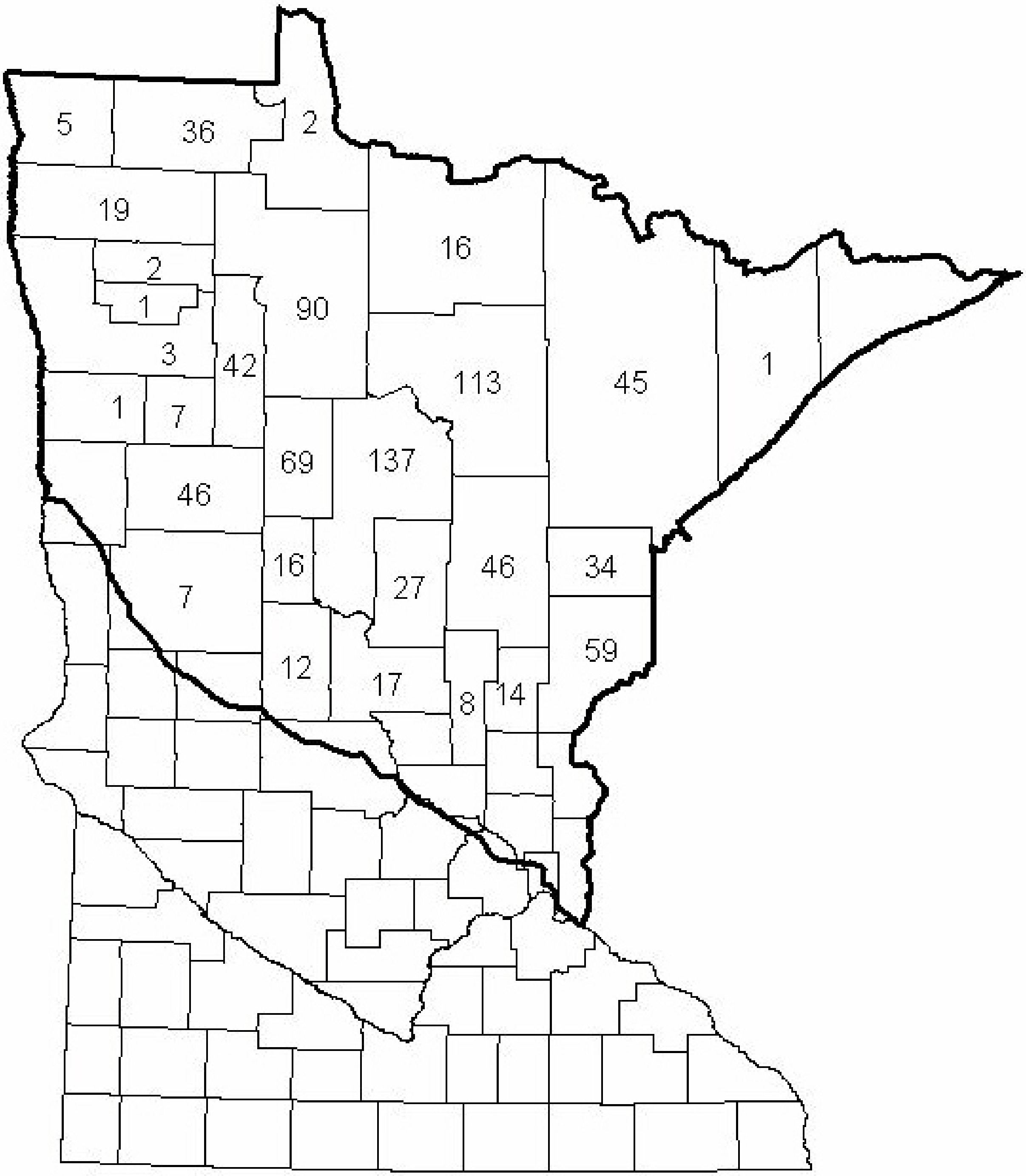

Figure 1. Bobcat harvest by county, 2006-07.

Table 2. Bobcat harvest by county and sex, 2006-07.

	Sex *			
County	Male	Female	Unknown	Total
Aitkin	21	25		46
Becker	18	27	1	46
Beltrami	44	46		90
Benton	0	0		0
Carlton	15	19		34
Cass	58	78	1	137
Chisago	0	0		0
Clay	0	0		0
Clearwater	19	23		42
Cook	0	0		0
Crow Wing	12	15		27
Hubbard	33	36		69
Isanti	0	0		0
Itasca	57	56		113
Kanabec	4	10		14
Kittson	3	2		5
Koochiching	6	10		16
Lake	1	0		1
LOW	1	1		2
Mahnomen	3	4		7
Marshall	11	8		19
Mille Lacs	4	4		8
Morrison	6	11		17
Norman	1	0		1
Ottertail	5	2		7
Pennington	0	2		2
Pine	37	22		59
Polk	2	1		3
Red Lake	1	0		1
Roseau	18	18		36
St. Louis	18	27		45
Todd	4	7	1	12
Wadena	6	10		16
Unknown	7	8		15
Total	415	472	3	890

* 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, 1996-2006.

County	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Aitkin	20	19	6	25	32	20	35	19	37	32	46
Becker	4	10	1	8	6	28	26	19	28	19	46
Beltrami	20	37	7	13	16	26	63	47	66	34	90
Benton	0	0	0	0	0	0	0	0	0	0	0
Carlton	14	18	4	10	12	14	11	20	27	25	34
Cass	22	64	16	24	11	17	59	48	56	103	137
Chisago	0	0	0	0	0	0	1	0	0	0	0
Clay	0	0	0	0	0	0	0	1	0	0	0
Clearwater	3	14	1	4	0	6	24	19	18	18	42
Cook	0	0	0	0	0	0	1	1	2	3	0
Crow Wing	5	8	15	21	13	4	20	15	19	18	27
Hubbard	4	19	1	7	4	10	31	21	35	22	69
Isanti	0	0	0	2	0	0	0	2	0	1	0
Itasca	51	45	10	23	40	33	74	76	93	68	113
Kanabec	6	13	3	4	11	8	10	9	17	11	14
Kittson	1	0	0	7	6	7	5	8	6	3	5
Kooch	23	14	2	8	11	12	23	25	14	22	16
Lake	0	0	1	0	1	0	0	0	1	2	1
LOW	2	0	2	2	3	0	6	4	6	3	2
Mahnomen	0	2	0	1	1	1	0	3	7	2	7
Marshall	5	28	4	10	2	4	24	14	20	16	19
Mille Lacs	0	0	0	1	2	0	10	4	11	9	8
Morrison	5	1	2	6	8	4	6	14	18	18	17
Norman	0	0	0	0	0	0	0	0	0	0	1
Ottertail	0	2	0	0	0	1	0	0	5	1	7
Pennington	2	1	0	0	1	1	1	0	6	3	2
Pine	20	23	12	15	21	23	49	44	59	47	59
Polk	1	1	0	0	1	0	2	2	4	1	3
Red Lake	0	0	0	0	2	0	1	1	0	6	1
Roseau	5	15	3	7	12	18	22	28	27	28	36
St. Louis	7	14	10	5	9	7	30	25	37	44	45
Todd	0	0	2	1	0	1	3	6	5	7	12
Wadena	1	5	1	2	0	5	7	8	3	17	16
Unknown	2	4	0	0	4	0	0	0	4	7	15
Total	223	357	103	206	229	250	544	483	631	590	890

Table 4. Bobcat harvest by sex and week, 2006-07 season.

Date	Sex* Male	Sex* Female	Sex* Unknown	Total	% of Total	Cumulative %
Nov.25 - Dec.1	64	78		142	15.96	15.96
Dec.2 - Dec.8	75	97	1	173	19.44	35.39
Dec.9 - Dec.15	55	81	1	137	15.39	50.79
Dec.16 - Dec.22	69	53		122	13.71	64.49
Dec.23 - Dec.29	65	67		132	14.83	79.33
Dec.30 - Jan.7*	81	88		169	18.99	98.31
Unknown	6	8	1	15	1.69	100%
Total	415	472	3	890	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, 1985-2006.

Number (%) of Takers	Number Taken 1	2	3	4	5	Total Takers
1985-86	70 (79)	11 (12)	6 (7)	1 (1)	1 (1)	89
1986-87	92 (77)	18 (15)	9 (8)	0 (0)	1 (1)	120
1987-88	104 (72)	23 (16)	10 (7)	6 (4)	2 (1)	145
1988-89	88 (82)	11 (10)	7 (7)	1 (1)	1 (1)	108
1989-90	56 (69)	13 (16)	5 (6)	3 (4)	4 (5)	81
1990-91	47 (77)	9 (15)	1 (2)	4 (7)	0 (0)	61
1991-92	42 (64)	15 (23)	4 (6)	3 (5)	2 (3)	66
1992-93	69 (64)	21 (20)	9 (9)	5 (5)	2 (2)	106
1993-94	90 (70)	17 (13)	13 (10)	7 (5)	2 (2)	201
1994-95	103 (68)	25 (17)	12 (8)	6 (4)	5 (3)	151
1995-96	67 (74)	13 (14)	5 (6)	4 (4)	2 (2)	91
1996-97	115 (73)	28 (18)	85 (5)	2 (1)	4 (3)	157
1997-98	129 (61)	43 (20)	17 (8)	12 (6)	9 (5)	210
1998-99	59 (77)	11 (14)	2 (3)	3 (4)	1 (2)	76
1999-00	113 (76)	21 (14)	10 (6)	4 (3)	1(1)	149
2000-01	99 (69)	23 (16)	7 (5)	5 (4)	9 (6)	143
2001-02	101 (71)	23 (16)	12 (8)	1 (1)	5 (4)	142
2002-03	185 (60)	64 (21)	33 (10)	15 (5)	12 (4)	309
2003-04	171 (64)	40 (15)	25 (10)	20 (7)	11 (4)	267
2004-05	193 (59)	55 (17)	32 (10)	25 (7)	24 (7)	329
2005-06	198 (60)	67 (20)	33 (10)	15 (5)	18 (5)	331
2006-07	265 (57)	90 (19)	44 (9)	25 (5)	42 (9)	466

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

Table 6. Bobcat harvest by method of take, 1980-2006.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
1980-81	210	177	84	68	2.6		33	16	24	1.4	
1981-82	259	218	84	142	1.5		41	16	30	1.4	
1982-83	274	239	87	147	1.6		35	13	23	1.5	
1983-84	208	168	81	118	1.4		40	19	32	1.3	
1984-85	280	252	90	156	1.6		28	10	22	1.3	
1985-86	119	83	70	62	1.3		36	30	27	1.3	
1986-87	160	119	74	89	1.3		41	26	31	1.3	
1987-88	214	177	83	118	1.5		37	17	26	1.4	
1988-89	140	94	67	76	1.2		46	33	32	1.4	
1989-90	129	90	70	49	1.8		39	30	28	1.4	
1990-91	83	61	73	43	1.4		22	27	17	1.3	
1991-92	102	59	58	31	1.9		43	42	33	1.3	
1992-93	168	133	79	85	1.6		35	21	23	1.5	
1993-94	201	147	73	88	1.7		54	27	41	1.3	
1994-95	238	189	79	120	1.6		49	21	31	1.6	
1995-96	134	73	54	53	1.4		61	46	38	1.6	
1996-97	203	133	66	91	1.5		70	34	53	1.3	
1997-98	357	313	88	176	1.8		44	12	34	1.3	
1998-99	103	95	92	67	1.4		8	8	8	1.0	
1999-00	206	155	75	114	1.4		51	25	36	1.4	
2000-01	231	140	61	85	1.6		91	39	58	1.6	
2001-02	250	208	83	116	1.8	41	42	17	27	1.6	68
2002-03	544	500	92	279	1.8	38	44	8	32	1.4	57
2003-04	483	415	86	230	1.8	46	68	14	40	1.7	65
2004-05	631	542	86	279	1.9	43	89	14	53	1.7	60
2005-06	583	435	75	250	1.7	37	148	25	85	1.7	65
2006-07	890	779	88	391	2.0	45	111	12	81	1.4	57

[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

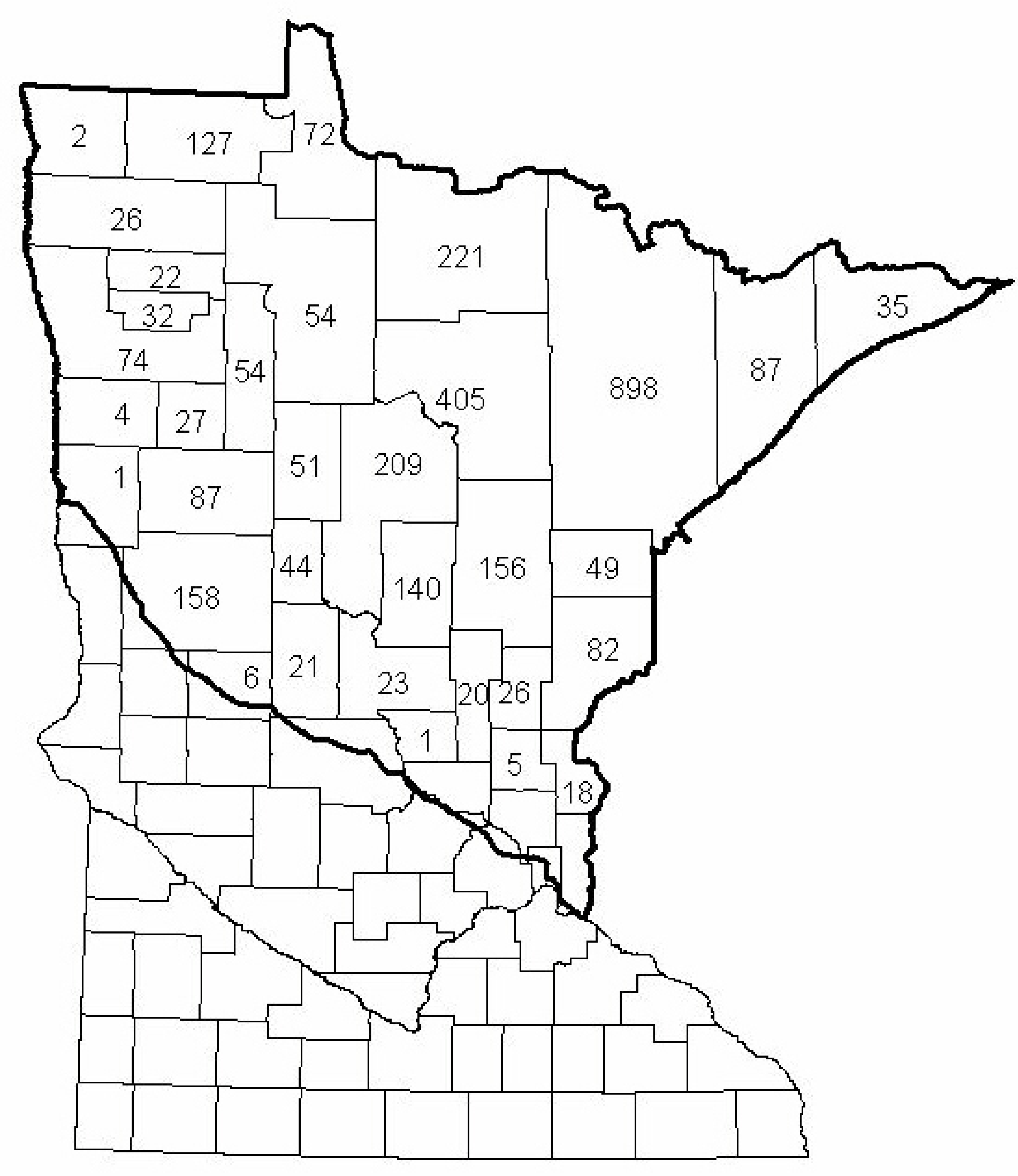

Figure 2. Fisher harvest by county, 2006-07.

Table 7. Fisher harvest by county and sex, 2006-07 season.

County	Sex			Total
	Male	Female	Unknown	
Aitkin	79	77		156
Anoka	0	0		0
Becker	48	39		87
Beltrami	27	26	1	54
Benton	1	0		1
Carlton	22	27		49
Cass	116	93		209
Chisago	8	10		18
Clay	0	1		1
Clearwater	22	32		54
Cook	18	17		35
Crow Wing	73	66	1	140
Douglas	3	3		6
Hubbard	27	24		51
Isanti	1	4		5
Itasca	194	210	1	405
Kanabec	17	9		26
Kittson	2	0		2
Koochiching	116	105		221
Lake	40	47		87
LOW	38	34		72
Mahnomen	14	13		27
Marshall	13	13		26
Mille Lacs	9	11		20
Morrison	13	10		23
Norman	3	1		4
Ottertail	75	83		158
Pennington	12	10		22
Pine	48	34		82
Polk	33	39	2	74
Red Lake	20	12		32
Roseau	74	53		127
St. Louis	452	446		898
Sherburne	0	0		0
Stearns	0	0		0
Todd	12	9		21
Wadena	29	15		44
Unknown	8	6		14
Total	1,667	1,579	5	3,251

Table 8. Comparison of fisher harvest by county, 1995-2006.

County	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Aitkin	26	58	86	105	84	68	103	122	124	96	97	156
Anoka	0	0	0	0	0	0	0	0	1	0	0	0
Becker	17	15	25	15	32	42	46	96	88	92	49	87
Beltrami	27	84	140	105	70	60	73	117	74	71	47	54
Benton	0	0	0	0	0	0	0	0	1	0	1	1
Carlton	14	10	45	25	23	27	37	48	42	40	35	49
Cass	58	142	212	133	123	122	134	225	205	186	149	209
Chisago	0	0	0	1	0	3	2	6	5	6	2	18
Clay	0	0	0	0	0	0	0	0	0	0	0	1
Clearwater	0	6	31	18	13	15	45	45	52	41	35	54
Cook	12	12	24	26	19	19	33	27	28	24	40	35
Crow Wing	24	32	65	75	53	71	82	106	106	113	79	140
Douglas	0	0	0	0	0	1	0	0	3	3	3	6
Hubbard	15	30	66	38	34	34	64	59	62	32	20	51
Isanti	0	0	0	0	0	0	0	0	0	2	3	5
Itasca	116	291	477	441	248	288	298	354	319	323	320	405
Kanabec	0	6	7	3	11	4	4	19	21	13	15	26
Kittson	0	0	7	3	3	3	7	3	11	2	7	2
Koochiching	92	232	386	369	150	159	156	178	171	179	209	221
Lake	43	60	123	84	46	62	54	72	74	87	85	87
Lake of the Woods	4	30	59	99	83	71	48	115	78	33	63	72
Mahnomen	0	0	0	0	3	0	12	16	14	13	9	27
Marshall	2	4	21	7	10	27	19	18	21	25	18	26
Mille Lacs	0	6	0	3	0	4	3	16	22	14	16	20
Morrison	0	0	0	0	2	0	1	6	3	7	5	23
Norman	0	0	0	0	6	0	0	1	1	11	6	4
Ottertail	0	0	0	1	0	0	1	12	40	52	60	158
Pennington	0	1	1	0	2	4	4	10	18	42	22	22
Pine	20	24	34	55	36	37	29	44	54	56	42	82
Polk	3	3	6	5	6	8	24	46	65	47	38	74
Red Lake	0	2	5	0	2	18	16	15	16	29	34	32
Roseau	26	89	134	171	111	157	180	106	141	114	110	127
St Louis	153	604	783	880	546	369	608	734	611	740	688	898
Sherburne	0	0	0	0	0	0	0	0	2	0	0	0
Stearns	0	0	0	0	0	0	0	0	0	1	0	0
Todd	0	0	2	0	0	0	2	5	14	18	23	21
Wadena	1	2	10	5	8	0	31	39	32	31	40	44
Unknown	289	30	12	28	2	1	1	0	2	9	18	14
Total	942	1,773	2,761	2,695	1,726	1,674	2,117	2,660	2,521	2,552	2,388	3,251

Table 9. Fisher harvest by date and sex, 2006-07 season.

Date	Sex			Total	% of Known	Cumulative
	Male	Female	Unknown		Total	%
Nov. 25	8	2		10	0.31	0.31
Nov. 26	81	59	1	141	4.34	4.64
Nov. 27	132	129		261	8.03	12.67
Nov. 28	142	114	1	257	7.91	20.58
Nov. 29	120	106		226	6.95	27.53
Nov. 30	123	114		237	7.29	34.82
Dec. 1	117	120		237	7.29	42.11
Dec. 2	144	122		266	8.18	50.29
Dec. 3	127	103		230	7.07	57.37
Dec. 4	95	81		176	5.41	62.78
Dec. 5	83	91		174	5.35	68.13
Dec. 6	93	111		204	6.27	74.41
Dec. 7	72	67	2	141	4.34	78.75
Dec. 8	80	91	1	172	5.29	84.04
Dec. 9	107	121		228	7.01	91.05
Dec. 10	109	94		203	6.24	97.29
Unknown	34	54		88	2.71	100%
Total	1,667	1,579	5	3,251	100%	

Table 10. Distribution of fisher harvest* among trappers, 1993-2006.

Number (%) of Takers	Number Taken					Total Takers	Ave. Take
	1	2	3	4	5		
1993-94	239 (34)	460 (66)	----	----	----	699	1.7
1994-95	321 (31)	725 (69)	----	----	----	1046	1.7
1995-96	232 (40)	355 (60)	----	----	----	587	1.6
1996-97	321 (31)	726 (69)	----	----	----	1047	1.7
1997-98	351 (23)	1205 (77)	----	----	----	1556	1.8
1998-99	443 (28)	1141 (72)	----	----	----	1584	1.7
1999-00	397 (37)	664 (63)	----	----	----	1061	1.6
2000-01	301(38)	251 (31)	129 (16)	121 (15)	----	802	2.1
2001-02	294 (33)	271 (31)	146 (17)	168 (19)	----	879	2.2
2002-03	336 (35)	234 (25)	138 (15)	117 (12)	123 (13)	948	1.8
2003-04	403 (39)	249 (24)	150 (15)	107 (11)	115 (11)	1024	1.7
2004-05	390 (37)	260 (25)	184 (17)	95 (9)	132 (12)	1061	1.7
2005-06	407 (40)	251 (24)	150 (15)	102 (10)	118 (11)	1028	1.7
2006-07	510 (37)	328 (24)	208 (15)	150 (11)	171 (13)	1367	1.7

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

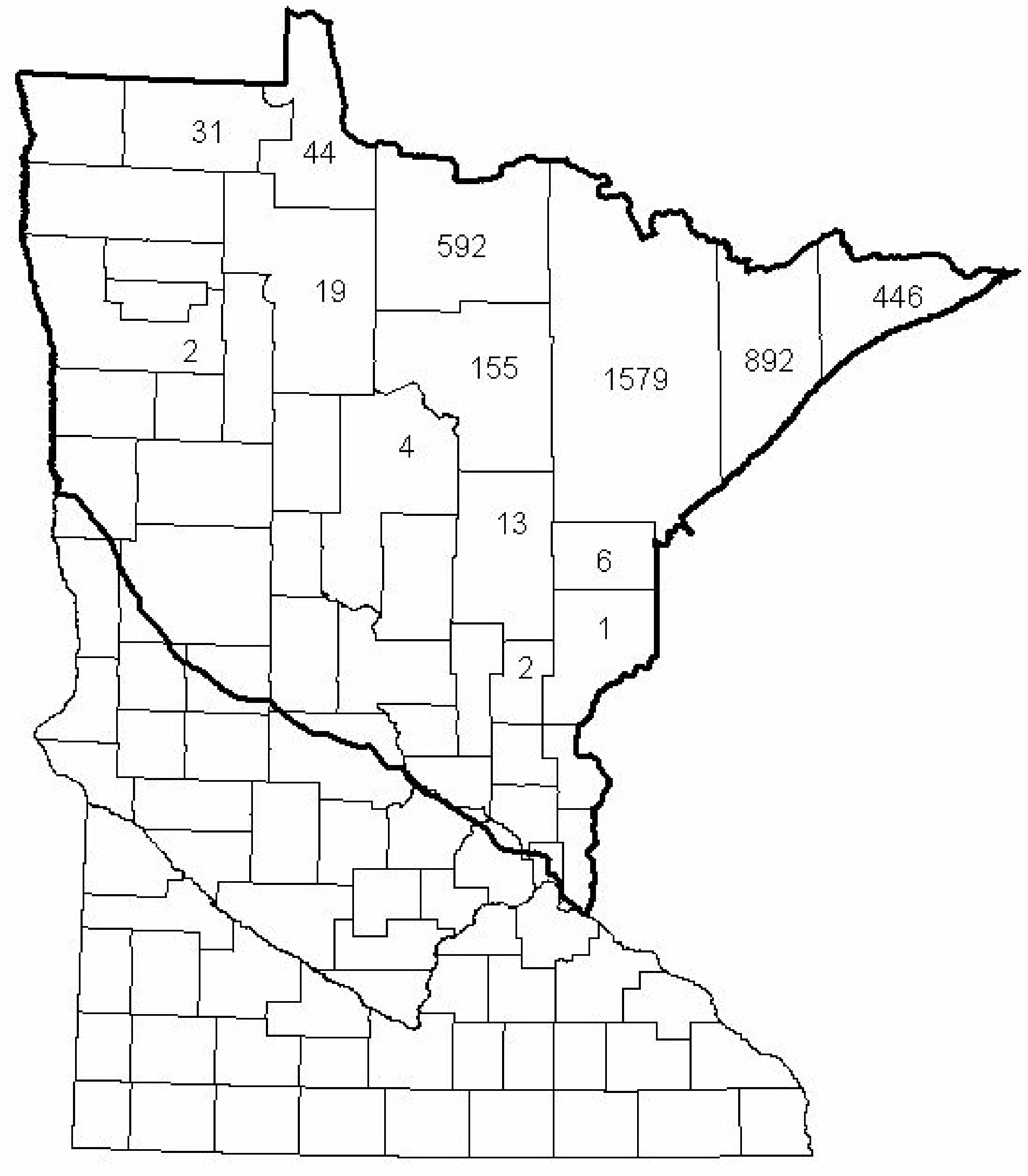

Figure 3. Marten harvest by county, 2006-07.

Table 11. Marten harvest by county and sex, 2006-07 season.

County	Sex			Total
	Male	Female	Unknown	
Aitkin	8	5		13
Beltrami	14	5		19
Carlton	3	3		6
Cass	4	0		4
Clearwater	0	0		0
Cook	299	147		446
Crow Wing	0	0		0
Itasca	107	48		155
Kanabec	2	0		2
Koochiching	434	158		592
Lake	604	288		892
Lake of the Woods	29	15		44
Mahnomen	0	0		0
Marshall	0	0		0
Pennington	0	0		0
Pine	1	0		1
Polk	0	2		2
Red Lake	0	0		0
Roseau	22	9		31
St. Louis	1,035	544		1,579
Unknown	1	1		2
Total	2,563	1,225	0	3,788

Table 12. Comparison of marten harvest by county in Minnesota, 1995-2006.

County	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Aitkin	0	0	0	1	2	2	3	5	6	6	6	13
Beltrami	0	2	12	12	37	2	24	30	38	65	17	19
Carlton	0	0	0	3	6	5	11	4	11	1	10	6
Cass	0	0	0	1	2	3	1	3	2	3	1	4
Clearwater	0	0	0	0	0	0	0	0	1	1	0	0
Cook	156	116	195	208	240	190	164	228	411	318	369	446
Crow Wing	0	0	0	0	3	0	0	0	0	0	0	0
Itasca	26	83	164	155	114	82	102	147	141	136	98	155
Kanabec	0	0	0	0	0	0	0	0	0	0	0	2
Koochiching	251	382	597	517	492	306	327	525	534	549	418	592
Lake	252	234	287	284	284	323	243	492	541	551	536	892
LOW	0	0	12	26	58	15	13	104	71	122	54	44
Mahnomen	0	0	0	0	0	0	0	0	0	2	0	0
Marshall	0	0	0	0	1	1	1	1	1	5	3	0
Pennington	0	0	0	0	0	2	0	0	0	0	0	0
Pine	0	0	0	0	0	0	0	0	1	2	1	1
Polk	0	0	0	0	0	0	0	0	0	0	0	2
Red Lake	0	0	0	0	0	3	0	0	0	0	0	0
Roseau	0	0	0	41	51	98	48	116	104	127	51	31
St. Louis	396	797	980	1,020	1,131	596	991	1,184	1,352	1,346	1,065	1,579
Unknown	419	11	14	31	2	1	0	0	0	7	24	2
Total	1,500	1,625	2,261	2,299	2,423	1,629	1,928	2,839	3,214	3,241	2,653	3,788

Table 13. Marten harvest by date and sex, 2006-07 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 25	4	6		10	0.26	0.26
Nov. 26	245	106		351	9.27	9.53
Nov. 27	199	103		302	7.97	17.50
Nov. 28	250	113		363	9.58	27.09
Nov. 29	230	98		328	8.66	35.74
Nov. 30	166	68		234	6.18	41.92
Dec. 1	170	74		244	6.44	48.36
Dec. 2	239	115		354	9.35	57.71
Dec. 3	156	74		230	6.07	63.78
Dec. 4	122	70		192	5.07	68.85
Dec. 5	126	53		179	4.73	73.57
Dec. 6	134	69		203	5.36	78.93
Dec. 7	84	59		143	3.78	82.71
Dec. 8	98	56		154	4.07	86.77
Dec. 9	124	59		183	4.83	91.61
Dec. 10	101	53		154	4.07	95.67
Unknown	115	49		164	4.33	100%
Total	2,563	1,225	0	3,788	100%	

Table 14. Distribution of marten harvest* among trappers, 1993-2006.

Number (%) of Takers	Number Taken					Total Takers	Ave. Take
	1	2	3	4	5		
1993-94	76 (10)	681 (90)	----	----	----	757	1.9
1994-95	165 (20)	681 (80)	----	----	----	846	1.8
1995-96	78 (10)	711 (90)	----	----	----	789	1.9
1996-97	157 (18)	734 (82)	----	----	----	891	1.8
1997-98	161 (13)	1050 (87)	----	----	----	1211	1.9
1998-99	187 (15)	1056 (85)	----	----	----	1243	1.8
1999-00	164 (17)	318 (34)	213 (23)	246 (26)	----	941	2.6
2000-01	188 (28)	190 (28)	123 (18)	173 (26)	----	674	2.4
2001-02	147 (23)	175 (27)	138 (21)	187 (29)	----	647	2.6
2002-03	149 (21)	138 (19)	147 (21)	123 (17)	160 (22)	717	1.9
2003-04	126 (15)	135 (16)	159 (19)	170 (20)	265 (31)	855	1.8
2004-05	165 (17)	153 (16)	171 (18)	164 (18)	282 (30)	935	1.8
2005-06	191 (22)	158 (18)	139 (16)	156 (18)	215 (25)	859	1.8
2006-07	206 (18)	201 (17)	226 (19)	203 (17)	335 (29)	1171	1.8

* 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, 2006-07. (Combined limit = 5)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		72	61	63	59	335
	1	252	34	44	36	144	
	2	146	26	31	125		
	3	118	23	67			
	4	100	50				
	5	171			Total takers of at least 1 fisher or marten		1957

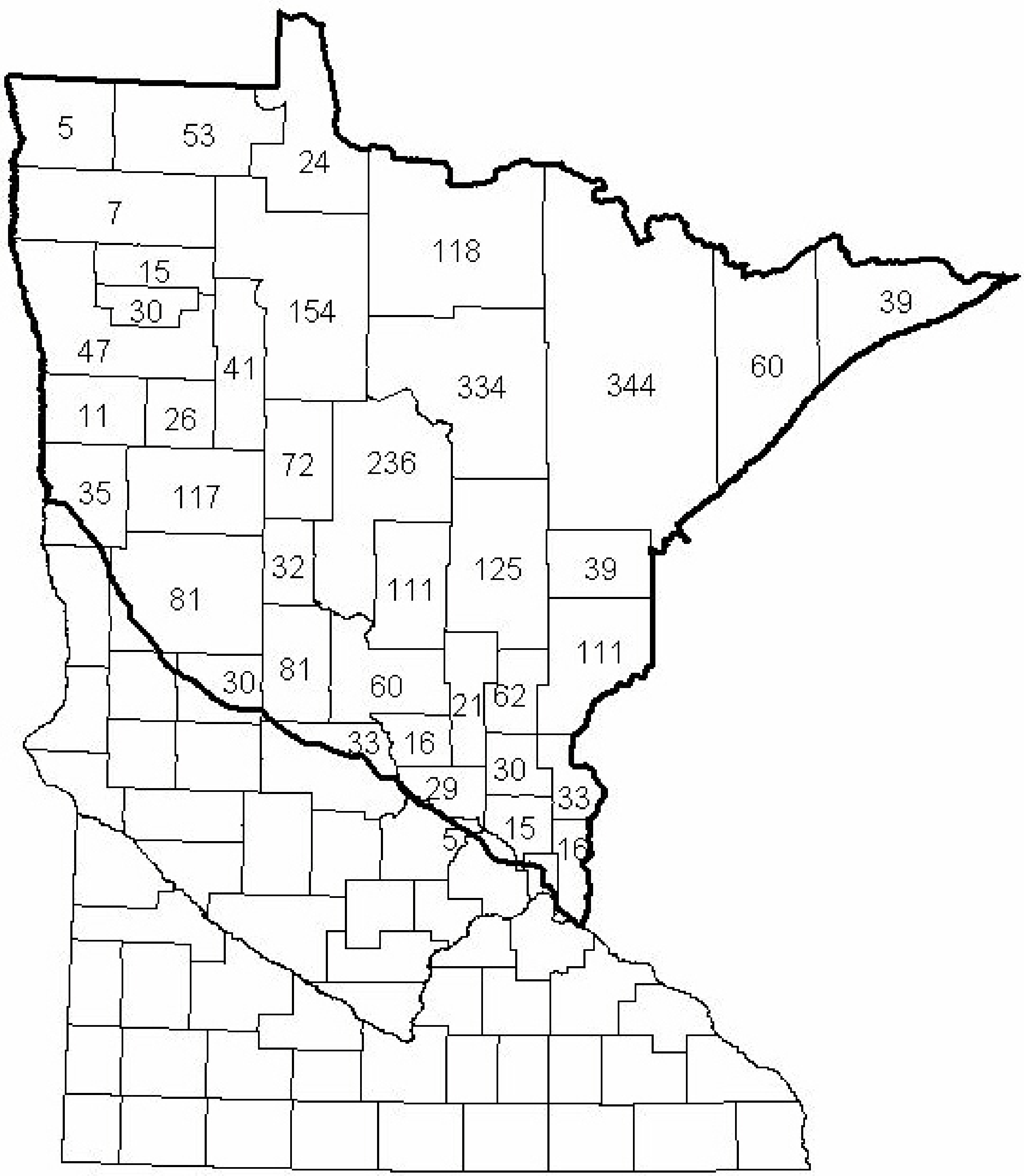

Figure 4. Otter harvest by county, 2006-07.

Table 16. Otter harvest by county and sex, 2006-07 season.

County	Sex			Total
	Male	Female	Unknown	
Aitkin	80	44		124
Anoka	6	9	1	16
Becker	66	51		117
Beltrami	76	78		154
Benton	10	6		16
Carlton	23	16		39
Cass	115	117	4	236
Chisago	20	13		33
Clay	19	16		35
Clearwater	24	17		41
Cook	24	15		39
Crow Wing	58	53		111
Douglas	14	16		30
Hubbard	35	37		72
Isanti	19	11		30
Itasca	190	142	2	334
Kanabec	32	30		62
Kittson	3	2		5
Koochiching	65	53		118
Lake	43	17		60
Lake of the Woods	13	11		24
Mahnomen	13	13		26
Marshall	3	4		7
Mille Lacs	12	9		21
Morrison	27	33		60
Norman	5	6		11
Ottertail	42	37	2	81
Pennington	11	4		15
Pine	68	43		111
Polk	28	19		47
Red Lake	12	18		30
Roseau	37	16		53
St. Louis	205	139		344
Sherburne	22	7		29
Stearns	23	10		33
Todd	41	40		81
Wadena	20	12		32
Washington	8	8		16
Wright	4	1		5
Unknown	13	9		22
Total	1,529	1,182	9	2,720

Table 17. Comparison of otter harvest by county, 1996-2006.

County	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Aitkin	57	78	95	87	103	82	100	78	87	113	132	124
Anoka	13	13	21	23	25	14	17	17	13	32	22	16
Becker	64	54	85	30	64	45	125	104	105	178	107	117
Beltrami	59	133	133	81	103	74	108	127	173	216	170	154
Benton	0	1	4	6	2	7	10	6	7	19	14	16
Carlton	17	33	43	39	45	29	33	40	38	53	36	39
Cass	124	184	189	149	109	107	197	189	198	255	231	236
Chisago	9	13	20	20	13	12	26	18	22	20	28	33
Clay	0	2	7	0	7	3	1	7	7	15	18	35
Clearwater	13	57	25	18	29	25	47	61	52	62	48	41
Cook	37	28	29	48	30	26	26	31	41	56	46	39
Crow Wing	59	73	84	81	77	76	96	108	119	141	102	111
Douglas	2	5	7	7	1	1	1	0	12	27	16	30
Hubbard	48	89	95	28	23	19	61	64	70	91	80	72
Isanti	10	17	29	26	20	28	33	33	27	35	38	30
Itasca	245	383	371	339	220	296	337	310	382	483	362	334
Kanabec	13	20	43	24	29	32	56	40	38	57	79	62
Kittson	1	0	2	1	0	0	1	2	3	3	3	5
Koochiching	68	139	109	126	63	107	118	96	164	167	131	118
Lake	33	62	57	77	44	70	57	57	81	88	65	60
LOW	9	16	24	32	36	18	17	21	42	31	34	24
Mahnomen	18	11	6	9	10	10	17	7	23	24	29	26
Marshall	3	14	14	5	8	16	13	35	34	29	18	7
Mille Lacs	7	27	18	17	15	12	20	22	33	48	51	21
Morrison	12	20	25	18	30	17	45	36	46	64	77	60
Norman	4	3	1	0	2	4	3	4	1	16	17	11
Ottertail	19	14	41	29	20	14	51	32	45	113	85	81
Pennington	0	5	6	2	10	2	6	12	16	18	33	15
Pine	59	72	73	62	21	35	42	61	78	99	51	111
Polk	36	45	35	23	21	34	60	63	72	104	45	47
Red Lake	1	9	9	7	8	22	18	27	35	58	26	30
Roseau	3	24	41	40	37	40	36	27	72	69	60	53
St. Louis	148	473	332	421	353	255	453	316	483	508	428	344
Sherburne	10	12	15	13	14	10	11	11	24	25	15	29
Stearns	3	15	15	11	7	5	5	17	13	22	21	33
Todd	19	22	22	23	16	22	24	30	49	53	63	81
Wadena	9	14	8	6	13	3	23	23	35	34	38	32
Washington	0	7	4	6	4	4	4	12	10	8	11	16
Wright	0	0	0	0	0	0	0	1	2	3	2	5
Unknown	203	32	8	12	3	2	3	0	14	13	14	22
Totals	1,435	2,219	2,145	1,946	1,635	1,578	2,301	2,145	2,766	3,450	2,846	2,720

Table 18. Otter harvest by sex and week, 2006-07 season.

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Date	Sex			Total	% of	Cumulative
	Male	Female	Unknown	Harvest	Total	%
Oct.28 - Nov.3	240	168	1	409	15.04	15.04
Nov.4 - Nov.10	267	198	2	467	17.17	32.21
Nov.11 - Nov.17	180	137		317	11.65	43.86
Nov.18 - Nov.24	162	133		295	10.85	54.71
Nov.25 - Dec.1	174	145	3	322	11.84	66.54
Dec.2 - Dec.8	134	112	1	247	9.08	75.63
Dec.9 - Dec.15	98	62	1	161	5.92	81.54
Dec.16 - Dec.22	78	80		158	5.81	87.35
Dec.23 - Dec.29	75	63		138	5.07	92.43
Dec.30 - Jan.7*	91	73	1	165	6.07	98.49
Unknown	30	11		41	1.51	100%
Total	1,529	1,182	9	2,720	100%	

* 9-day interval.

Table 19. Distribution of otter harvest* among trappers, 1993-2006.

Number (%) of Takers	Number Taken					
	1	2	3	4	Total Takers	Ave. Take
1993-94	193 (33)	115 (19)	100 (31)	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

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