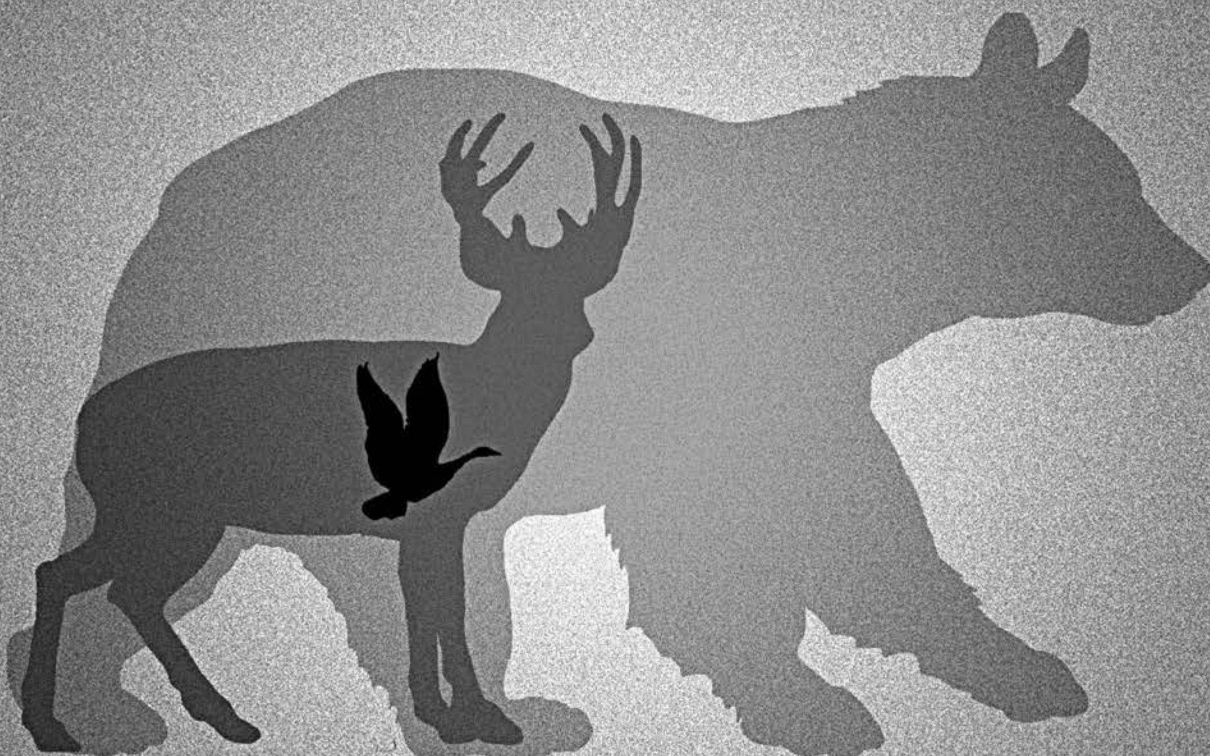

Status of Wildlife Populations

Fall 2014

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

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STATUS OF WILDLIFE POPULATIONS, FALL 2014

(Including 2004-2014 Hunting and Trapping Harvest Statistics)

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

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Status of Wildlife Populations, Fall 2014

(Including 2004-2014 Hunting and Trapping Harvest Statistics)

This is the 38th year that the DNR has compiled this booklet; it is primarily an administrative document intended for DNR personnel. Since 1984 we have also generated a companion volume, *Summaries of Wildlife Research Findings*, containing annual summaries of activities and findings from ongoing research projects in the Wildlife Policy and Research Unit. This publication will be posted on the DNR website and available in other formats upon request. In the on-line format links are available to the U.S. Fish and Wildlife Service Division of Migratory Bird Management to access their reports for Waterfowl Population Status; Migratory Bird Harvest Information Preliminary Estimates; American Woodcock Population Status; and Mourning Dove Population Status.

Most of the fieldwork associated with collection of census and survey data for farmland, wetland, and forest wildlife is performed by wildlife biologists and managers (conservation officers also participate in August roadside counts). The Farmland, Wetland, and Forest Wildlife Population and Research groups coordinate these activities, analyze and interpret data, and prepare recommendations for harvest regulations and season setting. Due to staffing changes and workload considerations some reports were not available at time of publication.

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

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FARMLAND WILDLIFE POPULATIONS

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2014 MINNESOTA AUGUST ROADSIDE SURVEY

Nicole M. Davros, Farmland Wildlife Populations and Research Group
Rachel Curtis, Farmland Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Population indices for ring-necked pheasants and eastern cottontail rabbits increased from 2013 but remained below the long-term averages. The white-tailed jackrabbit index was similar to last year and remains at a historic low. The population indices for gray partridge and mourning doves decreased slightly from last year and also remain below the long-term averages. The population index for white-tailed deer was similar to 2013 and was well above the long-term average. The index for total sandhill cranes decreased but the index for juvenile cranes increased from 2013.

Conservation Reserve Program (CRP) enrollment declined by 82,340 acres statewide in 2013. Increases in enrollment of other farm programs and acquisition of public lands only partially offset CRP losses, yielding a net loss of 51,375 acres of protected habitat for wildlife. Within the pheasant range, there was a net loss of 7,706 acres of set-aside habitat. The winter of 2013-14 was more severe than normal, especially for the Central and East Central regions. Spring temperatures and precipitation were highly variable across the farmland regions of Minnesota. Excessive rainfall occurred during June; however, temperatures were slightly above normal. Overall, conditions for overwinter survival of farmland wildlife were below average to severe and nesting season conditions, especially during the peak hatching period for pheasants, were fair to poor in many regions within the farmland zone.

The 2014 range-wide pheasant index (28.7 birds/100 mi) increased 6% from 2013 but was 58% below the 10-year average and 71% below the long-term average. Minnesota's pheasant population has steadily declined since the mid-2000s in conjunction with the loss of CRP acres, and indices over the past 4 years are comparable to the indices calculated in the mid-1980s. The hen index (4.1 hens/100 mi) increased 18% from 2013 but was 61% below the 10-year average. The cock index (4.6 cocks/100 mi) decreased 11% from 2013 and was 44% below the 10-year average. An improved hen:cock ratio (0.99) compared to 2013 (0.68) provides further evidence that hens were undercounted in last year's surveys due to the delayed nesting season, and the 2014 surveys were likely more representative of population trends in recent years. The pheasant brood index (4.4 broods/100 mi) increased 28% from last year but remained 58% below the 10-year average and 66% below the long-term average. Average brood size in 2014 (4.6 chicks/brood) decreased 15% compared to 2013 (5.4 chicks/brood) but was comparable to the 10-year average (4.7 chicks/brood). The median hatch date for pheasants was 16 June 2014, approximately 5 days later than the 10-year average. Projecting from the roadside index, an estimated 224,000 roosters may be harvested this fall. The best opportunity for harvesting pheasants appears to be in the Southwest, South Central, and West Central regions.

The gray partridge index decreased 16% from 2013 and remained well below the 10-year and long-term averages (-81% and -93%, respectively). Partridge counts were highest in the South Central region. The eastern cottontail rabbit index was 11% greater than last year, but 5% below the 10-year average and 12% below the long-term average. Counts of cottontail rabbits were highest in the Southeast, South Central, Southwest, and East Central regions. The white-tailed jackrabbit index did not change from 2014 and is 94% below the long-term average. The jackrabbit population peaked in the late 1950s but declined to low levels in the 1980s and has not recovered. The white-tailed deer index was similar to 2013, 34% above the 10-year average, and 109% above the long-term average. In contrast, the number of mourning doves observed was 5% lower than last year, 24% below the 10-year average, and 36% below the long-term average. Mourning dove counts were highest in the Southwest, South Central, and West

Central regions. The total sandhill crane index decreased 13% but the juvenile crane index increased 17% from last year.

INTRODUCTION

This report summarizes the 2014 Minnesota August roadside survey. The survey is conducted annually during the first half of August by Minnesota Department of Natural Resources (MNDNR) enforcement and wildlife personnel throughout Minnesota's farmland region (Figure 1). The 2014 August roadside survey consisted of 173 25-mi routes (1-4 routes/county); of which, 154 were located in the ring-necked pheasant range. Two new routes in Chippewa and Lac qui Parle Counties were added in 2014.

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

ACKNOWLEDGMENTS

We would like to thank the many cooperators for their efforts in completing routes in 2014. The survey would not be possible without them. Tonya Klinkner, Sandi Halvorson, and Brock Bermel provided logistical assistance including preparation of packets for mailing, data entry, and data proofing. Tabor Hoek of the Minnesota Board of Water & Soil Resources (BWSR) provided enrollment data on cropland retirement programs in Minnesota, Kim Hennings provided updated MNDNR land acquisition data, and Tamra Adams of the U.S. Fish & Wildlife Service (USFWS) provided federal land acquisition data. Marybeth Block provided information on the Minnesota Prairie Conservation Plan initiative and Jesse Roberts provided updated information on the Walk-in Access Program. Marrett Grund and John Giudice reviewed an earlier draft of this report.

WEATHER SUMMARY

Winter 2013-2014 had colder than normal temperatures that extended through April across the farmland region of Minnesota. Snow cover in the southern regions of the state (Figure 1) was intermittent in December but became deeper (>6 inches) and more persistent from mid-January through early March. The West Central, Central, East Central, and Northwest regions had snow depths that exceeded 6 inches for 16-20 consecutive weeks, and snow cover persisted into April for each of these regions (Minnesota Climatology Working Group [MCWG], Climate snow map). In addition, monthly temperatures averaged 5.1° F below normal (range = 4.5° to 13.7° F; MCWG, Monthly temperature and precipitation summary) in all farmland regions from December through March.

Spring precipitation and temperatures were highly variable across regions and months. April was slightly wetter than normal (1.8 inches above normal) across the farmland region with the Central and East Central regions receiving the most precipitation (2.5 and 3.1 inches above normal, respectively) and the Southwest region receiving the least precipitation (0.8 inches below normal). May had normal precipitation, on average, but the Central region was wetter and the Southwest was drier than normal (1.9 inches above and 1.0 inches below normal, respectively). Average temperatures across the farmland region were cooler than normal in April and May (4.3° F below normal and 1.0° F below normal, respectively). June was extremely wet and precipitation amounts averaged 4.1 inches above normal (range: 2.0-5.8 inches above normal). The Southwest and South Central regions saw the heaviest rainfall amounts in June, and many local areas reported >10 inches of total rain for the month. However, June temperatures across the farmland region were slightly above average during these rains (average: 0.9° F above normal; range: 0.1° to 1.7° F above normal). By July, conditions were again drier and cooler than normal (1.9 inches and 2.4° F below normal, respectively).

Overall, the conditions for over-winter survival of wildlife ranged from below average to severe throughout the farmland region in 2014. Conditions for production of young were poor due to cooler, wetter weather in the spring and extremely heavy rainfall amounts in June. Warmer temperatures in June may have partially offset the excessive rains for nesting birds and young chicks, and the drier conditions in July were beneficial for re-nesting birds.

HABITAT CONDITIONS

Minnesota's farmland landscape continued to undergo considerable changes in the last year. Conservation Reserve Program (CRP) enrollment declined by 82,340 acres statewide with losses in northwestern Minnesota's prairie chicken range (54,201 acres lost) compounded by a loss of 30,352 acres in Minnesota's pheasant range (Figure 2). There were also losses in Conservation Reserve Enhancement Program (CREP) acres throughout the state whereas acres enrolled in Reinvest in Minnesota (RIM), Wetlands Reserve Program (WRP), and RIM-WRP increased slightly. Acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) only partially offset CRP and CREP losses, yielding a net loss of 51,375 acres statewide. The net loss of protected habitat in Minnesota's pheasant range was 7,706 acres, and remaining protected habitat accounts for 5.9% of the landscape (range: 3.1-9.7%; Table 1).

Protecting grassland and wetland habitat is one of the most critical environmental challenges facing Minnesota. Farm programs, especially CRP, make up the largest portion of protected grasslands in the state. The expiration of a large proportion of existing CRP contracts continues to be a major concern for future wildlife populations, with the biggest loses yet to come (e.g., >290,000 acres in Minnesota scheduled to expire in the next 2 years). New funding from the Legacy Amendment has accelerated acquisition of WMAs and WPAs throughout Minnesota's farmland zone. In addition, the Minnesota Prairie Conservation Plan provides a blueprint for moving forward and demonstrates unprecedented cooperation between federal agencies, state agencies, and the state's most active conservation organizations. The plan identifies core conservation areas and creates a vision of a connected landscape from Canada to Iowa. The plan is being carried out through local teams (Local Technical Teams [LTTs]) that are using various state and federal funding sources to protect, restore, and enhance grasslands and wetlands. For more info, please visit: Minnesota Prairie Plan.

Efforts to increase public hunting opportunities on private lands, especially land enrolled in a conservation program (e.g., CRP, CREP, RIM), have continued in 2014. The 2012 Minnesota Legislature established a Walk-in Access (WIA) program to provide public access to wildlife habitat on private land. The WIA program compensates landowners for providing hunter access through an agreement with MNDNR Wildlife. For the 2014-2015 hunting season, the program has enrolled >180 sites in 35 counties in the Southwest and South Central regions and made >21,000 acres of private land available for public hunting. Walk-in Access sites are open for public hunting from September 1 – May 31 where boundary signs are present. Hunters must have a $3 WIA Validation to legally access WIA lands. For more information on the WIA program, including a printable atlas of enrolled sites by county, aerial photos of each site, interactive maps, and Global Positioning System (GPS) downloads, please visit the WIA program website at: www.mndnr.gov/walkin.

SURVEY CONDITIONS

The survey period was extended (29 July – 19 August) to allow routes to be completed, and observers completed 171 of 173 routes in 2014. One route in Washington County was not completed due to concerns related to traffic safety and one route in Isanti County was not completed within the survey's timeframe. Weather conditions during the survey ranged from excellent (calm, heavy dew, clear sky) to medium (light breeze and dew, overcast skies). Medium-to-heavy dew conditions were present at the start of 94% of the survey routes, which was less than 2013 (98%) but slightly better than the 10-year average (93%). Clear skies (<30% cloud cover) were present at the start of 88% of routes and wind speeds <7 mph were recorded for 97% of routes. Overall, survey conditions were excellent in 2014.

RING-NECKED PHEASANT

The average number of pheasants observed (28.7 birds/100 mi) increased 6% from 2013 but remained 58% below the 10-year average (Table 2; Figure 3A), 71% below the long-term average, and 89% below the benchmark years of 1955-64. The pheasant population has steadily declined since the mid-2000s in conjunction with the loss of CRP acres (Figure 2), and pheasant indices over the past 4 years are comparable to the indices calculated in the mid-1980s (Figure 3A). Total pheasants observed per 100 mi ranged from 10.4 in the Southeast region to 62.1 in the Southwest (Table 3). The pheasant roadside index increased in the three southern regions (Southwest, 22%; South Central, 17%, and Southeast, 40%), but decreased slightly in the West Central (-5%) and Central regions (-1%; Table 3). The most substantial decrease occurred in the East Central region (-33%; Table 3).

The range-wide hen index (4.1 hens/100 mi) increased 18% from 2013 but was 61% below the 10-year average (Table 2). The hen index varied from 1.0 hens/100 mi in the Southeast to 6.7 hens/100 mi in the Southwest region. The hen index increased in all regions (range: 14-50% increase) except the East Central region (-28%). The range-wide cock index (4.6 cocks/100 mi) decreased 11% from 2013 and was 44% below the 10-year average (Table 2). The cock index increased in the West Central (13%) and Southwest (6%) regions but decreased 8-42% in the other regions of the pheasant-range. The 2014 hen:cock ratio was 0.99, which was greater than 2013 (0.68) but still below average (1.42 ± 0.36) for the CRP years (1987-2013).

Across their range, the average number of pheasant broods observed (4.4 broods/100 mi) increased 28% from last year but remained 58% below the 10-year average and 66% below the long-term average (Table 2). Regional brood indices ranged from 1.4 broods/100 mi in the Southeast to 9.1 broods/100 mi in the Southwest. Only the East Central region showed a decrease (-37%) in the brood index compared to 2013. Average brood size in 2014 (4.6 ± 0.2 [SE] chicks/brood) decreased 15% compared to 2013 (5.4 ± 0.3 [SE] chicks/brood) but was comparable to the 10-year average (4.7 ± 0.1 [SE] chicks/brood; Table 2). The 2014 brood size index was 16% below the long-term average (5.5 ± 0.1 [SE] chicks/brood; Table 2). The median hatch date for pheasants was approximately 16 June 2014 (n = 177 broods), 5 days later than the 10-year average (Table 2). The distribution of estimated hatch dates for observed broods was relatively unimodal and normally distributed, which suggests that the late spring and heavy rains in June may not have been disruptive to nest incubation across the entire pheasant range. In fact, our survey data indicate that 22% of broods were estimated to have hatched in the 2-week time period after the heaviest of the June rainfall events. Estimated median age of observed broods was 8 weeks (range: 1-14 weeks), but successful late-season nests tend to be underrepresented in roadside data because very young chicks are hard to detect during surveys.

The modest increase in pheasant counts may be partially attributed to a less severe winter in the southern regions of the state. Winter conditions for pheasants are considered severe when the temperature is ≤0° F and snow cover exceeds 6 inches. The southern regions did not experience as prolonged of severe winter conditions compared to other regions of the state, and this likely helped reduce winter mortality, thereby allowing more hens to survive through spring. Further, two reproductive indices (broods/100 mi and broods/100 hens) increased in 2014, indicating that early-season nesting conditions were better than 2013. However, the lower chicks/brood index might suggest that chick survival was below normal due to the heavy rains in June. The slight delay in peak hatch likely helped improve chick survival during this period. Hens that are unsuccessful in hatching a clutch of eggs will persistently renest throughout the summer; historically, hens and chicks from late-season nests tend to be underrepresented in roadside survey data. Therefore, pheasant numbers will be greater than forecasted if these hens and their chicks were underrepresented in the 2014 surveys. Projecting from the roadside index, an estimated 224,000 roosters may be harvested this fall (Figure 2A). The best opportunity for harvesting pheasants appears to be in the Southwest, South Central, and West Central regions of Minnesota during fall/winter 2014.

GRAY PARTRIDGE

Range-wide, the gray partridge index (0.9 birds/100 mi) decreased 16% compared to 2013 and remained well below the 10-year and long-term averages (-81% and -93%, respectively; Table 2, Figure 3B). The partridge index ranged from 0.0 birds/100 mi in the Southeast, East Central, and Northwest regions to 3.6 birds/100 mi in the South Central region (Table 3). Similar to 2013, observations of gray partridge broods (n = 2 broods statewide) were too few for analysis by age class.

Conversion of diversified agricultural practices (e.g., haylands, pastures, small grains, and hedgerows) to more intense land-use (e.g., corn and soybeans) has reduced the amount of suitable habitat for the gray partridge in Minnesota. Gray partridge in their native range (southeastern Europe and northern Asia) are associated with arid climates and their reproductive success is limited in the Midwest except during successive dry or drought years. Consequently, gray partridge are more adversely affected by heavy precipitation during nesting and brood rearing than are pheasants. The South Central and Southwest regions will offer the best opportunity for harvesting gray partridge in 2014.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (5.2 rabbits/100 mi) was 11% greater than last year, but 5% below the 10-year average and 12% below the long-term average (Table 2; Figure 4A). The cottontail rabbit index ranged from 0.4 rabbits/100 mi in the Northwest to 11.2 rabbits/100 mi in the Southeast (Table 3). The Southeast, South Central, Southwest, and East Central regions will provide the best opportunities for harvesting cottontail rabbits.

The index of white-tailed jackrabbits (0.1 rabbits/100 mi) remains at a historic low (94% below the long-term average of 1.7 rabbits/100 mi). The range-wide jackrabbit population peaked in the late 1950s and declined to low levels in the 1980s (Figure 4B). The long-term decline in jackrabbits reflects the loss of their preferred habitats (i.e., pasture, hayfields, and small grains). The greatest potential for white-tailed jackrabbit hunting is likely in the Southwest region (Table 3). However, indices of relative abundance and annual percent change should be interpreted cautiously because estimates are based on a small number of jackrabbit sightings.

WHITE-TAILED DEER

The index for white-tailed deer (20.8 deer/100 mi) was similar to 2013, 34% above the 10-year average, and 109% above the long-term average (Table 2, Figure 5A). Roadside indices for deer ranged from 5.5 deer/100 mi in the South Central region to 45.9 deer/100 mi in the Northwest (Table 3).

MOURNING DOVE

The number of mourning doves observed (169.5 doves/100 mi) in 2014 was similar to 2013, 24% below the 10-year average (211.3 doves/100 mi), and 36% below the long-term average (271.2 doves/100 mi; Table 2, Figure 5B). The mourning dove index ranged from 68.7 doves/100 mi in the Southeast to 335.6 doves/100 mi in the Southwest region (Table 3).

The U.S. Fish and Wildlife Service conducted call-count surveys (CCS) for mourning doves from 1966-2013 to obtain annual indices of abundance but discontinued these surveys in 2014. Trend analyses indicated the number of mourning doves detected along CCS routes (n = 13) in Minnesota declined 1.6% per year (95% CI: -3.7 to 0.3%) during 2004-2013 and declined 1.5% per year (95% CI: -2.2 to -0.7%)

during 1966-2013 (Seamans et al. 2013). The North American Breeding Bird Survey (BBS), completed in June each year, provides additional independent estimates of trends in mourning dove abundance. Analysis of BBS trend data for Minnesota indicates that mourning doves declined 1.8% (95% CI: -3.2 to -0.5%; n = 71) during 2004-2013 and declined 1.1% (95% CI: -1.6 to -0.7%; n = 77) during 1966-2013 (Seamans and Sanders 2014).

SANDHILL CRANE

Range-wide indices of sandhill cranes averaged 8.9 total cranes/100 mi and 1.3 juvenile cranes/100 mi in 2014, representing a 13% decrease in total cranes but a 17% increase in juvenile cranes compared to 2013 (Table 2). Indices ranged from 0.0 total cranes/100 mi in the Southwest and Southeast regions to 43.2 total cranes/100 mi in the East Central region (Table 3). Juvenile cranes were observed in the Northwest (3.8 juveniles/100 mi), Central (1.5 juveniles/100 mi), East Central (7.3 juveniles/100 mi), and South Central (0.4 juveniles/100 mi) regions. Overall, regional indices for the total number of cranes increased in the Northwest region (32% increase), remained the same in the Southwest and South Central regions, and decreased in all other regions (range: -7 to -100%).

OTHER SPECIES

Other notable wildlife sightings included: American badger (Brown County), black-crowned night heron (LeSueur County), black-billed cuckoo (Polk County), black-billed magpie (Polk County), greater yellowlegs (Murray County), northern harrier (Norman County), belted kingfisher (Renville County), loggerhead shrike (Dakota County), meadowlark spp. (Goodhue, Redwood, Renville, and Wabasha Counties), merlin (Goodhue County), greater prairie-chicken (Clay and Norman Counties), red-headed woodpecker (Big Stone, Olmsted, Redwood, and Sibley Counties), red fox (Yellow Medicine County), striped skunk (Norman, Pipestone, and Rice Counties), sharp-tailed grouse (Polk County), trumpeter swan (Brown and Washington Counties), upland sandpiper (Mower and Redwood Counties), and western kingbird (Polk County). Wild turkeys, including poults, were recorded in 13 counties.

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Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within Minnesota's pheasant range, 2014[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi^2
WC[b]	271,295	37,670	19,739	12,747	19,576	190,345	109,473	660,845	9.7	62.2
SW	91,817	24,763	16,076	1,777	661	20,751	60,116	215,960	5.7	36.5
C	123,263	14,325	27,609	5,771	3,069	88,941	48,634	311,612	5.2	33.0
SC	83,938	27,656	11,722	8,637	9,165	9,086	33,768	183,972	4.6	29.1
SE	59,553	2,706	6,968	661	995	36,731	53,574	161,187	4.3	27.8
EC	3,343	0	1,132	0	4	4,994	90,557	100,030	3.1	19.9
Total	633,208	107,120	83,246	29,592	33,470	350,848	396,122	1,633,606	5.9	37.9

a. Unpublished data, Tabor Hoek, BWSR, 1 August 2014.

b. Does not include Norman County.

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

d. MNDNR Wildlife Management Areas (WMA).

Table 2. Range-wide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2014.

Species / Subgroup	Change from 2013[a]					Change from 10-year average[b]				Change from long-term average[c]			
	n	2013	2014	%	95% CI	*n*	2004-13	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	149	27.2	28.7	6	±26	148	68.0	-58	±12	149	97.9	-71	±8
Cocks	149	5.1	4.6	-11	±23	148	8.1	-44	±12	149	11.1	-59	±10
Hens	149	3.5	4.1	18	±29	148	10.6	-61	±13	149	14.2	-71	±8
Broods	149	3.4	4.4	28	±31	148	10.6	-58	±11	149	12.9	-66	±8
Chicks per brood	177	5.4	4.6	-15			4.7	-2			5.5	-16	
Broods per 100 hens	177	98.5	101.7	3.3			99.3	2			101.3	0.4	
Median hatch date	177	Jun 20	Jun 16				Jun 11						
Gray partridge	168	1.1	0.9	-16	±112	167	4.7	-81	±31	149	15.2	-93	±16
Eastern cottontail	168	4.7	5.2	11	±27	167	5.5	-5	±19	149	6.6	-12	±18
White-tailed jackrabbit	168	0.1	0.1	0	±137	167	0.2	-51	±55	149	1.7	-94	±15
White-tailed deer	168	20.9	20.8	-1	±16	167	15.6	34	±16	168	9.9	109	±31
Mourning dove	168	169.5	160.4	-5	±15	167	211.3	-24	±10	149	271.2	-36	±10
Sandhill crane													
Total cranes	168	10.2	8.9	-13	±36								
Juveniles	168	1.1	1.3	17	±60								

[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 = 1955-2013, except for deer = 1974-2013. Estimates for all species except deer based on routes (*n*) surveyed ≥40 years; estimates for deer based on routes surveyed ≥25 years. Thus, Northwest region (8 counties in Northwest were added to survey in 1982) included only for deer.

Table 3. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2014.

Region / Species	Change from 2013[a]					Change from 10-year average[b]				Change from long-term average[c]			
	n	2013	2014	%	95% CI	*n*	2004-13	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	19	0.0	0.0			19	0.6	-100	±93	19	3.4	-100	±67
Eastern cottontail		0.6	0.4	-33	±124		0.8	-44	±58		0.8	-48	±70
White-tailed jackrabbit		0.2	0.2	0	±305		0.4	-40	±153		0.6	-67	±88
White-tailed deer		36.6	45.9	25	±38		43.6	5	±22		29.8	54	±55
Mourning dove		102.4	78.3	-24	±77		84.9	-8	±45		120.7	-35	±29
Sandhill crane		22.7	29.9	32	±69								
West Central[e]													
Ring-necked pheasant	36	30.0	28.4	-5	±55	35	74.8	-61	±24	37	99.1	-72	±16
Gray partridge		0.0	0.3				1.0	-64	±112		9.7	-97	±22
Eastern cottontail		1.7	2.8	66	±90		2.8	2	±52		4.0	-32	±38
White-tailed jackrabbit		0.0	0.2				0.3	-21	±169		2.3	-91	±27
White-tailed deer		20.9	24.4	17	±42		14.1	79	±56		9.3	158	±89
Mourning dove		211.8	177.2	-16	±23		248.3	-30	±18		371.2	-52	±13
Sandhill crane		1.4	1.0	-31	±66								
Central													
Ring-necked pheasant	30	20.7	20.4	-1	±58	30	56.8	-64	±24	29	73.3	-71	±14
Gray partridge		0.1	0.3	100	±464		1.9	-86	±82		9.4	-97	±45
Eastern cottontail		2.9	1.9	-36	±77		5.5	-66	±41		6.3	-69	±26
White-tailed jackrabbit		0.1	0.0	-100	±205		0.1	-100	±103		1.2	-100	±22
White-tailed deer		18.1	14.4	-21	±41		9.3	54	±62		5.2	183	±127
Mourning dove		129.9	105.8	-19	±36		193.5	-45	±18		232.3	-54	±19
Sandhill crane		20.4	10.8	-47	±84								
East Central													
Ring-necked pheasant	12	30.6	20.4	-33	±81	12	59.8	-66	±31	12	91.2	-78	±19
Gray partridge		0.0	0.0				0.0	-100	±220		0.2	-100	±148
Eastern cottontail		9.0	7.0	-23	±95		10.8	-36	±43		9.0	-23	±65
White-tailed jackrabbit		0.0	0.0				0.0				0.2	-100	±71
White-tailed deer		27.6	22.2	-20	±42		17.2	30	±58		9.4	137	±99
Mourning dove		83.8	78.4	-7	±61		100.7	-22	±39		119.6	-34	±37
Sandhill crane		46.3	43.2	-7	±43								

Table 3. Continued.

Region / Species	Change from 2013 *n*	2013	2014	%	95% CI	Change from 10-year average *n*	2004-13	%	95% CI	Change from long-term average *n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	50.7	62.1	22	±56	19	131.4	-53	±31	19	115.4	-46	±23
Gray partridge		3.6	0.8	-77	±157		16.5	-95	±29		40.4	-98	±16
Eastern cottontail		5.3	7.6	44	±88		6.4	18	±56		8.0	-5	±51
White-tailed jackrabbit		0.2	0.4	100	±371		0.7	-43	±80		3.7	-89	±24
White-tailed deer		28.4	23.4	-18	±41		16.0	46	±47		9.1	158	±80
Mourning dove		245.9	335.6	37	±48		307.2	9	±31		310.0	8	±33
Sandhill crane		0.0	0.0										
South Central													
Ring-necked pheasant	32	27.1	31.6	17	±67	32	68.4	-54	±23	32	127.7	-75	±13
Gray partridge		3.3	3.6	12	±173		8.2	-56	±69		18.5	-80	±27
Eastern cottontail		9.5	8.1	-15	±30		8.2	-0.4	±25		7.6	7	±29
White-tailed jackrabbit		0.3	0.0	-100	±142		0.2	-100	±68		1.7	-100	±25
White-tailed deer		10.6	5.5	-48	±43		5.8	-5	±45		3.7	49	±70
Mourning dove		230.2	225.8	-2	±36		274.7	-18	±23		257.9	-13	±27
Sandhill crane		1.6	1.6	0	±141								
Southeast													
Ring-necked pheasant	20	7.4	10.4	40	±93	20	16.9	-38	±45	20	70.8	-85	±30
Gray partridge		0.2	0.0	-100	±209		5.0	-100	±78		13.6	-100	±32
Eastern cottontail		5.8	11.2	93	±109		6.4	74	±76		7.7	46	±70
White-tailed jackrabbit		0.0	0.0				0.1	-100	±122		0.6	-100	±42
White-tailed deer		15.7	21.0	34	±56		15.5	35	±34		10.3	104	±64
Mourning dove		98.7	68.7	-30	±29		166.6	-59	±23		218.1	-69	±22
Sandhill crane		0.4	0.0	-100	±209								

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

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

[c] LTA = 1955-2013, except for Northwest region (1982-2013) and white-tailed deer (1974-2013). Estimates based on routes (*n*) surveyed ≥40 years (1955-2013), except for Northwest (≥20 years) and white-tailed deer (≥25 years).

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

[e] Two routes were added to the West Central region in 2014.

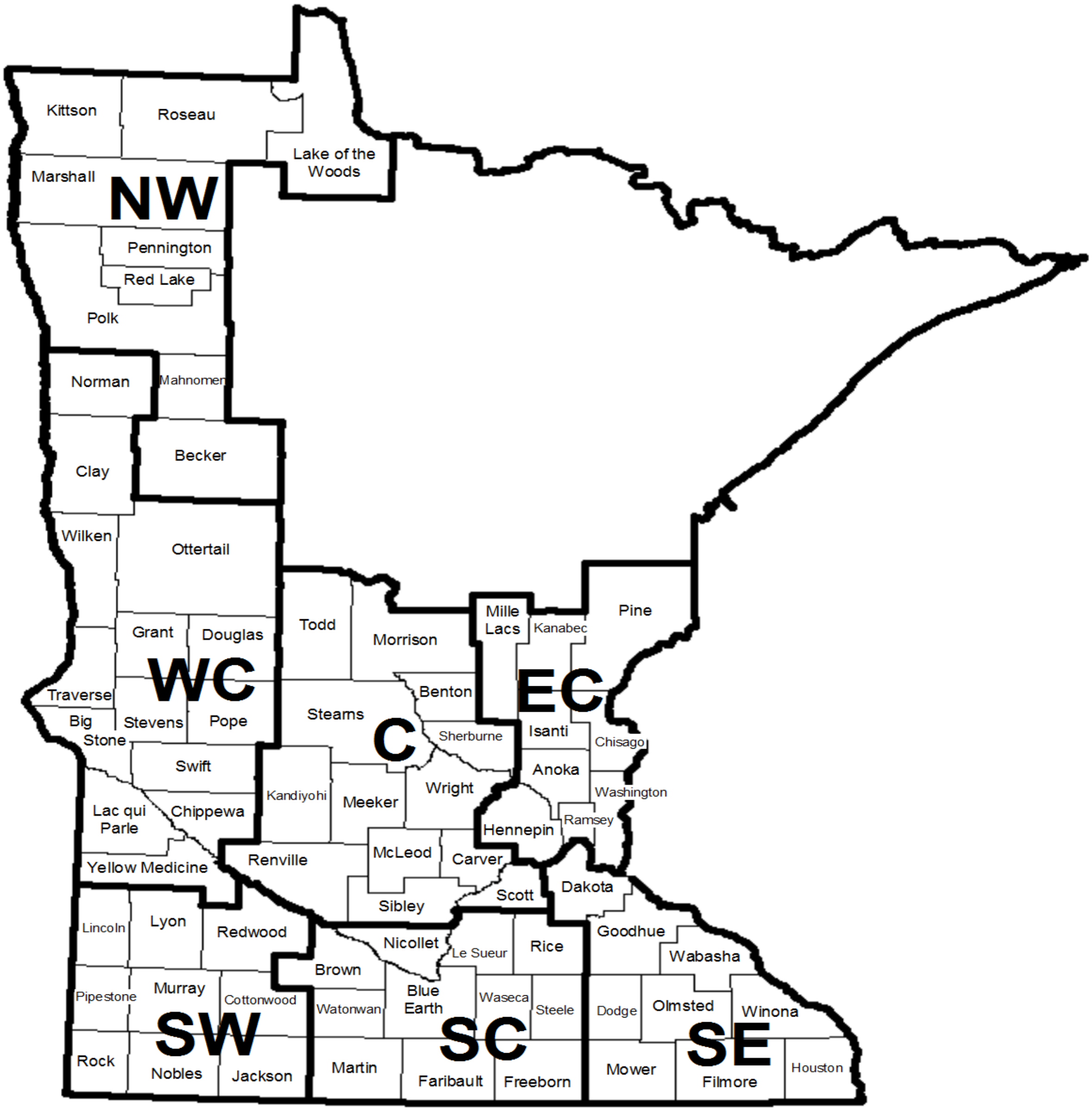


Figure 1. Survey regions for Minnesota's August roadside survey, 2014.

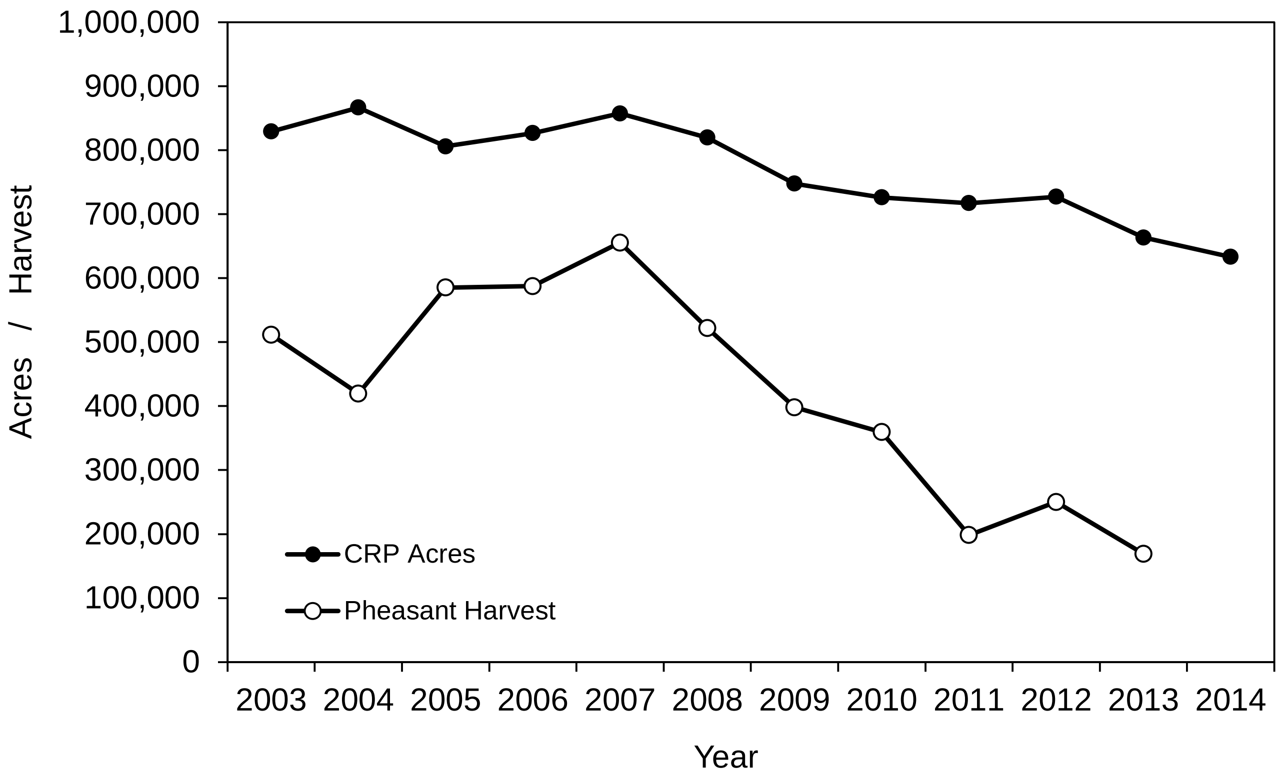


Figure 2. Acres enrolled in the Conservation Reserve Program (CRP) vs. ring-necked pheasant harvest trends in Minnesota, 2003-2014. CRP acres are calculated for the pheasant range only.

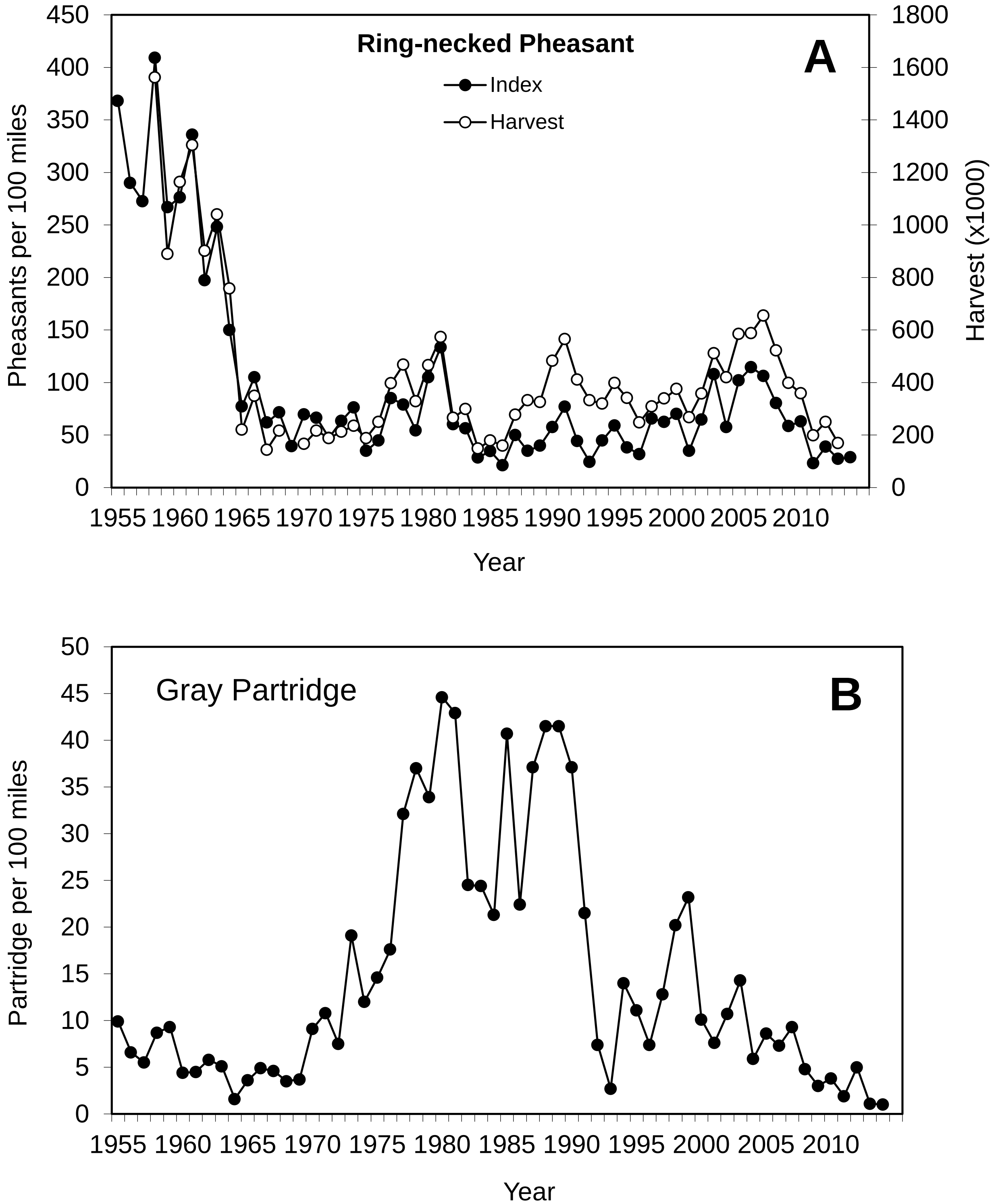


Figure 3. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 1955-2014. Does not include the Northwest region. Based on all survey routes completed.

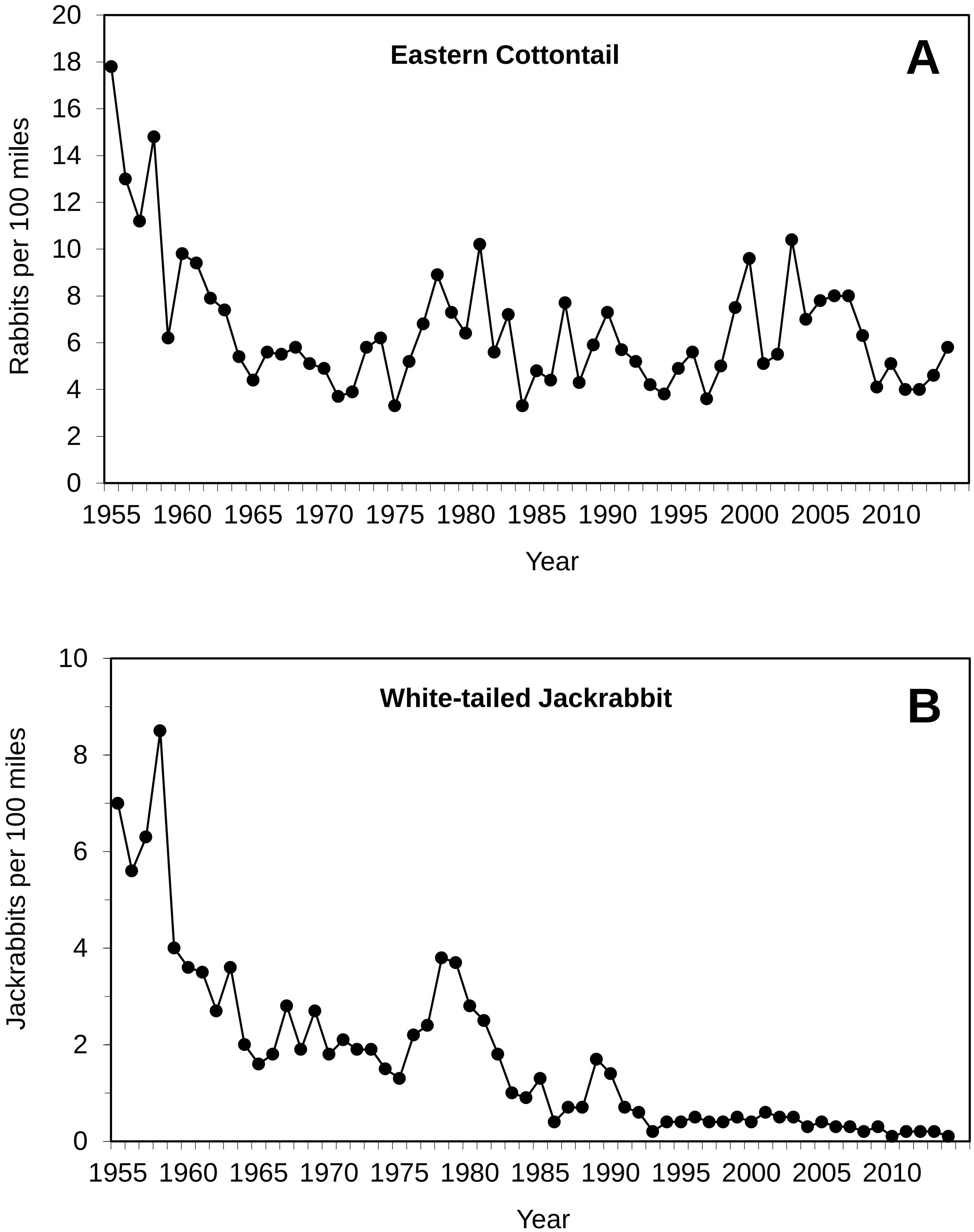
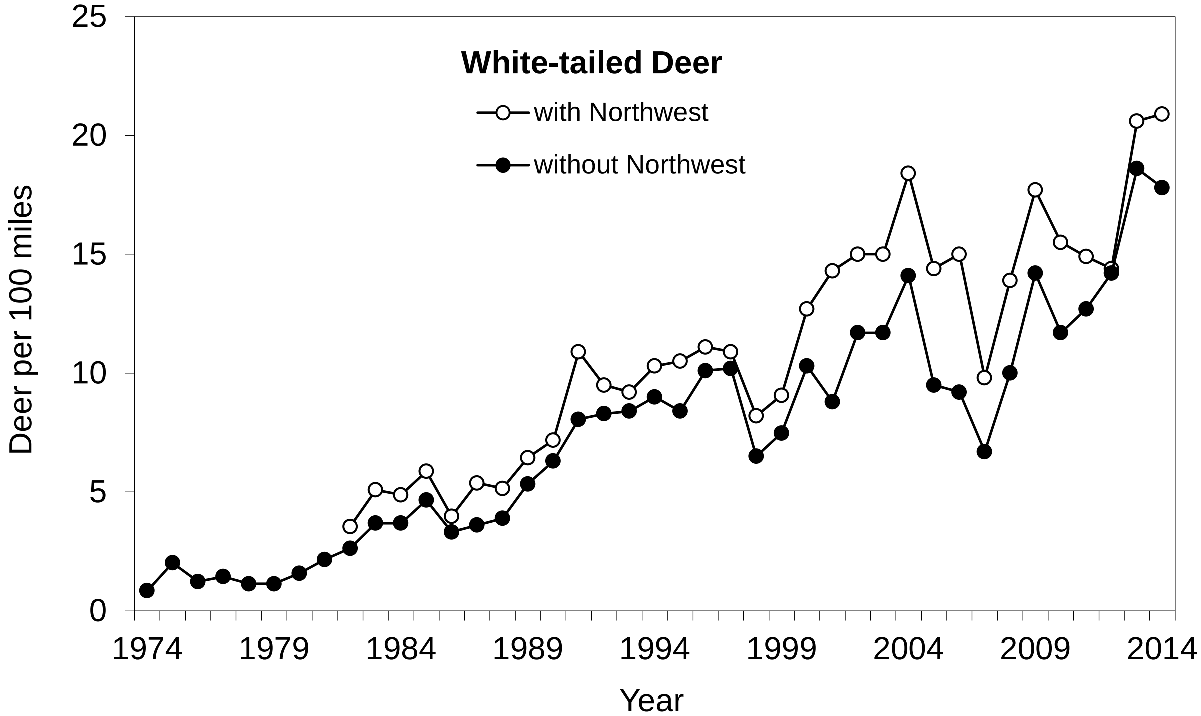


Figure 4. Range-wide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven in Minnesota, 1955-2014. Does not include the Northwest region. Based on all survey routes completed.



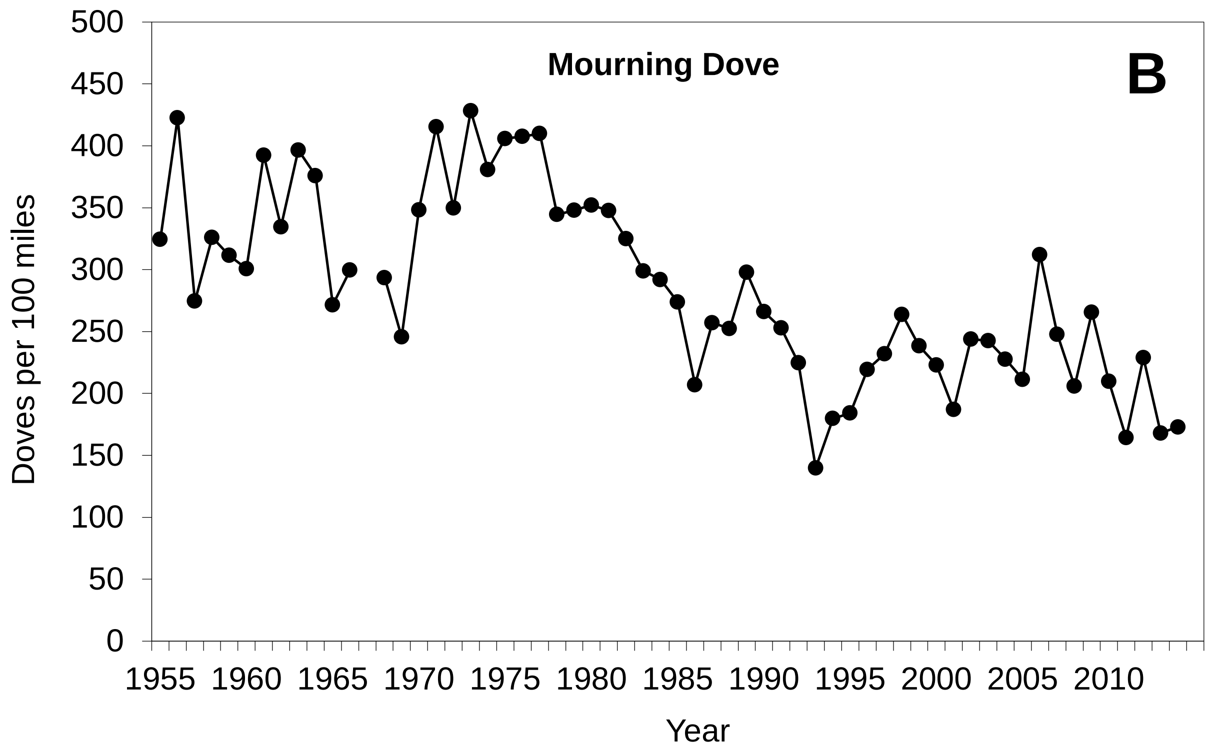


Figure 5. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2014. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA - 2014

Marrett Grund, Farmland Wildlife Populations and Research Group

INTRODUCTION

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

This document 1) describes the structure of and data inputs for the population model used on white-tailed deer in Minnesota, and 2) discusses general trends of deer density and current abundance.

METHODS

I arbitrarily pooled deer permit areas (DPAs) into 12 geographic units to describe population and harvest trends and management issues at a broader scale (Fig. 1). Several management strategies were available in 2013 including: 1) lottery with varying number of antlerless permits, 2) hunter's choice where hunters could hunt either-sex, 3) managed, 4) intensive, and 5) no limit antlerless. The strategy employed during a given year depended upon where the population trend was in relation to the population goal. Some DPAs were not modeled due to light harvest pressure and/or due to having small population sizes which causes stochastic error (Grund and Woolf 2004).

Population Modeling

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

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

RESULTS

Population Trends and Population Management

Northwest Management Units

Karlstad Unit – Deer numbers have moderately declined over the past 5 years in this unit and most populations are near goal (Table 1). Deer populations immediately to the west of PA 101 were well below goal due to prior TB management efforts, but management strategies have been more conservative over the past few years to allow populations to increase.

Crookston/TRF Unit – Deer densities have slightly declined in several areas, but population trends are relatively stable throughout the unit. Harvest sex ratios were heavily skewed toward antlerless deer from 2005 through 2011 to bring deer numbers down. However, these ratios have stabilized over the past few years suggesting that deer numbers are stabilizing.

Mahnomen Unit – Population trends in most areas are relatively stable, modeling indicates deer numbers have moderately declined in DPA 265 and buck harvest trends declined in a similar fashion. In other DPAs, however, modeling suggests fairly stable deer densities and harvest trends and harvest sex ratios agree with that pattern.

Central Management Units

Morris Unit – Population trends over the past 5-10 years have been stable, but deer numbers have significantly declined since the mid-90s in many permit areas. Harvest trends over the past 5-10 years are relatively stable as well, indicating the modeled trends throughout the unit likely reflect the true population dynamics between years in these areas.

Osakis Unit – Population trends have been stable in most DPAs over the past 5-10 years, but population trends in DPA 240 suggest a declining population and the harvest trends agree with that assessment. However, harvest sex ratios in the past two years are indicative of population increases, so I would expect trends to increase over the next few years in DPA 240.

Cambridge Unit – Modeled trends and harvest trends both indicate deer numbers have been relatively stable over the past 5-10 years in most DPAs. The exception is DPA 223 where modeled trends have increased approximately 45% over the past 5 years and harvest trends have increased 30-35% over the past 5 years, these percentages are indicative of a substantial population increase.

Hutchinson Unit – Modeled trends and harvest trends suggest deer populations have been relatively stable in the southern DPAs in this unit, but the same trends suggest increasing deer densities in the northern DPAs over the past 5-10 years. Permit Area 284 was slow to respond to the conservative management strategies around 2005-2007, but trends suggest deer numbers have increase over the past 5 years.

Southern Management Units

Minnesota River Unit – Modeled trends and harvest trends both indicate that populations in these DPAs have been relatively stable over the past 5-10 years despite using relatively conservative management strategies. The eastern DPAs show slightly better patterns for an increasing deer population, but not significant increases as observed in some DPAs in other units.

Slayton Unit – Modeled deer densities are relatively low in southwestern Minnesota due to limited woody cover. Modeled trends and harvest trends are slowly increasing in some areas over the past 5 years, but in other areas those trends are relatively flat indicating a relatively stable deer population. Management strategies have been very conservative over the past 5-7 years, so it is noteworthy that the trends are not increasing at a faster rate.

Waseca Unit – Modeled trends and harvest trends suggest deer populations have been stable over the past 5-10 years. Modeled densities are higher to the eastern side of the unit where there is more woody cover available. Trends in those DPAs suggest stable to slightly increasing deer numbers over the past few years.

Rochester Unit – Modeled trends suggest relatively stable populations throughout most DPAs in this unit. Harvest trends are difficult to interpret due to the antler-point restriction that has been in effect since 2010. Permit areas 346 and 349 are perhaps the two most concerning DPAs in Minnesota this year. These areas were surveyed last winter and both DPAs had population estimates where the lower boundary of the confidence interval was nearly 30 deer per square mile.

Forest Unit – Deer populations in the forest zone have changed remarkably over the past 10 years. Deer densities and numeric harvests were high from 2004 through 2007 then deer numbers declined in most DPAs from 2007 through 2009. Short-term trends in modeled deer densities and numeric harvest trends indicated that 15 of the 36 modeled DPAs have populations that continued to decline from 2009 through 2014, primarily in more northern DPAs where winter severity indices were relatively extreme during the previous two winters. The more conservative harvest management strategies used throughout the forest zone used in 2012 and 2013 have helped offset the population declines, but winter mortality rates were very high and significantly reduced deer numbers from 2009 through 2014. Some of the most notable DPAs that have declining modeled and harvest trends from 2009 through 2014 include DPAs 110, 111, 122, 126, 177, 178, 180, 181, 197 and 298. Trends in modeled deer densities and numeric harvests were relatively stable from 2009 through 2014 in most southern forest zone DPAs (south of Park Rapids and Duluth). No modeled forest zone DPAs had trends that suggested an increasing deer population from 2009 through 2014.

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Figure 1. Deer management units in Minnesota, 2014.

Table 1. Pre-fawn deer density (deer/mi^2) as simulated from population modeling in each permit area in Minnesota, 2009-2014.

Region		Pre-fawning Density					
Permit Area	**Area (mi^2)**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Karlstad							
201	155	6	6	5	5	5	5
208	443	4	4	4	3	3	3
260	1249	4	3	2	2	2	2
263	512	5	5	4	4	4	4
264	669	7	6	5	6	6	6
267	472	4	3	3	3	2	2
268	230	9	8	7	7	6	5
Total	3,838	6	5	5	4	4	4
Crookston							
209	576	9	9	9	7	7	7
210	485	12	11	11	10	10	10
256	654	6	5	5	5	5	5
257	413	8	8	6	6	7	7
261	795	2	2	2	2	2	2
Total	3,053	7	6	6	6	7	7
Mahnomen							
262	677	2	2	2	2	2	2
265	494	10	10	10	9	8	7
266	617	6	5	4	4	4	4
297	438	2	3	3	2	3	3
Total	2,226	5	5	5	5	4	4

Morris							
269	651	2	2	2	2	2	2
270	749	2	2	2	2	2	2
271	634	2	3	3	2	3	3
272	531	2	2	2	2	2	2
273	575	5	4	4	4	5	5
274	360	3	4	3	3	3	3
275	766	4	5	4	3	3	4
276	544	4	4	4	3	4	4
282	779	1	1	1	1	2	2
Total	5,589	2	3	3	3	3	3
Osakis							
213	1058	12	13	10	11	12	14
214	557	19	19	19	19	19	19
215	702	10	10	10	10	10	10
239	924	9	10	8	9	9	9
240	642	17	17	13	14	14	15
Total	3,879	14	14	12	13	14	14
Cambridge							
221	642	13	13	13	13	13	13
222	412	16	16	16	16	16	15
223	376	9	9	10	10	12	13
225	619	16	16	15	14	15	14
227	472	13	14	13	13	14	14
229	287	6	7	6	6	7	8
236	374	16	15	14	15	15	16
Total	2,895	13	13	12	12	13	14

Hutchinson							
218	813	7	8	8	9	10	11
219	393	8	9	9	10	11	10
229	288	6	7	6	6	7	8
277	885	5	5	5	4	4	5
283	614	3	3	3	3	4	4
284	837	2	3	3	3	4	4
285	550	4	4	4	4	5	6
Total	4,380	5	6	5	5	6	7
Minnesota River							
278	397	6	7	6	5	6	7
281	575	4	4	4	3	4	5
290	662	3	4	4	4	5	5
291	806	4	5	4	4	5	5
Total	2,440	4	5	5	5	6	6
Slayton							
234	637	2	3	2	2	2	3
237	729	2	2	3	3	3	3
250	712	2	2	2	3	3	3
279	345	3	3	3	3	4	4
280	675	2	3	2	2	3	3
286	447	3	3	3	3	4	4
288	625	2	2	2	3	3	3
289	816	1	1	1	2	2	2
294	687	2	2	2	2	2	2
295	839	2	2	2	2	2	3
296	666	2	2	2	3	3	3
Total	7,178	2	2	2	3	3	3

Waseca							
230	453	3	4	4	4	4	4
232	377	4	4	4	5	5	5
233	390	4	4	4	4	4	4
252	715	2	2	2	3	3	3
253	974	2	2	2	2	3	3
254	931	3	3	3	3	3	3
255	774	3	3	3	3	4	4
292	481	8	9	8	9	10	10
293	506	7	8	8	8	8	8
299	386	4	5	4	4	5	5
Total	5,987	4	4	4	4	5	5
Rochester							
338	452	5	5	4	5	4	5
339	409	5	6	5	5	5	6
341	596	10	10	10	10	10	11
342	352	13	14	14	14	14	13
343	663	11	10	10	10	10	11
345	326	9	8	8	9	9	9
346	319	20	23	23	23	27	30
347	434	8	7	8	8	8	8
348	332	15	14	14	14	14	13
349	492	21	22	22	23	25	28
Total	4,564	12	12	11	11	11	13

Forest							
103	1824	5	5	4	4	4	4
105	932	12	11	9	9	8	7
108	1701	6	6	6	7	7	6
110	530	20	18	15	15	15	13
111	1440	4	3	3	3	3	3
118	1445	4	4	4	4	5	4
119	946	4	4	3	4	4	3
122	622	5	5	5	5	5	4
126	979	4	4	3	3	3	2
155	639	12	13	14	14	14	11
156	834	15	15	15	14	13	10
157	904	19	19	19	18	17	14
159	575	16	16	15	14	15	14
169	1202	9	9	9	9	9	7
171	729	9	9	10	10	10	9
172	786	13	13	13	13	13	12
173	617	9	9	9	10	10	9
176	1150	8	9	8	9	9	7
177	553	14	15	12	12	13	10
178	1325	16	16	14	13	13	10
179	939	15	15	14	14	13	10
180	999	8	7	7	6	6	5
181	746	15	15	12	11	11	9
183	675	11	11	11	11	12	9
184	1318	16	16	16	16	17	15
197	1343	7	7	5	5	6	5
241	1047	28	27	25	24	24	22
242	307	22	22	22	21	20	18

246	860	14	15	15	15	14	13
247	263	17	18	18	18	18	16
248	229	23	23	23	22	21	18
249	729	11	11	11	11	11	10
258	381	19	19	18	18	19	17
259	546	23	24	23	21	21	18
298	677	13	11	8	9	8	8
Total	32,907	11	11	11	10	10	9

2014 WHITE-TAILED DEER SURVEYS

Brian S. Haroldson, Farmland Wildlife Populations and Research Group

INTRODUCTION

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

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

Our objective was to use aerial surveys by helicopter to provide independent estimates of deer abundance in select deer PAs that were within 20% of the true population size with 90% confidence (Lancia et al. 1994). Estimates within these bounds were used to recalibrate population models to improve population management.

METHODS

We estimated deer populations in selected PAs using a quadrat-based, aerial survey design. Quadrat surveys have been used to estimate populations of caribou (*Rangifer tarandus*; Siniff and Skoog 1964), moose (*Alces alces*; Evans et al. 1966), and mule deer (*O. heimonus*; Bartmann et al. 1986) in a variety of habitat types. Within each PA, quadrats were delineated by Public Land Survey section boundaries. In PAs with woody cover distributed uniformly across the landscape, we used a simple random sampling frame. In PAs with abundant woody cover and past survey data, we used regression trees (Fabrizi and Trivisano 2007, Fieberg and Lenarz 2012), the R programming language (R Core Team 2012), and R package ’stratification’ (Baillargeon and Rivest 2012) to stratify the sampling frame into 2 categories (low, high) based upon past helicopter counts of deer and abundance of woody cover within each quadrat. Woody cover data were derived from the 2006 National Land Cover database (Fry et al. 2011). In some PAs, an additional stratum was constructed to encompass State Park boundaries where applicable. We used optimal allocation, R package ‘spsurvey’ (Kincaid and Olsen 2012), and a generalized random tessellation stratified procedure (GRTS; Stevens and Olsen 2004) to draw spatially balanced simple or stratified random samples within each PA.
During all surveys, we used Bell OH-58 helicopters and attempted to maintain flight altitude at 60 m above ground level and airspeed at 64-80 km/hr. A pilot and 2 observers searched for deer along transects spaced at 270-m intervals until they were confident all “available” deer were

observed. When animals fled the helicopter, direction of movement was noted to avoid double counting. We used a real-time, moving-map software program (DNRSurvey; Wright et al. 2011), coupled to a global positioning system receiver and a convertible tablet computer, to guide transect navigation and record deer locations, direction of movement, and aircraft flight paths directly to ArcGIS (Environmental Systems Research Institute, Redlands, CA) shapefiles. To minimize visibility bias, we completed surveys during winter (December-March) when snow cover measured at least 15 cm and we varied survey intensity as a function of cover and deer numbers (Gasaway et al. 1986). We estimated deer abundance using R package 'spsurvey' (Kincaid and Olsen 2012). We evaluated precision using coefficient of variation (CV), defined as standard deviation of the population estimate divided by the population estimate, and relative error, defined as the 90% confidence interval bound divided by the population estimate (Krebs 1999).

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

RESULTS AND DISCUSSION

We completed 6 surveys during 2014 (Table 1). We utilized a simple random sample in PAs 221, 222, 239, and 346, whereas PAs 342 and 349 were stratified using the relationship between woody cover abundance per quadrat and historic deer density. In PAs 346 and 349, sampling rate exceeded 20% to incorporate additional quadrats within Great River Bluffs State Park and Beaver Creek Valley State Park, respectively. Deer density estimates ranged from 7-35 deer/mi^2 throughout all PAs and all estimates met precision goals (relative error $\leq$ 20%; Table 1). Deer were observed in 43-90% of sample quadrats in the 6 surveyed areas, with greater occupancy in PAs with more woody cover (Table 2). In addition, although mean group size was similar across all areas, mean number of groups per "occupied" quadrat varied nearly 2-fold (range = 4-7; Table 2) in all areas.

Estimates of sightability ranged from 0.633 (SE = 0.034) in PA 222 to 0.757 (SE = 0.017) in PA 349 and averaged 0.710 (SE = 0.018 Table 1), which were similar to sightability estimates during 2009-2013 (range = 0.655-0.909). Correcting for sightability increased relative variance (CV [%]) of population estimates by 3.5-16.9%, which was a reasonable tradeoff between decreased bias and increased variance, although costs associated with the sightability surveys are also important. However, we caution that our sightability estimates are conditional on animals being available for detection (Johnson 2008, Nichols et al. 2009). Unfortunately, like many other wildlife surveys, we have no estimates of availability or how it varies over space and time. Our approach also assumes that sightability is constant across animals and quadrats. Heterogeneity in detection probabilities can lead to biased estimates of abundance. Common methods for correcting for heterogeneous detection probabilities include distance sampling, mark-recapture methods, and logistic-regression sightability models (based on radio-marked animals). We did not have marked animals in our populations, and relatively high densities of deer in our survey areas would present serious logistical and statistical problems for distance-sampling and double-observer methods. Therefore, our double-sampling approach is a reasonable alternative to using unadjusted counts or applying more complicated methods whose assumptions are tenuous. Nevertheless, our "adjusted" population estimates must still be viewed as approximations to the truth.

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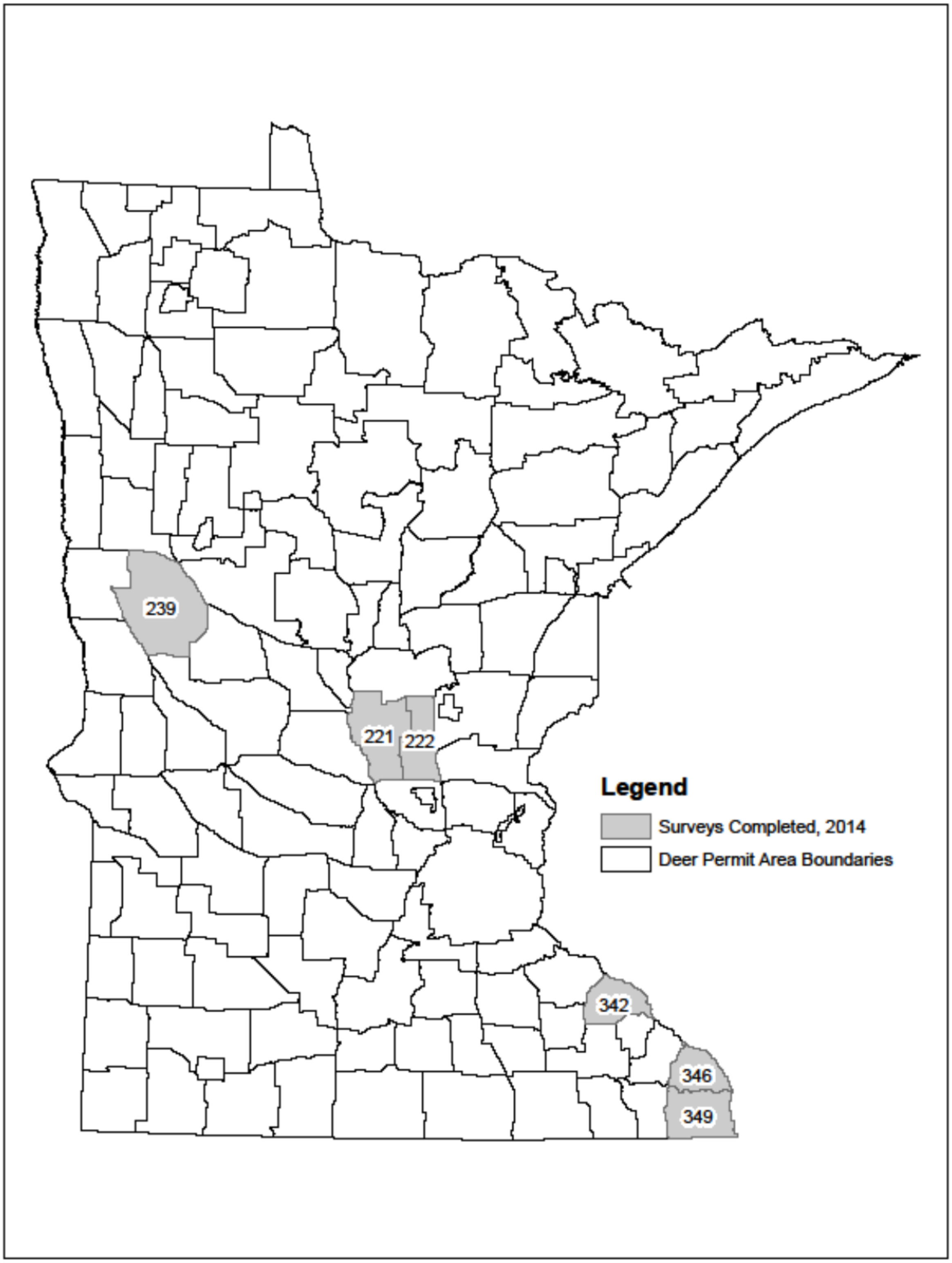

Figure 1. Aerial deer surveys completed in Minnesota, 2014.

Table 1. Deer population and density (deer/mi^2) estimates derived from aerial surveys in Minnesota, 2014.

Permit area	Sampling rate	Detection rate	Population estimate		CV (%)	Relative error (%)[a]	Density estimate	
			N	90% CI			Mean	90% CI
221	0.20	0.752	4,560	3,670 – 5,450	11.9	19.6	7	6 – 9
222	0.20	0.633	6,320	5,240 – 7,410	10.4	17.1	15	13 – 18
239	0.20	0.714	10,510	8,480 – 12,540	11.7	19.2	10	8 – 12
342	0.20	0.712	3,690	3,000 – 4,380	11.4	18.8	10	8 – 12
346[b]	0.24	0.693	11,550	9,820 – 13,280	9.1	15.0	35	30 – 41
349[c]	0.22	0.757	14,860	13,040 – 16,670	7.4	12.2	30	26 – 33

[a]Relative precision of population estimate. Calculated as 90% CI bound/*N*.
[b]Includes Great River Bluffs State Park.
[c]Includes Beaver Creek Valley State Park.

Table 2. Sampling metrics from aerial deer surveys in Minnesota, 2014.

Permit area	Total quadrats	Sample quadrats	Occupied quadrats[a]	Deer observed	Deer groups observed	Groups / occupied quadrat			Group size / occupied quadrat			Maximum quadrat count
						min	mean	max	min	mean	max	
221	635	127	55	686	199	1	4	10	1	3	32	46
222	418	84	60	803	263	1	4	13	1	3	21	45
239	1,050	210	94	1,500	353	1	4	20	1	4	35	115
342	366	74	48	670	173	1	4	10	1	4	22	66
346	327	80	72	1,937	519	1	7	18	1	4	46	121
349	500	112	95	2,831	678	1	7	19	1	4	33	103

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

CARNIVORE SCENT STATION SURVEY

AND

WINTER TRACK INDICES

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

CARNIVORE SCENT STATION SURVEY SUMMARY, 2013

John Erb, Forest Wildlife and Populations Research Group

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for understanding 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 annually 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, Levi and Wilmers 2012).

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 38th year of the carnivore scent station survey.

METHODS

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

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

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

Replicates are ranked according to the magnitude of the calculated index, and the 25th and 975th values constitute the lower and upper bounds of the confidence interval.

RESULTS AND DISCUSSION

A total of 273 routes were completed this year. There were 2,512 operable scent stations examined on the 273 routes. Route density varied from 1 route per 546 km^2 in the Forest Zone to 1 route per 1,335 km^2 in the Farmland Zone (Figure 1).

Statewide, route visitation rates (% of routes with detection) were highest for red foxes (35%), followed by raccoons (30%), skunks (28%), domestic cats (26%), coyotes (25%), domestic dogs (19%), bobcats (12%), and wolves (11%). Regionally, route visitation rates were as follows: red fox – Farmland (FA) 16%, Transition (TR) 39%, Forest (FO) 39%; coyote – FA 39%, TR 43%, FO 13%; skunk – FA 31%, TR 24%, FO 29%; raccoon – FA 51%, TR 49%, FO 14%; domestic cat – FA 41%, TR 41%, FO 13%; domestic dog – FA 33%, TR 31%, FO 9%; wolf - FA 0%, TR 1%, FO 18%; bobcat - FA 0%, TR 3%, FO 21%.

Figures 2-5 show station visitation indices (% of stations visited) from the survey's inception through the current year. Although the survey is largely intended to document long-term trends in populations, confidence intervals improve interpretation of the significance of annual changes. Based strictly on the presence/absence of confidence interval overlap, the only significant change this year was a decrease in the Transition Zone striped skunk index (Figure 3). Other 'marginally significant' changes included declines in both the striped skunk and domestic cat indices in the Farmland Zone (Figure 2) and a decline in the Forest Zone wolf index (Figure 5).

In the Farmland Zone (Figure 2), recent red fox data showed indications of an upturn following years of declining indices, but this year's index declined to the second lowest level since the survey began and remained well below the long-term average. Conversely, the Farmland coyote index remains well above its long-term average. This year's declines in striped skunk and domestic cat indices in the Farmland Zone dropped both to levels below their long-term averages for the first time in many years. The confidence interval for the raccoon index overlaps the long-term average though point estimates have remained above-average for several years.

In the Transition Zone (Figure 3), red fox indices had increased to near the long-term average in recent years. However, indices from the past 2 years have now declined and are once again below the long-term average. The Transition Zone coyote index continues an upward trend, with the point estimate for this year's track index the highest yet recorded. Indices for most other species are near their long-term average.

In the Forest Zone (Figure 4), indices for all species except coyotes are at or near their long-term average. Coyote indices remain below the long-term average, with indices from the past 2 years being the lowest recorded since the survey began. After a rapid 2-year rise (2009-11), the Forest Zone wolf index has declined the past 2 years back to near the long-term average (Figure 5). The point estimate for the Transition Zone wolf index also dropped to near the long-term average, though the Transition Zone represents a small portion of wolf range and confidence intervals are large. The Forest Zone bobcat index remains near record levels, while the Transition Zone bobcat index has declined over the past 3 years from record levels to near the long-term average (Figure 5).

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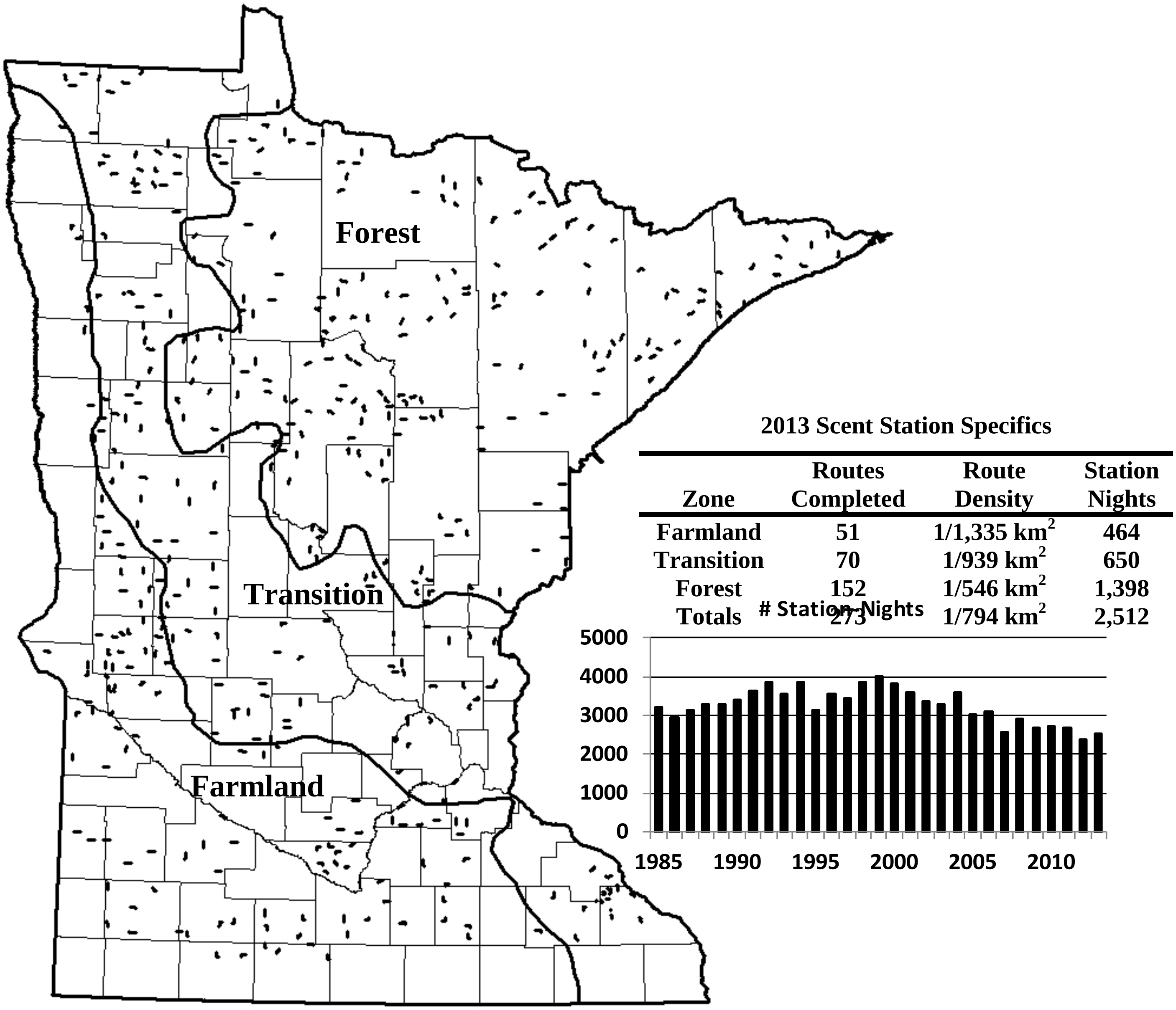

2013 Scent Station Specifics

Zone	Routes Completed	Route Density	Station Nights
Farmland	51	1/1,335 km^2	464
Transition	70	1/939 km^2	650
Forest	152	1/546 km^2	1,398
Totals	273	1/794 km^2	2,512

Figure 1. Locations of existing scent station routes (not all completed every year). Insets show 2013 route specifics and the number of station-nights per year since 1983.

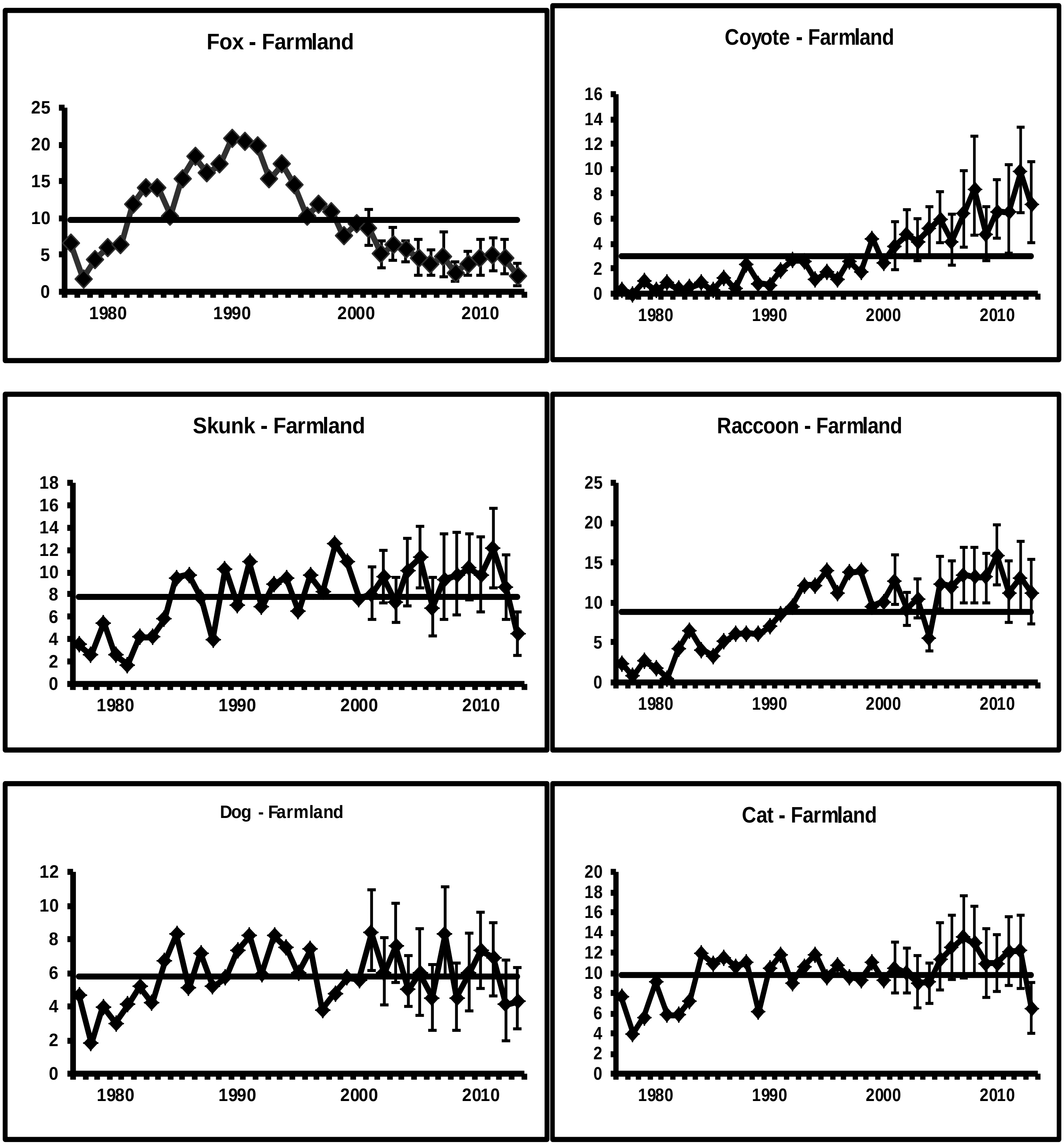

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2013. Horizontal line represents long-term mean.

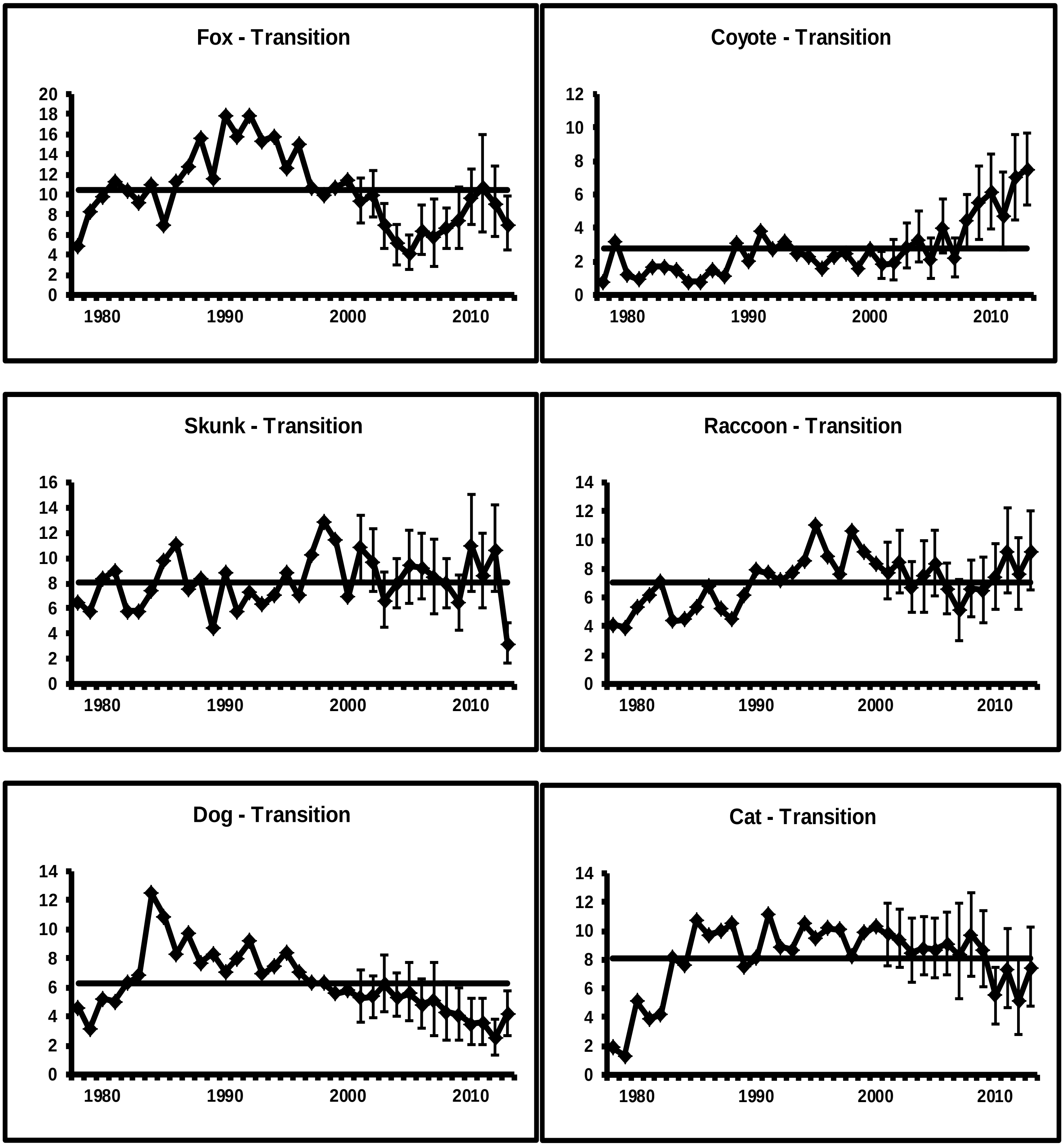

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2013. Horizontal line represents long-term mean.

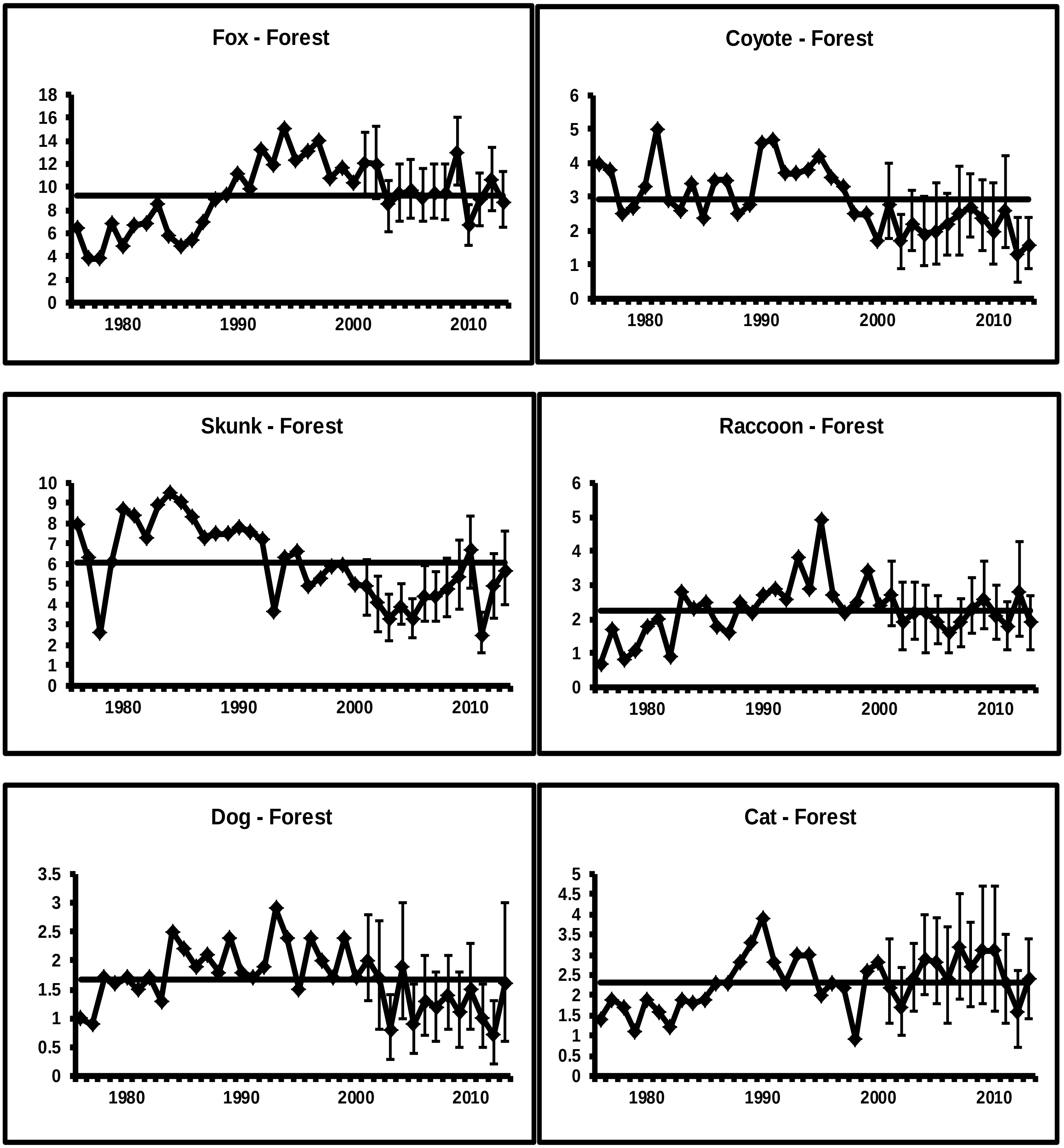

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2013. Horizontal line represents long-term mean.

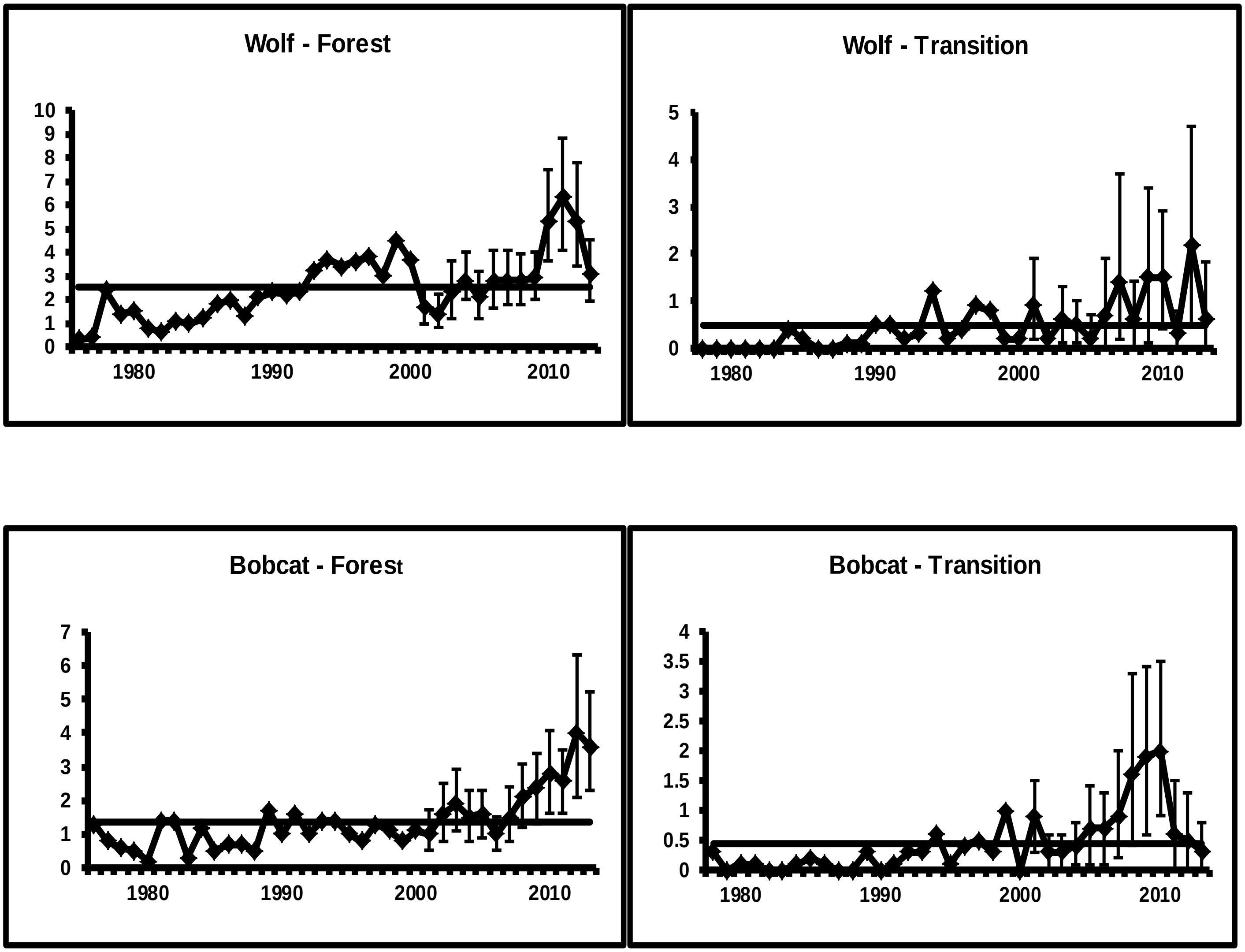

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2013. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2013

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

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

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

METHODS

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

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

Currently, three summary statistics 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 two adjacent 0.5-mile segments along the road, and it was the only 'new' red fox (*Vulpes vulpes*) in the second segment, only one of the two segments is considered independently occupied). In addition to this metric, but on the same graph, the average number of tracks per 10-mile route is presented after removing any obvious duplicate tracks across segments. For wolves (*Canis lupus*) traveling through adjacent segments, the maximum number of pack members recorded in any one 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 two indices (% segments occupied and # tracks per route) will often yield mathematically equivalent results (i.e., on average, one tends to differ from the other by a constant factor). In the case of wolf packs, and to a lesser extent red fox and coyotes (*Canis latrans*) which may still associate with previous offspring or start traveling as breeding pairs in winter, the approximate equivalence of these two indices will still be true if average (detected) group sizes are similar across years. However, the solitary tendencies in some species are not absolute, potential abundance (in relation to survey plot size) varies across species, and for wolves, pack size may vary annually. For these reasons, as well as to provide an intuitive count metric, both indices are currently presented. Because snowshoe hares are tallied only as present/absent, the 2 indices will by definition be equivalent. Dating back to 1974, hare survey data has also been obtained via counts of hares observed on ruffed grouse drumming count surveys conducted in spring. Post-1993 data for both the spring and winter hare indices are presented for comparison in this report.

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

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

RESULTS

In spite of abundant snow, logistic constraints allowed only 32 of the 60 routes to be completed this year (Figure 2). Survey routes took an average of 1.8 hours to complete. Total snow depths averaged 19" along completed routes, the deepest since the survey began (Figure 3). Mean overnight low temperature the night preceding the surveys was -8°F, tied for the coldest since the survey began (Figure 3). Survey routes were completed between December 15th and April 2nd, with a mean survey date of January 16th (Figure 3).

Although few changes were statistically significant, survey point estimates declined for all species whose results are presented graphically in this report. Point estimates for fisher and marten both declined to their lowest levels, though declines were not significant (Figure 4). Fishers were detected on 3% of the route segments, and along 50% of the routes (Figure 4). Numerous sources of information indicate that fishers have been expanding in distribution and abundance along the southern and western edge of their Minnesota range, an area currently with few or no track survey routes. Hence, fisher indices in this report are presumed indicative of fisher population trends only in the previous 'core' of fisher range, not in the southern and western periphery where they appear to have increased in recent years. Marten were detected on 3.2% of the route segments, and 44% of the survey routes (Figure 4).

Bobcats (*Lynx rufus*) were detected on 3.1% of the route segments and 44% of the survey routes, both the lowest since 2008 but still at or above the long-term average (Figure 4). Although wolf indices were near the long-term average, they declined significantly (or marginally so) compared to last year. Wolves were detected on 7.6% of the route segments and 66% of the survey routes (Figure 4). Red fox indices also declined significantly, and appreciable though non-significant declines were also observed for coyote indices. Segment visitation rates were 8.3% and 1.2%, while route visitation rates were 59% and 15% for red foxes and coyotes, respectively (Figure 4).

No significant changes were observed for either weasels (*Mustela erminea* and *Mustela frenata*) or snowshoe hares. However, indices for weasels continue to be characterized as exhibiting a downward trend with periodic irruptions (Figure 4). Although historic data (pre-1994; not presented here) for snowshoe hares clearly exhibited 10-year cycles, in recent times the cycle appears to have dampened though hints of the cycle remain. Cycle peaks have historically occurred, on average, in the first few years of each decade. Data from the past 3 years is consistent with this pattern, but with the minor cyclic peaks being superimposed on a generally increasing trend since 1994 (Figure 4).

Lynx are rarely detected on the survey and graphical data is not presented herein. Nevertheless, the survey index for lynx increased appreciably this year to the highest level since the survey began. Lynx were detected on 6% of the completed routes this year.

DISCUSSION

Reliable interpretation of changes in these track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000, MacKenzie et al.

2004). Because this remains an untested assumption, caution is warranted when interpreting changes, particularly annual changes of low to moderate magnitude, or short-term trends. Of particular note this year, surveys were conducted during the most extreme conditions (coldest temperatures, deepest snow) since the survey began. Although the response to colder conditions and deeper snow likely varies by species, in general such conditions would be expected to reduce activity of many species and may partially explain the across-the-board decline in indices. Nevertheless, apparent declines in some species are consistent with other data or anecdotal observation.

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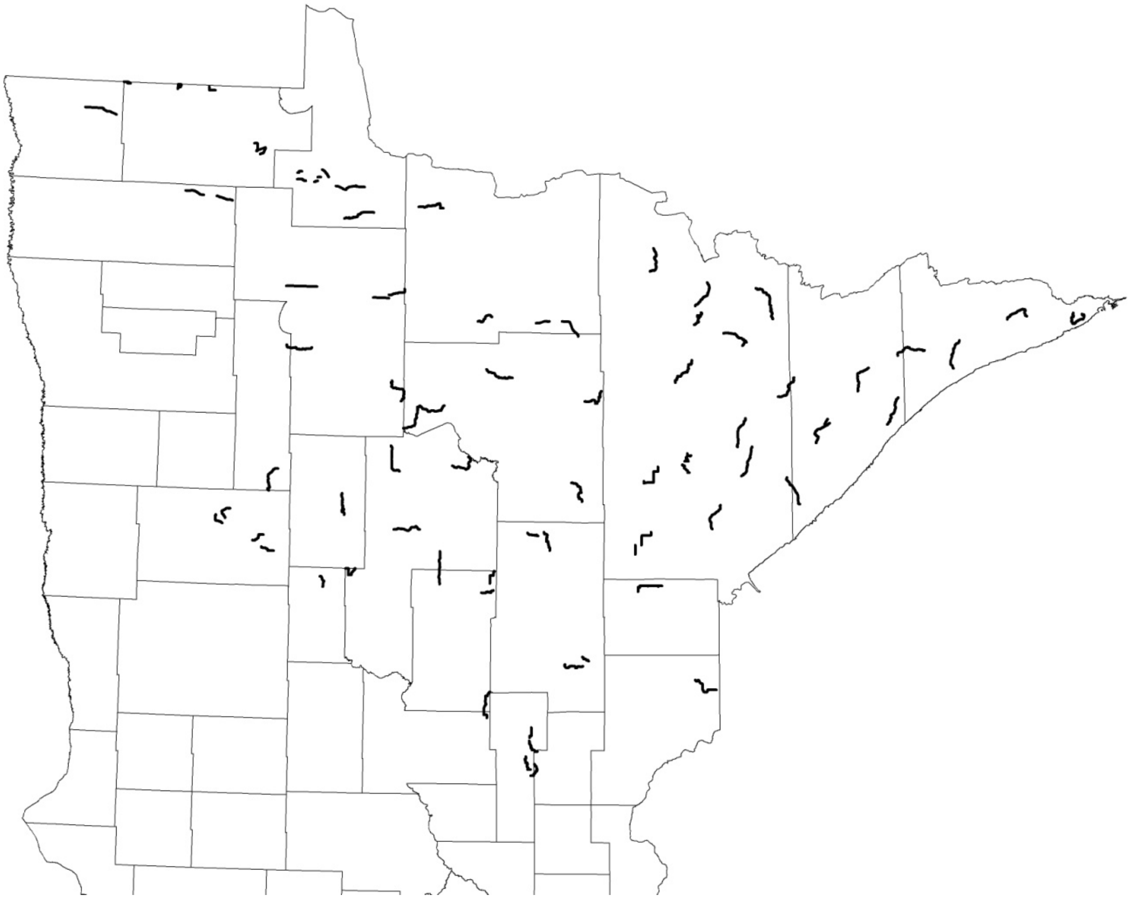

Figure 1. Locations of established furbearer winter track survey routes in northern Minnesota.

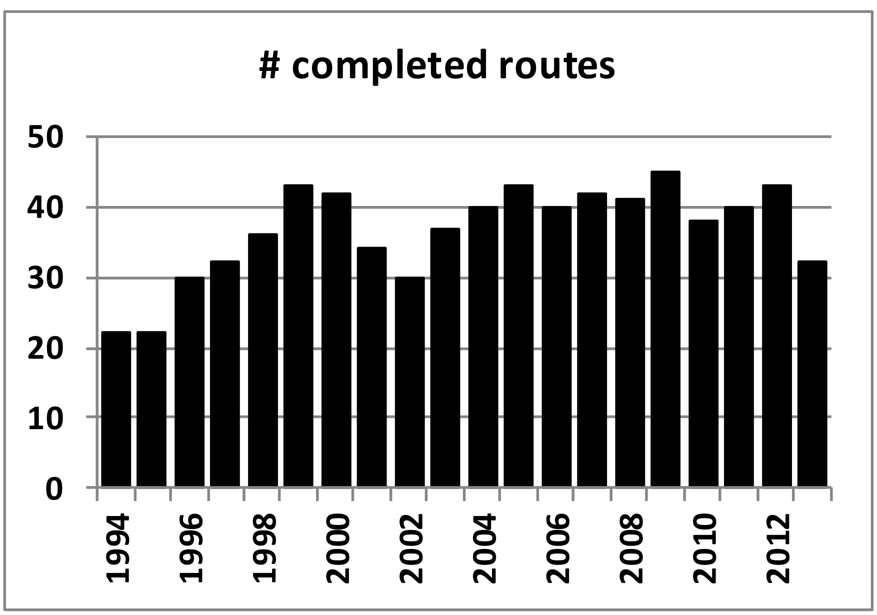

Figure 2. Number of snow track routes surveyed in Minnesota, 1994-2013.

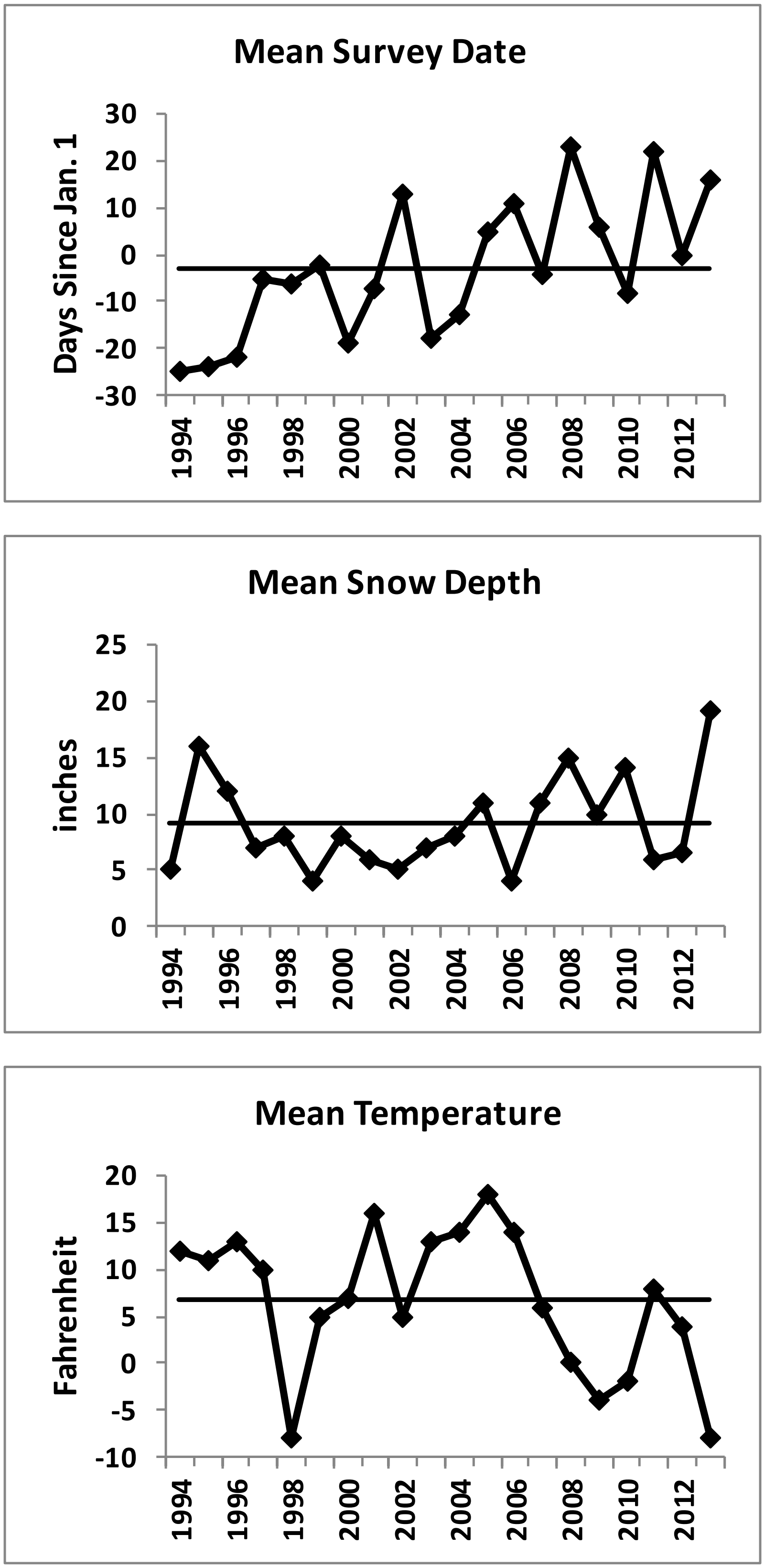

Figure 3. Average survey date, snow depth, and temperature for snow track routes completed in Minnesota, 1994-2013. Horizontal line represents long-term mean.

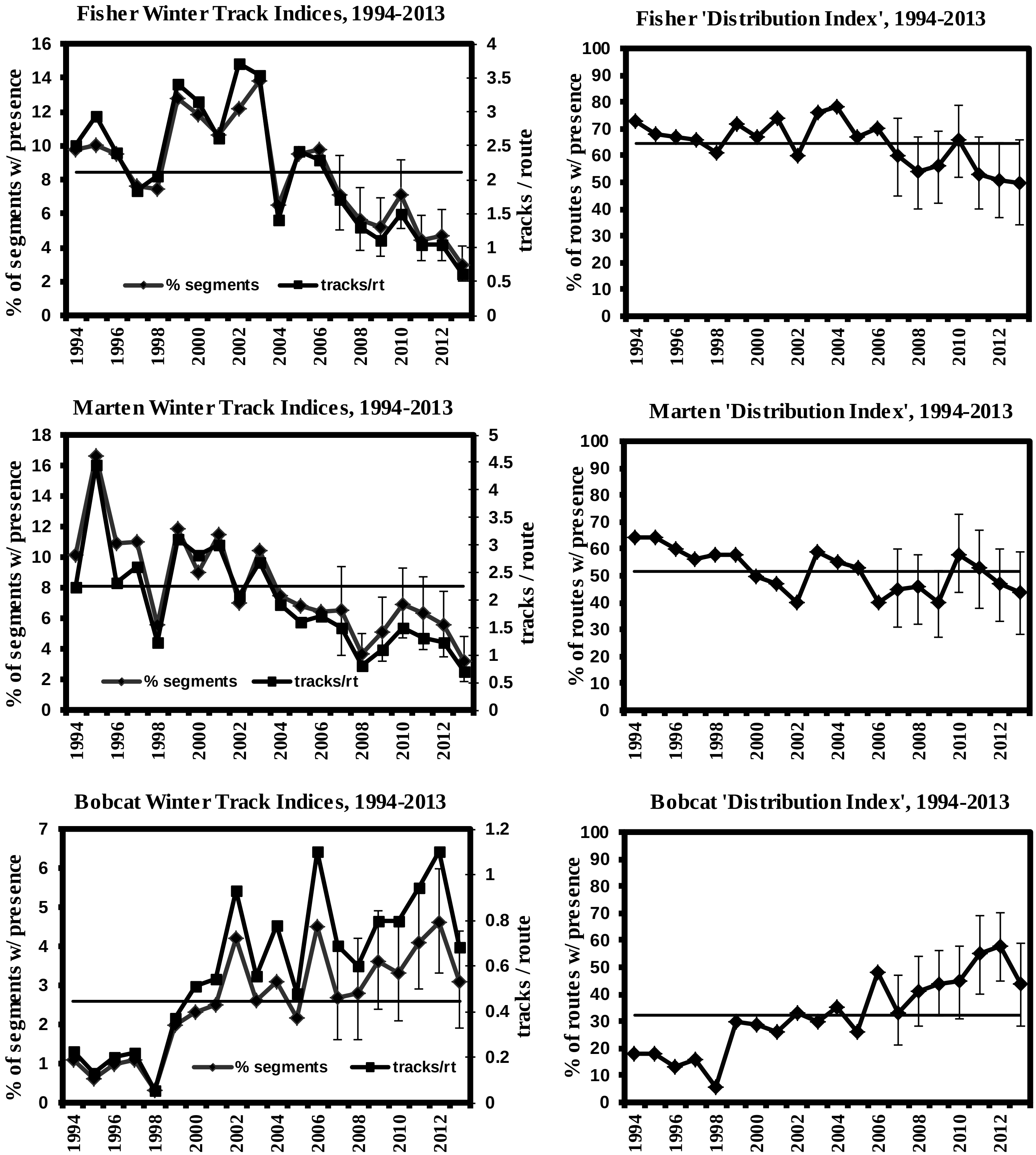

Figure 4. Winter track indices for selected species in Minnesota, 1994-2013. Confidence intervals only presented for % segments and % routes with track presence. Horizontal lines represent long-term average for percentage of segments and routes with presence.

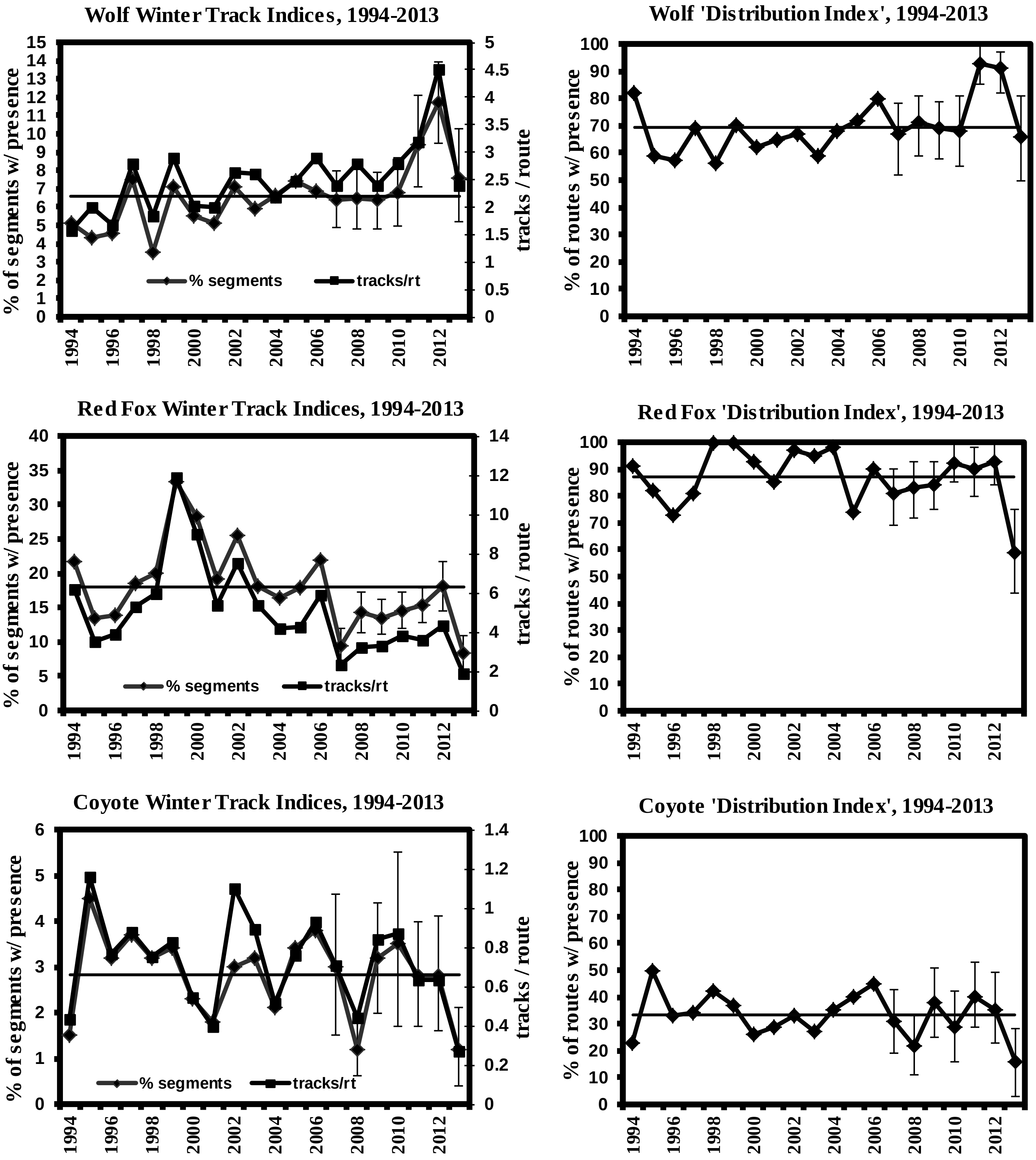

Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2013.

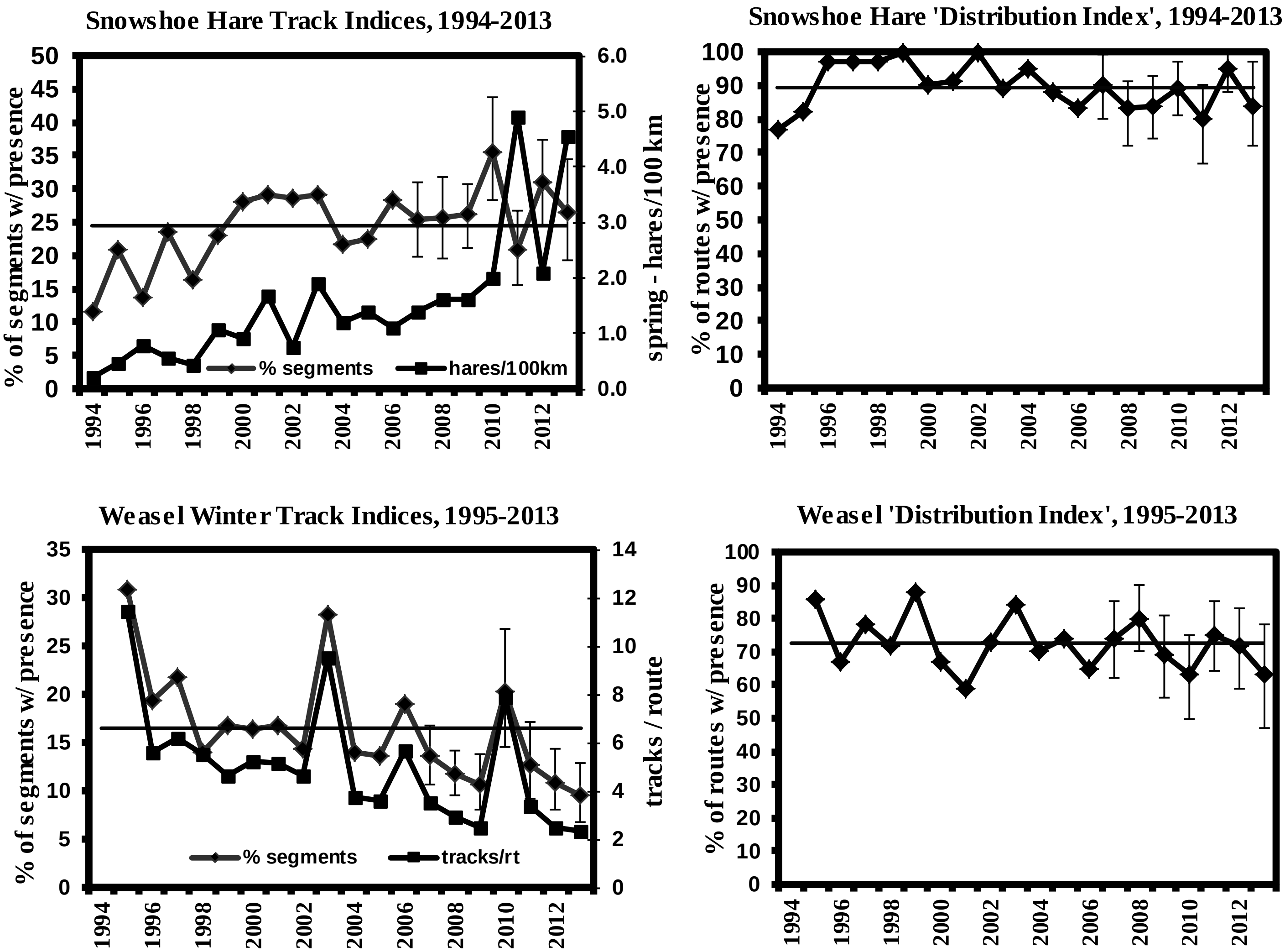

Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2013.

FOREST WILDLIFE POPULATIONS

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2014 MINNESOTA SPRING GROUSE SURVEYS

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Each spring, the Minnesota DNR coordinates statewide ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) surveys with the help of wildlife managers, cooperating agencies, and organizations (e.g., tribal agencies, U.S. Forest Service, college wildlife clubs). In 2014, ruffed grouse surveys were conducted between 21 April and 28 May, which was later than usual, but it allowed the peak of drumming activity to be captured during the late spring. Mean ruffed grouse drums per stop (dps) were 1.1 (95% confidence interval = 0.9–1.3) and increased 34% from the previous year. This increase occurred in the northern portion of the state; increases were not observed in southern regions. This may indicate the beginning of an upswing in the grouse cycle, which has been in the declining phase since 2009.

Sharp-tailed grouse surveys were conducted between 28 March and 28 May 2014, with 1,771 birds observed at 181 leks. The mean numbers of sharp-tailed grouse/lek were 5.4 (4.5-6.4) in the East Central (EC) survey region, 10.9 (9.8–12.1) in the Northwest (NW) region, and 9.8 (8.8–10.9) statewide. Comparisons between leks observed in consecutive years (2013 and 2014) were higher statewide ($t = 2.2$, $P = 0.04$) but increases were not significant in regional comparisons ($P > 0.05$).

INTRODUCTION

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

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

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

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

METHODS

Ruffed Grouse

Surveys for ruffed grouse were conducted along 121 established routes throughout the state. Each route consisted of 10 listening stops at approximately 1.6-km (1-mile) intervals. The placement of routes on the landscape was determined from historical survey routes, which were originally placed near ruffed grouse habitat in low traffic areas. Annual sampling of these historical routes provides information about temporal changes along the routes, but may not be representative of the counties or regions where the routes occurred.

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

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

Sharp-tailed Grouse

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

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

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

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 11 cooperating organizations surveyed routes between 21 April and 28 May 2014. Most routes (75%) were surveyed between 4 May and 16 May, with the median date (7 May) earlier than last year (May 10) but comparatively late (April 23 and 25 in 2010 and 2012, and May 1 and 3 in 2009 and 2011, respectively). Excellent (41%), Good (50%), and Fair (9%) survey conditions were reported for 116 routes reporting conditions, which is notable as the only time that more people reported good than excellent conditions in the last decade. However, the guidance provided was to survey during the peak of drumming activity in each area, if conditions would allow.

Statewide counts of ruffed grouse drums averaged 1.1 dps (95% confidence interval = 1.0–1.3 dps) during 2014 (Figure 3). Drum counts were 1.3 (1.1–1.5) dps in the Northeast (n = 98 routes), 1.2 (0.7–2.1) dps in the Northwest (n = 8), 0.8 (0.4–1.2) dps in the Central Hardwoods (n = 13), and 0.3 (0.1–0.5) dps in the Southeast (n = 7) regions (Figure 4a-d).

Statewide drum counts increased 34% this year. Increases were driven by changes in the northern portion of the state, in the prime ruffed grouse range. This increase is consistent with changes expected with the 10-year cycle, with the most recent peak in drum counts during 2009. The cycle is less pronounced in the more southern regions of the state, near the edge of their range.

Sharp-tailed Grouse

A total of 1,771 male sharp-tailed grouse and grouse of unknown sex was counted at 181 leks (Table 1) during 28 March - 28 May 2014. More leks (30%) were observed in 2014 than during 2013, in part due to the filling of several DNR Wildlife staff vacancies in northwestern Minnesota which permitted greater effort this year. Leks with ≥2 grouse were observed an average of 1.8 times.

The statewide index value of 9.8 (8.8–10.9) was centrally located among values observed since 1980 (Figure 5). In the EC survey region, 201 grouse were counted on 37 leks, and 1,570 grouse were counted on 144 leks in the NW region. The index value (i.e., grouse/lek) was higher statewide and in both regions compared to 2014, but confidence intervals overlapped those from the last few years (Table 1). Counts at leks observed during both years increased statewide from 2013 ($t = 2.2$, $P = 0.04$), but changes by region were not significant ($P > 0.05$) in either region (Table 2). These changes may indicate the beginning of an upswing in the cycle concordant with that of ruffed grouse. Sharp-tailed grouse population index values peaked with those for ruffed grouse in 2009, and appear to have troughed with them in 2013, although sharp-tailed grouse peaks can follow those of ruffed grouse by as much as 2 years.

ACKNOWLEDGEMENTS

The ruffed grouse survey was accomplished this year through the combined efforts of staff and volunteers at Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Red Lake, and White Earth Reservations; 1854 Treaty Authority; Agassiz and Tamarac National Wildlife Refuges (U.S. Fish & Wildlife Service); Vermilion Community College; Cass County Land Department; and DNR staff at Aitkin, Baudette, Bemidji, Brainerd, Cambridge, Carlos Avery Wildlife Management Area (WMA), Cloquet, Crookston, Detroit Lakes, Fergus Falls, Grand Rapids, International Falls, Karlstad, Little Falls, Mille Lacs WMA, Park Rapids, Red Lake WMA, Rochester, Roseau River WMA, Sauk Rapids, Thief Lake WMA, Thief River Falls, Tower, Two Harbors, Whitewater WMA, and Winona work areas. I would like to thank DNR staff and volunteers at Aitkin, Baudette, Bemidji, Cambridge, Cloquet, Karlstad, International Falls, Tower, Thief River Falls, and Thief Lake work areas, staff and volunteers at Red Lake and Roseau River WMAs, and partners at Agassiz National Wildlife Refuge for participating in sharp-tailed grouse surveys. Laura Gilbert helped enter ruffed grouse data. Gary Drotts, John Erb, and Rick Horton organized an effort to enter the ruffed grouse survey data for 1982–2004, and Doug Mailhot and another volunteer helped enter the data. I would also like to thank Mike Larson for his assistance in the transition coordinating the surveys and for making helpful comments on this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

Table 1. Sharp-tailed grouse / lek (≥2 males) at all leks observed during spring surveys each year in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Year	Mean	95% CI[b]	*n*[c]	Mean	95% CI[b]	*n*[c]	Mean	95%CI[b]	*n*[c]
2004	11.2	10.1–12.3	183	12.7	11.3–14.2	116	8.5	7.2–9.9	67
2005	11.3	10.2–12.5	161	13.1	11.5–14.7	95	8.8	7.3–10.2	66
2006	9.2	8.3–10.1	161	9.8	8.7–11.1	97	8.2	6.9–9.7	64
2007	11.6	10.5–12.8	188	12.7	11.3–14.1	128	9.4	8.0–11.0	60
2008	12.4	11.2–13.7	192	13.6	12.0–15.3	122	10.4	8.7–12.3	70
2009	13.6	12.2–15.1	199	15.2	13.4–17.0	137	10.0	8.5–11.7	62
2010	10.7	9.8–11.7	202	11.7	10.5–12.9	132	8.9	7.5–10.5	70
2011	10.2	9.5–11.1	216	11.2	10.2–12.2	156	7.8	6.7–8.9	60
2012	9.2	8.2–10.3	153	10.7	9.3–12.3	100	6.3	5.4–7.3	53
2013	9.2	8.2–10.2	139	10.5	9.3–11.7	107	4.8	3.8–5.9	32
2014	9.8	8.8–10.9	181	10.9	9.8–12.1	144	5.4	4.5–6.4	37

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

Table 2. Difference in the number of sharp-tailed grouse / lek observed during spring surveys of the same lek in consecutive years in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Comparison[b]	Mean	95% CI[c]	*n*[d]	Mean	95% CI[c]	*n*[d]	Mean	95%CI[c]	*n*[d]
2004 - 2005	-1.3	-2.2– -0.3	186	-2.1	-3.5– -0.8	112	0.0	-1.0– 1.1	74
2005 - 2006	-2.5	-3.7– -1.3	126	-3.6	-5.3– -1.9	70	-1.1	-2.6– 0.6	56
2006 - 2007	2.6	1.5– 3.8	152	3.3	1.7– 5.1	99	1.2	0.1– 2.3	53
2007 - 2008	0.4	-0.8– 1.5	166	0.0	-1.6– 1.6	115	1.2	0.1– 2.5	51
2008 - 2009	0.9	-0.4– 2.3	181	1.8	-0.1– 3.8	120	-0.8	-2.1– 0.6	61
2009 - 2010	-0.6	-1.8– 0.6	179	-0.8	-2.6– 1.0	118	-0.1	-1.2– 1.0	61
2010 - 2011	-1.7	-2.7– -0.8	183	-1.8	-3.1– -0.5	124	-1.5	-2.8– -0.3	59
2011 - 2012	-2.0	-2.9– -1.1	170	-1.7	-2.9– -0.4	112	-2.4	-3.3– -1.6	58
2012 - 2013	-0.8	-2.0– 0.4	140	0.4	-1.3– 2.3	88	-2.9	-4.2– -1.8	52
2013 - 2014	1.4	0.1– 2.7	121	1.6	-0.3– 3.5	79	1.1	-0.1– 2.3	42

[a] Survey regions; see Figure 1.
[b] Consecutive years for which comparable leks were compared.
[c] 95% CI = 95% confidence interval
[d] *n* = number of leks in the sample. Here, a lek can have a 0 count in 1 of the 2 years and still be considered.

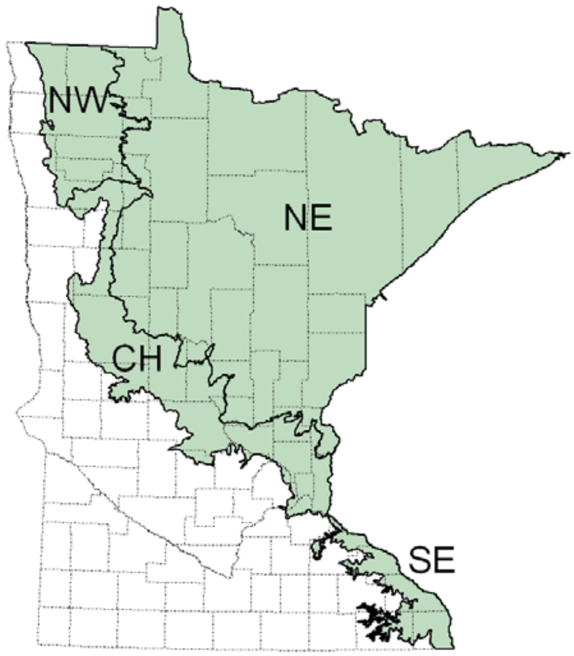


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

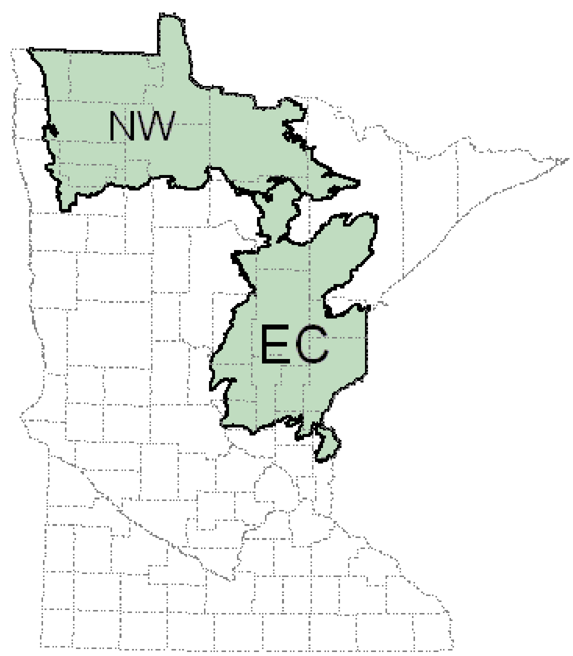


Figure 2. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

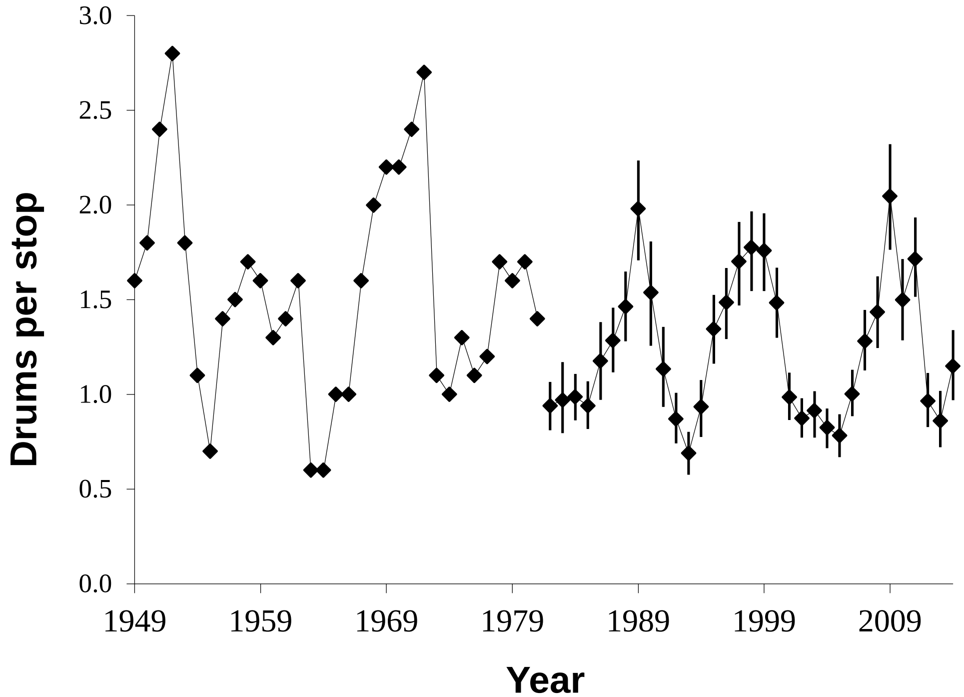
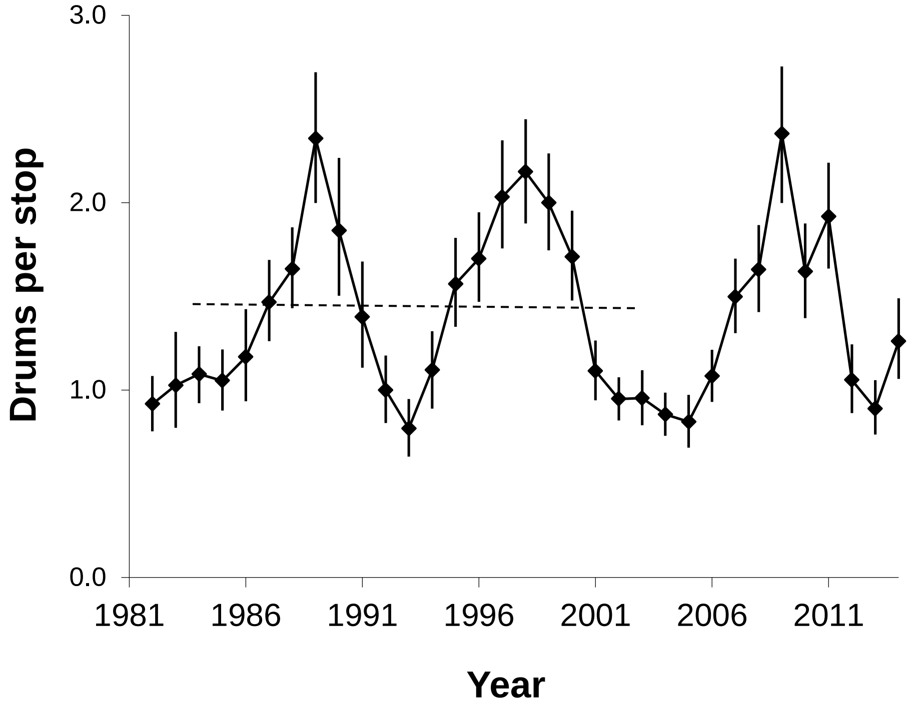
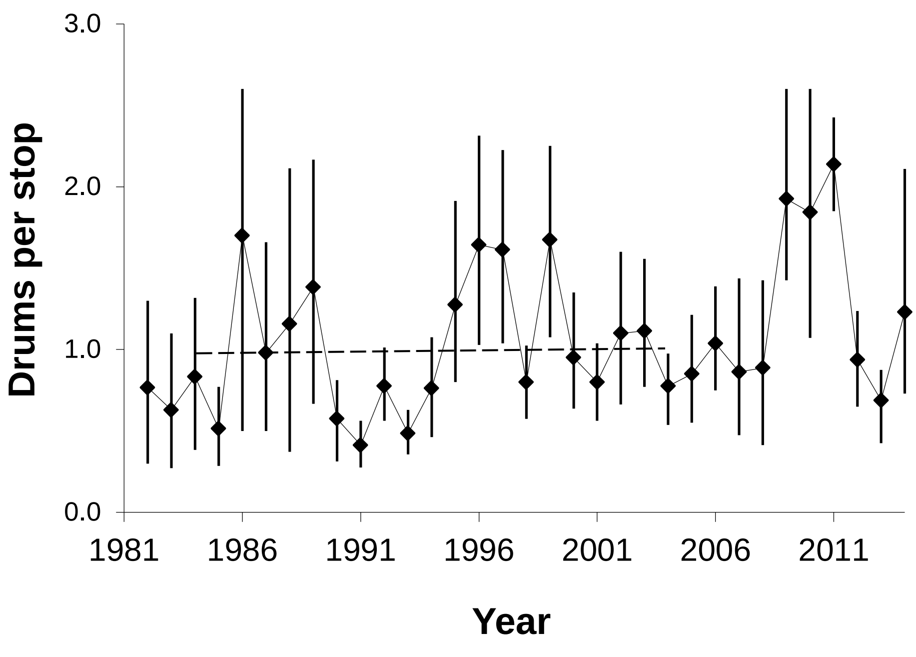


Figure 3. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not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

a.


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


3.0
2.0
1.0
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Drums per stop
1981
1986
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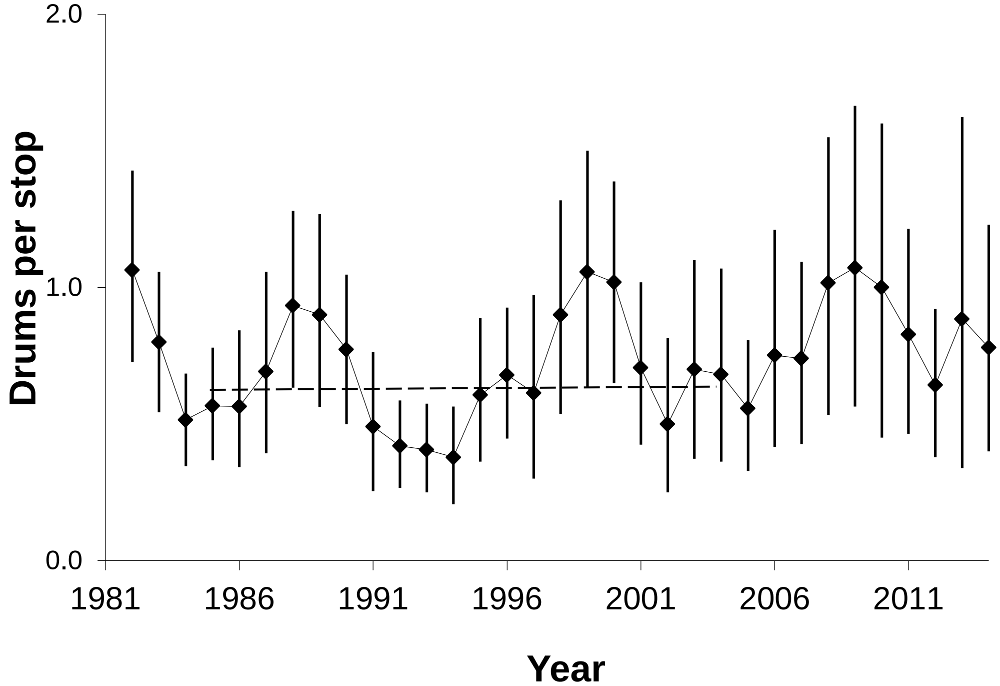
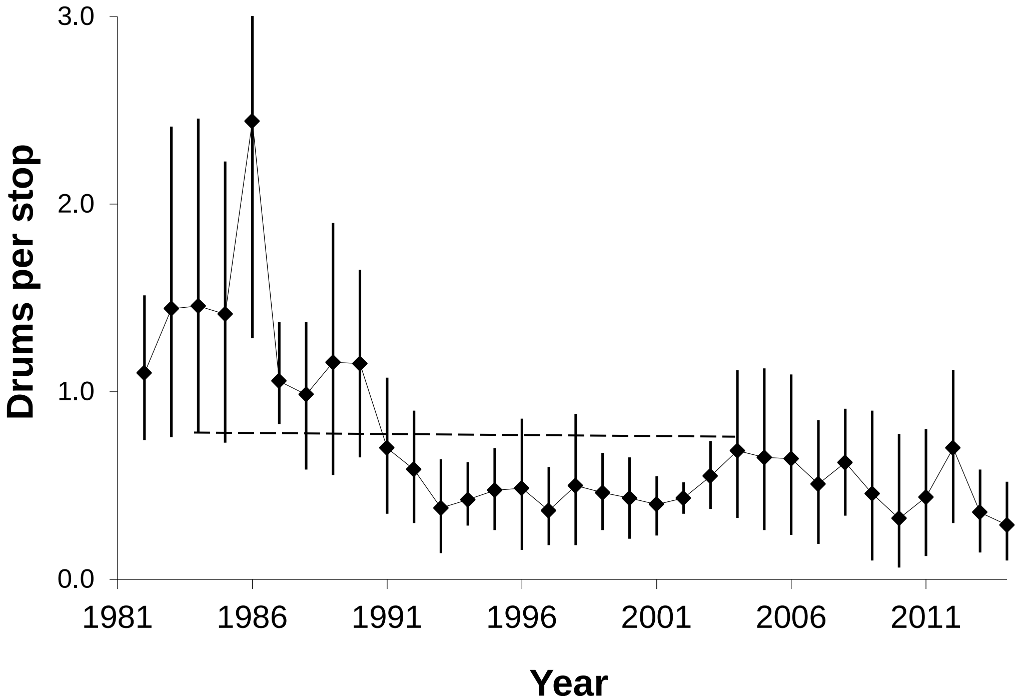
2006
2011
Year

b.

c.





d.

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

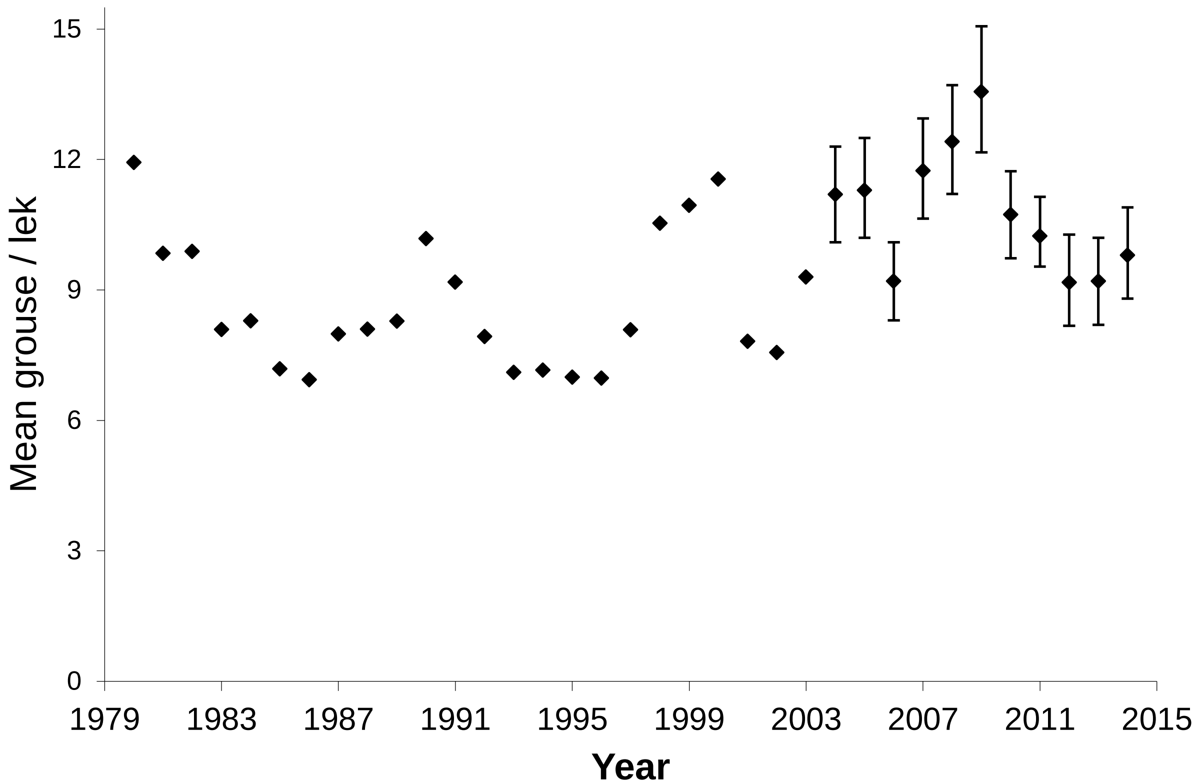


Figure 5. **Sharp-tailed grouse** counted in Spring lek surveys statewide during 1980–2014. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year.

2014 MINNESOTA PRAIRIE-CHICKEN SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Greater prairie-chickens (*Tympanuchus cupido pinnatus*) were surveyed in 16 of 17 survey blocks during the spring of 2014. Observers located 138 booming grounds and counted 1,245 male prairie-chickens and 101 birds of unknown sex. Estimated densities of 0.10 (0.07-0.13) booming grounds/km^2 and 9.8 (8.4-11.2) males/booming ground within the survey blocks were similar to densities during recent years and during the 10 years preceding modern hunting seasons (i.e., 1993–2002).

INTRODUCTION

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

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

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

METHODS

Cooperating biologists and volunteers surveyed booming grounds in 16 of 17 designated survey blocks in western Minnesota (Figure 2) during late-March through mid-May. Each survey block was nonrandomly selected so that surveys would be conducted in areas where habitat was expected to be good (i.e., grassland was relatively abundant) and booming grounds were known to occur. Each surveyor attempted to find and observe each booming ground repeatedly in his/her assigned block, which comprised 4 sections of the Public Land Survey (approximately 4,144 ha). We obtained multiple counts at each booming ground in the morning because male attendance at leks varies throughout the season and throughout the day.

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

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

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

RESULTS & DISCUSSION

Observers from DNR Division of Fish and Wildlife, the U.S. Fish & Wildlife Service, and The Nature Conservancy, as well as many unaffiliated volunteers counted prairie-chickens between 24 March and 23 May 2014. Observers located 138 booming grounds and observed 1,245 male prairie-chickens and 101 birds of unknown sex within and outside survey blocks during 2014 (Table 1). These counts represent a minimum number of prairie-chickens in Minnesota during 2014, but because survey effort outside of survey blocks is not standardized among years, these counts should not be compared among years or permit areas.

Table 1. Minimum abundance of prairie-chickens within and outside hunting permit areas in Minnesota during spring 2014. Lek and bird counts are not comparable among permit areas or years.

Permit Area	Area (km^2)	Leks	Males	Unk[a]
803A	1,411	18	163	0
804A	435	NA	NA	NA
805A	267	14	168	0
806A	747	10	60	0
807A	440	25	151	26
808A	417	19	248	0
809A	744	13	152	0
810A	505	7	83	0
811A	706	8	37	27
812A	914	10	30	28
813A	925	3	56	0
PA subtotal	7,511	127	1,148	81
Outside PAs[b]	NA[c]	11	97	20
Grand total	NA[c]	138	1,245	101

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

Within the standardized survey blocks, 669 males and birds of unknown sex were counted on 68 booming grounds during 2014 (Table 2). Each lek was observed an average of 1.8 times (median = 1), with 53% of booming grounds observed just once. Densities of prairie-chickens in the 10 core survey blocks were 0.11 (0.07–0.14) booming grounds/km^2 and 10.9 (9.1–12.7) males/booming ground (Table 2, Figure 2). In 6 of the 7 peripheral survey blocks, densities were 0.08 (0.03–0.14) booming grounds/km^2 and 7.8 (5.9–9.6) males/booming ground.

The density of 0.10 (0.07-0.13) booming grounds/km^2 in all survey blocks during 2014 was similar to densities during recent years (Table 2, Figure 3) and the average of 0.08 (0.06–0.09) booming grounds/km^2 during the 10 years preceding recent hunting seasons (i.e., 1993–2002). Similarly, the density of 9.8 (8.4-11.2) males/booming ground in all survey blocks during 2014 was comparable to densities during recent years and similar to the average of 11.5 (10.1–12.9) males/booming ground observed during 1993–2002 (Table 2, Figure 3). These counts should not be regarded as estimates of abundance because detection probabilities of leks and birds have not been estimated. However, if we assume that detection probabilities are similar among years, then this index can be used to monitor changes in abundance among years.

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

			2014		Change from 2013[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	6	49	-1	-13
	Polk 2	42.0	6	97	-8	-51
	Norman 1	42.0	1	13	-1	-3
	Norman 2	42.2	2	33	-5	-37
	Norman 3	41.0	9	49	4	-9
	Clay 1	46.0	6	73	0	-24
	Clay 2	41.0	2	43	0	-6
	Clay 3	42.0	5	51	-1	-35
	Clay 4	39.0	3	27	1	0
	Wilkin 1	40.0	4	47	-1	-20
	Core subtotal	415.0	44	482	-12	-198
Periphery	Mahnomen	41.7	3	37	1	21
	Becker 1	41.4	10	58	NA[d]	NA[d]
	Becker 2	41.7	4	33	2	-1
	Wilkin 2	41.7	2	20	0	5
	Wilkin 3	42.0	3	25	-1	-4
	Otter Tail 1	41.0	2	14	-1	-6
	Otter Tail 2	40.7	NA	NA	NA	NA
	Periphery subtotal	290.6	24[e]	187[e]	11[e]	73
Grand total		705.5	68[e]	669[e]	-1[e]	-125[e]

[a] The 2013 count was subtracted from the 2014 count, so positive values indicate increases.
[b] Survey blocks were categorized as within the core or periphery of the Minnesota prairie-chicken range based upon bird densities and geographic location.
[c] Includes birds recorded as being of unknown sex but excludes lone males.
[d] Surveys were not conducted in this block during 2013.
[e] These totals only reflect blocks for which count data were available.

ACKNOWLEDGMENTS

I would like to thank cooperators who conducted and helped coordinate the prairie-chicken survey. Cooperators within the DNR included Ross Hier, Emily Hutchins, Brian Torgusson, and Michael Oehler; cooperators with The Nature Conservancy included Brian Winter, Travis Issendorf, and volunteers Pat Beauzay, Rick Julian, Dennis Thielen, Matt Mecklenburg, Candis Sommerfeld, Bob O’Connor, and Tony Nelson; cooperators with the US Fish and Wildlife Service included Doug Wells, Shawn Papon, Chad Raitz, Maria Fosado, Larry Hanson, Stacy Salvevold, Jessica Dowler, Jacob Kaplan, and Trina Brennan; and numerous additional volunteers participated including Steve Bommersbach, Dan Svedarsky, Tom Kucera, and Doug Hedtke. This survey was funded in part by the Wildlife Restoration (Pittman-Robertson) Program W-69-S-13 Project #16. Mike Larson provided assistance and comments which improved this report.

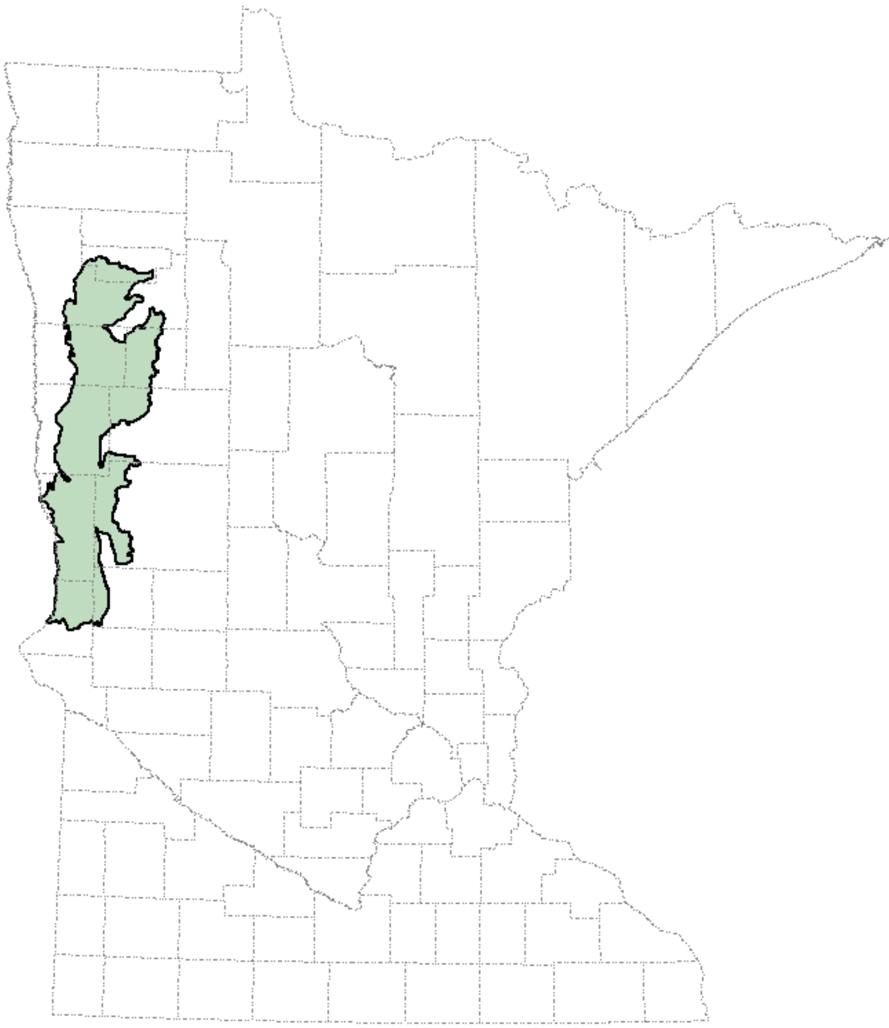


Figure 1. Primary greater prairie-chicken range in Minnesota (shaded area) relative to county boundaries. The range boundary was based on Ecological Classification System Land Type Associations and excludes some areas known to be occupied by prairie-chickens.

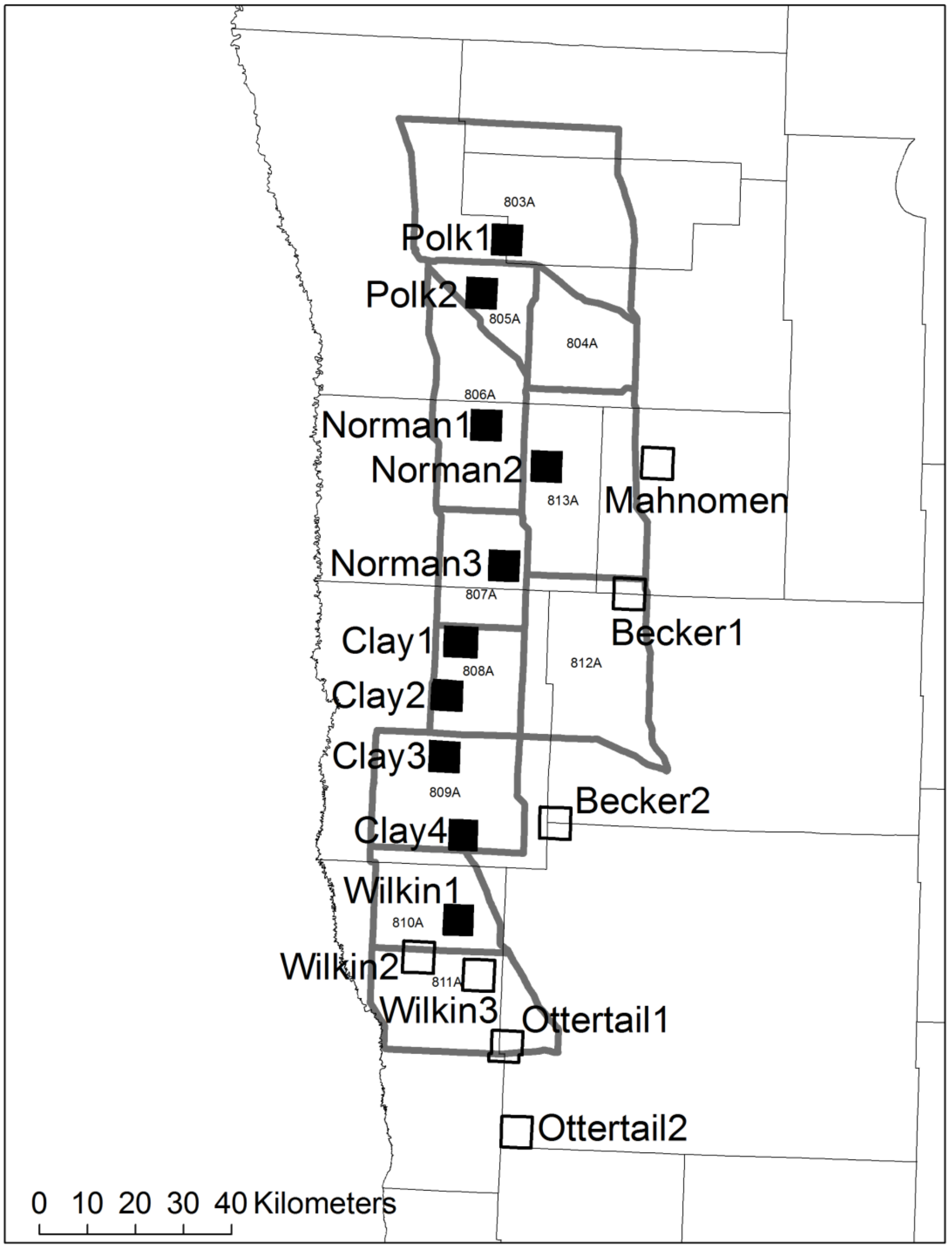


Figure 2. Prairie-chicken lek survey blocks (41 km^2, labeled squares) and hunting permit areas (thick grey lines) in western Minnesota. Survey blocks were either in the core (black) or periphery (white) of the range with a threshold of 1.0 male/km^2 in 2010, and were named after their respective counties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

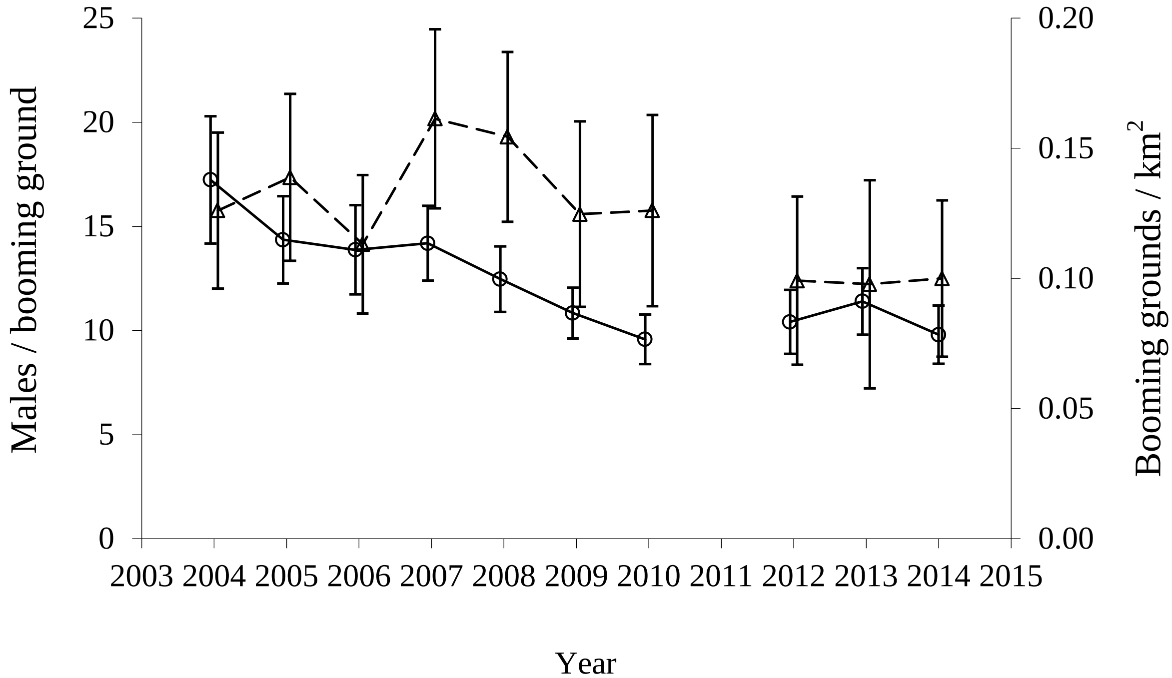


Figure 3. Mean prairie-chicken males/booming ground (circles connected by solid line) and booming grounds/km^2 (triangles connected by dashed line) in survey blocks in Minnesota with 95% confidence intervals. Counts for 6 of the survey blocks in 2011, including 4 blocks in the core, were not available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

2014 AERIAL MOOSE SURVEY

Glenn D. DelGiudice, Forest Wildlife Populations and Research Group

INTRODUCTION

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

METHODS

We estimated moose numbers, age and sex ratios by flying transects within a stratified random sample of survey plots (Figure 1). All survey plots are reviewed and re-stratified as low, medium, or high density about every 5 years based on past survey observations of moose, locations of harvested moose in past years, and extensive field experience of moose managers and researchers. For the most recent re-stratification (November 2013), survey plots were classified as low, medium, or high based on whether < 2, 3-7, or $\geq$8 moose, respectively, would be expected to occur in a specific plot. Stratification is most important to optimizing precision of our survey estimates. In 2012, we added a 4th stratum to represent a series of 9 plots which have undergone disturbance by wild fire, prescribed burning, and timber harvest. Each year since, these same 9 plots are surveyed in an effort to evaluate the effect of disturbance on moose density over time.

As in previous years, all survey plots were rectangular (5 x 2.67 mi.) and oriented east to west with 8 transects. Minnesota Department of Natural Resources (MNDNR) Enforcement pilots flew the Bell Jet Ranger (OH-58) helicopters used to conduct the survey. We sexed moose using the presence of antlers or the presence of a vulval patch (Mitchell 1970), nose coloration, bell size and shape, and identified calves on the basis of size and behavior. We used the program DNRSurvey on Toughbook® tablet style computers to record survey data. DNRSurvey allowed us to display transect lines superimposed on a background of aerial photography, observe the aircraft's flight path over this background in real time, and record data using a tablet pen with a menu-driven data entry form. Two of the primary strengths of this survey are the consistency and standardization of the methods since 2005 and the long-term consistency of the survey team personnel.

We accounted for visibility bias by using a sightability model (Giudice et al. 2012). We developed this model between 2004 and 2007 using moose that were radiocollared as part of research on the dynamics of the northeastern moose population (Lenarz et al. 2009). Logistic regression indicated that the covariate "visual obstruction" (VO) was the most important covariate in determining whether radiocollared moose were observed. We defined VO as the proportion of vegetation within a circle (30-ft. radius or roughly 4 moose lengths) that would prevent you from seeing a moose when circling that spot from an oblique angle. If we observed more than 1 moose at a location, VO was based on the first moose sighted. We used uncorrected estimates (no visibility bias correction) of bulls, cows, and calves, adjusted for sampling, to calculate the bull:cow and calf:cow ratios (i.e., using the combined ratio estimator; Cochran 1977:165).

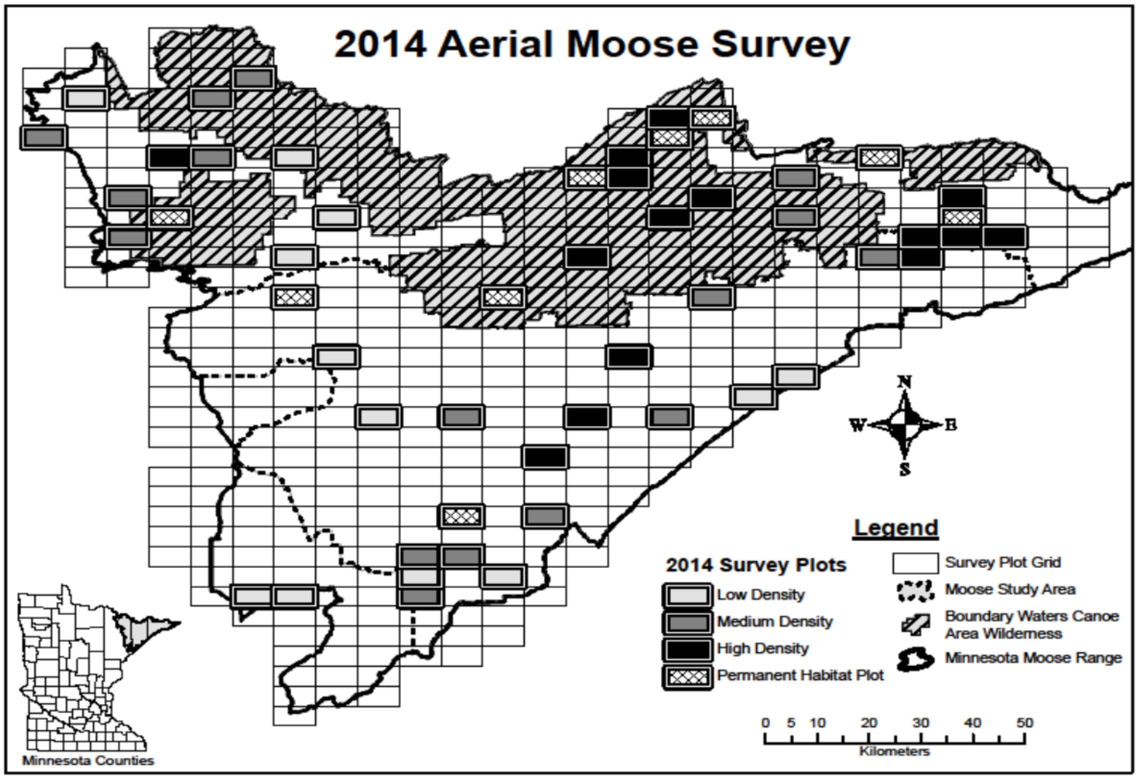


Figure 1. Moose survey area and sample plots flown in the 2014 aerial moose survey. The study area for ongoing MNDNR moose research also is shown.

RESULTS AND DISCUSSION

The survey was conducted from 7 to 18 January 2014. It consisted of 9 actual survey days and included 52 survey plots. Snow depths were consistently greater than the minimum 8" desired for the survey (92% of plots had >16", 8% had 8-16"), with 96% of the plot surveys conducted under good survey conditions and 2% under fair conditions. Overall, survey conditions were notably better than during the past several years. During the survey flights, 419 moose were observed on 41 (79%) of the 52 plots flown (694 mi^2), including 176 bulls, 174 cows, 65 calves, and 4 unclassified moose. This apparent occupancy of plots compares to a 10-year average of 82%. An average of 10.2 moose were observed per "occupied" plot (range = 1-51 moose) compared to a 10-year average of 12.2 moose. Estimates of the calf:cow and bull:cow ratios were 0.44 and 1.24, respectively, both among the highest ratios since 2005 (Table 1).

After adjusting for sampling and sightability, we estimated the population in northeastern Minnesota at 4,350 (3,220–6,210) moose (Table 1). Based on the log rate of change (0.456;

90% CI: 0.086, 0.827), the 2014 population estimate was significantly higher (58%; 90% CI: 9-128%) than the 2013 estimate of 2760 moose, but similar to the 2012 and 2011 estimates of 4,230 and 4,900 moose, respectively. As can be noted from the 90% confidence limits associated with the population point estimates (3,220-6,210; Table 1, Figure 2), statistical uncertainty inherent in aerial wildlife surveys, even of large, relatively conspicuous animals such as moose during the winter, can be quite large due to the varied (1) occurrence of dense vegetation, (2) habitat use by moose, (3) behavioral responses to aircraft, (4) effects of annual environmental conditions (e.g., snow depth) on their movements, and (5) the interaction of these factors. Past aerial survey and research results have indicated that the trend of the population of northeastern Minnesota has been declining since 2006 (Lenarz et al. 2010, DelGiudice 2013). Despite this year's higher point estimate, the downward trend persists ($r^2 = 0.82$, $P = 0.0003$, Figure 2). Lenarz et al. (2010) used simulation modeling to integrate survival and reproductive rates measured between 2002 and 2008 and found that the population was decreasing approximately 15% per year over the long-term. The 2013 estimate (2,760 moose) indicated a 35% decrease from 2012 and a 52% decrease in the population since 2010, not inconsistent with the declining trend, but exceeding the projected rate of change (Table 1). It is likely that the population was underestimated in 2013 and that with almost optimum snow and survey conditions this year, more moose were observed and the estimate is more reflective of actual moose numbers, although the variability associated with the estimate is large due to atypically high numbers of moose being observed in low and medium density plots.

Table 1. Estimated moose numbers, 90% confidence intervals, and calf:cow ratios, percent calves, percent cows with twins, and bull:cow ratios estimated from aerial surveys in northeastern Minnesota, 2005-2014.

Survey	Estimate	**90% Confidence Interval**	**Calf: Cow**	**% Calves**	**% Cows w/ twins**	**Bull: Cow**
2005	8,160	5,960 – 11,170	0.52	19	9	1.04
2006	8,840	6,670 – 11,710	0.34	13	5	1.09
2007	6,860	5,230 – 9,000	0.29	13	3	0.89
2008	7,890	5,970 – 10,420	0.36	17	2	0.77
2009	7,840	6,190 – 9,910	0.32	14	2	0.94
2010	5,700	4,480 – 7,250	0.28	13	3	0.83
2011	4,900	3,810 – 6,290	0.24	13	1	0.64
2012	4,230	3,190 – 5,600	0.36	15	6	1.08
2013	2,760	2,120 – 3,580	0.33	13	3	1.23
2014	4,350	3,220 – 6,210	0.44	15	3	1.24

Estimated calf recruitment from this year's survey remained *relatively* high and similar to last year's estimate (Table 1). The calf:cow ratio in mid-January 2014 was 0.44, up slightly from last year's survey (0.33), and calves represented 15% of the total moose observed, also slightly elevated from last year's estimate (Table 1). Like last year, only 3% of the cow moose were accompanied by twins (Table 1). Based on survey results calf survival through to mid-January 2014 appears relatively high. However, an ongoing study of GPS-collared moose calves indicates that calf survival is low (Severud and DelGiudice, unpublished data), and *annual* recruitment of the calves is not actually determined until the next spring calving season when winter survey-observed calves become yearlings. At this point, little is known about the survival rates of moose calves during the period between the annual winter survey and subsequent spring calving. It also is important to note that adult moose survival has the most significant impact on annual changes in the moose population (Lenarz et al. 2010), and elevated annual mortality of adult moose has continued during the past year (~21%, Carstensen et al., unpublished data).

The estimated bull:cow ratio (Table 1; Figure 4) was similar to last year's estimate and is the highest since 2005. Further, the past two year's estimated bull:cow ratios indicate that adult bulls may outnumber adult females, although there is a great deal of variability associated with these annual ratio estimates. Consequently, there is no clear upward or downward long-term trend (2005-2014) in bull:cow ratios.

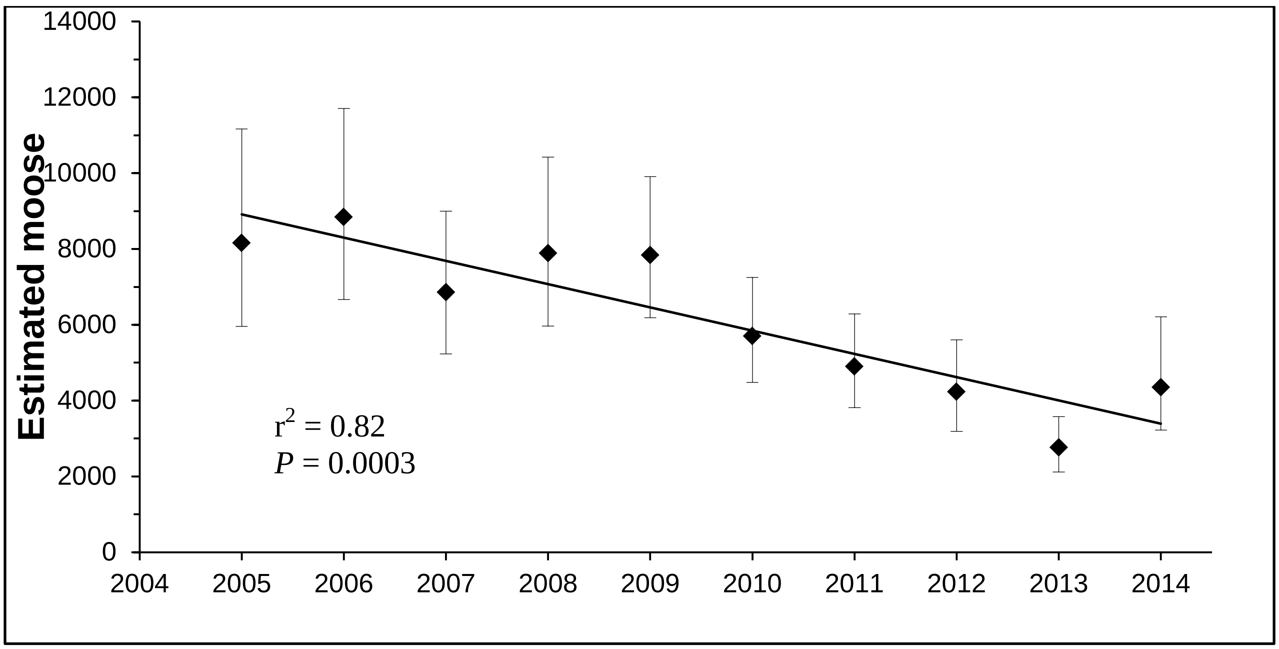


Figure 2. Point estimates, 90% confidence intervals, and trend line of estimated moose numbers in northeastern Minnesota, 2005-2014. (Note: The 2005 survey was the first to be flown with helicopters, and to include a sightability model and a uniform grid of east-west oriented rectangular 5 x 2.67 mi plots).

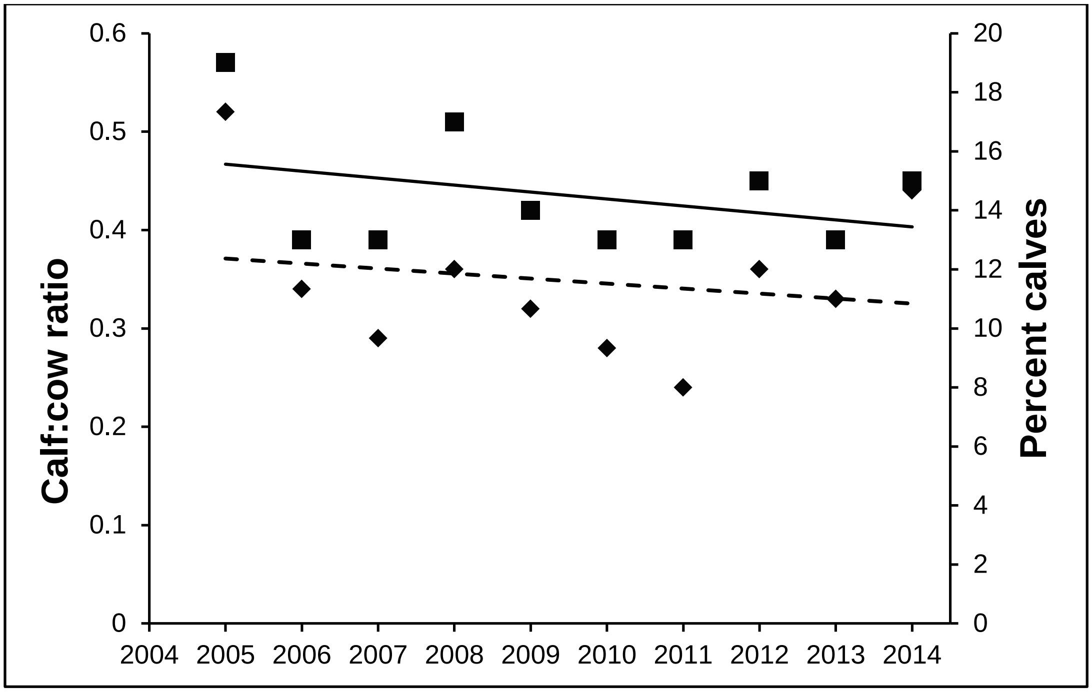


Figure 3. Estimated calf:cow ratios (solid diamonds, dashed trend line) and percent calves (solid squares, solid trend line) from aerial moose surveys in northeastern Minnesota, 2005-2014.

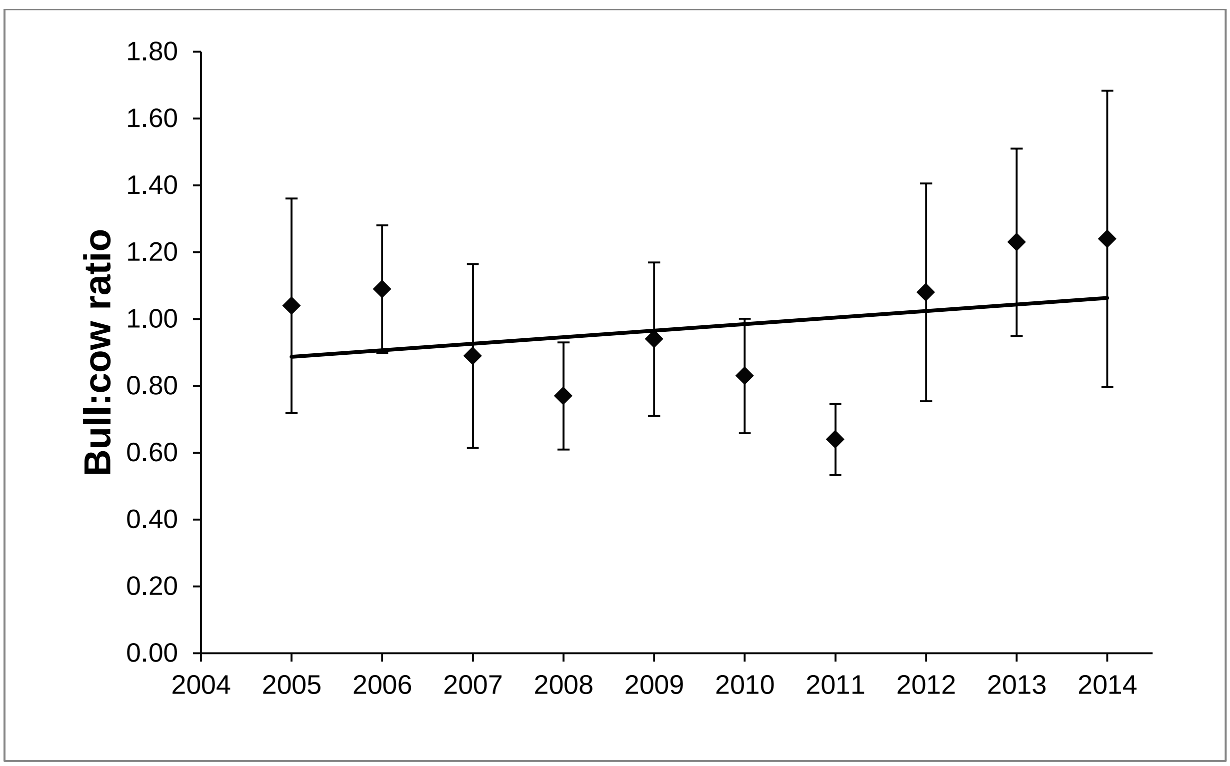


Figure 4. Estimated bull:cow ratios, 90% confidence intervals, and trend line from aerial moose surveys in northeastern Minnesota, 2005-2014.

ACKNOWLEDGMENTS

This survey is an excellent partnership between the Division of Enforcement, the Division of Fish and Wildlife, the Fond du Lac Band of Lake Superior Chippewa and the 1854 Treaty Authority. In particular, I would like to thank Thomas Buker, Chief Pilot, for coordinating all of the aircraft and pilots; Tom Rusch for coordinating flights and survey crews; and Mike Schrage (Fond du Lac Band of Lake Superior Chippewa) and Andy Edwards (1854 Treaty Authority) for securing supplemental survey funding from their respective groups. Enforcement pilots, Brad Maas and John Heineman, skillfully piloted the aircraft during the surveys, and Tom Rusch, Andy Edwards, Mike Schrage, and Nancy Hansen flew as observers; their efforts are gratefully appreciated. I also want to thank John Giudice who continues to provide critical statistical consultation and analyses. Thanks to Barry Sampson for creating the process to generate the GIS survey maps and GPS coordinates for the transect lines and for his work on re-stratification of the survey plots, as well as to Bob Wright, Brian Haroldson, and Chris Pouliot for the creation of the program DNRSurvey. Bob also modifies the software as needed and each year provides refresher training for survey observers using DNRSurvey.

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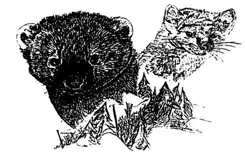

Drawing by Gilbert Proulx

REGISTERED FURBEARER POPULATION MODELING, 2014 Report

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

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

In the late 1970s, Minnesota developed population models for 4 species of carnivores (fisher, marten, bobcat, and otter) to help 'estimate' population size and track population changes. All are deterministic accounting models that do not currently incorporate density-dependence. However, annual adjustments to demographic inputs are often made for bobcats, fishers, and martens in response to the known or assumed influence of factors such as prey fluctuations and winter conditions, or competitor/predator density. Modeling projections are interpreted in conjunction with harvest data and results from any annual field-based track surveys.

METHODS

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

Harvest data is obtained through mandatory furbearer registration. A detailed summary of 2013 harvest information is available in a separate report. Bobcat, marten, and fisher age data is obtained via x-ray examination of pulp cavity width or microscopic counts of cementum annuli from teeth of harvested animals. Although the population models only utilize data for the 3 age-classes (juvenile, yearling, adult), cementum annuli counts have periodically been collected for all non-juveniles either to examine age-specific reproductive output (bobcats) or to obtain periodic information on year-class distribution for selected species. In years where age data is not obtained for a given species, harvest age proportions are approximated using averages computed from the most recent period when data was collected.

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

RESULTS AND DISCUSSION

Bobcat. The 2013 registered DNR trapping and hunting harvest declined 45% to 1,038 (Table 1). Total modeled harvest, which includes reported tribal take, was 1,138. At this time, age and reproductive analyses from harvested bobcats have not been completed. Data from previous years is presented in Table 1 and Figure 1.

Based on projections from the population model, 20% of the fall 2013 population was harvested. As a result of the high harvests in 2011 and 2012, plus an assumed reduction in survival from two severe winters and reduced ungulate prey, population modeling projects a 7% decline in the bobcat population (Figure 3), with an estimated 2014 spring population size of ~ 4,000 (Figure 3). Both track indices remain near the upper end of their previously recorded range (Figure 3).

Fisher. Over the past 7 years, the fisher harvest season has become progressively more conservative, with the 2013 season lasting only 6 days and a per trapper limit of 2 (identical to the 2012 season). Fisher harvest this year under the DNR framework decreased ~ 11% to 1,146 (Table 2). Modeled harvest, which includes reported tribal take, was 1,295.

After a 15-year lapse, fisher carcass collections were resumed in 2010 to collect current information on harvest age distribution. A total of 1,040 carcasses were collected in 2013 (Table 2). Juveniles accounted for 51% of the total harvest, similar to the previous 3-year average (a period of estimated population decline), but well below the average (64%) from 1977-1994 (generally a period of population growth). Similarly, the juvenile:adult female ratio was 3.4, slightly below the recent average (3.8), and well below the 1977-1994 average of 6.4 (Table 2). Average age of harvested males and females was 1.5 and 1.9, respectively, with the harvest being comprised of few fishers over the age of 1.5 (Figures 4 and 5).

Based on model projections, 17% of the fall fisher population was harvested during the 2013 season. In spite of the conservative seasons in recent years, this year's harvest may still have exceeded the current sustainable level, and the 3-year-averaged winter track index for fisher once again declined to its lowest level (Figure 6). It remains possible that last winter's track index could be biased low due to the deep snow and cold weather that may have reduced fisher activity. Furthermore, the population model inputs (and winter track index) are assumed to best reflect the fisher population only in the historically 'core areas' of northern Minnesota. Along the southern and western periphery of fisher range, harvest data and other anecdotal information clearly indicate a population increase over the past 5-10 years, though these areas represent a comparatively small portion of overall fisher range. Acknowledging these caveats, modeling projects a 1.5% decline in the fisher population with an estimated 2014 spring population size of ~ 6,000 fishers (Figure 6).

Marten. As with fishers, the marten harvest season has become progressively more conservative in recent years, with the 2013 season lasting 6 days and a per trapper limit of 2 marten. The 2012 season was also 6 days, but with a limit of 5 martens per trapper. Harvest this year under the DNR framework was 1,014, down 31% from last year and the lowest since 1991 (Table 3). Modeled harvest, which includes reported tribal take, was 1,323.

Juveniles accounted for 43% of the total harvest with a juvenile:adult female ratio of 3.5 (Table 3, Figure 7). Both numbers are similar to their 2002-12 averages (3.8; 43%) when modeling projects the population to have been in decline, and well below levels estimated from the 1986 – 2001 period (10; 61%) when the population is projected to have increased. Average age of both harvested males and females was 2.1 (Figures 8 and 9).

Based on projections from the marten population model, 15% of the fall 2013 population was harvested. This represents the lowest estimated harvest rate since 2001 (Table 3). Although modeling projects that conservative seasons have slowed or periodically stopped the population decline, collective data has yet to suggest a multi-year increase (Figure 10). In spite of the reduced 2013 marten harvest, the estimated harvest rate was still close to the projected sustainable level. In addition, downward adjustments have been made to juvenile survival inputs the past 2 years because of an apparent low in small mammal abundance. Modeling projects a 1% decline in the population from last year, with an estimated 2014 spring population size of ~ 7,500 martens.

Otter. From 1977 - 2007, otter harvest was only allowed in the northern part of the state. From 2007-2009, otter harvest was allowed in 2 separate zones with differing limits (4 otter in the north zone, 2 in the southeast zone). Beginning in 2010, otter harvest was allowed statewide with a consistent limit of 4 otter per trapper. Statewide otter harvest in 2013 under the DNR framework decreased 11% to 2,824 (Table 4). Modeled statewide otter harvest, which includes tribal take, was 2,993 (Table 4).

An estimated 21% of the fall 2013 otter population was harvested. Carcass collections ended in 1986 so no age or reproductive data are available, and no harvest-independent otter survey is currently established. Because demographic parameters in the otter model are typically held constant, annual differences in population trajectory are largely a function of varying harvest levels. Harvest levels exceeding ~3,000 for consecutive years typically predict population declines. After the population declined and then rebounded from 2002-12 as a result of a cycle in fur prices and harvests, modeling indicates the population has once again declined the past 2 years as a result of higher harvests and fur prices. Nevertheless, the population remains near the high end of levels estimated over the past 35 years (Figure 11). The 2014 spring population is estimated to be ~ 11,300, a 2.6% decline from last year.

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Table 1. Bobcat harvest data, 1984 to 2013.

Year	DNR Harvest	Modeled Harvest[1]	% Autumn Pop. Taken[2]	Carcasses Examined	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	Overall % males	Mean Pelt Price[3]
1984	280	288	15	288	37	13	50	1.4	52	66	44	51	$76
1985	119	121	6	99	33	19	48	1.2	41	41	43	42	$70
1986	160	160	8	132	26	17	57	0.9	53	32	51	51	$120
1987	214	229	12	163	33	16	51	1.3	44	52	48	48	$101
1988	140	143	7	114	40	18	42	1.7	58	62	46	54	$68
1989	129	129	6	119	39	17	44	2.0	49	53	56	53	$48
1990	84	87	4	62	20	34	46	0.8	58	80	44	59	$43
1991	106	110	5	93	35	33	32	3.5	59	55	70	61	$37
1992	167	167	7	151	28	22	50	1.2	55	45	53	53	$28
1993	201	210	8	161	32	20	48	1.4	51	45	52	50	$43
1994	238	270	11	187	26	16	58	0.8	64	43	45	50	$36
1995	134	152	6	96	31	15	54	2.7	57	71	79	71	$32
1996	223	250	10	164	35	20	45	1.8	51	30	49	46	$33
1997	364	401	16	270	35	16	49	1.4	60	37	43	48	$30
1998	103	107	4	77	29	26	45	1.6	59	60	60	60	$28
1999	206	228	8	163	18	24	58	0.8	55	59	62	60	$24
2000	231	250	8	183	31	26	43	1.4	54	59	50	53	$33
2001	259	278	8	213	30	21	49	1.3	46	45	47	46	$46
2002	544	621	15	475	27	25	48	1.1	68	51	48	54	$72
2003	483	518	13	425	25	13	62	0.9	62	48	54	55	$96
2004	631	709	14	524	28	34	38	1.7	52	40	55	49	$99
2005	590	638	13	485	25	13	62	0.8	51	48	47	48	$96
2006	890	983	18	813	26	17	57	1.1	60	51	58	57	$101
2007	702	758	14	633	34	14	52	1.2	55	60	47	52	$93
2008	853	928	15	714	26	25	49	1.1	55	52	50	52	$75
2009	884	942	15	844	24	22	54	0.9	57	46	51	51	$43
2010	1012	1042	15	955	38	16	46	1.4	62	55	42	52	$71
2011	1711	1898	26	1626	23	21	55	0.8	61	73	47	56	$98
2012	1875	2026	29	1744	25	19	56	1.0	63	53	54	56	$144
2013	1038	1138	20	634				data not yet available				56	$89

[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.

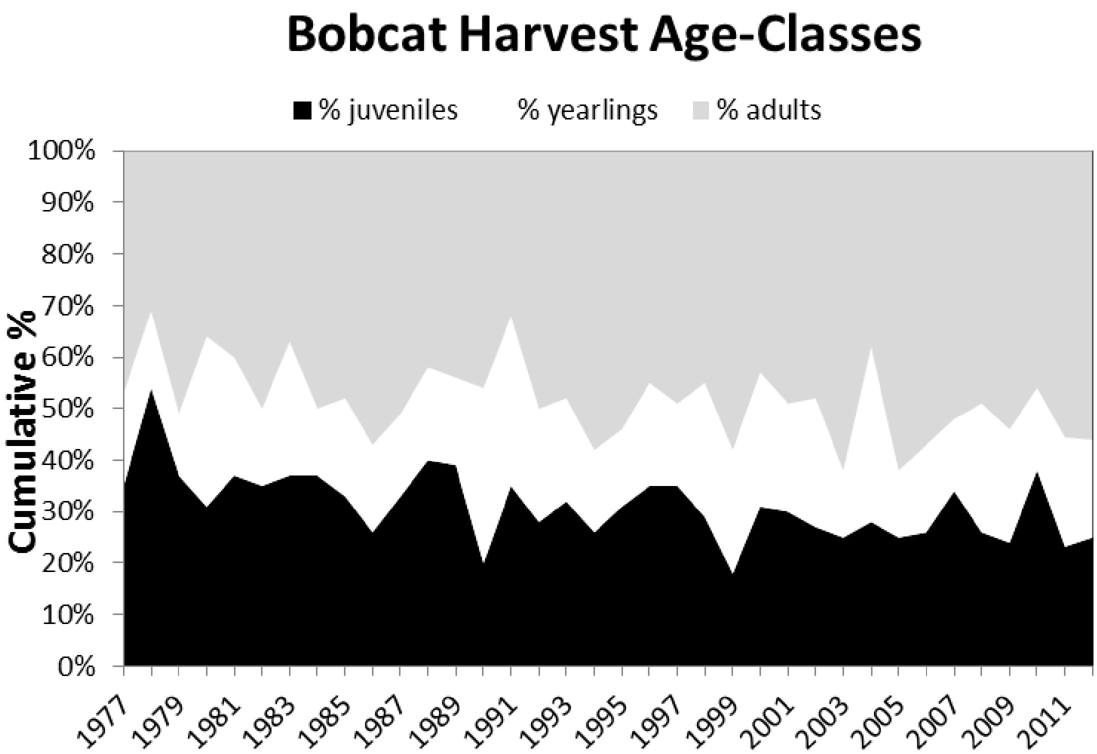

Figure 1. Age-class distribution of bobcats harvested in Minnesota 1977 - 2012.

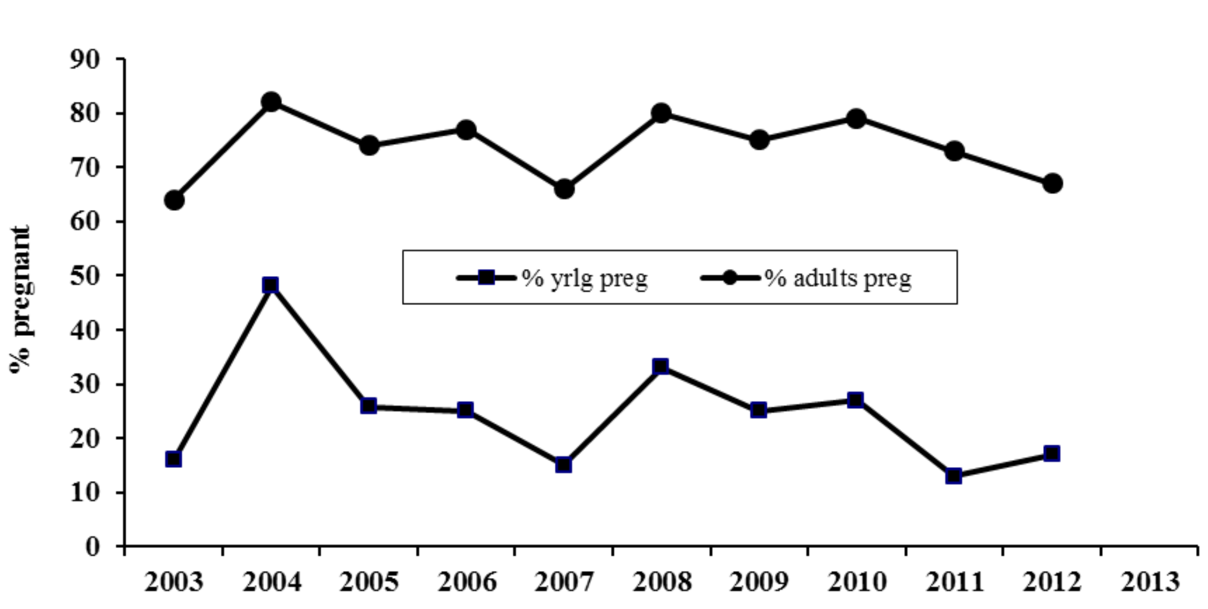

Figure 2. Pregnancy rates for yearling and adult bobcats in Minnesota, 2003-2012.

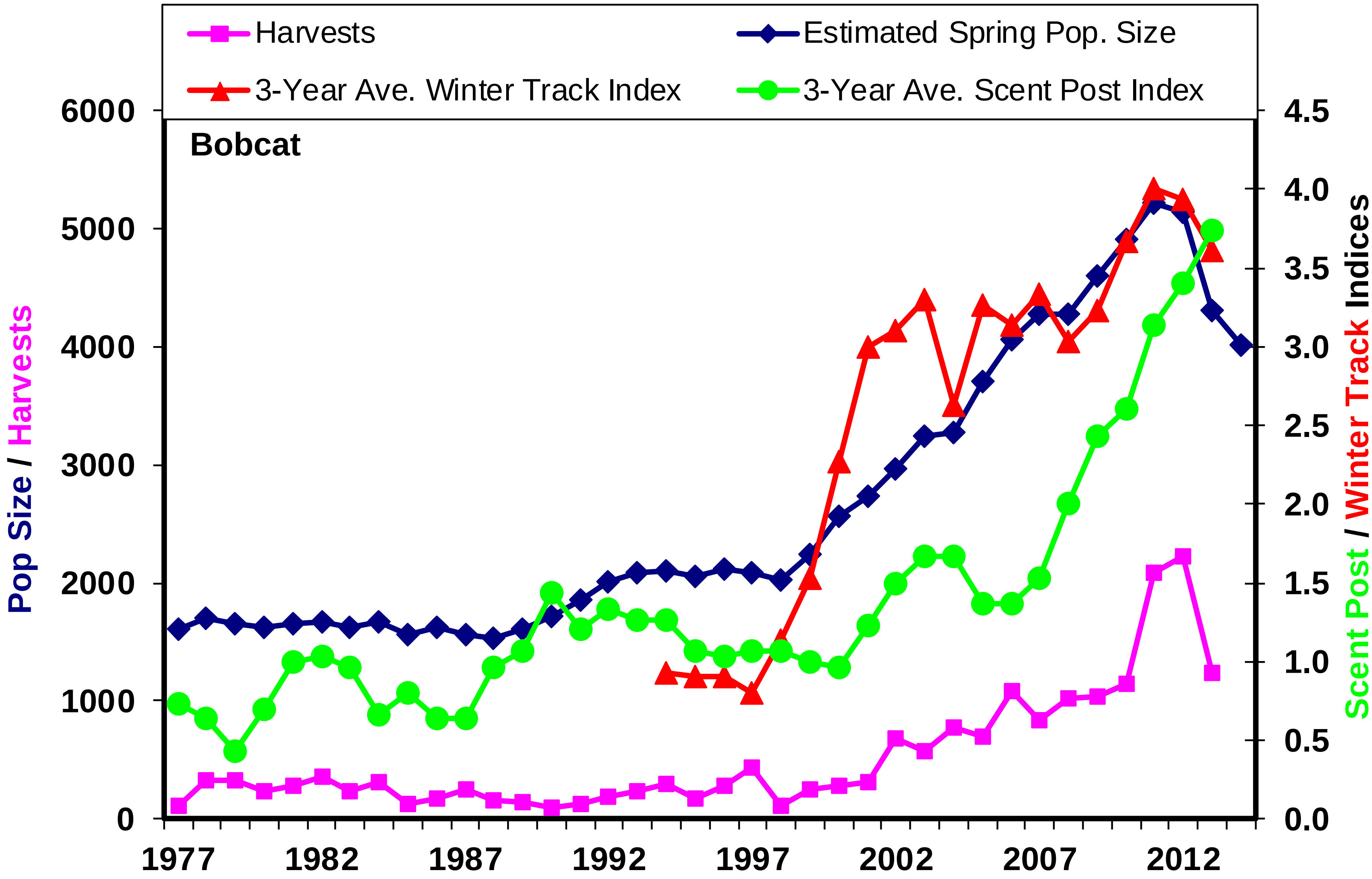

Figure 3. Bobcat populations, harvests, and survey indices, 1977-2014. Harvests include an estimate of non-reported take.

Table 2. Fisher harvest data, 1984 to 2013.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses examined	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[3]	Pelt price Females[3]
1984	1285	1332	18	1270	63	20	17	6.6	52	45	45	49	$70	$122
1985	678	735	10	712	63	20	18	5.5	46	40	34	43	$74	$130
1986	1068	1186	15	1186	59	24	18	5.2	48	50	37	46	$84	$162
1987	1642	1749	22	1534	63	15	22	4.7	46	40	37	43	$84	$170
1988	1025	1050	14	805	70	15	15	6.7	48	45	33	45	$54	$100
1989	1243	1243	16	1024	64	19	17	5.8	47	47	36	45	$26	$53
1990	746	756	9	592	65	14	21	4.4	44	55	30	43	$35	$46
1991	528	528	6	410	66	21	13	7.5	50	52	35	48	$21	$48
1992	778	782	8	629	58	21	21	4.8	42	55	45	46	$16	$29
1993	1159	1192	10	937	59	22	19	6.0	47	37	42	44	$14	$28
1994	1771	1932	15	1360	56	18	26	4.0	47	54	44	48	$19	$30
1995	942	1060	8	-	-	-	-	-	-	-	-	45	$16	$25
1996	1773	2000	14	-	-	-	-	-	-	-	-	45	$25	$34
1997	2761	2974	20	-	-	-	-	-	-	-	-	45	$31	$34
1998	2695	2987	20	-	-	-	-	-	-	-	-	45	$19	$22
1999	1725	1880	13	-	-	-	-	-	-	-	-	45	$19	$20
2000	1674	1900	13	-	-	-	-	-	-	-	-	45	$20	$19
2001	2145	2362	15	-	-	-	-	-	-	-	-	54	$23	$23
2002	2660	3028	20	-	-	-	-	-	-	-	-	54	$27	$25
2003	2521	2728	19	-	-	-	-	-	-	-	-	55	$27	$26
2004	2552	2753	20	-	-	-	-	-	-	-	-	52	$30	$27
2005	2388	2454	19	-	-	-	-	-	-	-	-	52	$36	$31
2006	3250	3500	29	-	-	-	-	-	-	-	-	51	$76	$68
2007	1682	1811	18	-	-	-	-	-	-	-	-	52	$63	$48
2008	1712	1828	19	-	-	-	-	-	-	-	-	52	$22	$37
2009	1259	1323	15	-	-	-	-	-	-	-	-	53	$35	$34
2010	903	951	11	759	52	25	23	4.5	55	54	50	54	$38	$37
2011	1473	1651	19	1314	47	28	25	3.2	59	53	42	53	$48	$40
2012	1293	1450	18	1108	51	24	25	3.7	59	53	45	54	$62	$63
2013	1146	1295	17	1040	51	24	25	3.4	55	56	42	52	$74	$68

[1] Includes DNR and Tribal harvests

[2] Estimated from population model, includes estimated non-reported harvest of 20% 1977-1992, and 10% from 1993-present.

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

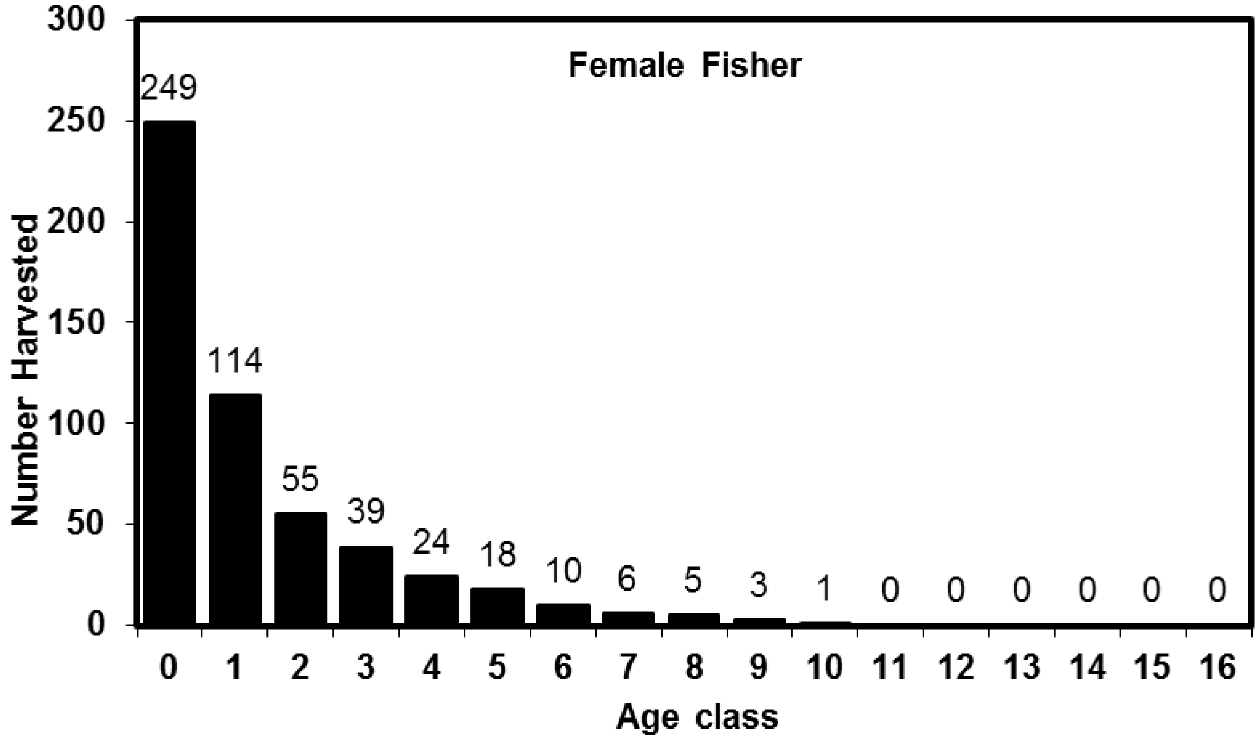

Figure 4. Age structure of female fishers in the 2013 harvest.

Figure 5. Age structure of male fishers in the 2013 harvest.

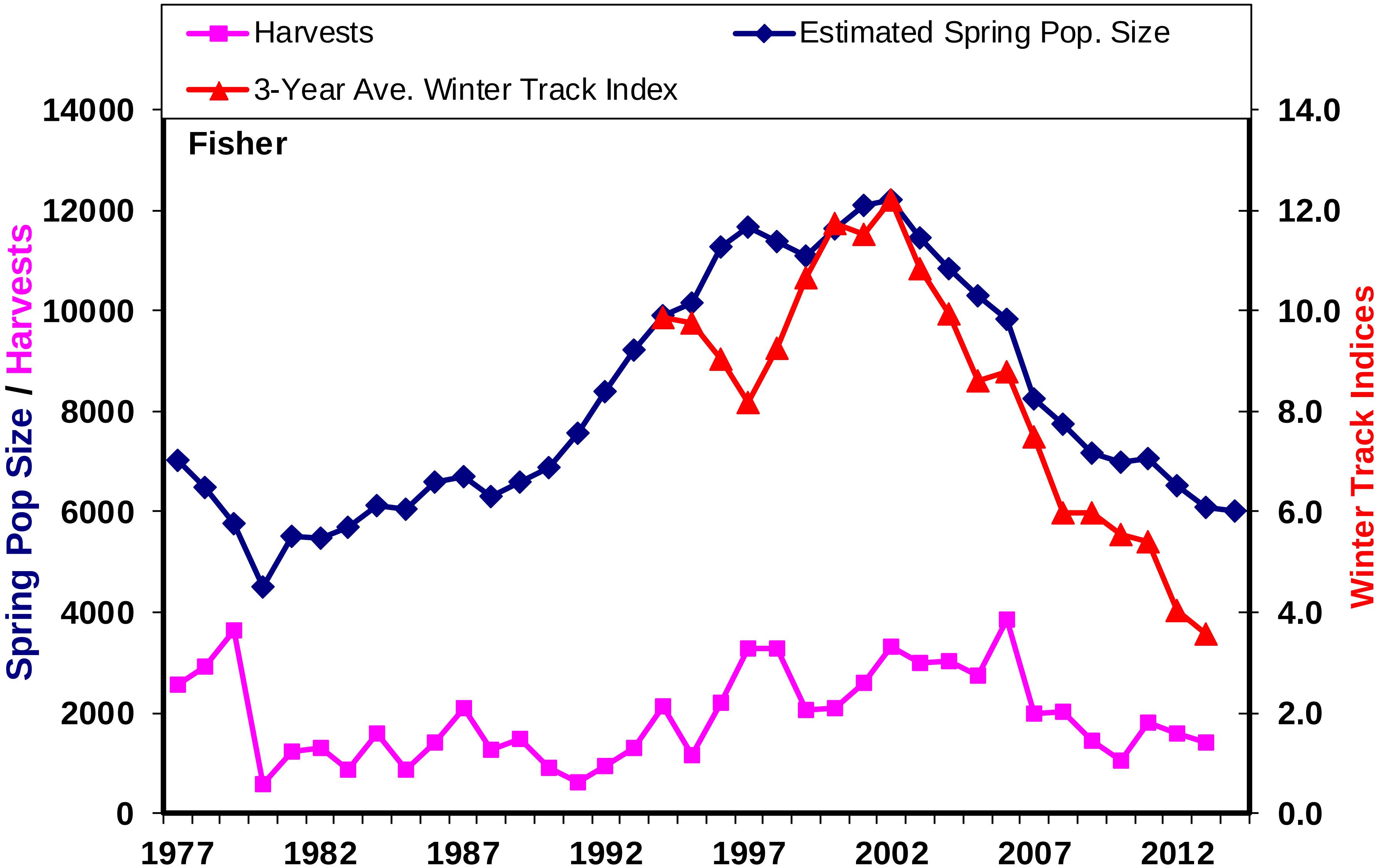

Figure 6. Fisher populations, harvests, and survey indices, 1977-2014. Harvests include an estimate of non-reported take.

Table 3. Marten harvest data, 1985 to 2013.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses Examined[3]	% juveniles	% yearlings	% adults	Juv: Ad. Female ratio	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Males[4]	Pelt price Females[4]
1985	430	430	6	507	73	18	9	49.2	69	68	82	70	$30	$28
1986	798	798	9	884	64	21	15	23.1	65	71	81	69	$36	$27
1987	1363	1363	15	1754	66	18	16	16.7	65	67	75	67	$43	$39
1988	2072	2072	18	1977	66	11	23	8.8	58	50	66	59	$50	$43
1989	2119	2119	19	1014	68	12	20	9.9	57	63	65	59	$48	$47
1990	1349	1447	13	1375	48	18	34	3.6	59	54	61	59	$44	$41
1991	686	1000	8	716	74	9	17	13.5	69	71	72	70	$40	$27
1992	1602	1802	14	1661	65	18	17	14.8	63	70	75	66	$28	$25
1993	1438	1828	14	1396	57	20	23	7.6	61	71	67	64	$36	$30
1994	1527	1846	13	1452	58	15	27	6.5	62	76	67	66	$34	$28
1995	1500	1774	13	1393	60	18	22	8.2	63	68	66	65	$28	$21
1996	1625	2000	14	1372	48	22	30	4.9	62	69	67	65	$34	$29
1997	2261	2762	20	2238	61	13	26	6.2	60	60	63	61	$28	$22
1998	2299	2795	21	1577	57	18	25	6.5	62	66	65	63	$20	$16
1999	2423	3000	21	2013	67	12	21	9.9	65	66	67	66	$25	$21
2000	1629	2050	15	1598	56	25	19	8.8	62	69	66	64	$28	$21
2001	1940	2250	15	1895	62	15	23	10.7	65	73	74	69	$24	$23
2002	2839	3192	20	2451	38	30	32	3.3	59	65	62	62	$28	$27
2003	3214	3548	23	2391	49	16	35	4.2	59	66	68	64	$30	$27
2004	3241	3592	24	2776	26	28	46	1.4	54	67	59	60	$31	$27
2005	2653	2873	22	1992	53	16	31	5.1	64	63	65	65	$37	$32
2006	3788	4120	32	1914	64	17	20	9.5	67	68	67	67	$74	$66
2007	2221	2481	21	1355	30	29	41	1.6	60	68	54	60	$59	$50
2008	1823	1953	18	1095	40	21	39	2.4	62	64	57	60	$31	$28
2009	2073	2250	20	1252	56	15	29	5.1	67	49	63	63	$27	$30
2010	1842	1977	18	1202	47	25	28	4.4	71	56	62	65	$40	$37
2011	2525	2744	25	1615	39	25	36	2.7	64	64	60	62	$42	$39
2012	1472	1610	17	1260	34	30	36	2.6	67	57	64	63	$57	$54
2013	1014	1323	15	942	43	20	37	3.5	59	62	68	63	$74	$71

[1] Includes DNR and Tribal harvests

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

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

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

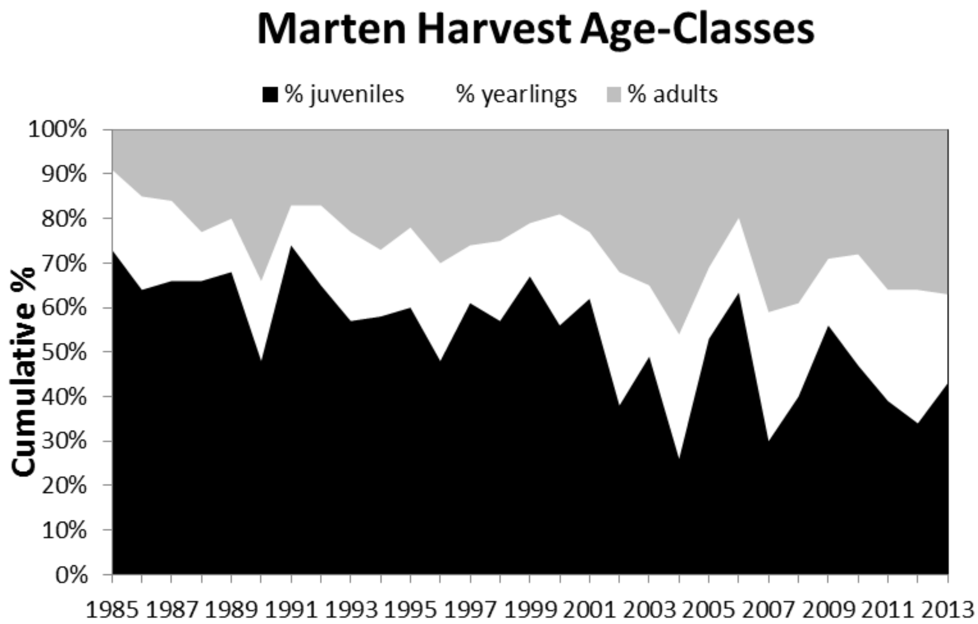

Figure 7. Age-class distribution of martens harvested in Minnesota, 1985 - 2013.

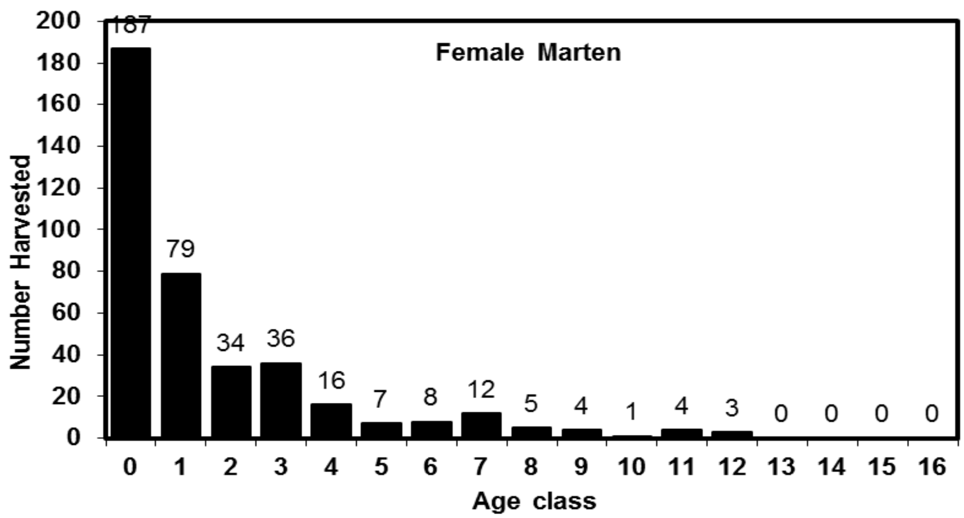

Figure 8. Age structure of female martens in the 2013 harvest.

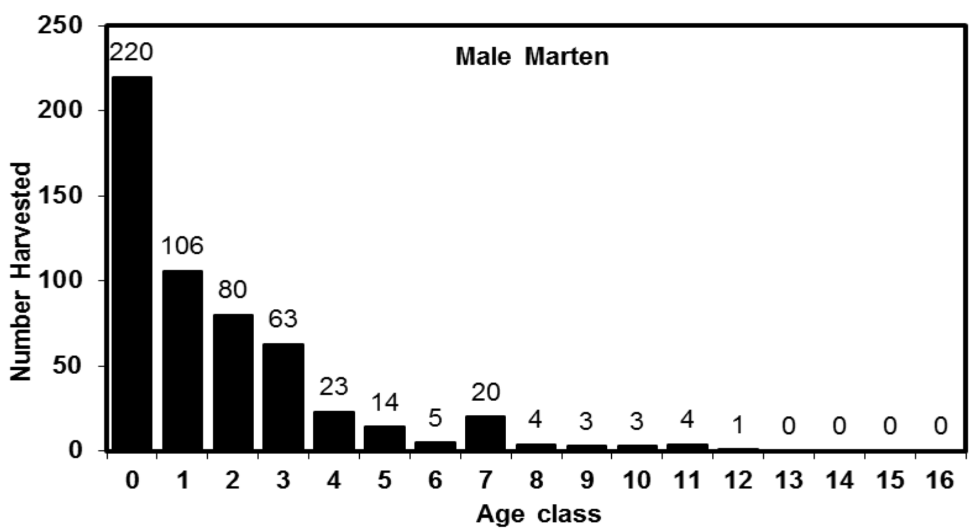

Figure 8. Age structure of male martens in the 2013 harvest.

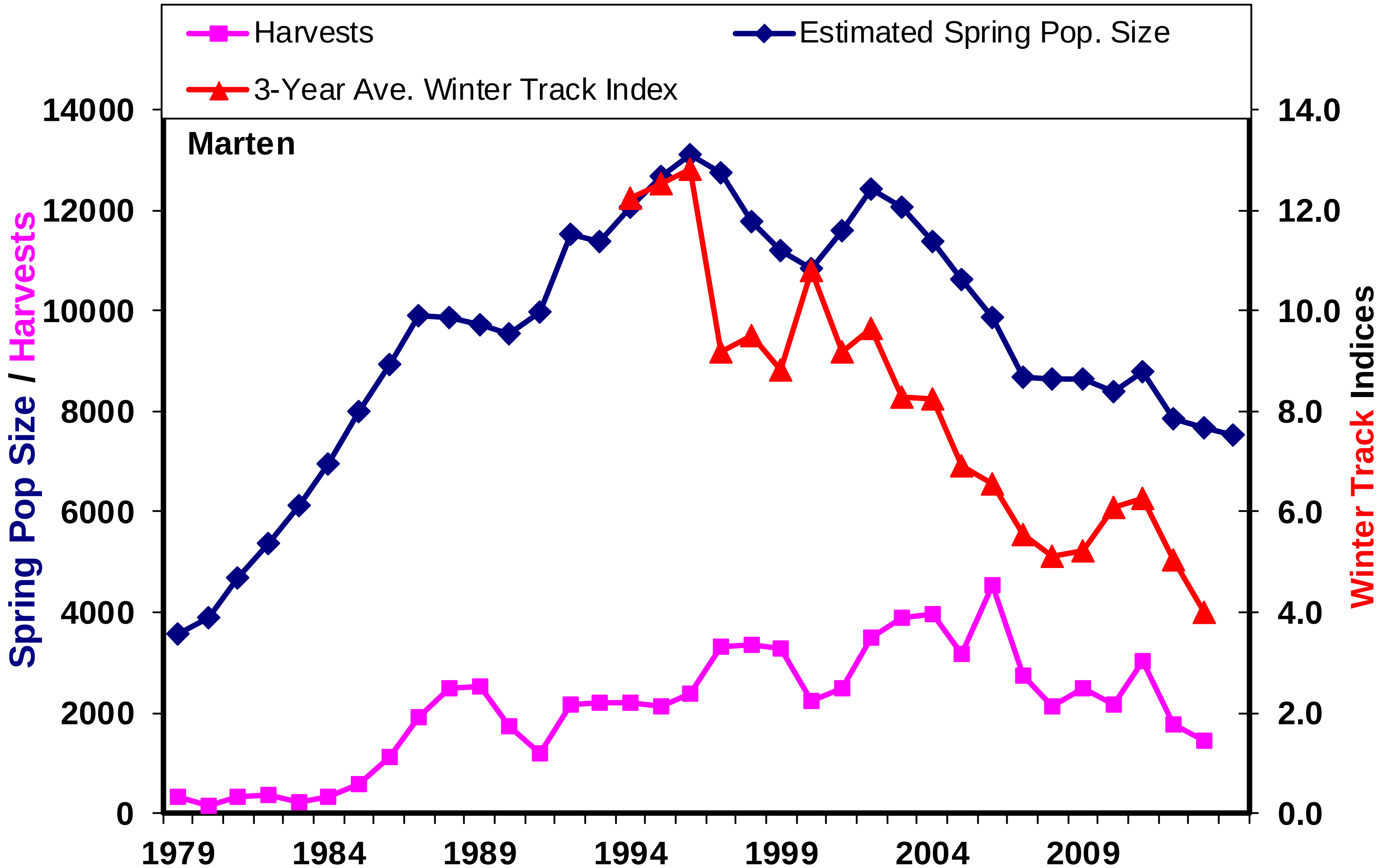

Figure 10. American marten populations, harvests, and survey indices, 1979-2014. Harvests include an estimate of non-reported take.

Table 4. Otter harvest data[1], 1984 to 2013. Carcasses were only collected from 1980-86.

Year	DNR harvest	Modeled Harvest[1]	% Autumn Pop. Harvested[2]	Carcasses examined	% juveniles	% yearlings	% adults	Juv:ad. females	% male juveniles	% male yearlings	% male adults	% males overall	Pelt price Otter[3]	Pelt price Beaver[3]
1984	529	561	7	549	48	23	29	3.2	47	50	49	49	$22	$12
1985	559	572	6	572	43	23	34	2.2	53	50	43	51	$21	$15
1986	777	777	8	745	45	23	32	2.7	45	48	46	47	$24	$20
1987	1386	1484	15	-	-	-	-	-	-	-	-	52	$23	$17
1988	922	922	9	-	-	-	-	-	-	-	-	52	$22	$14
1989	1294	1294	12	-	-	-	-	-	-	-	-	52	$22	$12
1990	888	903	8	-	-	-	-	-	-	-	-	52	$24	$9
1991	855	925	8	-	-	-	-	-	-	-	-	51	$25	$9
1992	1368	1365	10	-	-	-	-	-	-	-	-	52	$30	$7
1993	1459	1368	10	-	-	-	-	-	-	-	-	52	$43	$10
1994	2445	2708	18	-	-	-	-	-	-	-	-	52	$48	$14
1995	1435	1646	12	-	-	-	-	-	-	-	-	52	$39	$12
1996	2219	2500	17	-	-	-	-	-	-	-	-	52	$39	$19
1997	2145	2313	16	-	-	-	-	-	-	-	-	52	$40	$17
1998	1946	2139	15	-	-	-	-	-	-	-	-	52	$34	$13
1999	1635	1717	12	-	-	-	-	-	-	-	-	52	$41	$11
2000	1578	1750	12	-	-	-	-	-	-	-	-	52	$51	$14
2001	2301	2531	17	-	-	-	-	-	-	-	-	57	$46	$13
2002	2145	2390	15	-	-	-	-	-	-	-	-	59	$61	$10
2003	2766	2966	19	-	-	-	-	-	-	-	-	57	$85	$12
2004	3450	3700	24	-	-	-	-	-	-	-	-	56	$87	$14
2005	2846	3018	22	-	-	-	-	-	-	-	-	58	$89	$15
2006	2720	2873	21	-	-	-	-	-	-	-	-	56	$43	$17
2007	1861	1911	15	-	-	-	-	-	-	-	-	55	$29	$16
2008	1938	1983	15	-	-	-	-	-	-	-	-	59	$24	$12
2009	1544	1578	12	-	-	-	-	-	-	-	-	59	$36	$13
2010	1814	1830	13	-	-	-	-	-	-	-	-	57	$35	$13
2011	2294	2490	17	-	-	-	-	-	-	-	-	58	$51	$17
2012	3171	3377	22	-	-	-	-	-	-	-	-	60	$72	$16
2013	2824	2993	21	-	-	-	-	-	-	-	-	48	$61	$17

[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% from 2002-present.

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

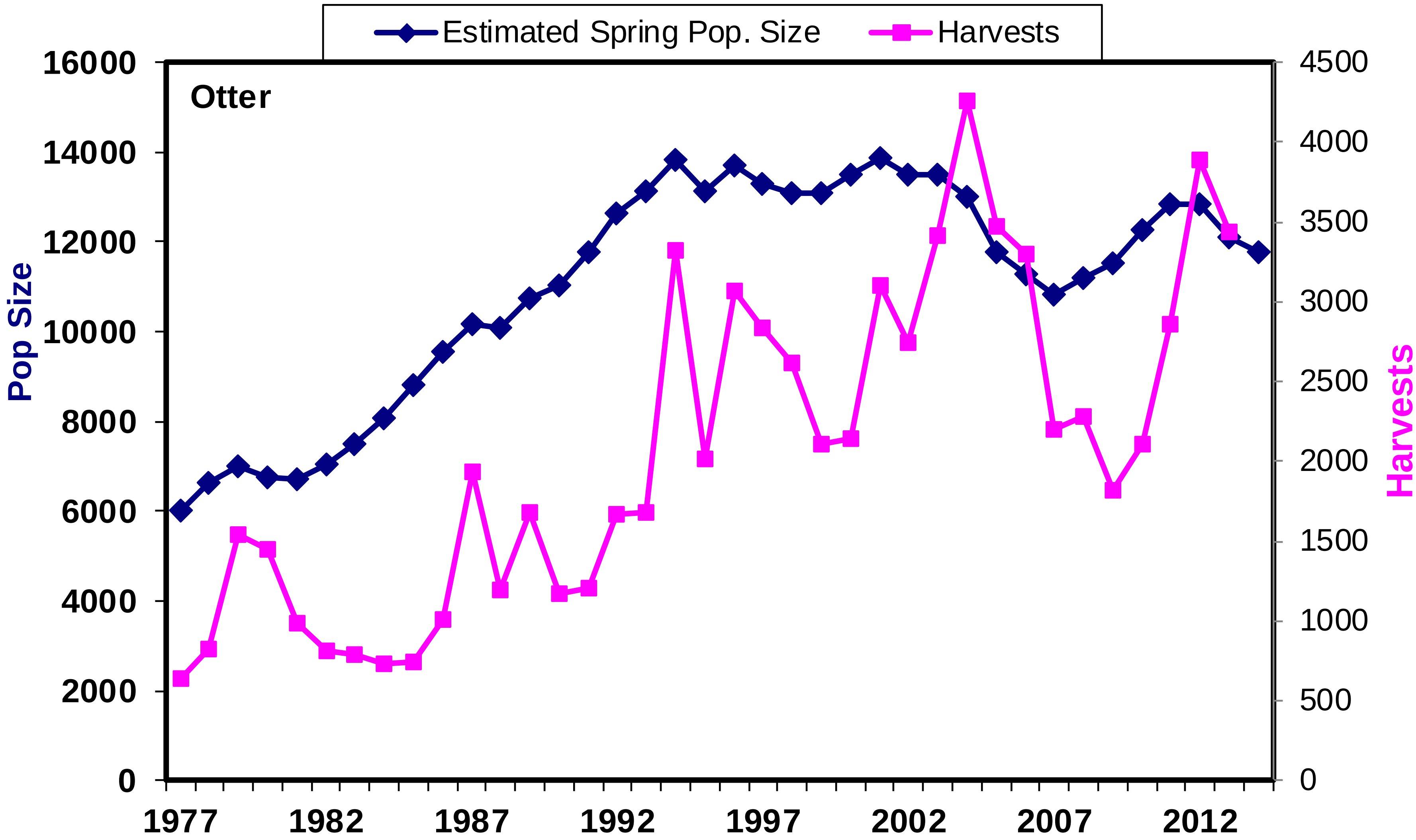

Figure 11. Otter populations and harvests, 1977-2014. Harvests include an estimate of non-reported take.

WETLAND WILDLIFE POPULATIONS

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2014 WATERFOWL BREEDING POPULATION SURVEY MINNESOTA

Steve Cordts, Minnesota DNR, Waterfowl Staff Specialist

ABSTRACT:

The number of breeding waterfowl in a portion of Minnesota has been estimated each year since 1968 as a part of the overall inventory of North American breeding waterfowl. The survey consists of aerial observations in addition to more intensive ground counts on selected routes to determine the proportion of birds counted by the aerial crew. Procedures used are similar to those used elsewhere across the waterfowl breeding grounds. The 2014 aerial survey portion was flown from May 10 to May 24. Both the start and end dates were about a week later than normal due to the late spring and weather delays during the survey. Spring ice-out dates were ~2 weeks later than average across the state. Temperatures were well below normal and precipitation was well above normal in March, April, and May. Spring wetland conditions were very good overall with drier conditions in southwest Minnesota and extremely wet conditions in east central Minnesota. Overall, wetland numbers (Types II-V) increased 33% compared to 2013 and were above both the 10-year (+28%) and long-term (+28%) averages. The number of temporary wetlands (Type 1) remained 13% below the long-term average.

The 2014 estimated mallard breeding population was 257,000, which was 12% lower than last year's estimate of 293,000 mallards, but statistically unchanged (P=0.65). Mallard numbers were 1% below the 10-year average and 13% above the long-term average of 228,000 breeding mallards. The estimated blue-winged teal population was 102,000, which was 29% lower than last year's estimate of 144,000 blue-winged teal, but statistically unchanged (P=0.42). Blue-winged teal numbers remained 41% below the 10-year average and 53% below the long-term average of 215,000 blue-winged teal. The combined population index of other ducks, excluding scaup, was 116,000 ducks, which was 53% lower than last year's estimate and 41% below the 10-year average and 35% below the long-term average of 179,000 other ducks.

The estimate of total duck abundance (474,000), which excludes scaup, was 31% lower than last year's estimate of 683,000 ducks and was 25% below the 10-year average and 24% below the long-term average of 621,000 ducks. The estimated number of Canada geese was 100,000 and 52% lower than last year and 39% below the 10-year average.

Visibility Correction Factors declined for mallards, blue-winged teal, other ducks, and Canada geese and were 15-30% below their respective 10-year averages.

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. Wetlands were counted on only the observer's side of the plane (0.125 mile wide transect); a correction factor obtained in 1989 (123,000/203,000 = 0.606) was used to adjust previous estimates (1968-88) of wetland abundance (Type II-V; Table 2) that were obtained when the observer counted wetlands on both sides of the plane (0.25 mile wide transect). All wetland and waterfowl data were recorded on digital voice recorders by the pilot and observer and transcribed by the observer from the digital files. On transects with low waterfowl abundance, the observer recorded all observations to make transcription easier.

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

The SAS computer program was modified in 1992 to obtain standard errors for mallard and blue-winged teal breeding population estimates. These calculations were based upon SAS computer code written by Graham Smith, USFWS-Office of Migratory Bird Management. Estimates for 2013 and 2014 were compared using two-tailed Z-tests.

SURVEY CHRONOLOGY:

The 2014 aerial survey began on 10 May in southern Minnesota and concluded in northern Minnesota on 24 May. The start date was similar to last year but about 1 week later than average due to the late spring. Transects were flown on 9 days, May 10-11, May 14-16, and May 21-24. Flights began no earlier than 7 AM and were completed by 12:30 PM each day. The median date for survey completion was May 21, which was similar to last year but one of the latest surveys on record.

WEATHER AND HABITAT CONDITIONS:

For the majority of Minnesota lakes, ice out was about 2 weeks later than average but a few days earlier than 2013. Temperatures in March averaged 8°F below normal and precipitation was 1.0 inches above normal statewide. Temperatures in April averaged 4°F below normal. April precipitation was 1.5 inches above normal statewide and ranged from 0.5 inches below normal in southwest Minnesota to 3.0 inches above normal in east central Minnesota. May

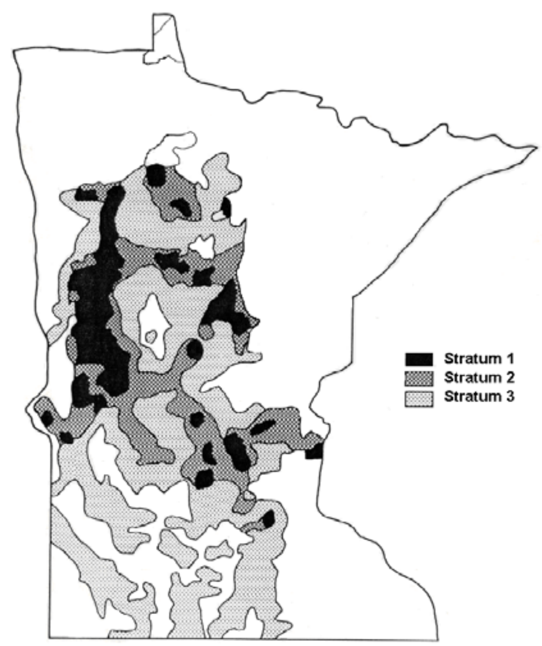

Figure. 1. Location of waterfowl breeding population survey strata in Minnesota.

temperatures averaged 0.8°F below normal statewide. May precipitation was 0.4 inches above normal statewide and ranged from 2.0 inches above normal in northeast and central Minnesota to 1.0 inches below normal in southwest Minnesota (http://climate.umn.edu). Additional temperature and precipitation data are provided in Appendix A.

Wetland conditions in April were variable and ranged from dry in southwest Minnesota to very wet in the east central region. In early May 2014, 8% of the state was under moderate drought, 10% was abnormally dry, and 82% of the state was under no drought designation. In early May 2013, 15% of the state was under severe drought, 15% was moderate drought, 40% was abnormally dry, and 15% of the state was under no drought designation. In early May 2014, statewide topsoil moisture indices were rated as 1% very short or short, 62% adequate and 37% surplus moisture *(http://droughtmonitor.unl.edu).*

Planting dates for row crops were late in 2014. By May 11, only 31% of the corn acres had been planted statewide compared to 16% in 2013 and 62% for the previous 5-year average. By June 1, only 6% of alfalfa hay had been cut compared to 2% in 2013 and a 5-year average of 29% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, (http://www.nass.usda.gov/mn/).

Due to the late spring, leaf-out dates and wetland vegetation growth was about 2-3 weeks later than average and visibility was excellent during the entire survey.

Wetland numbers (Type II-V) increased 33% from 2013 and were 28% above both the 10-year average and the long-term average (Table 2; Figure 2). The number of temporary (Type 1) sheet water wetlands was 13% below the long-term average. In general, wetland conditions improved in mid to late May, particularly in the eastern portions of the survey region.

WATERFOWL POPULATIONS:

The number of ducks, Canada geese, and coots, by stratum, are shown in Tables 3-5; total numbers are presented in Table 6. These estimates are expanded for area but not corrected for visibility bias. Table 7 and Table 8 provide the unadjusted population index (Unad. PI), which is multiplied by the visibility correction factor (VCF) to obtain the population index (PI) for ducks and Canada geese. The standard error (SE) of the estimate is also provided for mallard and blue-winged teal estimates.

The 2014 breeding population estimate of mallards was 256,996 (SE = 55,366), which was 12% lower than the 2013 estimate of 293,239 mallards, but statistically unchanged ($Z = 0.45$, $P = 0.65$) (Table 7, Figure 3). Mallard numbers were 1% below the 10-year average and 13% above the long-term average of 228,000 mallards. In 2013, the mallard population was comprised of 75% lone or flocked males, 21% pairs, and 4% flocked mallards. The 5-year average is 74% lone or flocked males, 20% pairs, and 6% flocked mallards.

The estimated blue-winged teal population was 101,640 (SE = 24,089), which was 29% below the 2013 estimate of 143,927 blue-winged teal, but statistically unchanged ($Z = 0.81$, $P = 0.42$). Blue-winged teal numbers were 41% below the 10-year average and 53% below the long-term average (Table 7, Figure 4). The blue-winged teal population was comprised of 7% lone males, 53% pairs, and 40% flocks. The long-term average is 20% lone males, 54% pairs, and 26% flocks. The lower percentage of lone males and higher percentage of flocks may reflect a later nesting effort due to the extremely late spring.

The combined population estimate of other ducks (excluding scaup) was 115,751 which was 53% below last year's estimate of 246,000 other ducks and 41% below the 10-year average and 35% below the long-term average (Table 7, Figure 5). Ring-necked ducks and wood ducks were the most abundant species of other ducks (Table 6). Scaup numbers (15,000) were 54% below the 10-year average and 77% below the long-term average.

The total duck population index, excluding scaup, was 474,000 ducks and was 31% below last year's index of 683,000 ducks and 25% below the 10-year average and 24% below the long-term average (Table 8, Figure 6).

The population index for total ducks was 489,000 ducks, which was 26% below the 10-year average and 28% below the long-term average.

Visibility Correction Factors (VCFs) for mallards, blue-winged teal, other ducks, and Canada geese were all lower in 2014 than 2013 and below their long-term averages (Table 7, Table 8). The mallard VCF (2.31) was 13% below last year's estimate and 4% above the long-term average. The blue-winged teal VCF (3.18) was 40% below last year's estimate and 18% below the long-term average. The VCF for other ducks (2.24) was 37% below last year's estimate and 28% below the long-term average. The VCF for Canada geese (1.57) was 29% below last year's estimate and 33% below the long-term average.

The population estimate of Canada geese (adjusted for visibility) was 100,255, which was 39% below the 10-year average (Table 8, Figure 7). A total of 13 Canada goose broods were observed, compared to 5 in 2013 and 70 in 2012, which indicates a late nesting effort again this year.

The estimated coot population, uncorrected for visibility, was 19,000 compared to 40,500 in 2013.

The estimated number of swans (likely trumpeters) was 7,700 swans compared to last year's estimate of 11,500. This estimate is expanded for area but not visibility and lone swans are not doubled. Trumpeter swans continue to expand their range and dramatically increase in number.

SUMMARY:

Ice out was about 2 weeks later than average across the state in 2014. Temperatures in March, April, and May were below normal statewide. Precipitation in March, April, and May was above average throughout most of the survey area. Wetland conditions were very good across the region in spring 2014. Overall, wetland numbers were 33% higher than last year and 28% above the long-term average. Mallard abundance in 2014 was 257,000 mallards, which was 12% lower than last year, similar to the 10-year average, and 13% above the long-term average of 228,000 breeding mallards. Blue-winged teal abundance (102,000) was 29% lower than 2013 and 53% below the long-term average of 215,000 blue-winged teal. The combined population index of other ducks (116,000) was 53% lower than 2013 and 35% below the long-term average of 179,000 other ducks. Total duck abundance (474,000), excluding scaup, was 31% lower than 2013 and was 24% below the long-term average. Canada goose numbers, adjusted for visibility bias, decreased 52% from 2013. Visibility Correction Factors were lower for all species of ducks and Canada geese in 2014 and were all below their long-term averages.

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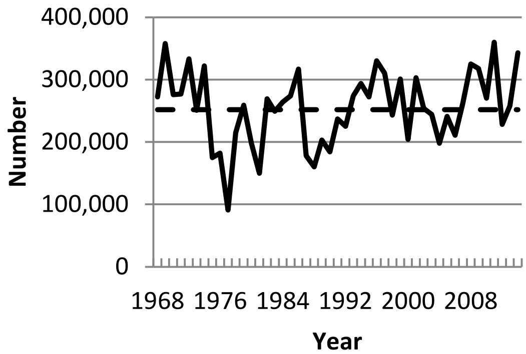

Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2014.

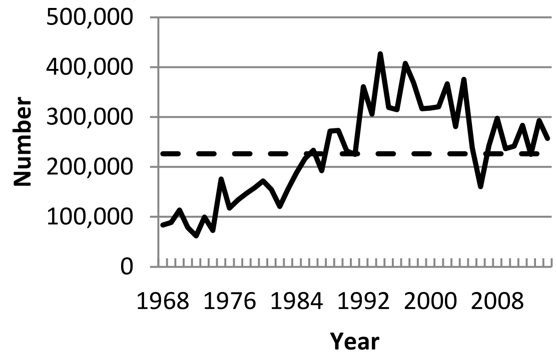

Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2014.

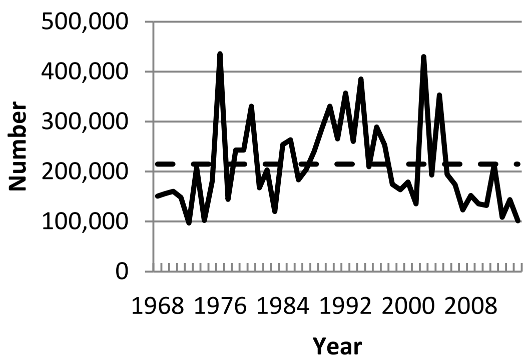

Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2014.

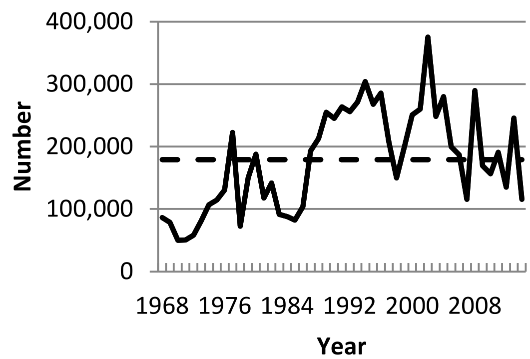

Figure 5. Other duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2014

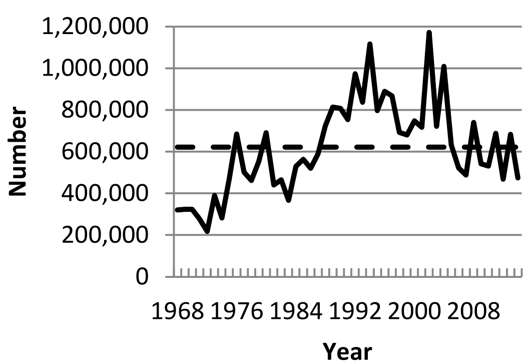

Figure 6. Total duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2014

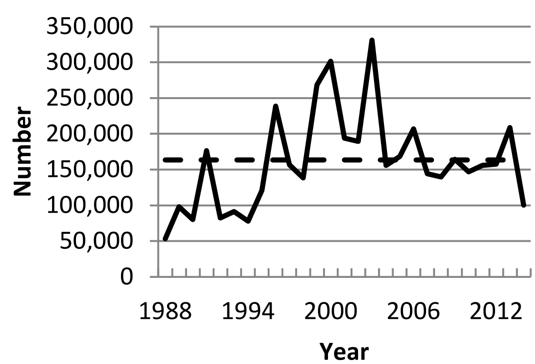

Figure 7. Canada goose population (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1988-2014.

Table 1. Survey design for Minnesota, May 2014.[1]

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

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

Table 2. Estimated May ponds (Type 1 and Types II-V), 1968-2014.

	Year	Type I	Number of ponds[1]
	1968		272,000
	1969		358,000
	1970		276,000
	1971		277,000
	1972		333,000
	1973		251,000
	1974		322,000
	1975		175,000
	1976		182,000
	1977		91,000
	1978		215,000
	1979		259,000
	1980		198,000
	1981		150,000
	1982		269,000
	1983		249,000
	1984		264,000
	1985		274,000
	1986		317,000
	1987		178,000
	1988		160,000
	1989		203,000
	1990		184,000
	1991	82,862	237,000
	1992	10,019	225,000
	1993	199,870	274,000
	1994	123,958	294,000
	1995	140,432	272,000
	1996	147,859	330,000
	1997	30,751	310,000
	1998	20,560	243,000
	1999	152,747	301,000
	2000	5,090	204,000
	2001	66,444	303,000
	2002	30,602	254,000
	2003	34,005	244,000
	2004	9,494	198,000
	2005	30,764	241,000
	2006	56,798	211,000
	2007	32,415	262,000
	2008	69,734	325,000
	2009	39,078	318,000
	2010	26,880	270,000
	2011	89,218	360,000
	2012	30,910	228,000
	2013	9,813	258,000
	2014	54,300	343,000
Averages:	10-year	39,510	267,000
	Long-term	62,622	268,000
% change from:	2013	453%	33%
	10-year	37%	28%
	Long-term	-13%	28%

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1996-2014.

	Year																		
Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dabblers:																			
Mallard	25,104	26,992	33,157	26,576	26,604	28,742	29,297	25,937	29,381	19,050	16,829	16,357	25,104	19,467	18,439	19,856	18,911	21,161	19,522
Black Duck	0	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	333	167
Gadwall	1,083	611	1,111	1,777	833	1,333	944	1,250	2,111	1,166	1,444	889	1,166	1,055	1,000	167	1,389	722	555
American Wigeon	0	0	56	56	56	111	0	56	555	167	0	56	111	56	56	111	222	222	167
Green-winged Teal	278	56	333	0	278	56	278	222	444	56	56	167	278	167	56	56	56	0	0
Blue-winged Teal	6,720	6,387	8,220	6,998	11,247	7,387	14,218	9,664	23,771	9,303	5,665	5,332	9,942	5,998	7,304	4,665	5,110	4,193	3,388
Northern Shoveler	1,277	1,500	500	555	1,055	305	1,277	278	1,166	333	167	56	1,000	666	1,027	111	56	333	722
Northern Pintail	167	111	111	167	167	389	56	111	56	0	56	0	56	56	0	111	0	111	167
Wood Duck	6,498	9,497	12,302	5,582	10,219	6,720	2,888	4,499	8,081	5,498	3,555	2,666	6,665	4,277	3,999	3,416	4,138	3,249	2,527
Dabbler Subtotal	41,127	45,154	55,790	41,711	50,459	45,043	48,958	42,017	65,565	35,629	27,772	25,523	44,322	31,742	31,881	28,493	29,882	30,324	27,215
Divers:																			
Redhead	722	778	944	500	583	1,444	750	333	805	666	666	916	1,389	472	944	805	750	861	1,333
Canvasback	1,166	1,333	1,777	2,971	1,222	2,027	1,833	1,333	666	972	833	1,000	2,277	1,333	1,222	833	722	1,555	1,777
Scaup	13,829	3,416	9,247	1,750	7,415	5,832	2,444	2,055	5,971	4,110	111	555	6,276	8,553	2,777	2,222	1,055	1,000	1,250
Ring-necked Duck	3,166	2,694	2,749	2,360	4,776	2,444	2,777	1,361	5,165	1,722	2,055	1,555	21,494	6,859	3,138	4,804	2,666	3,582	4,554
Goldeneye	167	0	111	56	56	333	111	0	222	222	56	222	278	278	222	56	56	333	444
Bufflehead	278	0	56	111	56	111	222	111	389	167	222	56	1,611	833	389	278	56	611	56
Ruddy Duck	139	528	11,052	972	0	83	1,305	417	305	1,222	305	0	1,027	861	28	56	0	305	111
Hooded Merganser	611	555	389	722	500	722	555	333	278	333	555	111	666	944	555	500	555	333	666
Large Merganser	0	56	0	0	0	111	0	972	0	111	0	278	333	333	333	111	56	222	139
Diver Subtotal	20,078	9,360	26,325	9,442	14,608	13,107	9,997	6,915	13,801	9,525	4,803	4,693	35,351	20,466	9,608	9,665	5,916	8,802	10,330
Total Ducks	61,205	54,514	82,115	51,153	65,067	58,150	58,955	48,932	79,366	45,154	32,575	30,216	79,673	52,208	41,489	38,158	35,798	39,126	37,545
Other:																			
Coot	3,055	5,054	555	83	3,999	1,722	2,888	2,666	21,411	2,444	639	139	16,829	2,166	139	2,194	444	10,386	2,360
Canada Goose	12,774	10,330	16,967	19,495	22,160	24,882	24,104	22,160	23,160	22,938	21,633	29,797	18,717	16,523	16,440	13,691	26,437	23,771	18,578

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1996-2014.

	Year																		
Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dabblers:																			
Mallard	48,507	54,643	53,942	52,247	49,559	44,650	43,773	34,715	44,474	26,883	25,130	24,779	27,935	23,494	21,507	30,974	29,689	27,409	28,987
Black Duck	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	935	468	584	1,519	3,039	1,636	701	584	3,565	584	1,052	234	3,039	1,169	1,286	935	1,987	701	234
American Wigeon	468	351	818	0	468	0	0	0	2,513	117	0	0	351	0	351	0	117	234	0
Green-winged Teal	935	234	351	117	117	117	468	234	234	0	117	0	0	234	117	0	0	117	351
Blue-winged Teal	13,851	13,792	13,208	10,578	19,637	9,701	21,390	15,955	30,624	11,513	9,000	8,416	12,740	11,104	8,474	12,390	9,000	4,383	7,364
Northern Shoveler	1,636	2,571	701	2,104	4,675	1,052	2,221	1,403	1,753	234	584	351	468	701	2,513	1,052	0	351	935
Northern Pintail	117	234	468	117	117	117	0	117	0	0	0	234	0	0	0	234	0	0	117
Wood Duck	8,708	11,338	10,520	19,753	13,792	7,831	5,143	4,558	8,766	3,273	1,753	2,221	6,546	5,260	6,312	6,955	5,143	4,792	1,636
Dabbler subtotal	75,157	83,631	80,592	86,435	91,404	65,221	73,696	57,566	91,929	42,604	37,636	36,235	51,079	41,962	40,560	52,540	45,936	37,987	39,624
Divers:																			
Redhead	1,110	1,987	935	1,636	2,805	2,455	234	584	1,110	292	175	935	935	584	760	1,578	468	468	526
Canvasback	234	701	117	117	935	0	468	1,052	234	0	0	1,169	468	234	117	584	117	935	1,286
Scaup	21,916	18,935	4,032	3,331	6,779	3,039	5,961	2,279	7,188	2,981	468	643	3,097	2,104	0	1,929	935	2,045	2,396
Ring-necked Duck	7,714	3,565	2,279	2,221	5,610	3,799	6,370	2,455	5,377	1,929	3,331	1,578	13,149	9,117	2,396	11,455	1,695	6,253	5,143
Goldeneye	1,753	818	234	935	584	468	234	234	351	117	117	0	351	584	468	468	584	935	1,519
Bufflehead	117	117	0	0	0	0	1,169	117	468	351	117	117	1,403	818	643	1,403	468	0	818
Ruddy Duck	58	117	0	468	0	0	1,870	2,688	0	351	58	0	0	175	409	58	234	117	0
Hooded Merganser	234	468	117	701	935	1,403	701	701	234	234	351	234	584	701	117	2,221	1,636	701	234
Large Merganser	0	0	0	0	117	117	0	0	234	351	0	0	351	0	0	234	0	234	117
Diver subtotal	33,136	26,708	7,714	9,409	17,765	11,281	17,007	10,110	15,196	6,606	4,617	4,676	20,338	14,317	4,910	19,930	6,137	11,688	12,039
Total Ducks	108,293	110,339	88,306	95,844	109,169	76,502	90,703	67,676	107,125	49,210	42,253	40,911	71,417	56,279	45,470	72,470	52,073	49,675	51,663
Other:																			
Coot	7,013	5,026	643	234	1,110	468	4,909	1,519	8,007	584	292	409	23,961	0	117	292	292	2,571	877
Canada Goose	13,559	16,364	19,812	18,585	25,831	24,604	20,688	22,091	28,461	20,688	26,825	25,890	19,753	22,675	18,935	14,201	23,260	22,442	20,572

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1996-2014.

	Year																		
Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dabblers:																			
Mallard	79,862	78,993	101,873	90,390	81,690	72,642	72,121	55,156	84,561	36,539	30,884	35,843	50,371	35,408	40,976	51,415	47,848	62,638	62,899
Black Duck	0	0	0	0	0	0	0	0	174	0	0	174	174	0	0	0	174	174	0
Gadwall	3,306	2,436	3,045	2,436	2,610	10,701	3,306	1,566	6,960	2,001	5,568	4,176	870	1,392	1,392	4,089	1,566	5,220	1,914
American Wigeon	1,044	348	696	0	522	174	1,218	174	1,566	1,044	174	348	348	174	348	1,044	174	348	174
Green-winged Teal	957	348	174	0	1,218	1,392	522	174	0	174	522	0	0	0	0	174	348	696	0
Blue-winged Teal	36,625	25,316	26,360	18,530	29,405	20,618	56,374	21,140	39,758	27,578	23,663	15,659	18,095	20,183	16,964	44,716	35,669	18,617	21,227
Northern Shoveler	12,701	11,049	4,176	4,002	20,444	10,701	6,264	870	3,828	348	522	870	4,002	2,088	6,873	2,088	8,265	6,786	522
Northern Pintail	870	522	870	870	696	522	0	174	348	174	174	348	174	0	174	0	174	174	0
Wood Duck	27,926	14,268	23,837	20,531	25,055	17,225	13,572	12,702	20,705	7,482	7,308	5,394	14,442	10,266	12,354	13,659	10,962	12,180	9,657
Dabbler subtotal	163,291	133,280	161,031	136,759	161,640	133,975	153,377	91,956	157,900	75,340	68,815	62,812	88,476	69,511	79,081	117,185	105,180	106,833	96,393
Divers:																			
Redhead	1,044	1,044	2,001	3,480	2,523	3,654	1,305	174	1,740	1,479	0	522	783	870	174	4,350	3,306	1,827	1,566
Canvasback	1,392	0	3,306	174	3,915	522	696	1,131	2,784	0	0	348	1,566	1,218	348	1,044	1,044	696	522
Scaup	29,840	8,787	15,137	8,961	18,182	6,873	4,611	783	17,747	5,307	1,392	696	5,481	1,914	522	5,133	696	8,874	2,871
Ring-necked Duck	12,875	3,654	2,958	1,479	8,178	8,526	7,395	1,479	5,133	10,179	6,699	1,392	8,526	6,525	3,045	6,264	9,135	6,960	5,568
Goldeneye	1,914	522	696	696	1,044	1,566	3,132	1,305	696	1,044	1,044	870	348	522	174	870	0	348	174
Bufflehead	1,044	174	348	0	0	0	1,218	783	2,088	0	174	696	1,218	870	174	2,871	174	3,915	4,698
Ruddy Duck	1,740	348	0	174	0	696	18,878	87	2,262	870	696	261	87	348	0	3,828	522	522	174
Hooded Merganser	1,566	696	696	1,218	957	174	2,175	174	1,740	1,218	870	174	696	348	1,218	1,044	1,044	348	348
Large Merganser	0	0	0	0	0	0	522	0	0	261	957	348	348	348	348	174	174	0	0
Diver subtotal	51,415	15,225	25,142	16,182	34,799	22,011	39,932	5,916	34,190	20,358	11,832	5,307	19,053	12,963	6,003	25,578	16,095	23,490	15,921
Total Ducks	214,706	148,505	186,173	152,941	196,439	155,986	193,309	97,872	192,090	95,698	80,647	68,119	107,529	82,474	85,084	142,763	121,275	130,323	112,314
Other:																			
Coot	182,953	24,620	5,133	14,702	67,684	3,132	14,007	7,134	77,427	8,613	14,702	5,742	15,137	7,047	435	1,479	25,664	27,578	15,746
Canada Goose	34,537	33,755	42,368	41,933	57,940	39,932	33,407	43,412	46,717	39,758	27,230	42,629	31,841	28,274	30,710	32,711	37,496	48,022	24,707

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1996-2014.

	Year																		
Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dabblers:																			
Mallard	153,473	160,628	188,972	169,213	157,853	146,034	145,191	115,974	158,416	82,472	72,843	76,979	103,411	78,368	80,922	102,245	96,448	111,208	111,408
Black Duck	0	0	0	0	0	117	0	0	174	56	0	174	174	0	0	0	174	507	167
Gadwall	5,324	3,515	4,740	5,733	6,482	13,670	4,951	3,400	12,635	3,752	8,064	5,298	5,075	3,616	3,677	5,191	4,941	6,643	2,703
American Wigeon	1,512	699	1,570	56	1,045	285	1,218	230	4,634	1,327	174	404	810	230	754	1,155	513	804	341
Green-winged Teal	2,170	638	858	117	1,613	1,564	1,267	630	678	230	694	167	278	400	172	230	404	813	351
Blue-winged Teal	57,196	45,495	47,788	36,106	60,288	37,706	91,982	46,759	94,152	48,394	38,328	29,407	40,777	37,286	32,742	61,772	49,779	27,194	31,979
Northern Shoveler	15,614	15,120	5,377	6,661	26,175	12,058	9,762	2,550	6,747	915	1,273	1,276	5,469	3,456	10,413	3,251	8,320	7,470	2,179
Northern Pintail	1,154	867	1,449	1,153	979	1,028	56	402	404	174	230	582	230	56	174	345	174	285	284
Wood Duck	43,132	35,103	46,659	45,866	49,067	31,777	21,603	21,759	37,553	16,253	12,616	10,281	27,652	19,802	22,664	24,029	20,242	20,221	13,820
Dabbler subtotal	279,575	262,065	297,413	264,905	303,502	244,239	276,030	191,704	315,393	153,573	134,222	124,568	183,876	143,214	151,518	198,218	180,995	175,145	163,232
Divers:																			
Redhead	2,876	3,809	3,880	5,616	5,911	7,552	2,289	1,092	3,656	2,438	842	2,373	3,107	1,926	1,878	6,733	4,523	3,155	3,425
Canvasback	2,792	2,034	5,200	3,262	6,072	2,549	2,996	3,516	3,684	972	833	2,517	4,311	2,785	1,687	2,461	1,883	3,186	3,585
Scaup	65,585	31,138	28,416	14,041	32,376	15,743	13,016	5,117	30,906	12,397	1,971	1,894	14,854	12,571	3,299	9,283	2,686	11,919	6,517
Ring-necked Duck	23,755	9,913	7,986	6,060	18,565	14,768	16,542	5,294	15,675	13,829	12,085	4,525	43,169	22,501	8,579	22,523	13,495	16,795	15,265
Goldeneye	3,834	1,340	1,041	1,687	1,684	2,367	3,477	1,539	1,269	1,383	1,216	1,092	976	1,384	864	1,393	640	1,616	2,138
Bufflehead	1,439	291	404	111	56	111	2,609	1,011	2,944	517	513	868	4,231	2,521	1,206	4,551	697	4,526	5,572
Ruddy Duck	1,937	993	11,052	1,613	0	779	22,054	3,192	2,567	2,443	1,060	261	1,114	1,384	437	3,942	756	944	285
Hooded Merganser	2,411	1,719	1,202	2,641	2,392	2,299	3,432	1,209	2,251	1,785	1,776	519	1,947	1,993	1,890	3,765	3,236	1,383	1,248
Large Merganser	0	56	0	0	117	228	522	972	234	723	957	626	1,032	681	681	519	230	456	256
Diver subtotal	104,629	51,293	59,181	35,031	67,173	46,396	66,937	22,942	63,186	36,487	21,253	14,675	74,741	47,746	20,521	55,170	28,146	43,980	38,291
Total Ducks	384,204	313,358	356,594	299,936	370,675	290,635	342,967	214,646	378,579	190,060	155,475	139,243	258,617	190,960	172,039	253,388	209,141	219,125	201,523
Other:																			
Coot	193,021	34,700	6,331	15,020	72,793	5,321	21,804	11,319	106,845	11,641	15,633	6,290	55,927	9,213	691	3,965	26,401	40,535	18,984
Canada Goose	60,870	60,449	79,147	80,012	105,932	89,418	78,200	87,663	98,339	83,384	75,688	98,316	70,311	67,473	66,085	60,603	87,193	94,235	63,857

Table 7. Mallard, blue-winged teal, and other duck (excluding scaup) populations in Minnesota, 1968-2014.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
1968	41,030	2.04	83,701		61,493	2.44	151,141		41,419	2.08	86,152
1969	53,167	1.67	88,789		45,180	3.45	155,871		34,605	2.27	78,553
1970	67,463	1.69	113,945		31,682	5.06	160,343		30,822	1.62	49,932
1971	47,702	1.65	78,470		42,445	3.49	148,218		29,520	1.71	50,450
1972	49,137	1.27	62,158		49,386	1.96	96,895		34,405	1.69	58,127
1973	56,607	1.76	99,832		53,095	3.92	208,292		33,155	2.45	81,362
1974	44,866	1.62	72,826		39,402	2.59	102,169		38,266	2.79	106,609
1975	55,093	3.19	175,774		45,948	3.95	181,375		34,585	3.31	114,459
1976	69,844	1.69	117,806		89,370	4.87	435,607		39,022	3.35	130,669
1977	60,617	2.21	134,164		37,391	3.86	144,187		18,633	11.95	222,748
1978	56,152	2.61	146,781		28,491	8.53	242,923		22,034	3.30	72,798
1979	61,743	2.57	158,704	28,668	46,708	5.21	243,167	62,226	39,749	3.79	150,545
1980	83,775	2.05	171,957	22,312	50,966	6.49	330,616	40,571	47,322	3.97	188,020
1981	79,562	1.95	154,844	16,402	64,546	2.59	167,258	23,835	30,947	3.80	117,667
1982	51,655	2.33	120,527	17,078	42,772	4.75	203,167	34,503	32,726	4.32	141,501
1983	73,424	2.12	155,762	15,419	42,728	2.81	119,980	20,809	32,240	2.84	91,400
1984	94,514	1.99	188,149	24,065	89,896	2.82	253,821	33,286	40,326	2.18	87,709
1985	96,045	2.26	216,908	32,935	90,453	2.91	263,607	33,369	35,018	2.35	82,383
1986	108,328	2.16	233,598	30,384	68,235	2.69	183,338	28,204	38,900	2.67	103,851
1987	165,881	1.16	192,289	23,500	102,480	1.99	203,718	32,289	76,746	2.51	192,947
1988	155,543	1.75	271,718	38,675	101,183	2.38	240,532	39,512	81,514	2.61	212,988
1989	124,362	2.19	272,968	26,508	90,300	3.16	285,760	39,834	88,109	2.89	254,887
1990	140,879	1.65	232,059	26,316	107,177	3.09	330,659	44,455	124,531	1.97	245,152
1991	128,315	1.75	224,953	28,832	91,496	2.90	265,138	42,057	93,784	2.81	263,619
1992	144,126	2.50	360,870	43,621	93,107	3.83	356,679	53,619	109,779	2.33	255,774
1993	123,771	2.47	305,838	31,103	64,670	4.02	260,070	36,307	82,612	3.28	271,263
1994	138,482	3.08	426,455	66,240	70,324	5.48	385,256	82,580	85,671	3.55	303,847
1995	142,557	2.24	319,433	48,124	47,737	4.40	210,043	40,531	66,096	4.05	267,668
1996	153,473	2.05	314,816	53,461	57,196	5.05	288,913	64,064	107,950	2.64	285,328
1997	160,629	2.54	407,413	65,771	45,496	5.57	253,408	67,526	76,095	2.72	207,316

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
1998	188,972	1.95	368,450	61,513	47,788	3.66	174,848	33,855	91,478	1.64	149,786
1999	169,213	1.87	316,394	51,651	36,106	4.53	163,499	36,124	80,459	2.49	200,570
2000	157,853	2.02	318,134	36,857	60,288	2.97	179,055	32,189	120,158	2.09	250,590
2001	146,034	2.20	320,560	39,541	37,706	3.60	135,742	19,631	91,152	2.85	260,051
2002	145,191	2.53	366,625	46,264	91,982	4.67	429,934	87,312	92,778	4.04	374,978
2003	115,974	2.42	280,517	34,556	46,759	4.13	193,269	36,176	46,796	5.30	248,019
2004	158,416	2.37	375,313	57,591	94,152	3.75	353,209	56,539	95,105	2.94	279,802
2005	82,472	2.89	238,500	28,595	48,394	4.01	194,125	37,358	46,797	4.26	199,355
2006	72,843	2.21	160,715	24,230	38,328	4.53	173,674	60,353	42,333	4.41	186,719
2007	76,979	3.15	242,481	30,020	29,407	4.20	123,588	20,055	30,963	3.73	115,390
2008	103,411	2.88	297,565	27,787	40,777	3.74	152,359	24,157	99,575	2.91	289,629
2009	78,368	3.02	236,436	36,539	37,286	3.63	135,262	32,155	62,725	2.70	169,568
2010	80,922	2.99	241,884	33,940	32,742	4.04	132,261	27,430	55,076	2.84	156,599
2011	102,245	2.77	283,329	49,845	61,772	3.46	213,584	88,720	79,743	2.39	190,586
2012	96,448	2.33	224,965	45,057	49,779	2.18	108,607	31,971	60,228	2.24	135,017
2013	111,208	2.64	293,239	58,463	27,194	5.29	143,927	46,635	68,804	3.57	245,729
2014	111,408	2.31	256,996	55,366	31,979	3.18	101,640	24,089	51,619	2.24	115,751
Averages:											
10-year	96,331	2.73	259,443	39,207	45,983	3.88	173,060	42,537	64,135	3.20	196,839
Long-term	102,506	2.23	227,579	37,196	58,093	3.88	214,763	42,578	61,103	3.13	178,872
% change from											
2013	0%	-13%	-12%	-5%	18%	-40%	-29%	-48%	-25%	-37%	-53%
10-year average	16%	-15%	-1%	41%	-30%	-18%	-41%	-43%	-20%	-30%	-41%
Long-term average	9%	4%	13%	49%	-45%	-18%	-53%	-43%	-16%	-28%	-35%

Table 8. Scaup, total ducks (excluding scaup), total ducks, and Canada goose populations in Minnesota, 1968-2014.

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
1968	22,834	2.08	47,495	144,392	320,994	167,226	368,488			
1969	9,719	2.27	22,062	132,952	323,213	142,671	345,275			
1970	12,105	1.62	19,610	129,967	324,219	142,072	343,829			
1971	5,713	1.71	9,764	119,667	277,137	125,380	286,901			
1972	12,062	1.69	20,379	132,928	217,181	144,990	237,560	366		
1973	10,633	2.45	26,093	142,857	389,486	153,490	415,580	1,965		
1974	18,378	2.79	51,201	122,534	281,605	140,912	332,806	8,835		
1975	9,563	3.31	31,649	135,626	471,608	145,189	503,257	5,997		
1976	22,494	3.35	75,323	198,236	684,082	220,730	759,405	5,409		
1977	2,971	11.95	35,517	116,641	501,099	119,612	536,616	7,279		
1978	14,774	3.35	48,812	106,677	462,502	121,451	511,314	7,865		
1979	92,134	3.79	348,948	148,200	552,416	240,334	901,364	4,843		
1980	12,602	3.97	50,070	182,063	690,593	194,665	740,663	6,307		
1981	19,844	3.88	75,451	175,055	439,769	194,899	515,220	10,156		
1982	21,556	4.32	93,204	127,153	465,195	148,709	558,399	6,600		
1983	9,551	2.84	27,077	148,392	367,142	157,943	394,219	11,081		
1984	15,683	2.18	34,111	224,736	529,679	240,419	563,790	14,051		
1985	7,409	2.35	17,430	221,516	562,898	228,925	580,328	16,658		
1986	6,247	2.67	16,678	215,463	520,787	221,710	537,465	19,599		
1987	10,306	2.51	25,910	345,107	588,954	355,413	614,864	29,960		
1988	10,545	2.61	27,553	338,240	725,238	348,785	752,791	39,057	1.36	53,004
1989	71,898	2.89	207,991	302,771	813,615	374,669	1,021,606	51,946	1.88	97,898
1990	40,075	1.97	78,892	372,587	807,870	412,662	886,761	58,425	1.37	80,147
1991	40,727	2.81	114,480	313,595	753,710	354,322	868,191	42,231	4.18	176,465
1992	66,071	2.33	153,939	347,012	973,323	413,083	1,127,262	33,965	2.43	82,486
1993	11,801	3.28	38,750	271,053	837,172	282,854	875,921	43,858	2.08	91,369
1994	57,670	3.55	204,536	294,477	1,115,558	352,147	1,320,095	48,595	1.68	77,878
1995	28,421	4.05	115,096	256,390	797,144	284,811	912,241	58,065	2.08	120,775
1996	65,585	2.64	173,351	318,619	889,057	384,204	1,062,408	60,870	3.92	238,708
1997	31,138	2.72	84,834	282,220	868,137	313,358	952,971	60,449	2.59	156,817
1998	28,416	1.64	46,528	328,238	693,084	356,654	739,612	79,147	1.75	138,507

Table 8. Scaup, total ducks (excluding scaup), total ducks, and Canada goose populations in Minnesota, 1968-2014.

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
1999	14,041	2.49	35,002	285,778	680,463	299,819	715,465	80,012	3.35	268,168
2000	32,376	2.09	67,520	338,299	747,779	370,675	815,299	105,932	2.84	301,298
2001	15,743	2.85	44,914	274,892	716,353	290,653	761,267	89,418	2.17	193,887
2002	13,016	4.04	52,606	327,951	1,171,537	340,967	1,224,143	78,200	2.42	189,353
2003	5,117	5.30	27,120	209,529	721,805	214,646	748,925	87,663	3.78	331,094
2004	30,906	2.94	90,926	347,673	1,008,324	378,579	1,099,250	98,339	1.58	155,859
2005	12,397	4.26	52,811	177,663	631,980	190,060	684,791	83,384	2.02	168,469
2006	1,971	4.41	8,692	153,504	521,109	155,475	529,801	75,688	2.73	206,757
2007	1,894	3.73	7,058	137,349	488,517	139,243	495,575	98,316	1.47	144,289
2008	14,854	2.91	43,205	243,763	739,553	258,617	782,758	70,311	1.99	139,708
2009	12,571	2.70	33,979	178,379	541,266	190,950	575,245	67,473	2.44	164,405
2010	3,299	2.84	9,380	168,740	530,744	172,039	540,124	66,085	2.22	146,960
2011	9,283	2.39	22,186	244,105	687,499	253,043	709,685	60,603	2.57	155,750
2012	2,686	2.24	6,021	206,455	468,589	209,141	474,610	87,193	1.81	157,706
2013	11,919	3.57	42,568	207,206	682,895	219,125	725,463	94,235	2.22	208,825
2014	6,517	2.24	14,614	195,006	474,387	201,523	489,001	63,857	1.57	100,255
Averages:										
10-year	10,178	3.20	31,683	206,484	630,048	216,627	661,730	80,163	2.11	164,873
Long-term	21,109	3.14	62,320	221,666	621,367	242,768	683,687	47,058	2.34	163,330
% change from										
2013	-45%	-37%	-66%	-6%	-31%	-8%	-33%	-32%	-29%	-52%
10-year average	-36%	-30%	-54%	-6%	-25%	-7%	-26%	-20%	-25%	-39%
Long-term average	-69%	-29%	-77%	-12%	-24%	-17%	-28%	36%	-33%	-39%

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 27 April - 26 May 2014 (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
		27-April		4-May		11-May		18-May		25-May							
Region	City	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	27-April	4-May	11-May	18-May	25-May	1 Apri1-May 25
NW	Crookston	45.5	-1.0	42.9	-6.6	48.8	-3.5	45.8	-9.1	61.4	3.9	0.73	1.26	0.41	0.28	0.18	-0.42
NC	Grand Rapids	38.4	-7.4	40.0	-8.7	48.4	-3.0	44.7	-9.3	60.2	3.8	0.64	0.74	1.43	1.09	0.33	1.23
	Itasca	39.8	-3.5	39.7	-6.7	47.0	-2.3	44.7	-7.4	M	M	1.59	0.33	0.76	0.87	M	1.60
WC	Alexandria	43.2	-4.5	42.6	-8.1	52.0	-1.4	46.8	-9.2	61.9	3.5	1.83	0.81	1.13	0.41	0.82	1.71
	Montevideo	47.5	-1.3	42.8	-9.0	53.1	-1.5	46.0	-11.3	62.4	2.5	1.22	1.43	0.86	0.12	0.20	-0.78
	Morris	45.5	-2.6	42.0	-9.1	49.7	-4.3	44.8	-11.9	61.3	2.1	1.61	0.97	1.26	0.54	0.30	1.27
C	Becker	47.4	-2.7	42.2	-10.8	54.0	-1.7	49.7	-8.5	61.4	1.0	2.96	2.05	2.91	0.37	1.36	6.14
	Hutchinson	49.0	-0.7	42.2	-10.3	54.0	-1.1	49.0	-8.7	62.4	2.2	1.37	2.12	1.44	1.66	1.39	4.27
	St. Cloud	44.8	-3.6	45.4	-5.8	55.0	1.2	50.0	-6.2	62.8	4.2	2.63	1.84	2.83	0.24	0.95	5.22
	Willmar	46.2	-3.2	41.6	-10.8	51.0	-4.6	45.6	-12.2	60.2	-0.2	1.40	2.24	0.93	0.72	0.63	1.69
EC	Aitkin	43.1	-2.5	41.2	-7.0	47.8	-3.2	46.6	-6.5	58.7	3.2	0.62	1.10	1.85	0.74	0.44	1.62
	Msp Airport	46.7	-4.5	44.6	-9.3	56.8	0.5	51.2	-7.6	62.3	1.1	3.10	1.37	1.32	0.27	2.25	4.87
SW	Pipestone	50.6	1.7	42.4	-9.3	53.4	-1.0	45.0	-12.0	64.1	4.6	0.60	1.25	0.16	1.19	0	-1.83
	Redwood Falls	48.6	-1.9	44.8	-8.6	56.5	0.4	49.4	-9.3	63.6	2.4	1.01	1.42	1.28	0.12	0.01	0.00
	Worthington	51.6	2.9	43.4	-8.2	54.8	0.5	46.8	-10.3	62.4	2.7	0.42	0.89	0.45	0.38	0	-2.83
SC	Faribault																
	Waseca	49.4	-0.6	42.4	-10.5	54.5	-1.2	48.8	-9.6	60.7	-0.3	1.13	2.95	0.58	1.54	0.38	1.82
	Winnebago	51.2	1.0	43.4	-9.6	56.2	0.4	48.8	-9.6	62.6	1.7	0.67	2.08	0.82	2.00	0.03	0.73
Statewide		45.1	-2.4	42.2	-8.2	51.3	-1.6	47.2	-8.3	60.7	2.7	1.20	1.55	1.07	0.88	0.60	

[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, 2014 by Kathy Fleming, Pamela Garrettson, Walt Rhodes, and Nathan Zimpfer. The entire report is available on the Division of Migratory Bird Management website (http://www.fws.gov/migratorybirds/reports/reports.html).

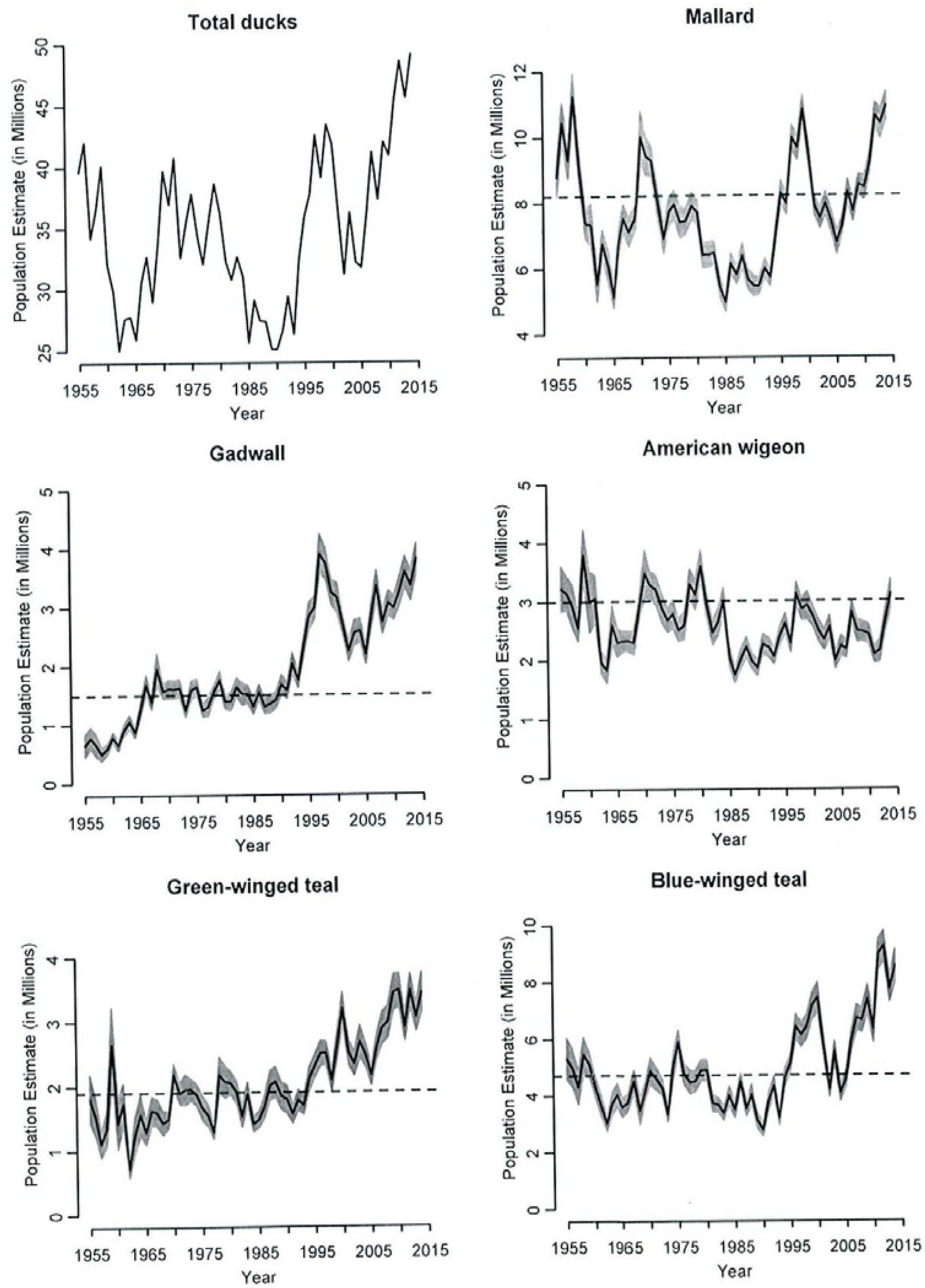

Figure 1 Estimates of North American breeding populations, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S (from: U.S. Fish and Wildlife Service 2014).

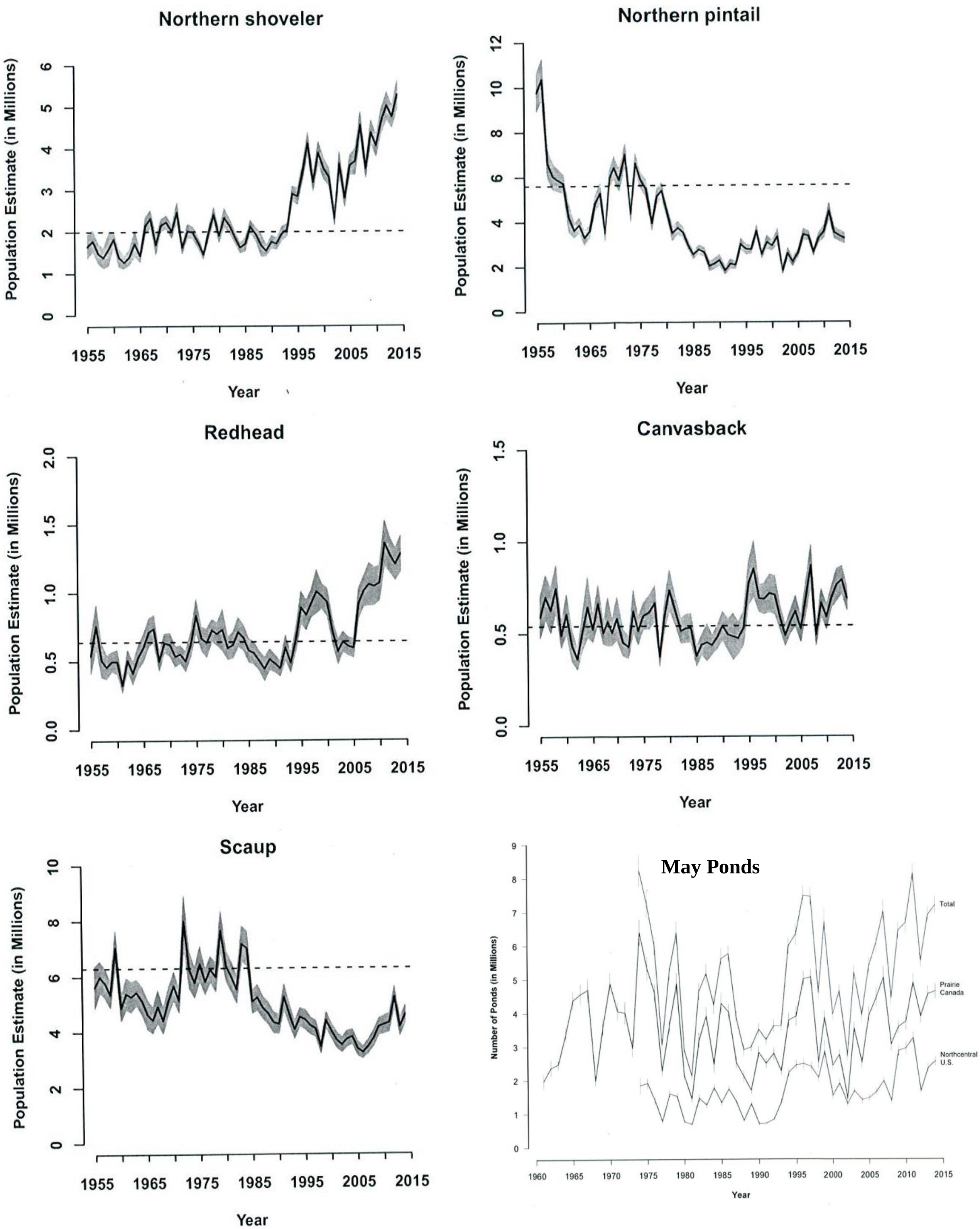

Figure 1 (continued).

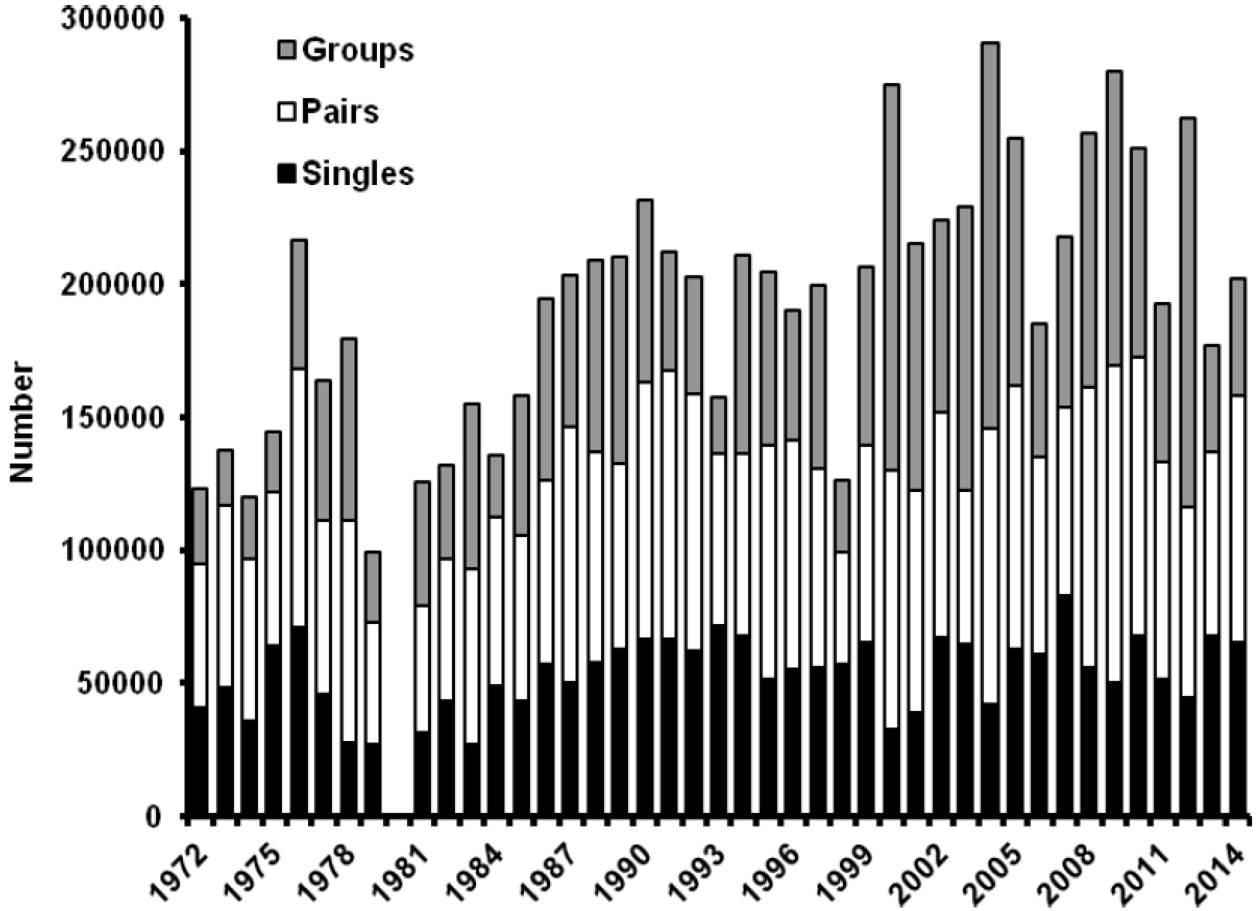

Figure 2 Breeding ground survey estimates of the Eastern Prairie Population of Canada geese, 1972-2014. (from: Baldwin, F., J. Wollenberg, and B. Lubinski. 2014. 2014 EPP Breeding Population Survey. Unpublished report prepared for the Mississippi Flyway Council Technical Section). Data not available for 1980.

2014 MINNESOTA SPRING CANADA GOOSE SURVEY

David Rave, Wetland Habitat Team

INTRODUCTION

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

METHODS

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

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

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

Habitat-classification criteria for each ecoregion:

Prairie

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

Transition

No geese =	Type 3-4-5 <1 acre and rivers <8 acres or plot is all water. (n = 39,484 plots).

1-2 pairs = Type 3-4-5 = 1-25 acres or Type 3-4-5 >25 acres, but Type 3 <15 acres or Type 3-4-5 <1 acre and rivers >8 acres. (n = 31,091 plots).

3+ pairs = Type 3-4-5 >25 acres, but Type 3 >15 acres and plot is not all water. (n = 7,988 plots).

Forest

No geese = Type 3-4-5 <2 acres and rivers <2 acres or plot all water. (n = 75,835 plots).

1-2 pairs = Type 3-4-5 ≥2 acres, but not all water or Type 3-4-5 <2 acres and rivers >2 acres. (n = 51,155 plots).

3+ pairs = None.

Plots in the "no geese class" are not flown and there are no plots in the "3+ pairs" class in the Forest ecoregion. Prior to 2011, 30 plots were randomly selected in each of the 5 remaining strata using ArcView's AlaskaPak extension, and these 150 plots were surveyed at low level using a helicopter. The stratification was modified slightly in 2011 to include a binary stratification variable (zone), which permitted a domain analysis of total geese in a proposed new hunting zone (Figure 1). Thus, the 9 strata for 2014 were Forest–12, Transition–12new, Transition–12other, Transition–3new, Transition– 3other, Prairie–12new, Prairie–12other, Prairie–3new, and Prairie–3other. Thirty plots (quarter sections) were randomly selected from strata in the new zone (using proportional allocation) and 130 plots were selected from strata not in the new zone for a total of 160 sample plots (Figure 1). Ideally, the survey should be conducted during mid-incubation.

Pilot John Heineman and I flew the survey on 8 days between 21 April and 4 May, 2014, which are about average start and end dates over the past 12 years. Canada geese seen within plot boundaries were recorded as singles, pairs, and groups. We also recorded whether singles and pairs were observed with a nest. The number of singles and pairs was doubled when the total number of geese per plot was calculated.

RESULTS AND DISCUSSION

The total Canada goose population estimate in the surveyed area for 2014 was 244,100 (±77,800). Adding 17,500 for the Twin Cities metro area (Cooper 2004) yields a statewide estimate of 261,600 Canada geese (Table 1). Relative error (95% CI half-width) was 31.9% of the estimate. The survey tallied 39.0% singles, 55.0% pairs, and 5.5% groups (Table 2). Typically, some of the pairs seen on this survey are not associated with nests and are likely non-breeders. An index to nesting effort (i.e., Productive Geese) was obtained by combining singles and pairs associated with nests. In 2014, 44.0% of the geese seen were classified as Productive Geese (Table 2).

The 2014 Canada goose breeding population estimate for the surveyed area was very similar to the estimate in 2013 (2.5% decline). Goose number estimates were lower than 2013 in Prairie and Forest Ecoregions, and higher than 2013in the Transition Ecoregion (Table 1). A time-series plot suggests the goose population in the survey area has been reasonably stable over the last 14 years (Figure 2). The 2014 estimated breeding population in a portion of the new August hunting zone that has been surveyed since 2011 was 93,600 (±54,300), which was similar to the 2013 estimate for this zone, 79,700 (±48,000).

Ambient temperatures in Minnesota during April and May of 2014 were below average prior to and during the Canada goose survey, and lake ice-out dates statewide were $\geq$ 10 days later than normal statewide. The below average cold and late ice-out conditions likely affected Canada goose population estimates again in 2014. For a second consecutive year, when the survey started, resident Canada geese were in various stages of pairing, laying and incubation. This is different than the norm, when there is a slight difference in stages between geese in the southern portions of the state, and the north. April and May temperatures well below normal caused birds in the southern third of the state to be anywhere from seeking nest sites to late incubation when the survey started. Ice, which still covered lakes in the northernmost portions of the state on the final day of the survey, may actually have prevented breeding birds from even arriving before the survey was concluded in northern portions of the state.

Wetland and habitat quality were variable in the state this year. Wetland conditions during the Canada goose survey were drier than average in prairie portions of the state, and about average in transition and forested portions of the state. After the survey was completed, heavy rains fell statewide, which may have improved conditions in parts of the state, but likely also flooded some goose nests. One interesting note, very few muskrat houses were seen during the 2014 Canada goose survey. When available, many geese nest on muskrat houses, and the lack of these houses will mean geese must find alternative nesting sites. The late spring likely influenced the number of total geese observed this year. However, although the late spring likely reduced the total number of Canada geese counted on the survey again this year, the numbers of productive geese was higher than in 2013, and close to the average percentage of productive geese counted on this survey. Weather conditions throughout June and July will also influence goose productivity in 2014. Regardless, the total 2014 Canada goose population estimate was above the state Canada goose population goal of 250,000 geese.

With the same number of geese in the population as in 2013, but an overall higher percentage of productive geese, I expect better goose production in Minnesota in 2014 than in 2013, and an overall average production of goslings.

ACKNOWLEDGMENTS

Frank Martin (Univ. of MN) and Steve Maxson were instrumental in the original design of this survey. Steve also was the principal observer during the first 6 years of the survey. Tim Loesch, Christopher Pouliot, and Shelly Sentyrz set up the original 2,700 ¼-section plots using ArcView and were very helpful in getting the survey up and running in 2001. Shelly Sentyrz was also instrumental in helping to restratify plots statewide for the 2008 survey. Chris Scharenbroich and Jacqueline Amor provided GPS coordinates of plots to the pilot, and printed out maps of the 160 plots flown this year. John Heineman piloted the helicopter and served as the second observer. Margaret Dexter was instrumental in coordinating the sampling scheme for the survey, and entered the data. John Giudice provided statistical assistance, and analyzed the data.

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Maxson, S.J. 2002. 2002 Minnesota Spring Canada Goose Survey. Unpublished Report.

Table 1. Spring Canada goose population estimates in Minnesota, 2001-2014.

Year	Prairie	Transition	Forest	Subtotal	95% CI	Metro	**TOTAL**
2001	77,360	95,470	92,390	265,220	±69,500	20,000	**285,220**
2002	135,850	144,900	33,940	314,690	±134,286	20,000	**334,690**
2003	106,520	121,290	56,420	284,230	±78,428	20,000	**304,230**
2004	128,501	130,609	95,636	354,747	±107,303	20,000	**374,747**
2005	113,939	149,286	57,529	320,754	±90,541	17,500	**338,254**
2006	126,042	164,085	67,994	358,071	±108,436	17,500	**375,571**
2007	137,151	99,274	25,509	261,933	±80,167	17,500	**279,433**
2008*	113,483	127,490	30,400	271,372	±69,055	17,500	**288,872**
2009	129,115	114,737	23,644	267,496	±70,607	17,500	**284,996**
2010	83,911	151,902	57,421	293,234	±70,760	17,500	**310,734**
2011	143,266	117,711	91,199	352,175	±119,814	17,500	**369,674**
2012	144,762	166,727	104,710	416,198	±132,344	17,500	**433,698**
2013	104,907	91,652	54,044	250,602	±73,122	17,500	**268,102**
2014	94,664	122,438	27,022	244,123	±77,836	17,500	**261,623**

*Prior to 2008, double-sampling for stratification was used to estimate stratum weights. The entire frame was re-stratified in 2008 (double-sampling was eliminated) and Lake of the Woods and the NW Angle were removed from the frame. The sampling frame was adjusted slightly in 2009 because of some processing errors in 2008. The population estimates for 2008-2014 are based on the updated sampling frame.

Table 2. Percent of Canada Geese seen as singles, pairs, groups, and productive geese on the Minnesota Spring Canada Goose Survey, 2001-2014.

Year	Singles[1]	Pairs[1]	Groups	Productive Geese[2]	Dates of Survey	Number of productive geese
2001	27.0	63.9	9.1	36.4	4/14 to 5/02/2001	103,820
2002	30.7	52.0	17.2	41.5	4/26 to 5/11/2002	138,896
2003	27.9	58.2	13.9	29.3	4/22 to 5/01/2003	89,139
2004	26.5	57.5	16.0	35.5	4/22 to 5/04/2004	133,035
2005	33.0	50.2	16.8	40.7	4/20 to 5/03/2005	137,679
2006	43.5	45.9	10.6	50.3	4/24 to 5/05/2006	188,912
2007	31.0	51.5	17.5	36.2	4/23 to 4/28/2007	101,154
2008	38.4	55.4	6.2	42.6	4/23 to 5/05/2008	123,059
2009	41.8	50.7	7.5	45.2	4/21 to 5/01/2009	128,818
2010	42.5	48.2	9.3	46.6	4/15 to 4/20/2010	144,802
2011	50.3	47.2	2.6	55.7	4/21 to 4/29/2011	205,908
2012	30.0	49.6	20.4	35.1	4/16 to 4/23/2012	152,228
2013	27.0	68.0	5.0	30.0	5/06 to 5/14/2013	80,431
2014	39.3	55.1	5.6	44.0	4/21 to 5/4/2014	115,114

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

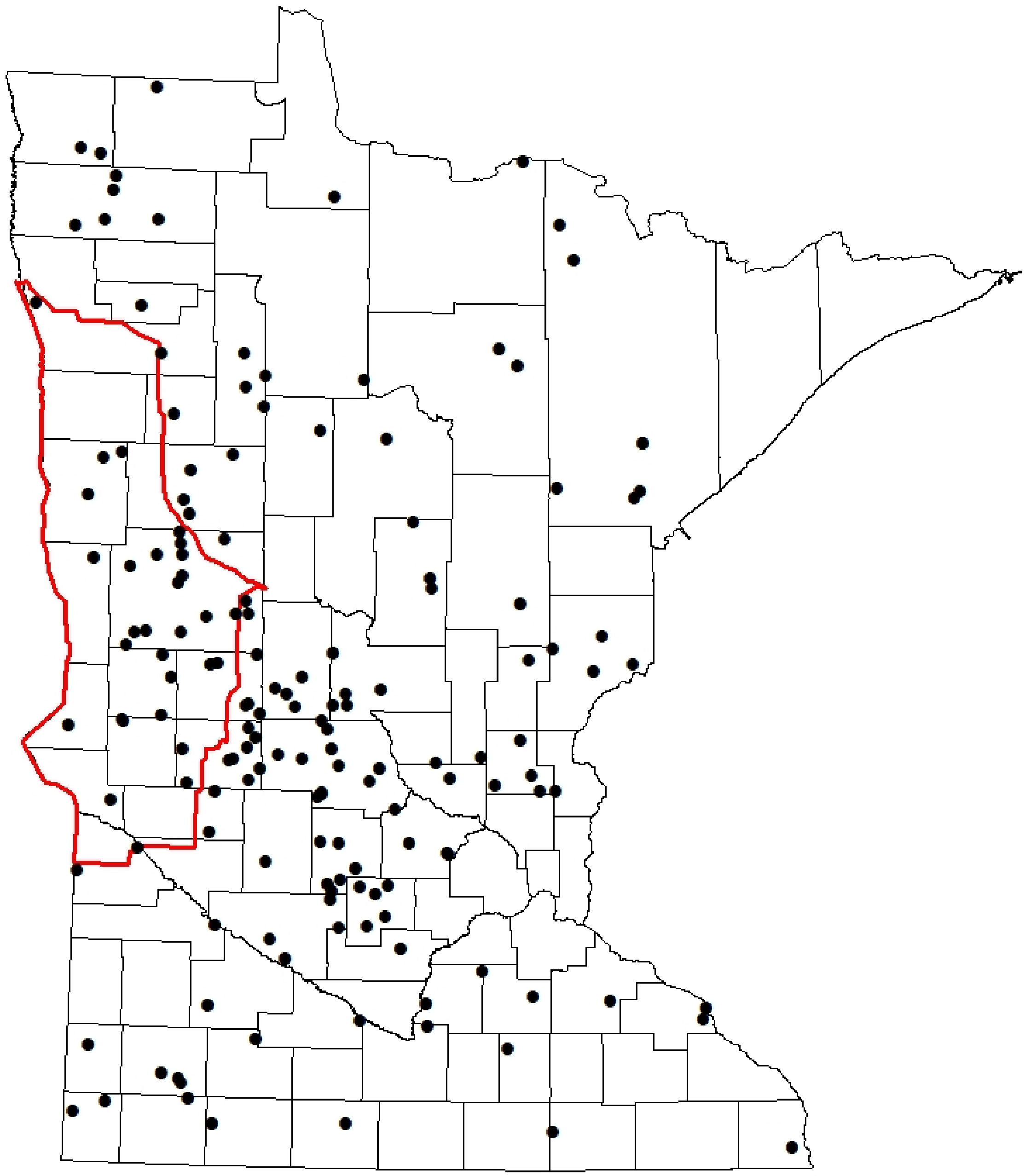

Figure 1. Location of 160 ¼ mi^2 plots surveyed for the 2014 Canada goose breeding pair survey within 3 ecoregions of Minnesota; forest, transition, and prairie. Red outlined polygon was the original location of a possible "new" Early Season Canada goose hunting zone.

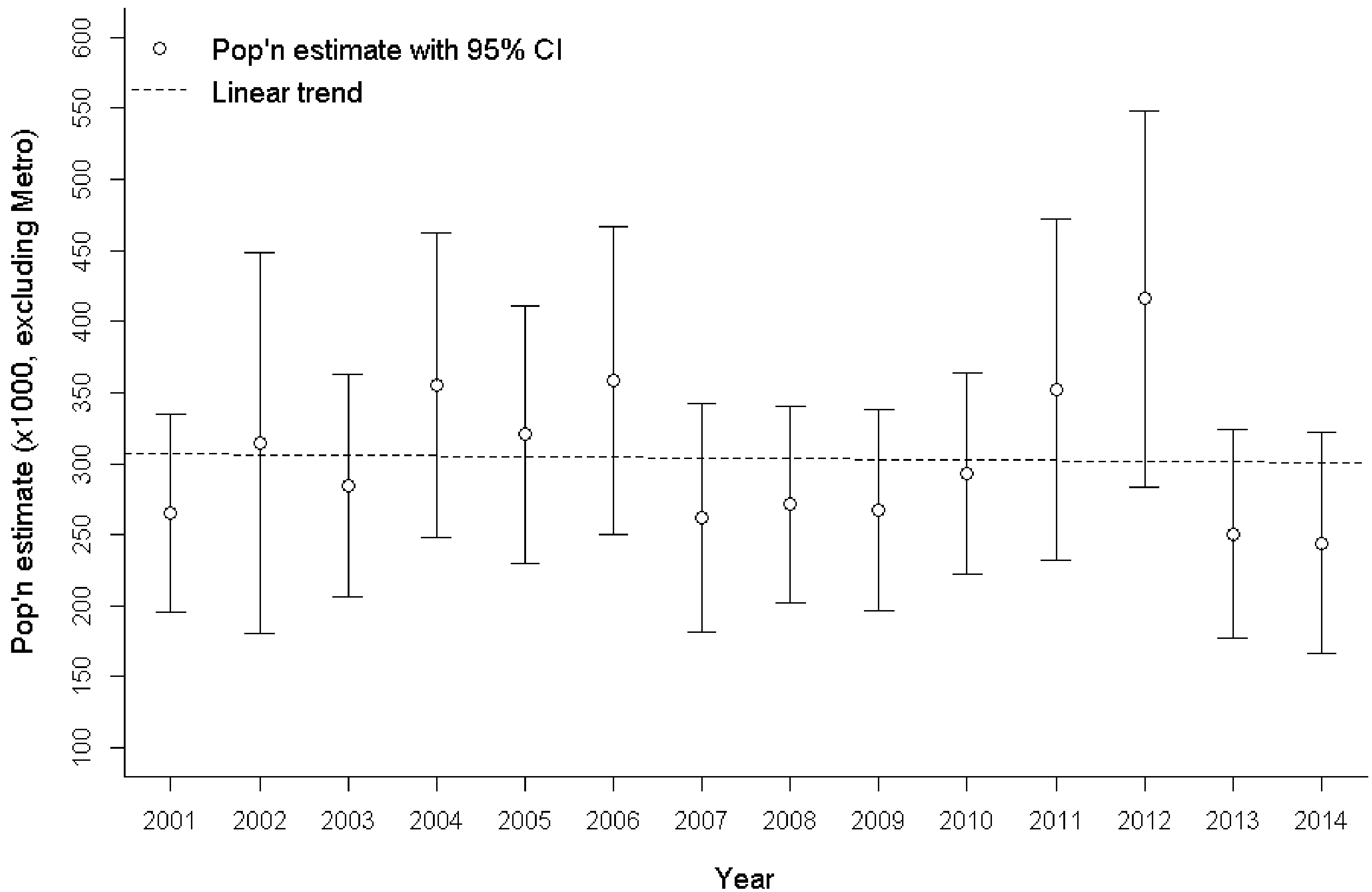

Figure 2. Spring Canada goose population estimates (±95% CI) in Minnesota, 2001-2014. (Does not include Metro area.)

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Seamans, M.E., and T.A. Sanders. 2014. Mourning dove population status, 2014. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 17 pp. The entire report is available on the Division of Migratory Bird Management web site (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

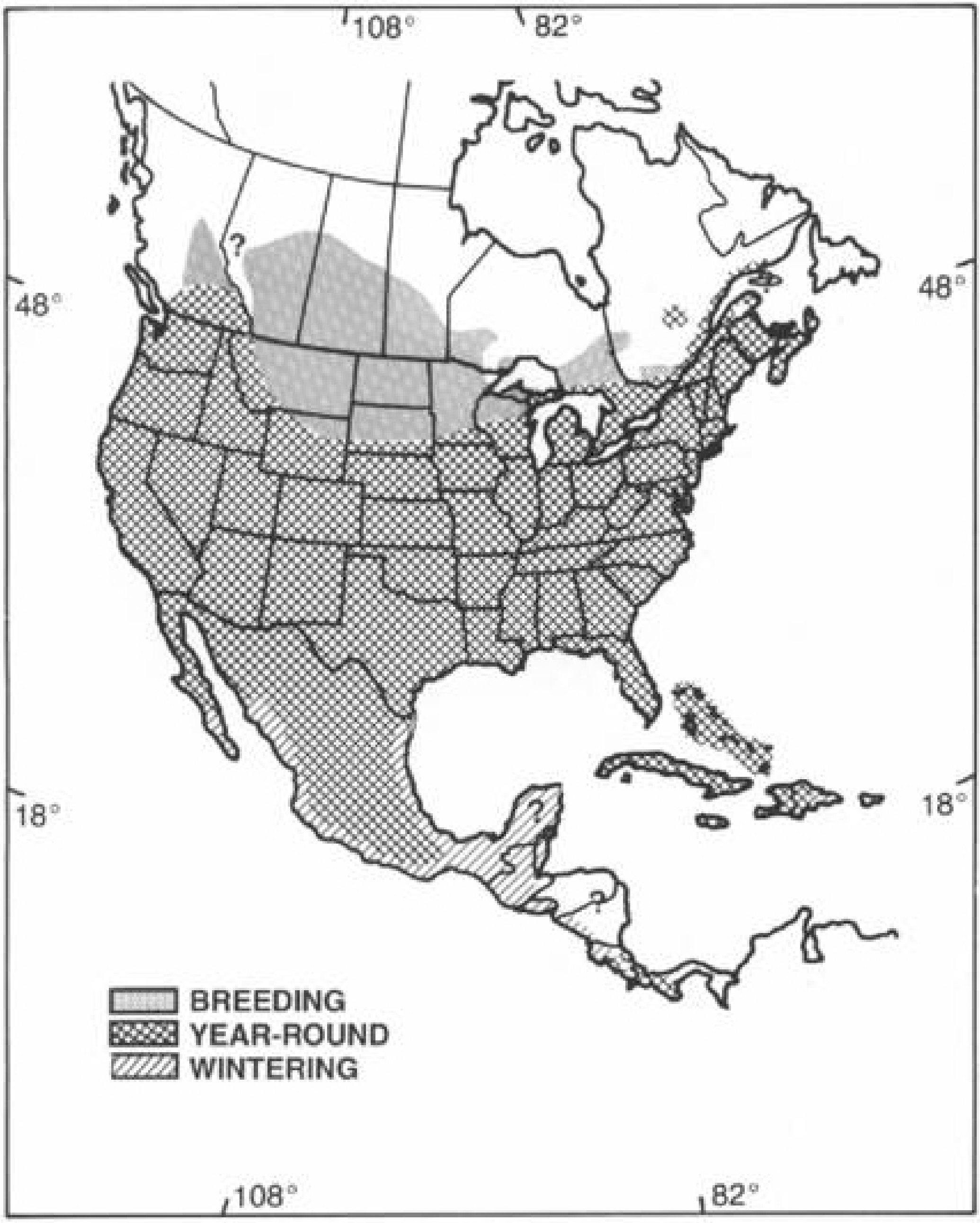

Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). (From: Seamans, M.E., R.D. and T.A. Sanders. 2014. Mourning dove population status, 2014. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 17 pp.)

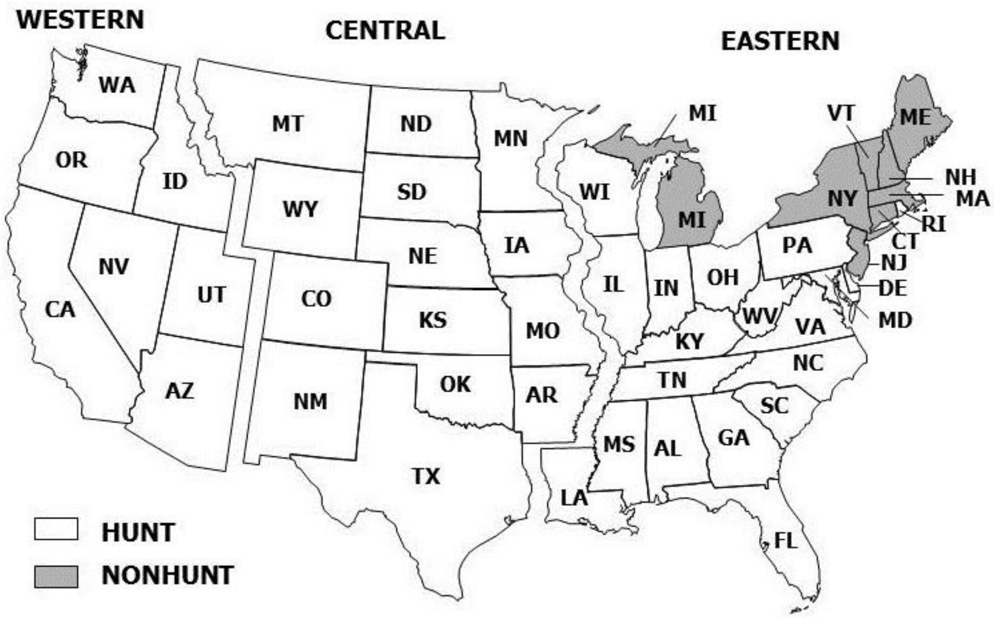

Figure 2. Mourning dove management units with 2014 hunting and non-hunting states. (From: Seamans, M.E., and T.A. Sanders. 2014. Mourning dove population status, 2014. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 17 pp.)

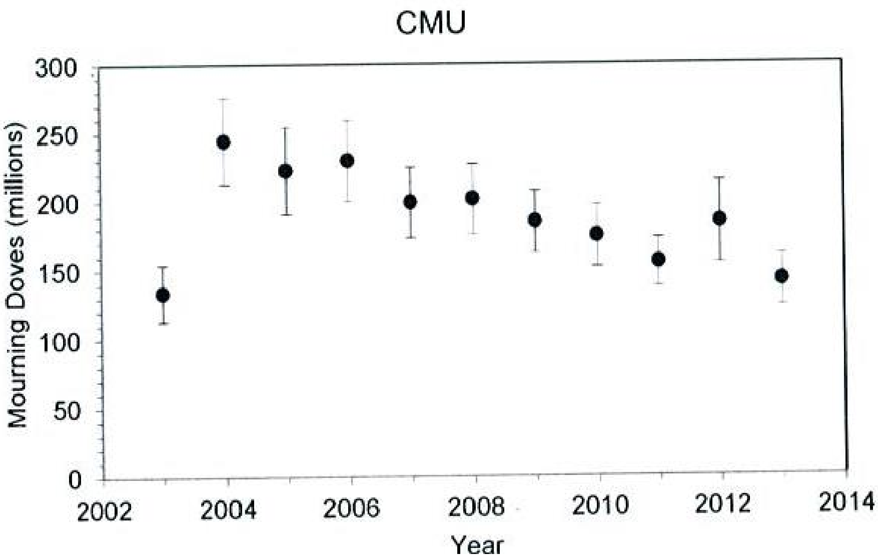

Figure 3. Estimates and 95% confidence intervals of mourning dove absolute abundance in the Central Management Unit (CMU), 2003-13. Estimates based on band recovery and harvest data. (From: Seamans, M.E. and T.A. Sanders. 2014. Mourning dove population status, 2014. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 17 pp.)

Table 1. Preliminary estimates and 95% confidence intervals (CI, expressed as the interval half width in percent) of mourning dove harvest and hunter activity for the Central management unit during the 2011, 2012 and 2013 seasons [a]. (From: Seamans, M.E. and T.A. Sanders. 2014. Mourning dove population status, 2014. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 17 pp.)

Management unit / State	Active Hunters			Hunter Days Afield			Total Harvest		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
CENTRAL	427,700 †	338,700 †	353,000 †	1,444,800±11	1,108,700 ±11	1,185,300±10	7,657,700 ±9	6,361,600 ±14	6,236,000 ±11
AR	25,300 ±20	21,400 ±22	8,900 ±42	63,800 ±34	57,600 ±26	30,100 ±57	519,300 ±43	494,200 ±30	155,900 ±46
CO	15,300 ±14	17,000 ±18	15,600 ±15	44,500 ±24	43,800 ±26	36,900 ±19	178,700 ±14	204,300 ±26	176,900 ±25
IA	5,800 ±11	†[b]	12,900 ±9	19,000 ±17	†[b]	49,400 ±14	56,800 ±21	†[b]	214, 300 ±16
KS	32,800 ±10	12,200 ±39	31,900 ±12	95,800 ±15	49,100 ±52	93,000 ±16	534,800 ±18	244,800 ±62	504,400 ±18
MN	9,400 ±49	6,800 ±52	7,700 ±53	25,100 ±51	21,600 ±48	17,000 ±39	57,300 ±40	65,400 ±75	53,500 ±30
MO	31,600 ±11	23,800 ±29	36,400 ±11	74,600 ±14	51,400 ±50	104,500 ±18	359,600 ±16	296,600 ±81	587,600 ±28
MT	2,200 ±37	200 ±87	1,700 ±46	5,900 ±47	500 ±120	2,900 ±41	14,400 ±61	2,600 ±161	12,000 ± 41
NE	15,500 ±16	13,200 ±17	13,500 ±16	46,900 ±28	39,000 ±17	39,300 ±19	265,500 ±23	223,400 ±20	239,800 ±24
NM	6,700 ±39	9,000 ±11	6,500 ±9	24,600 ±49	38,000 ±17	23,700 ±13	76,900 ±42	160,100 ±17	123,000 ±15
ND	3,700 ±25	4,900 ±30	6,300 ±28	10,400 ±29	17,400 ±36	16,400 ±29	41,800 ±31	78,900 ±37	88,200 ±37
OK	17,100 ±15	15,700 ±14	23,300 ±13	54,200 ±25	49,200 ±19	69,400 ±24	379,400 ±33	349,700 ±26	421,200 ±25
SD	6,200 ±21	4,500 ±22	6,200 ±22	16,300 ±26	14,700 ±28	17,500 ±26	87,200 ±26	65,500 ±28	118,300 ±31
TX	253,200 ±11	207,200 ±13	178,900 ±13	958,600 ±16	720,200 ±16	677,900 ±16	5,061,100 ±13	4,150,800 ±20	3,506,700 ±18
WY	2,700 ±30	2,700 ±32	3,100 ±19	5,100 ±38	6,300 ±38	7,200 ±19	25,000 ±52	25,300 ±40	34,200 ±19

[a] Hunter number estimates at the Management Unit and national levels may be biased high, because the HIP sample frames are state specific; therefore hunters are counted more than once if they hunt in >1 state. Variance is inestimable.
[b] † No estimate available.

American Woodcock information is taken from the U.S. Fish and Wildlife Service report American Woodcock Population Status, 2014. Cooper, T.R. and R.D. Rau. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.
The entire report is available on the Division of Migratory Bird Management home page (http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html).

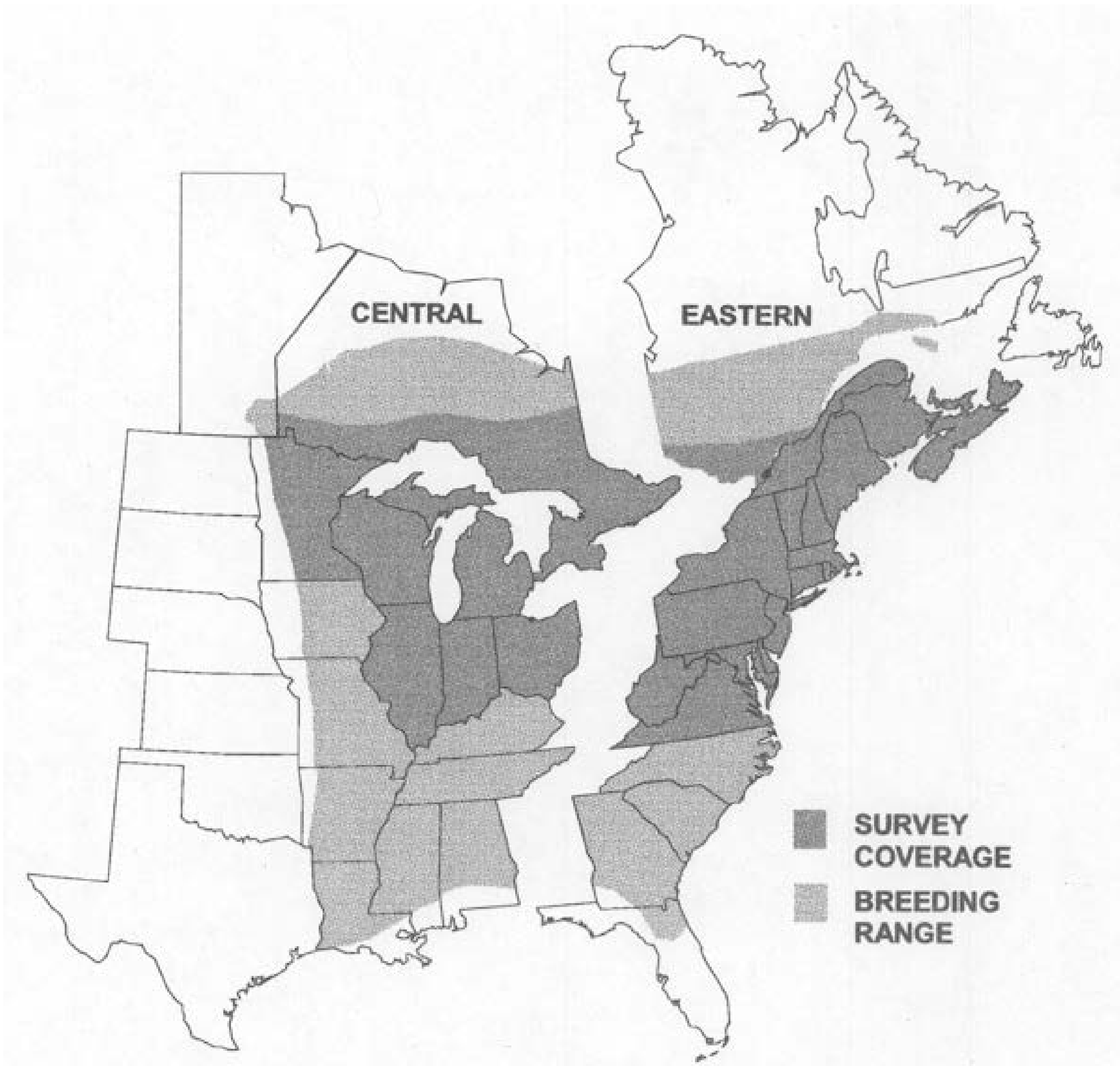

Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 1. Short term (2013 – 14), 10 –year (2004-2014), and long-term (1968-2014) trends (% change per year [a]) in the number of American woodcock heard during the Singing-ground Survey as determined by using the hierarchical log-linear modeling technique (Sauer et al. 2008) (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit/State	Number of Routes[b]	n[c]	2013-14			2004-14			1968-14		
			% Change	95% CI[d]		% Change	95% CI[d]		% Change	95% CI[d]	
				lower	upper		lower	upper		lower	upper
CENTRAL	408	729	-7.26	-14.02	-0.02	- 1.22	-2.08	- 0.36	- 0.90	-1.16	-0.65
IL	12	46	19.68	-66.36	328.50	- 14.12	-24.85	- 4.19	- 1.04	-4.28	2.32
IN	15	60	2.89	-38.43	85.69	- 3.99	- 9.53	1.26	- 4.13	-5.49	-2.88
MB[e]	18	30	4.44	-22.17	43.40	- 1.09	- 2.18	5.36	- 0.31	-2.23	1.75
MI	95	153	-4.36	-15.81	8.59	- 0.53	- 1.93	0.95	- 0.77	-1.17	-0.38
MN	76	120	-7.86	-22.19	8.57	- 0.43	- 2.19	1.38	- 0.09	-0.68	0.53
OH	30	73	-3.61	-27.17	26.80	- 2.61	- 5.80	0.08	- 1.58	-2.38	-0.78
ON	82	157	-2.55	-16.80	14.45	- 1.43	- 3.22	0.42	- 0.90	-1.38	-0.39
WI	80	120	-22.21	-34.41	-7.81	- 0.64	- 2.50	1.29	- 0.76	-1.27	-0.24

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

[b] Total number of routes surveyed in 2014 for which data were received by 3 June, 2014.

[c] Number of routes with at least one year of non-zero data between 1968 and 2014.

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

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

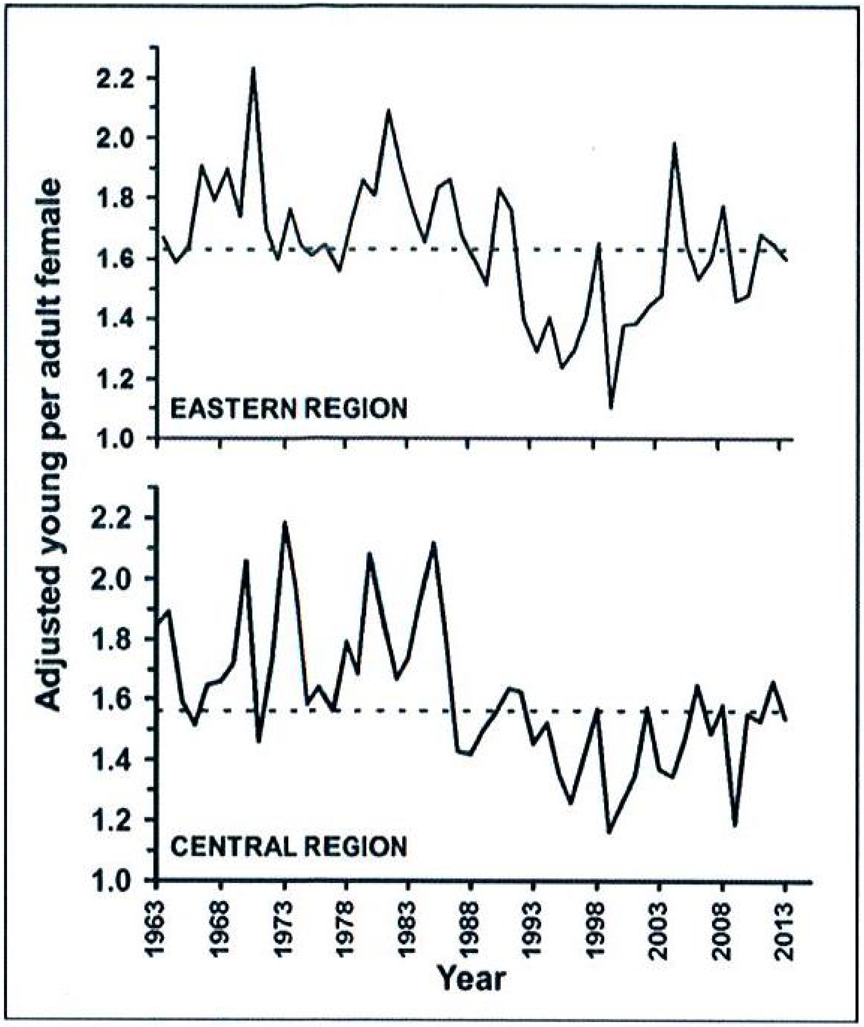

Figure 2. Weighted annual indices of American woodcock recruitment, 1963-2013. Dashed line is the 1963-2012 average. (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

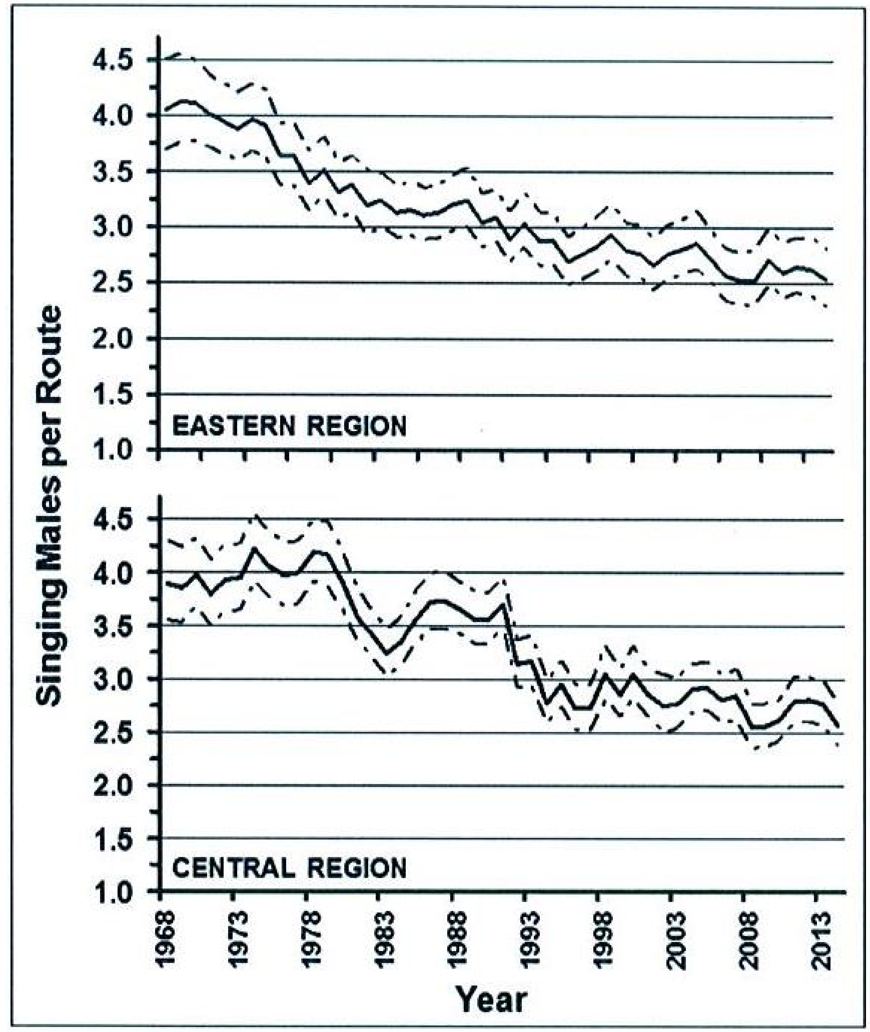

Figure 3. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2014. The dashed lines represent the 95th percentile credible interval. (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 2. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2010-11, 2011-12, 2012-13 and 2013-14 Harvest Information Program surveys. Note: beginning 2008-09 all estimates rounded to the nearest 100 for harvest, hunters, and days afield. (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit / State	Active woodcock hunters ([a])				Days afield ([a, c])				Harvest ([a, c])			
	2010-11	2011-12	2012-13	2013-14	2010-11	2011-12	2012-13	2013-14	2010-11	2011-12	2012-13	2013-14
Central Region	n.a. [b]	n.a. [b]	n.a. [b]	n.a. [b]	392,400 ± 20	350,500 ± 16	276,900 ± 16	306,100 ± 20	233,100 ± 20	231,700 ± 20	193,100 ± 23	180,600 ± 20
IL	800 ± 171	2,900 ± 108	900 ± 175	1,600 ± 128	1,200 ± 123	8,800 ± 131	3,500 ± 172	3,400 ± 119	900 ± 106	3,700 ± 195	1,900 ± 160	1,000 ± 142
IN	1,000 ± 66	1,100 ± 79	400 ± 119	700 ± 77	3,900 ± 89	4,100 ± 86	1,500 ± 122	1,600 ± 58	3,000 ± 134	1,800 ± 102	600 ± 84	1,400 ± 84
MI	31,100 ± 14	28,400 ± 15	25,700 ± 17	30,000 ± 19	159,200 ± 19	144,000 ± 18	121,400 ± 22	123,700 ± 24	93,200 ± 21	106,900 ± 28	74,100 ± 28	79,300 ± 28
MN	13,900 ± 32	17,000 ± 29	11,200 ± 36	10,900 ± 37	55,400 ± 33	76,900 ± 46	40,400 ± 34	74,700 ± 62	34,800 ± 39	44,200 ± 42	31,000 ± 59	18,600 ± 57
OH	1,800 ± 98	3,100 ± 98	600 ± 115	3,000 ± 63	4,300 ± 70	10,200 ± 96	2,600 ± 83	8,600 ± 64	1,700 ± 93	2,300 ± 74	1,500 ± 80	8,600 ± 85
WI	14,600 ± 25	15,200 ±25	13,700 ± 28	14,500 ± 27	65,700 ± 40	69,000 ± 30	58,000 ± 33	60,000 ± 31	42,300 ± 22	42,600 ± 31	40,400 ± 37	38,400 ± 24

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

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

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

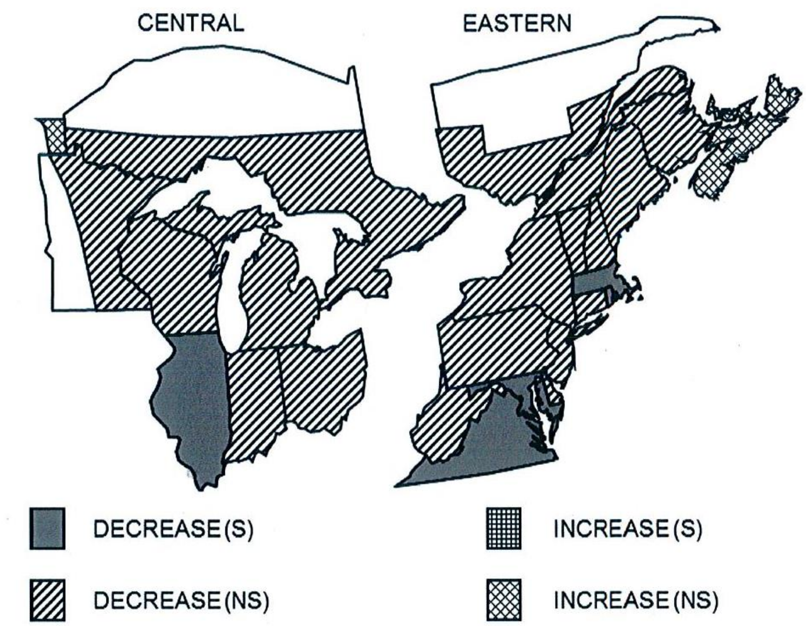

Figure 4. Ten-year trends in number of American woodcock heard on the Singing-ground Survey; 2004-14, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

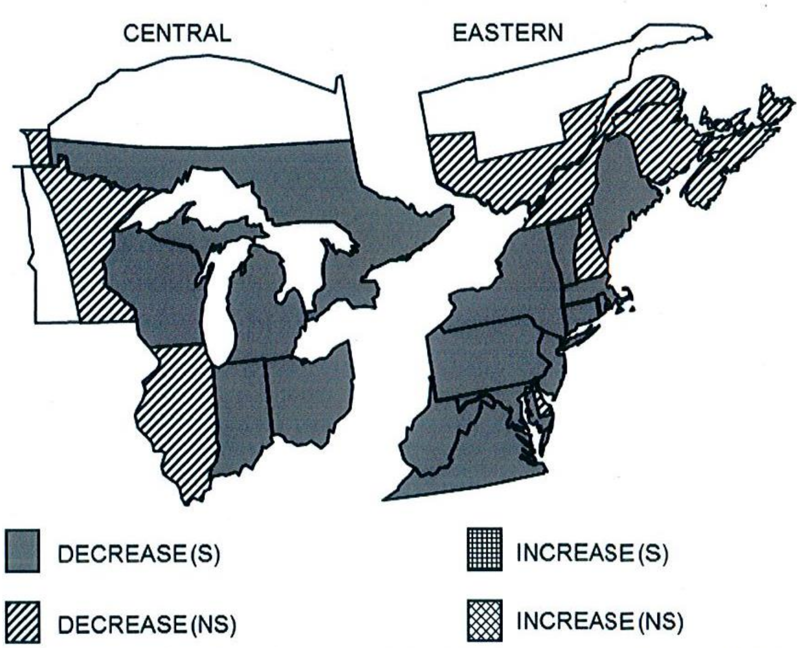

Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-2014, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2014. American woodcock population status, 2014. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

ESTIMATING NUMBERS OF BREEDING SANDHILL CRANES IN NORTHWEST MINNESOTA, 2012-2014

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SUMMARY

We conducted an annual sandhill crane (SACR, *Grus canadensis*) breeding population survey in northwest Minnesota during 2012-2014. In 2013 and 2014, we excluded the portion of the Red River Prairie Ecological Classification System (ECS) Subsection that we surveyed in 2012 due to low crane numbers in the agricultural landscape. We used 4 km^2 plots as the primary sampling unit and used a generalized random-tessellation stratified (GRTS) design to select a spatially balanced sample of 115 plots in each year. We surveyed each sample plot once during May using a Bell OH-58 helicopter with a 2-person crew. We counted and classified all crane observations in each plot based on their social status (individuals, pairs, groups) and evidence of breeding status (e.g., nest, colts, territorial behavior).

We estimated that there were 7,265, 5,550, and 2,285 SACR in the area of Aspen Parklands and some adjacent areas within the Northwest Goose and Crane Zone (NWGCZ) that was consistently surveyed in all 3 years. Habitat conditions were very different with dry conditions in 2012 and wet conditions in 2013 and 2014. We believe that survey timing and arrival of nonbreeding cranes on the breeding grounds may have influenced the count in 2014. This final report documents results of the 3-year pilot survey.

INTRODUCTION

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

When we began the survey, there was no template for a large-scale, aerial survey specifically designed for breeding SACR. Thus, we proposed conducting a pilot survey for three years to provide sufficient information for making intelligent survey-design choices, including developing and evaluating a stratification scheme (e.g., Zicus et al. 2008), answering questions about bias-precision-cost tradeoffs (e.g., Giudice et al. 2010), and identifying important sources of variation in estimates of abundance and population trends (Thompson et al. 1998:149). The survey was designed to provide an estimate of the number of breeding cranes in northwest Minnesota that was within ±25% of the true population size with 90% certainty (i.e., if we could replicate the sample survey many times, 90% of the population estimates will be within ±25% of the true population size).

In 2012, we stratified 4 km^2 plots in the NWGCZ and adjoining Aspen Parkland Habitat based upon amount of expected crane nesting habitat in each plot (Lawrence et al. 2012), and surveyed 60 plots in more likely crane nesting habitat, mostly associated with the Aspen Parkland, (Figure 2) and 30 plots in less likely habitat, which was mostly associated with the Red River Valley. We also surveyed one 100-km^2 plot in an area with previous records of nesting cranes. We did not survey plots that were not expected to have any cranes. For the second and third years of this pilot survey, we used results from 2012 to modify the survey area and focus on parkland habitat where most of the breeding cranes were detected.

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

Here, we describe the survey sampling scheme used in 2012-2014, present population estimates for the 3 years, and discuss future survey plans.

STUDY AREA

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

In 2013, we reduced the size of the survey area to only include plots in the Aspen Parkland ECS subsection and the small area of Agassiz Lowland subsection that was within the NWGCZ. We did not survey any plots in the Red River Prairie ECS subsection because the likelihood of finding nesting cranes in this area was low. Although there were a few Stratum 2 plots (some nesting cover) and several Stratum 3 plots (no nesting cover, but other possible habitat) in the Red River Prairie subsection, there were only 2 SACR observations in plots we flew in this area in 2012. We used the same survey area in 2014 as in 2013.

METHODS

Sampling frame

We used ArcGIS 10.2 (Environmental Systems Research Institute, Redlands, CA) to develop an overlay grid of 4-km^2 plots for the northwestern Minnesota study area (Figure 2). The grid was rotated approximately 2.5 degrees east to orient it with Public Land Survey (PLS) based features such as roads and property boundaries. We treated 4-km^2 plots as the primary sampling unit (PSU) and in 2012 excluded any PSUs not located entirely within the boundary of the SACR survey area (Figure 2). In 2012, we also non-randomly selected a 100-km^2 plot, approximately overlaying Espelie township (EspTwp) in eastern Marshall County, based on previous crane work by DNR staff (S. Maxson, unpublished DNR files).

In 2013 and 2014, we excluded the Red River Prairie survey area because 2012 results indicated that few breeding cranes used this area in May (Figure 3). We also included any PSUs on the border of the survey area where >50% of the plot was located within the boundary of the survey area rather than just PSUs that were located entirely within the survey area.

Sampling design

We used descriptions of crane nesting habitat in northwest Minnesota (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008) to evaluate GIS layers to stratify potential survey plots. Prior to the 2012 survey, we examined land cover data layers contained in Minnesota Gap Analysis Project (GAP; Drotts and Heinzen 2007) and National Land Cover Data (NLCD; Fry et al. 2011) to identify potential nesting cover. Both the GAP and NLCD land cover layers have a cell resolution of 30 meters. We considered 3 preliminary classification scenarios: GAP1 – nesting cover defined as GAP level-4 habitat types 14 (sedge meadow) and 15 (broadleaf sedge/cattail); GAP2 – similar to GAP1 but nesting cover also included habitat type 10 (lowland deciduous shrub); and NLCD - nesting cover defined as cover type 95 (emergent herbaceous wetland). We visually compared data layers associated with crane nest locations from the DNR Rare Natural Features database to decide which GIS data layers to use for stratification (Lawrence et al. 2012). We decided to use the 2006 NLCD to stratify the survey plots for the pilot year and then examine relationships of crane sightings and GIS layers to consider better stratifications in future years.

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

NLCD-1: $\geq$ median amount of nesting habitat,
NLCD-2: $0 < m^2$ of nesting habitat < median,
NLCD-3: nesting habitat = 0 but other SACR habitat > 0,
NLCD-4: no SACR habitat.

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

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

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

In 2013 and 2014, we only sampled plots within the reduced survey area that included all the Aspen Parkland ECS subsection and parts of the Agassiz Lowlands subsection within the NWGCZ (Figures 4 and 5). We included the 95 Stratum 3 plots in the reduced survey area in the sample of plots, but did not survey the 74 Stratum 4 plots in this area. We used the GRTS design to select 115 plots within Stratum 1, 2, and 3 combined, without further stratification. We also recalculated the 2012 estimates based upon the 2013 sample frame. Results from 2012-13 indicated small differences in crane numbers related to the amount of nesting habitat in each stratum (Lawrence et al. 2012, 2013), thus we did not use further stratification in 2014.

Target population(s)

In 2013 and 2014, we chose to not survey the Red River Prairie, thus we did not have an estimate of cranes for the entire NWGCZ and adjacent parkland habitats. However, 2012 results suggest that the area we surveyed in 2013 and 2014 provides a good approximation of the total number of cranes in the zone. In all years, separating breeding and non-breeding components of the population was problematic. We recorded crane observations as singles, pairs, and groups. Groups of SACR likely contain mostly non-breeders (subadults, non-territorial adult birds, and, possibly, failed breeders), whereas the breeding status of singles and pairs is more difficult to determine (Hayes and Barzen 2006). Therefore, for the purposes of this survey, we classified crane observations as follows:

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

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

We determined SACR distribution by calculating the number of single and paired (x2) birds/km^2 in the survey plots. Then density maps were generated from plot density data using the Inverse Distance Weighted and Reclassify tools in ArcGIS ver. 10.2.2.

Survey Procedures

The survey was conducted during mid-May, which is the peak incubation period for cranes in northwest Minnesota (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008). All plots were surveyed using Bell OH-58 [Jet Ranger] containing a pilot and one observer. Plots were surveyed 5-45 meters above ground level at 10-100 km/hr, depending upon the land cover. During the first 2 years of the survey, observations were recorded in digital voice files, each associated with a UTM location, on a tablet computer using the DNRSurvey software program developed by Minnesota DNR Wildlife and GIS staff (Wright et al. 2011). In 2014, we used DNRSurvey ver. 2.11, an ArcGIS addin developed by Minnesota DNR Wildlife and MN.IT Services GIS staff.

RESULTS

Survey effort

The 2014 survey was conducted over 4 days (9, 10, 14, and 15 May) and averaged 29 plots/day (range: 14-43). The survey timing (Figure 6) was slightly later than in 2012 (7-11 May, 14-15 May), but earlier than in 2013 (17, 22, 23 May). The survey team (DNR pilot John Heineman and observer Jeff Lawrence) spent an average of 7 min surveying each plot (range: 2.3 – 19.4 min), similar to 2013 but less than the 9 minutes/plot in 2012 (Table 1). Fifty percent of the total aerial survey time in 2014 was associated with surveying plots.

Sampling statistics

We detected SACR on 37 (32%) of the 115 sample plots in 2014 compared to on 53% and 43% of the plots in 2012 and 2013 (Table 2), respectively. The average count per occupied plot was 2.4 birds, also less than the 4.4-4.9 in 2012 or 2013. In 2014, we counted 89 SACR on sample plots, of which 43% were pairs, 43% were singles, and 15% were groups (Table 3). We observed 5 groups, which ranged in size from 3 to 6 birds. We did not see as many groups (11 in 2012, 8 in 2013) or the larger groups that were recorded in the 2 previous surveys. In 2014, about 15% of the birds observed were in groups compared to approximately 40% in 2012 and 2013 (Table 3). Thirty percent of observed pairs and singles exhibited some evidence of being breeding birds (32% of pairs and 29% of singles), similar to the previous years (Table 3). In 2014, we detected 17 nests; 15 nests had 2 eggs and 2 nests had 1 egg. We detected 20 nests each in 2012 and 2013.

Population estimates and Distribution

The estimated total number of cranes declined (Z-test, P=0.004) to 2,285 (90% CI: 1,720-2,850) in 2014 compared to 5,550 (90% CI: 3,580–7,510) in 2013 (Table 4). The population in the reduced survey area was an estimated 7,260 (90% CI: 4,160–10,370) in 2012. The 2014 estimate was less than in 2012 or 2013 (see confidence intervals, Figure 7). These are minimum estimates because we did not adjust for detection probabilities (which are likely <1, at least for singles and pairs in dense cover). If our sample of singles and pairs exhibiting breeding behavior was representative of the relative abundance of breeding birds in the target population, then we estimated there were a minimum of 1,450, 950, and 590 breeding birds in the survey area in 2012-2014, respectively (Table 4). The estimate of breeding birds in 2014 was similar to 2013, but less than 2012.

In 2014, the bound on the estimated total (all strata) met the usual target level for a Minnesota Department of Natural Resources (MNDNR) wildlife survey (i.e., CV = 15% and relative bound = 25%). This was not true in 2012 and 2013, when one plot in each year had a high count of birds (46-49 birds) which increased the estimated population variance. The estimated CV for breeding birds and status-unknown birds was greater than the target (20-23%; Table 4).

Cranes were distributed throughout much of the study area, but indicated lower densities in the northeast and portions of the southern Aspen Parkland survey area (Figure 8). These areas had less nesting cover (Figure 2), but there were other areas on the western side of the Aspen Parklands that had limited nesting cover yet had nesting cranes.

Habitat associations

We did not stratify the plots by amount of potential crane habitat in 2013 or 2014 because we saw little benefit to this during the 2012 survey (Lawrence et al. 2012). In 2012-14, there were only weak relationships between plot counts (total birds or breeding birds) and amount of potential nesting cover as defined by NLCD and GAP cover data (Figure 9). However, there was a positive relationship between the probability that a plot would contain cranes and the amount of NLCD nesting cover (Figure 10).

DISCUSSION

Survey Effort and Design Considerations

The surveys in 2013 and 2014 were completed in 3-4 days compared to 7 days in 2012. The shorter surveys in 2013 and 2014 were in part due to the reduced survey area compared to 2012, but we also flew longer each day. We flew all 115 plots in 26-28 hours of helicopter time in 2013-14 compared to 37 hours in 2012. The additional helicopter time in 2012 was due to the larger survey area and the resurvey plots (Lawrence et al. 2012).

In 2014, we began the survey on 9 May which was 8 days earlier than 2013 and 2 days later than 2012. Spring and ice out in 2014 were late relative to historical averages, but ice out was about 9 days earlier than 2013. (http://www.dnr.state.mn.us/climate/journal/2014_ice_out_recap.html). 2013 was characterized by a late spring and near record late ice out on Minnesota lakes (http://climate.umn.edu/doc/journal/ice_out_recap_2013.htm). This was in contrast to the near record early spring in 2012 (http://climate.umn.edu/doc/journal/warm_spring2012.htm). In 2012, we observed some SACR colts during the survey even though we began 1 week earlier than originally scheduled. We did not observe any colts in 2013 and believe our survey timing was good and likely near mid-incubation. However, in 2014, the number and size of groups was smaller than in previous years and the number of pairs declined, too. This suggested that the survey may have been flown too early in 2014.

Timing of the SACR survey may be critical to getting consistent results. Survey timing may need to vary dependent upon spring phenology and crane activity. Prior to the 2012 survey, we planned to begin the survey on 14 May; however, we began on 7 May due to the early spring phenology. The delayed start in 2013 was appropriate, and although there was a decline in proportion of detected breeding pairs, many birds were associated with nests and no young were observed. In 2014, we began early and fewer pairs and groups were observed.

Similar to the last 2 days of the survey in 2013, conditions were very wet when we flew the 2014 survey. There was standing water in some fields and rivers were high. Conversely, onditions were extremely dry in 2012. They were also extremely dry on the first day of the 2013 survey, but then rainfall (~7.4 cm in Thief River Falls) forced us to delay the survey until 22 May. The landscape had changed dramatically when we resumed the survey, with standing water in many fields, flooded rivers, and likely increased water levels in many wetlands. We suspect some crane nests were flooded in 2013.

Population Estimate

The number of cranes was lower in 2014 than 2012, but was not different between 2012 and 2013 although the point estimate declined by 28% (95% CI =-62% to +38%). Generally, precision of our aerial breeding population surveys (e.g., May waterfowl, Canada goose) is not adequate to determine annual changes to populations, but the surveys provide guidance on long-term population trends. For the SACR survey, we would need approximately a 50% change in the breeding population or a 40% change in the breeding pair estimate to detect a difference between years. This was only the third year of the crane survey, thus we do not know how much annual variability in population estimates we will observe. It is possible the decline in the point estimates observed in crane population size was also partially due to spring phenology. Future surveys will provide insights on changes in estimates of population size and whether there is a trend.

In 2013, we reduced the size of the survey area to what we believe, and 2012 survey results supported, was the core SACR breeding habitat in the NWGCZ. There were a few nesting birds in the Red River Prairie subsection in 2012, but they accounted for 290 of the 7,200 estimated birds (Lawrence et al. 2012). We do not know how strong the affinity is for nonbreeding birds to be associated with SACR nesting habitat that we used to select the survey plots. We did not record any flocks in the Red River Prairie in 2012, but it is possible that nonbreeders may use these agricultural habitats. We suspect there may have been a reduced nesting effort in 2013 and in 2014 due to the delayed spring, and a larger proportion of the population may have been nonbreeders. This was evident in Minnesota's Canada goose breeding population (Rave 2013); however, the timing of goose nesting is earlier than SACR nesting. We note that in 2012, we questioned if some cranes had foregone nesting due to the extremely dry conditions.

Our estimates of breeding and status unknown birds was reasonably precise (CV% $\leq$ 23%). Much of the variability in the population estimates is due to the groups that tend to use agricultural fields, thus their distribution on the landscape is difficult to predict relative to nesting cranes. In 2012 and 2013, one plot contained 42-48% of the cranes in groups. In 2014, the sample did not include a plot with a large group(s) and the number of birds in groups indicated a substantial decline. We may consider using breeding and status unknown birds (singles and pairs) to provide a better index of the status of population trends in the future.

We suspect most of the unknown-status pairs were likely nonbreeders, although some may have been failed nesters. Some nests were likely flooded with the increase in water levels following the rainfall during the 2013 survey. A portion of the unknown-status singles likely had a mate on an undetected nest. All singles recorded as breeders were observed on a nest and it is likely that these birds had an undetected mate in the vicinity, although some may have been off plot. Usually, there were no other singles on any of these plots that could have been mates, although we are uncertain how far the mate may be from the bird on the nest.

Survey Evaluation

Post-hoc stratification analyses of 3 years of survey results indicate that NLCD was not a very effective stratification variable at the plot level, although there was a weak positive correlation (Figure 9). Additional cover attributes may be needed to increase stratification effectiveness. For example, many crane observations were in or adjacent to agricultural fields (e.g., feeding sites). Thus, developing an effective stratification scheme for the SACR survey may require a more sophisticated suite of habitat metrics. However, we did see a relationship between the presence of cranes and the amount of NLCD habitat, suggesting that more nesting habitat increased the probability of $\geq$1 crane being present on a plot.

After 3 years, we have UTM coordinates of crane nests and approximate locations of crane observations, which will allow us to examine habitat associations at finer scales (e.g., 1-km^2 subplot) and explore the utility of using other land-cover data sources to stratify the sampling frame. Our efforts to stratify were based upon potential nesting cover, which may not reflect the distribution of nonbreeding cranes. Many of the non-breeders were observed in agricultural habitats.

We have learned a great deal during the 3 year pilot survey, but our results also raised several questions. It is unlikely the population decline was as substantial as indicated during these 3 surveys. Other information may suggest a decline, but of a smaller magnitude.

In 2009, MNDNR wildlife managers began formally counting cranes as part of the statewide August Roadside (Pheasant) Survey. The numbers of cranes counted during this survey showed relatively high numbers of both adults and juveniles in northwest and east-central Minnesota (Figure 11, N. Davros and R. Curtis, MN DNR, 2014 unpublished report, http://files.dnr.state.mn.us/recreation/hunting/pheasant/roadside_survey.pdf). The population index for cranes in northwest Minnesota suggests a decline since 2012, in contrast to an increase in central and east-central Minnesota (Figure 11). Thus, the August Roadside Survey provides some information on relative abundance, but probably has low power for detecting anything but a large-magnitude population change. The August Roadside Survey does not provide an estimate of the actual size of the breeding population.

Agassiz National Wildlife Refuge (NWR) began counting pairs of cranes on and near the Refuge in 2011 (G. Knutsen, 2014, Agassiz NWR Breeding Sandhill Crane Survey Results, unpublished report). Counts of crane pairs at Agassiz NWR were lower in 2013 and 2014 than in 2011 (*n* pairs = 28, 20, and 19 in 2011, 2013, and 2014, respectively). Crane surveys were not conducted at Agassiz in 2012.

While there is evidence that the population of cranes is lower in northwest Minnesota than when we began the survey in 2012 (this survey, August Roadside s\Survey, Agassiz NWR Breeding Sandhill Crane Survey), we believe the magnitude of this decline was overestimated due to incorrect timing of the helicopter survey, especially in 2014. The lack of non-breeding cranes, both pairs and groups, suggest that this portion of the overall population may have not been present on the survey area in 2014. Alternatively, they may have not been present on the plots; however, we did not observe as many cranes during transit between plots in 2014 as in 2012 and 2013, suggesting that nonbreeders had not yet reached the breeding grounds.

We had hoped to establish a baseline population level with the 3-year pilot survey and then use other information (e.g. August roadside counts) to provide an index to population change over time. However, the low count in 2014 led us to plan for an additional helicopter crane survey in northwest Minnesota in 2015. The random plot selection used in 2012-2014 provides the most appropriate estimate of breeding population size. However, we will consider the utility of using the same sample of plots (e.g. similar to the same transects in the May breeding waterfowl survey) or perhaps use a mixture of random plots and resample plots as was used in the ring-necked duck helicopter survey (Herwig 2010) to better determine population trend.

We will further evaluate the habitat associated with crane observations and consider other options for improving the survey prior to next year. We plan to conduct the survey again in May 2015.

ACKNOWLEDGEMENTS

This project was funded by a grant from the U.S. Fish and Wildlife Service Webless Migratory Bird Program and the Minnesota Department of Natural Resources. Special thanks to pilot John Heineman, who did an exceptional job flying the helicopter and helping with the survey during all 3 years. The Thief River Falls DNR Wildlife office provided support with the helicopter fuel truck in 2012. Steve Cordts suggested the initiation formal counts of cranes during the August Roadside Survey.

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Table 1. Survey effort (minutes) by activity for an aerial survey of sandhill cranes in Minnesota, May 2012-2014.

		Survey time			Transit time			Total time[a]	
Year	Stratum	Total minutes	Plots	Min/ plot	Total minutes	Number transits	Min/ transit	Total minutes	Min/plot
2012	NLCD-123	822	90	9.1	663	104	6.4	1,485	16.5
	EspTwp	310	25	12.4	16	6	2.7	326	13.0
	All	1,132	115	9.8	679	110	6.2	1,811	15.7
2013	All	766	115	6.7	620	125	5.0	1,386	12.1
2014	All	758	115	6.7	776	131	5.0	1,534	13.3

[a]excludes visibility surveys conducted in 2012.

Table 2. Sampling statistics [a] for an aerial survey of sandhill cranes in northwestern Minnesota, May 2012-2014.

								Counts/occupied plot				
Year	*n* strata	Sampling allocation	nh	Nh	srate	n.occ	p.occ	min	max	med	mean	SE
2012	3	~Optimal	115	3,160	0.036	51	0.47	1	43	2	4.9	1.27
2013	1	SRS[b]	115	2,953	0.039	49	0.43	1	46	2	4.4	1.06
2014	1	SRS	115	2,953	0.039	37	0.32	1	10	1	2.4	0.31

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

[b]simple random sample.

Table 3. Social and breeding classification of sandhill crane observations, 2012-2014.

Social class[a]	2012 Count	2012 Proportion of total	2012 Proportion of pairs and singles	2013 Count	2013 Proportion of total	2013 Proportion of pairs and singles	2014 Count	2014 Proportion of total	2014 Proportion of pairs and singles
Pairs (x2)	114	0.48		92	0.43		38	0.43	
Breeding birds	50	0.21	0.44	28	0.13	0.30	12	0.14	0.32
Status unknown	64	0.27	0.56	64	0.30	0.70	26	0.29	0.68
Singles	37	0.15		34	0.16		38	0.43	
Breeding birds	8	0.03	0.22	9	0.04	0.27	11	0.12	0.29
Status unknown	29	0.12	0.78	25	0.12	0.73	27	0.30	0.71
Groups	89	0.37		90	0.42		13	0.15	
Total	240	1.00		216	1.00		89	1.00	

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

Table 4. Population estimates (N) by indicated breeding status for sandhill cranes in northwestern Minnesota, May 2012-2014.

Year	Survey Area	Status	Plots surveyed	Total plots	n plots with cranes	Minimum cranes/plot	Maximum cranes/plot	Avg. birds/plot	SE birds/plot	^ N	SE	LCB (90%)	UCB (90%)	CV %
2012	With Red River Valley	Breeding birds[b]	115	3,160	28	1	4	0.5	0.08	1,447	264	1,014	1,881	18
		Groups	115	3,160	9	3	37	1	0.49	3,013	1,545	472	5,554	51
		Status unknown[c]	115	3,160	40	1	6	0.9	0.13	2,751	415	2,069	3,433	15
		Total	115	3,160	51	1	43	2.3	0.58	7,211	1,818	4,220	10,202	25
2012[a]	Without Red River Valley	Breeding birds[b]		2,953						1,416	268	975	1,857	
		Groups		2,953						3,100	1,606	458	5,742	
		Status unknown[c]		2,953						2,749	424	2,052	3,446	
		Total		2,953						7,264	1,885	4,163	10,365	
2013	Without Red River Valley	Breeding birds[b]	115	2,953	22	1	2	0.3	0.05	950	158	691	1,210	17
		Groups	115	2,953	6	3	43	0.8	0.38	2,311	1,122	466	4,157	49
		Status unknown[c]	115	2,953	36	1	6	0.8	0.11	2,285	318	1,763	2,808	14
		Total	115	2,953	49	1	46	1.9	0.40	5,547	1,194	3,582	7,511	22
2014	Without Red River Valley	Breeding birds[b]	115	2,953	15	1	4	0.2	0.05	591	135	368	813	23
		Groups	115	2,953	3	3	6	0.1	0.05	334	162	68	600	49
		Status unknown[c]	115	2,953	26	1	9	0.5	0.09	1,361	276	907	1,815	20
		Total	115	2,953	37	1	10	0.8	0.12	2,285	346	1,716	2,855	15

[a] 2012 data adjusted to reflect 2013-14 sampling frame.

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

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

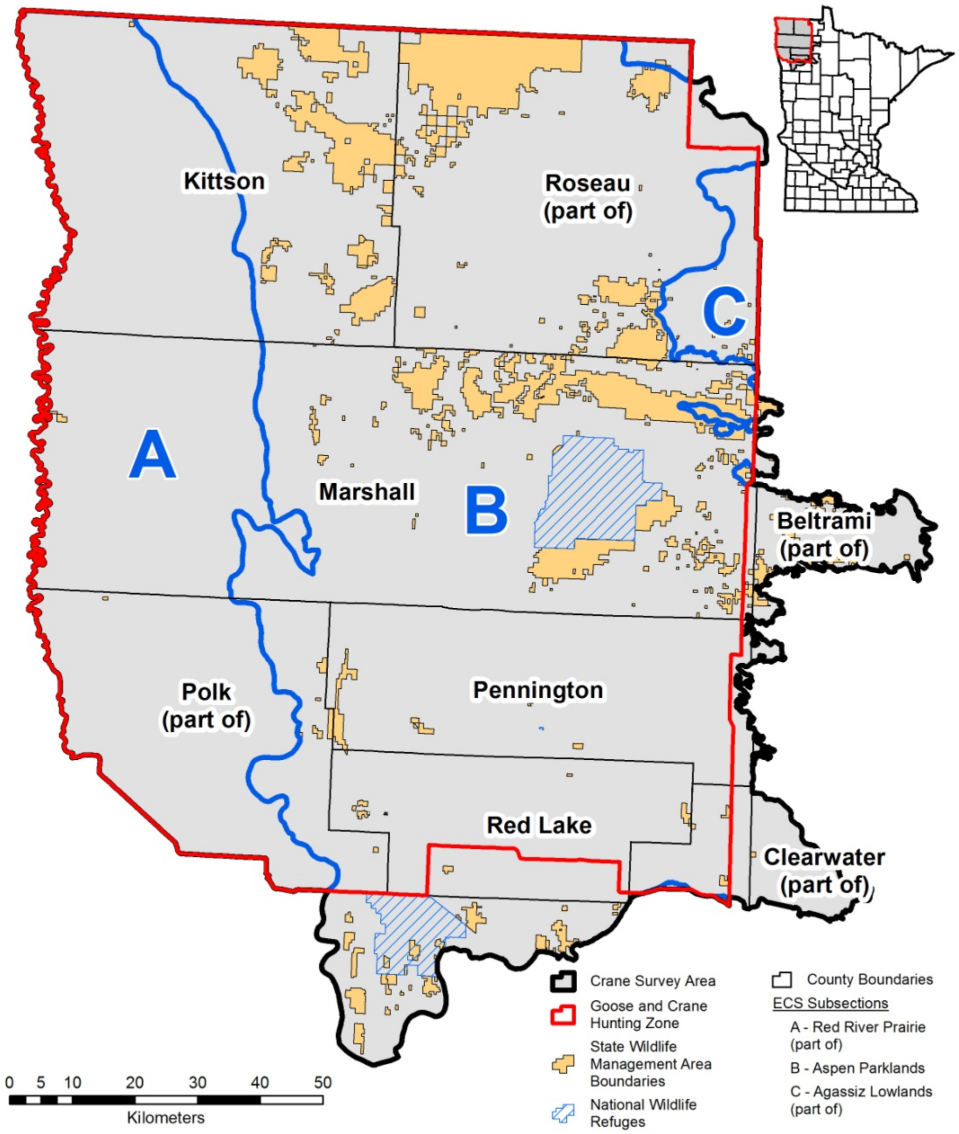

Figure 1. Location of the Northwest Goose and Sandhill Crane Hunting Zone in Minnesota and the sandhill crane survey area. ECS subsection A (portion of Red River Prairie) was surveyed in 2012 but not in 2013 or 2014.

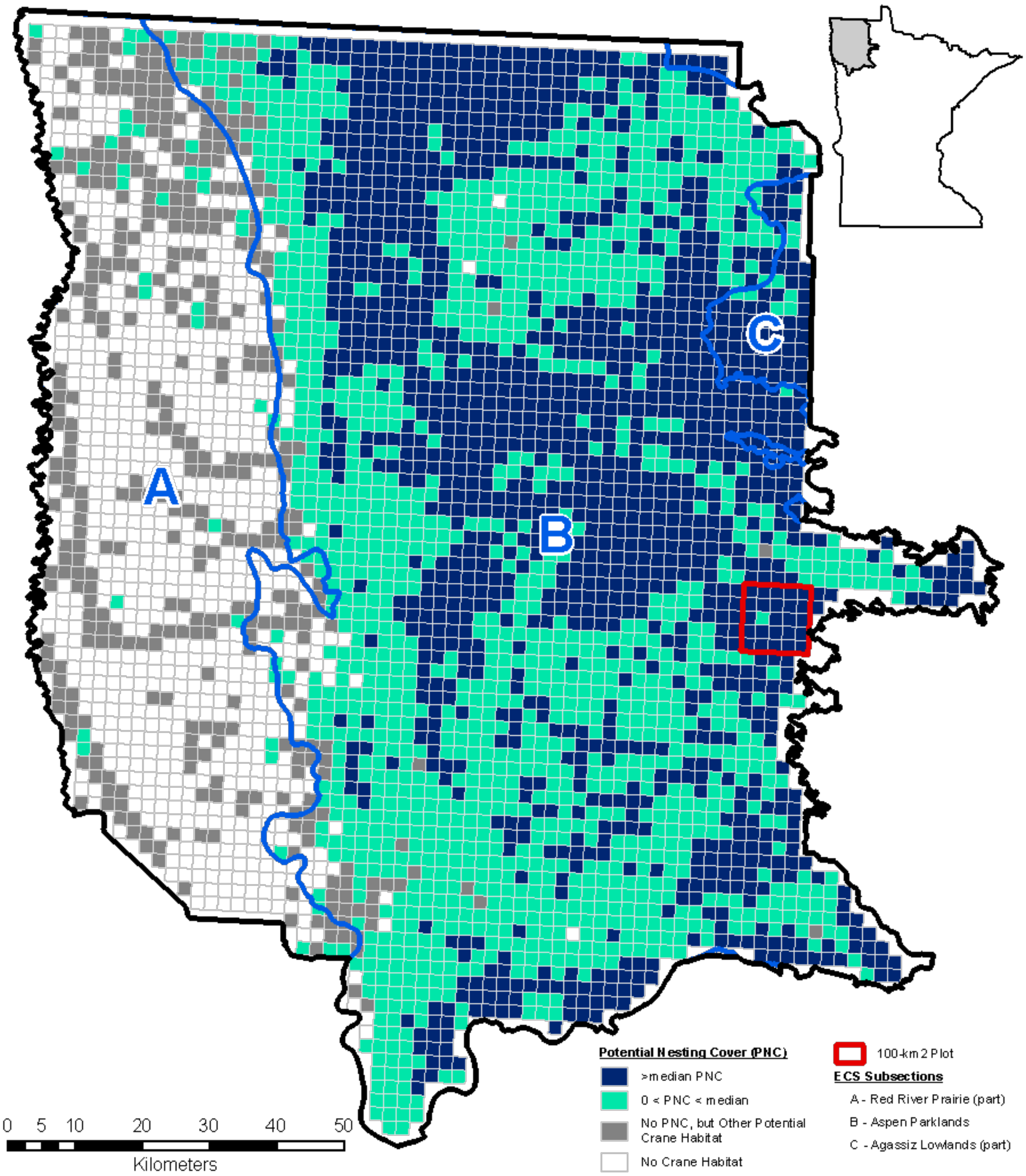

Figure 2. Sampling frame for the spring aerial survey of sandhill cranes, northwestern Minnesota. The primary sampling unit was 4-km^2 plots. Colored squares denote plots by strata as defined by National Land Cover Data: dark blue = NLCD-1 (>median amount of potential crane nesting cover [PNC]), turquoise = NLCD-2 (0 < potential nesting cover < median), gray = NLCD-3 (no nesting cover but other potential crane cover), white = NLCD-4 (no crane habitat). Black lines denote the boundaries of the survey area and blue lines note boundaries of ecological subsections. In 2012, we selected plots from strata 1-3 in the 3 subsections above (see text). In 2013 and 2014, we excluded plots in the Red River Prairie ECS subsection (A above) and did not survey the 100-km^2 plot. Also, note there were additional plots on the edge of the survey area in 2013 and 2014.

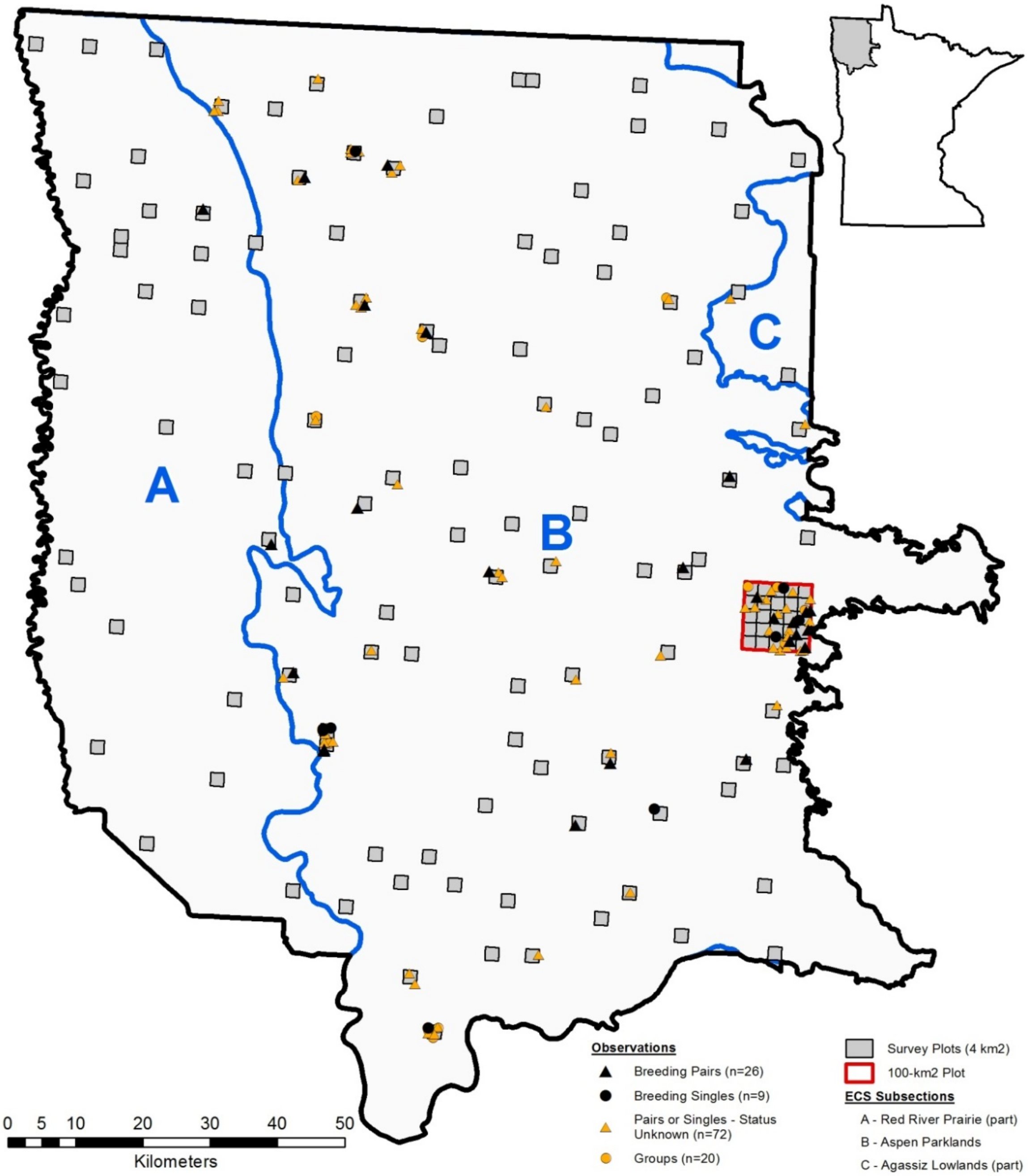

Figure 3. Distribution of sample plots (n = 115) and sandhill crane observations by type in the 2012 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 16,350 km^2.

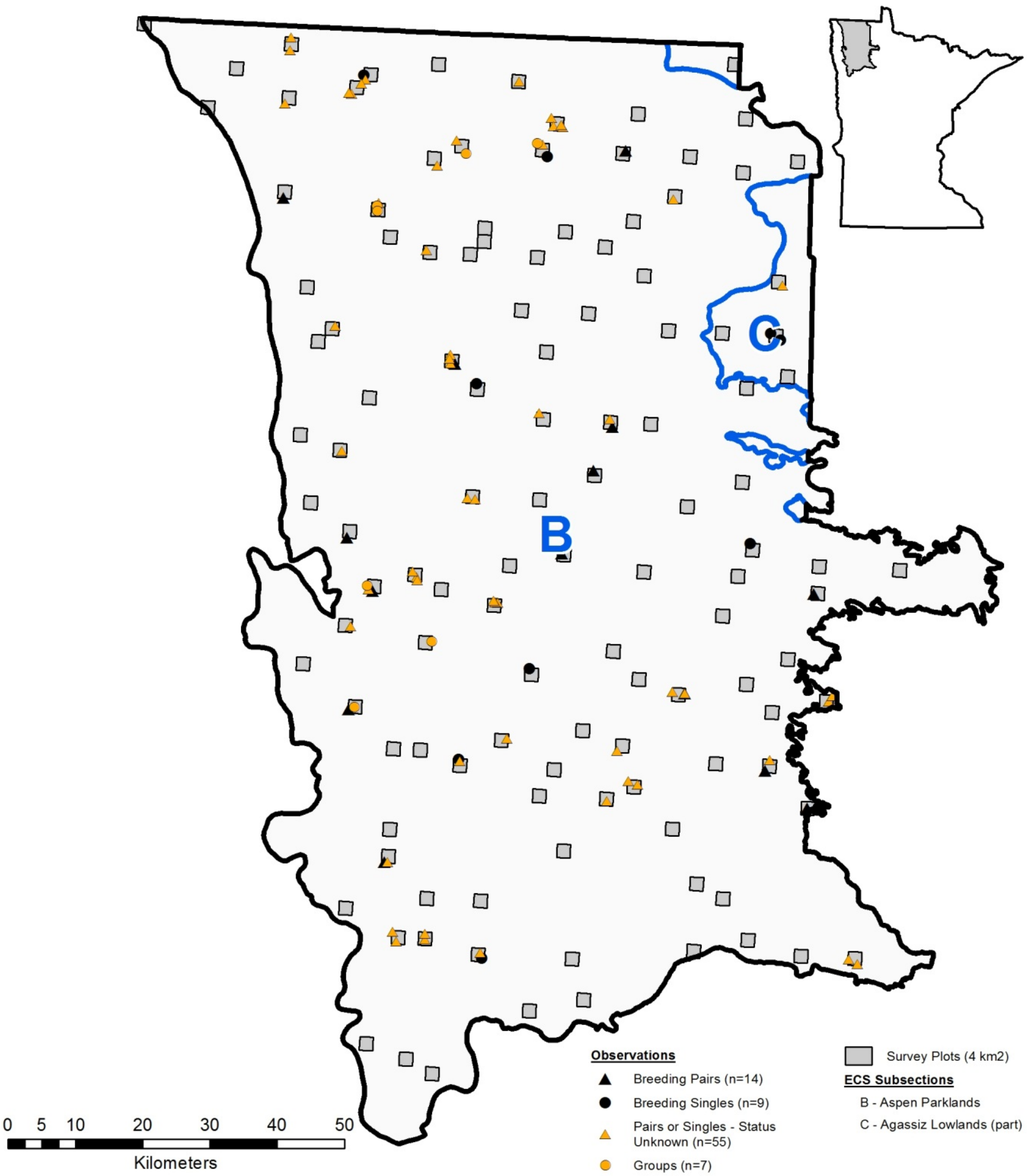

Figure 4. Distribution of sample plots (n = 115) and sandhill crane observations by type in the 2013 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 11,812 km^2.

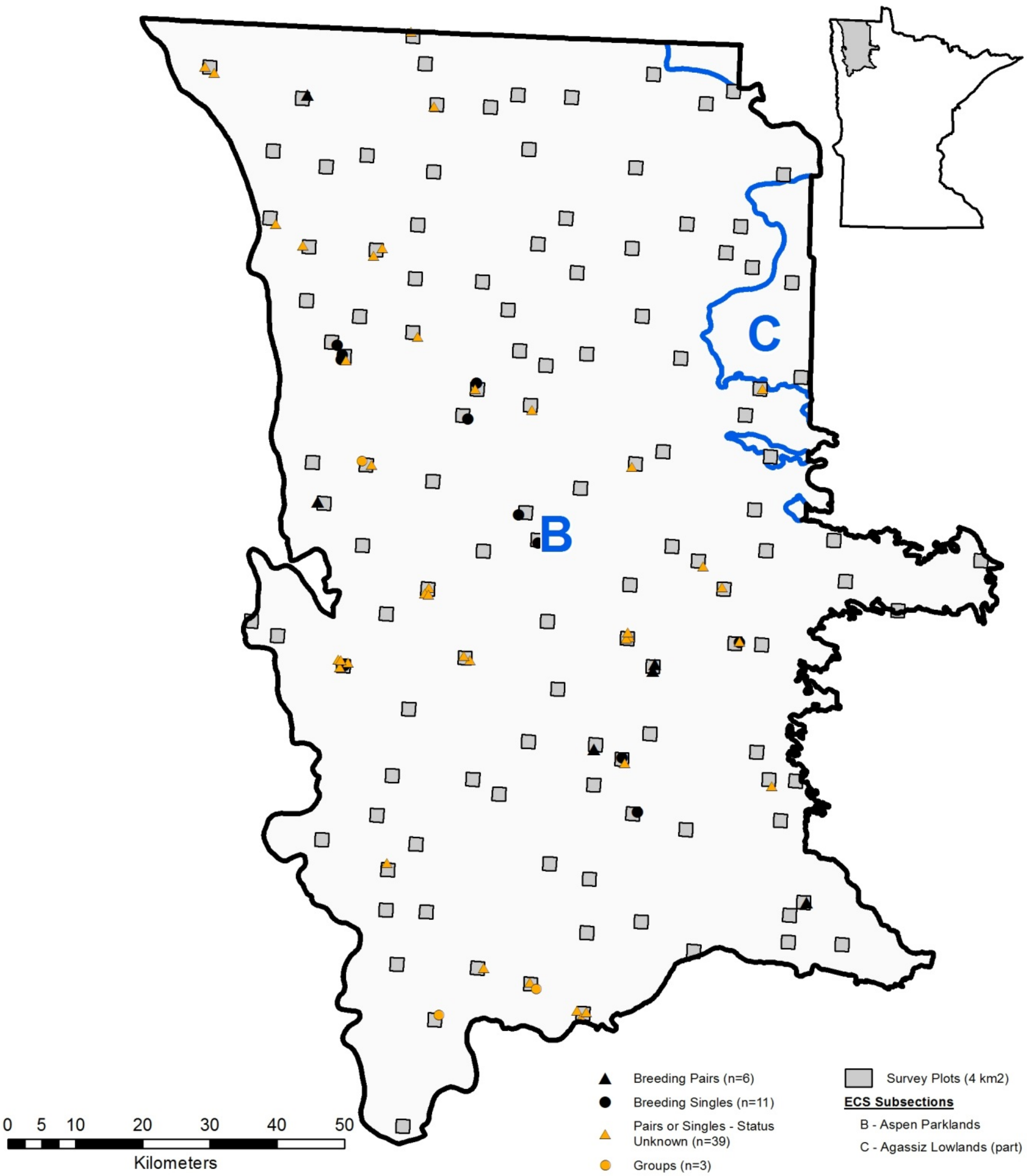

Figure 5. Distribution of sample plots (n = 115) and sandhill crane observations by type in the 2014 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 11,812 km^2.

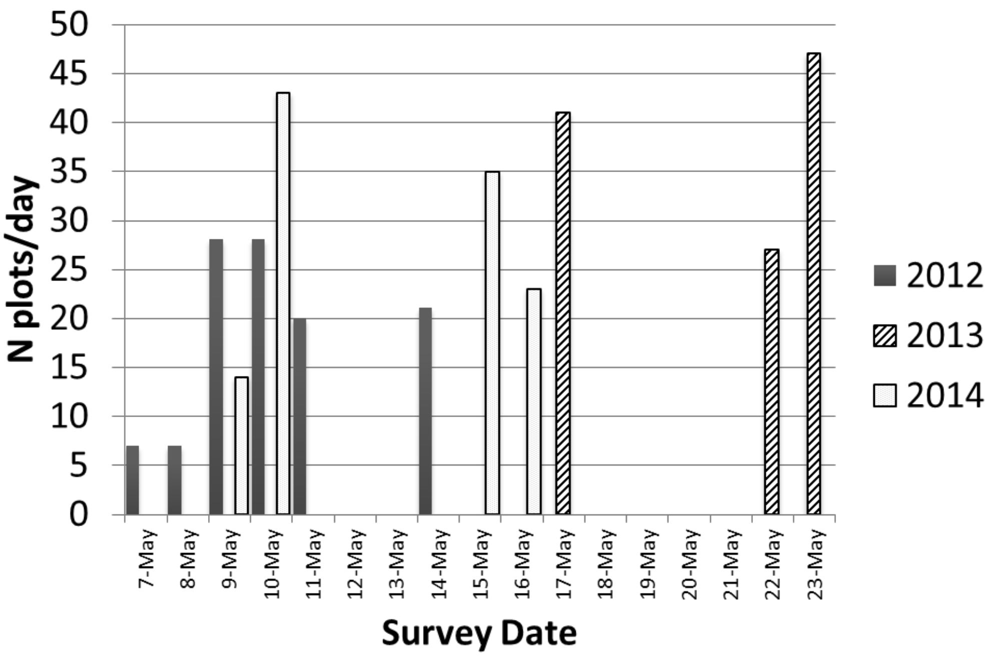

Figure 6. Number of plots surveyed by calendar date during the Northwestern Minnesota Sandhill Crane breeding population survey, 2012-2014. A total of 115 plots were flown in each year.

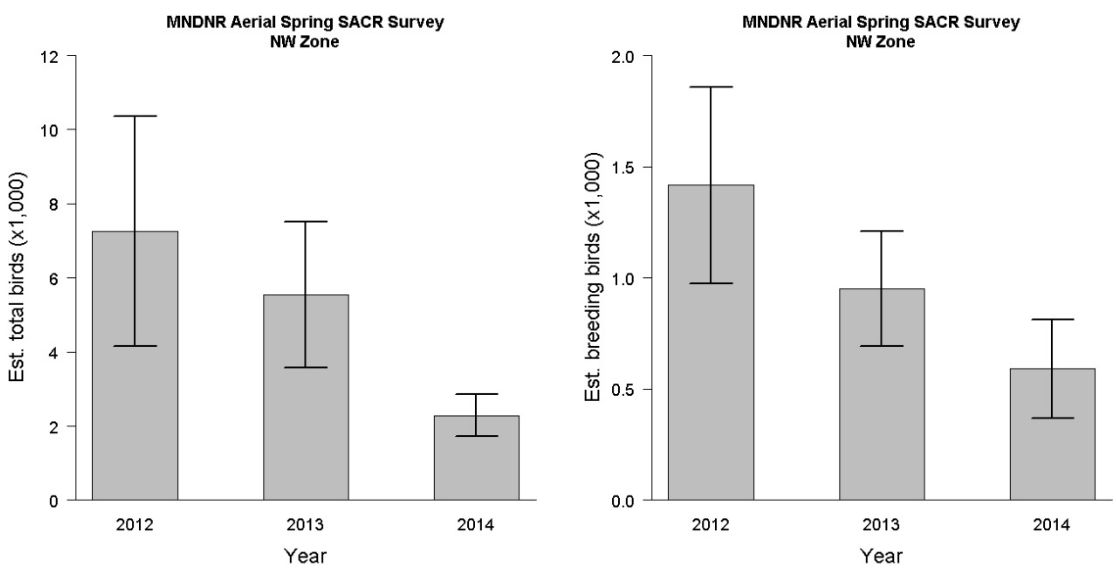

Figure 7. Estimates of total breeding ground population and breeding sandhill cranes in the Aspen Parklands survey area of northwestern Minnesota, 2012-2014.

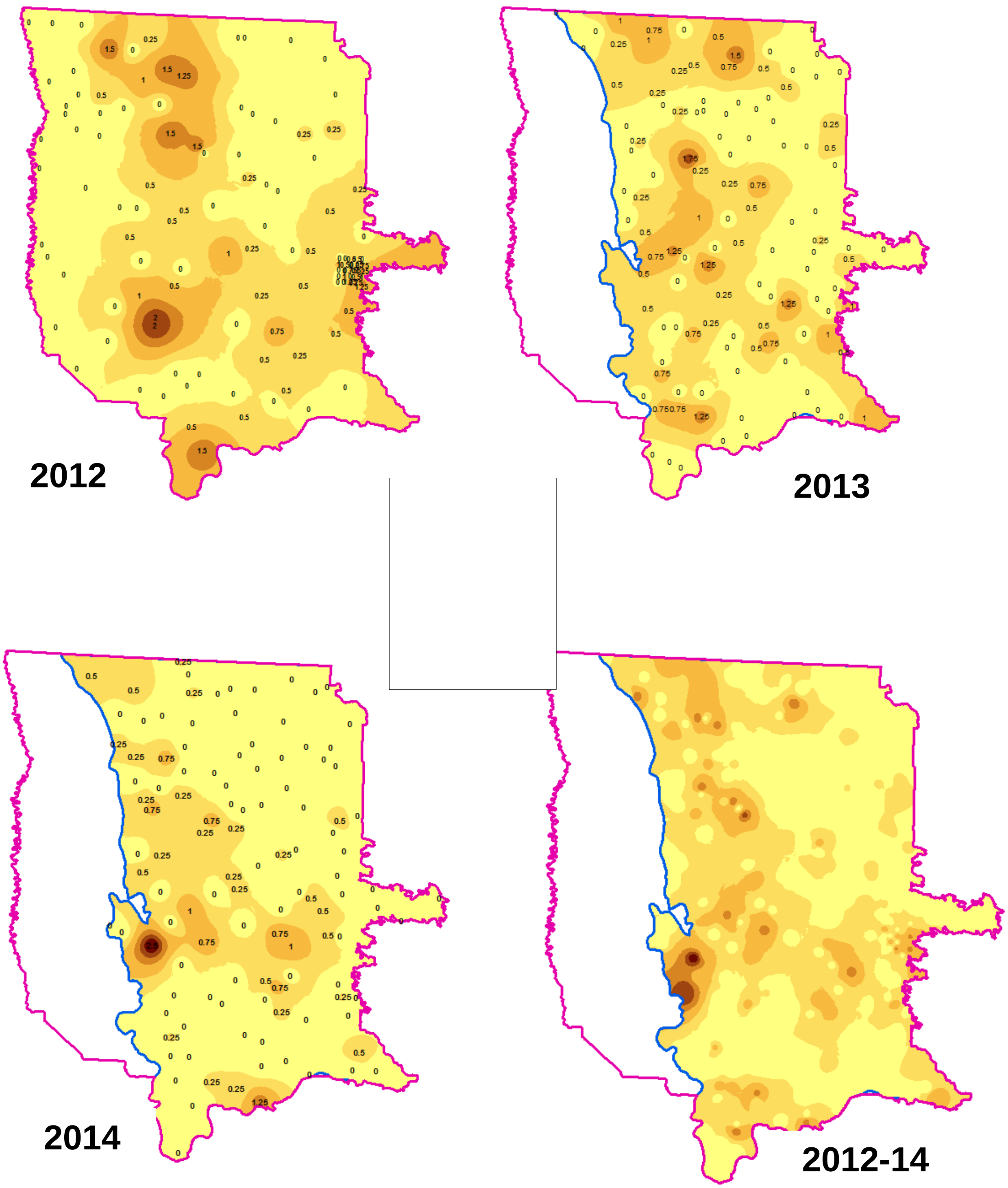

Figure 8. Densities of breeding sandhill cranes (singles + pairs) in the northwest Minnesota crane survey areas, 2012-2014.

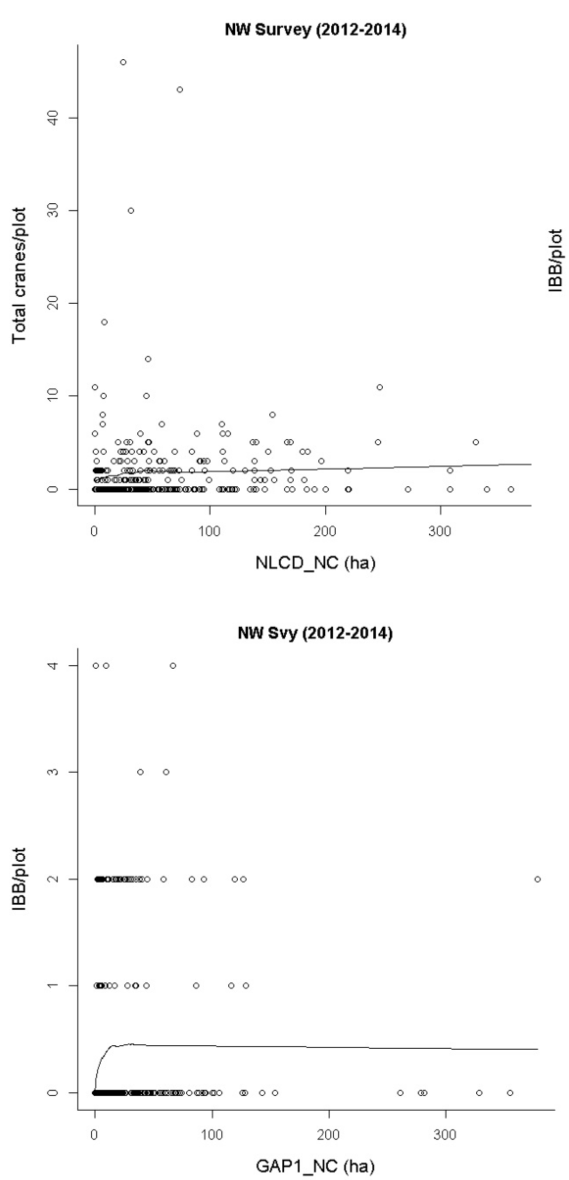

Figure 9. Relationship between sandhill crane observations (total SACR and Indicated Breeding Birds [IBB]) and habitat abundance (as defined by NLCD or GAP classification schemes [see text]) based on 345 4-km^2 plots surveyed in northwest Minnesota, 2102-2014.

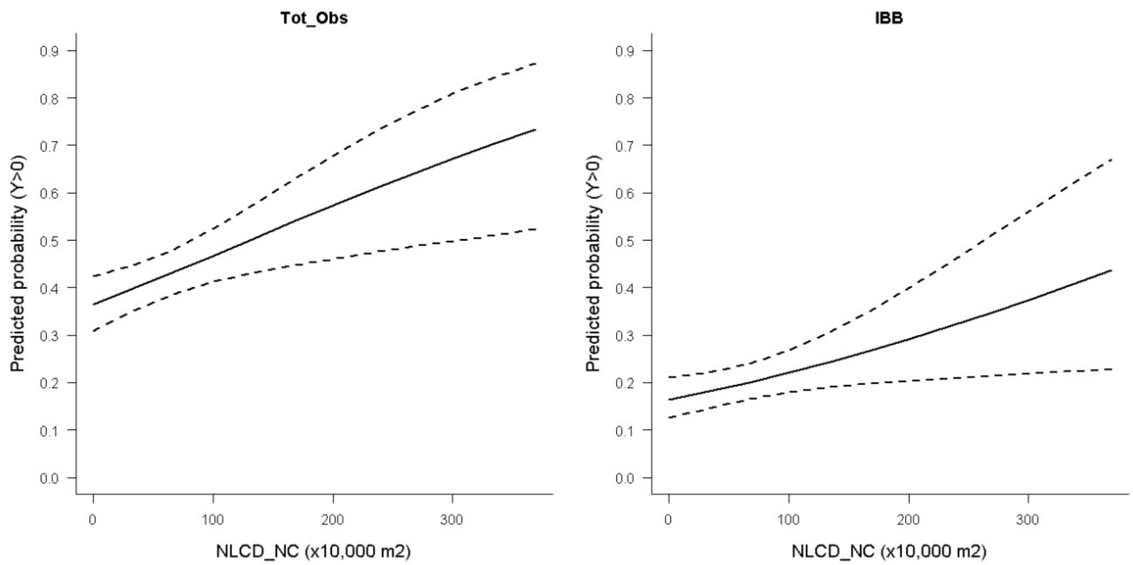

Figure 10. Relationship between sandhill crane occurrence (total SACR and Indicated Breeding Pairs [IBB]) and habitat abundance (as defined by NLCD classification schemes [see text]) based on 345 4-km2 plots surveyed in northwest Minnesota, 2102-2014.

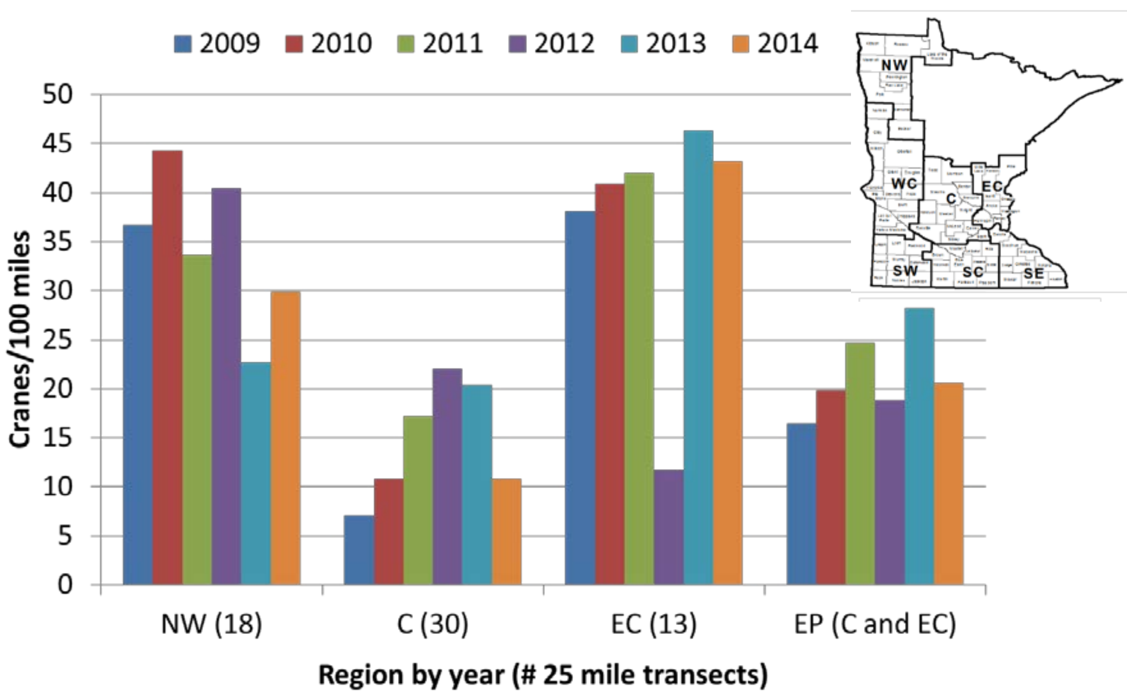

Figure 11. Cranes/100 miles counted during the Minnesota August Roadside Survey, 2009-2014. Counts are shown for the Northwest, Central, and East Central regions, and for the Eastern Population (Central and East Central combined).

ESTIMATING NUMBERS OF BREEDING SANDHILL CRANES IN EAST-CENTRAL MINNESOTA, 2014

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SUMMARY

We conducted a pilot sandhill crane (SACR, *Grus canadensis*) breeding population survey in east-central Minnesota (EC MN) in May 2014. The survey area we selected included the majority of 2 Ecological Classification System subsections. We used the crane survey design developed in northwest Minnesota (NW MN) with 4 km^2 plots as the primary sampling unit. We selected a spatially balanced sample of 115 plots using a generalized random-tessellation stratified (GRTS) design. We surveyed each sample plot once during May using a Bell OH-58 helicopter with a 2-person crew. All crane observations were counted and classified in each plot based on their social status (individuals, pairs, groups) and evidence of breeding status (e.g., nest, colts, territorial behavior).

We estimated that there were 1,924 SACR in EC MN survey area and approximately 1,000 of these were breeding. One group of SACR was observed. Habitat conditions were very wet in 2014. All cranes were located in the western ½ of the survey area, and a different area may be selected if we were to repeat this survey in the future.

INTRODUCTION

SACR in EC MN are part of the Eastern Population (EP), which has been increasing in recent years (Ad hoc Eastern Population Sandhill Crane Committee 2010). Surveys of EP SACR at Sherburne National Wildlife Refuge indicate that breeding cranes have increased from a few in the 1970s to 40-50 pairs in the past few years (Anthony Hewitt, U.S. Fish and Wildlife Service, personal communication). In addition, fall staging cranes have increased from <100 in the early 1990s to 6,500-7,200 at the refuge since 2012. Breeding SACR have also expanded their range in Minnesota so that the delineation between EP and Midcontinent population cranes (MCP) that nest in NW MN is no longer clear. The Minnesota Cooperative Fish and Wildlife Research Unit, in cooperation with Minnesota Department of Natural Resources (MNDNR) and the U.S. Fish and Wildlife Service began a Legislative-Citizen Commission on Minnesota Resources funded project in 2014 to delineate the boundary between these 2 populations.

We began a breeding population survey of MCP SACR in northwestern Minnesota in 2012 (Lawrence et al. 2014) and believed we could apply the same techniques to surveying breeding cranes in EC MN. The 2014 EC survey was designed similar to the NW survey. Our objective was to provide an estimate of the number of breeding cranes in a portion of EC MN that was within ±25% of the true population size with 90% certainty.

STUDY AREA

We examined data from the Minnesota Breeding Bird Atlas (http://www.mnbba.org/) and information from Wildlife Managers to select Ecological Classification System subsections (http://www.dnr.state.mn.us/ecs/index.html) to survey. We chose to survey portions of the Mille Lacs Upland and Anoka Sand Plain subsections (Figure 1). The Mille Lacs Upland Subsection is the only subsection in the Western Superior Uplands Section and is in the Laurentian Mixed Forest Province. The Anoka Sand Plain is one of 5 subsections in the Minnesota and Northeast Iowa Morainal Section and is part of the Eastern Broadleaf Forest Province. We excluded the portion of the Anoka Sand Plain in Anoka County and south due to high human populations in the Twin Cities Metropolitan area.

METHODS

Sampling frame

We used ArcGIS 10.2 (Environmental Systems Research Institute, Redlands, CA) to develop an overlay grid of 4-km^2 plots for the EC MN study area (Figure 2). The grid was rotated approximately 2.5 degrees east to orient it with Public Land Survey (PLS) based features such as roads and property boundaries. We treated 4-km^2 plots as the primary sampling unit (PSU) and excluded any PSUs where the centroid was not located within the boundary of the SACR survey area. We excluded plots that were mostly in Mille Lacs Lake, plots that overlapped any of Camp Ripley, and plots in the St. Cloud metro area. We also deleted 2 plots on the Wisconsin border where the centroid was in Minnesota, but much of the plot was in Wisconsin. There were 4,098 PSU in the study area.

Sampling design

We used National Land Cover Data (NLCD; Fry et al. 2011) to identify potential nesting habitat using the same criteria we used in NW MN (Lawrence et al. 2014) to delineate potential SACR breeding habitat in each 4-km^2 plot. NLCD is a Landsat-based land cover database created by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of Federal agencies led by the U.S. Geological Survey (USGS National Land Cover Database). We defined "SACR nesting habitat" as NLCD cover class 95 (emergent herbaceous wetland) and "other SACR habitat" as NLCD cover classes 11 (open water) and 90 (woody wetlands). All but 12 of the 4,098 PSU contained at least some NLCD emergent herbaceous wetland nesting cover (Figure 2) and 10 of these 12 contained some NLCD other SACR habitat. The median amount of nesting cover per PSU was 8.5% and the maximum amount was 69% (Figure 3). Thus, because essentially all the plots had as least some potential crane nesting cover and we did not know the relationship between the amount of nesting cover and crane density, we did not stratify the sample plots. We used a spatially-balanced, simple random sampling design (Generalized Random-Tessellation [GRTS], Stevens and Olsen 2004) to select 115 primary survey plots (sampling rate = 2.8%) and 20 alternate plots.

Target population(s)

As in the NW MN survey, separating breeding and non-breeding components of the population was problematic. We recorded crane observations as singles, pairs, and groups. Groups of SACR likely contain mostly non-breeders (subadults, non-territorial adult birds, and, possibly, failed breeders), whereas the breeding status of singles and pairs is more difficult to determine (Hayes and Barzen 2006). Therefore, for the purposes of this survey, we classified crane observations as follows:

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

For population estimates, we did not double observations of single 'breeding' birds to estimate indicated pairs (Lawrence et al. 2014). We used a conservative approach when estimating population size by taking observations of single birds at their face value (i.e., count = 1) regardless of their breeding status.

We determined SACR distribution by calculating the number of single and paired (x2) birds/km^2 in the survey plots. Then a density map was generated from plot density data using the Inverse Distance Weighted and Reclassify tools in ArcGIS ver. 10.2.2.

Survey procedures

The survey was conducted during late-May, slightly later than the peak incubation period for cranes in NW MN (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008). All plots were surveyed using Bell OH-58 [Jet Ranger] containing a pilot and one observer. Plots were surveyed 5-45 meters above ground level at 10-100 km/hr, depending upon the land cover. We used DNRSurvey ver. 2.11, an ArcGIS addin developed by Minnesota DNR Wildlife and MN.IT Services GIS staff, to record digital voice files, each associated with a UTM location, on a tablet computer.

RESULTS

Survey effort

The 2014 survey was conducted over 4 consecutive days (20-23 May) and we flew an average 29 plots/day (28, 38, 39, 10). The survey team (DNR pilot John Heineman and observer Beau Liddell) spent an average of 5.7 min surveying each plot (range: 2.6 – 13.4 min). Thirty-nine percent of the total aerial survey time was associated with surveying plots.

We surveyed 115 (2.8%) of the 4,098 4 km^2 plots in the survey area. Prior to the survey, the observer examined all the plots and replaced 10 of the 115 original plots with alternate plots. The 10 plots were replaced due to heavy residential development, poultry farms or feedlots.

Sampling statistics

We detected SACR on 24 (21%) of the 115 sample plots (Figure 4). The average count was 2.2 cranes per occupied plot and 0.5 cranes for all plots. We counted 54 SACR on sample plots, of which 48% were pairs, 46% were singles, and 6% were groups (Table 1). We observed 1 group of 3 birds. Fifty-seven percent of observed pairs and singles (54% of pairs and 60% of singles) exhibited some evidence of breeding (Table 1). We detected 17 nests and 2 pairs with colts.

Population estimates and distribution

We estimated 1,924 sandhill cranes (90% CI: 1,375-2,473) in the survey area in 2014. These are minimum estimates because we did not adjust for detection probabilities (which are likely <1, at least for singles and pairs in dense cover). If our sample of singles and pairs exhibiting breeding behavior was representative of the relative abundance of breeding birds in the target population, then we estimated there were a minimum of 1,033 breeding birds in the survey area (Table 2).

The bound on the estimated total (all strata) was slightly greater than the usual target level for a MNDNR wildlife survey (i.e., CV = 15% and relative bound = 25%). The estimated CV for breeding birds and status-unknown birds was greater than the target (20-27%; Table 2). Cranes were located in the western portion of the survey area (Figures 4, 5) even though potential nesting cover was distributed throughout the area (Figure 2).

DISCUSSION

Survey effort and design considerations

We selected the survey area based upon 2 main considerations: we wanted to use ECS subsections as the basic survey area and we wanted to cover a sizable portion of what was believed to be the range (1970s) of EP cranes in Minnesota (Johnson 1976) prior to the recent expansion. We knew there were likely higher densities of cranes west of the survey area, but the 2 ECS subsections we selected were believed to have good numbers of nesting SACR based upon the Minnesota Breeding Bird Atlas and anecdotal information. We did expect to find cranes throughout the survey area; however, all the cranes we observed were in the western half of the survey area. There was potential nesting habitat throughout the eastern (southern Carlton, Pine, Chisago, and extreme eastern Isanti Counties) and northern (e.g. southern Aitkin & northern Kanabec Counties) part of the survey area (Figure 2) where cranes were not observed. Either those habitats had become too wet and flooded, or breeding cranes are still expanding north and east from the central core range. We observed cranes on many of the plots in Sherburne, southern Kanabec, central and western Isanti, Mille Lacs, Morrison, and Crow Wing Counties. The core breeding area within the survey area was Morrison, Mille Lacs, and southern Crow Wing counties. If we repeat the survey in the future, we will consider including Todd, Ottertail and Wadena counties instead of Carlton, Pine and Chisago counties.

The landscape was extremely wet and high water levels may have influenced crane distribution and nesting. We observed sites that appeared to be excellent crane habitat but did not have nesting cranes. Some of these sites may have been dry earlier in the nesting season, or may have been non-core breeding range. Some nests may have been flooded as much of the precipitation occurred after crane nest initiation.

The phenology was late this year and the EC MN survey was flown on similar dates as the 2013 NW MN survey (Figure 6). We were concerned that the NW MN survey was flown too early this year relative to the phenology (Lawrence et al. 2014) and this may have contributed to the lack of SACR groups observed during the survey. The EC MN survey should have been timed better this year due to the late phenology; however, some colts had already hatched. Normally colts have been first observed near 15 May in EC MN; but, in 2014 we did not see the first colts until the 20-21 May. If this survey were repeated, it should be scheduled prior to the NW survey.

A higher proportion of SACR observations in the EC survey area were breeding birds (0.57) compared to NW MN, where 30% were actively breeding this year (Lawrence et al. 2014). The proportion actively breeding in NW MN has been <0.38 in all 3 years. Only 1 group (n = 3) was observed in the EC survey and the proportion of birds in groups in NW MN was less this year than the previous 2 years. Cranes typically begin breeding at 2-3 years of age (Gerber et al. 2014) so a substantial portion of the population should be nonbreeders. In NW MN, about 40% of the cranes observed in the first 2 years of the survey were in groups. In all years, a substantial portion of the pairs were likely nonbreeders. We speculated that the earlier NW MN survey in 2014 relative to the late phenology this year may have resulted in fewer nonbreeders (groups) being present on the breeding grounds (Lawrence et al. 2014); yet only 1 group was observed in EC MN even though the survey was later and some colts were already observed. The EC aerial survey crew also noted that they did not see groups of cranes while flying between plots, suggesting they were elsewhere. We do not know the reason for the apparent lack of nonbreeders observed in 2014.

As noted in the NW MN report, timing of the SACR survey may be critical to getting consistent results. However, the 2014 EC MN survey was flown consistent with the 2012 crane breeding activity (i.e. most nesting, a few colts); yet groups were not present. Additional surveys and perhaps studies with marked cranes (satellite transmitters) may be necessary to determine the nuances of crane arrival on the breeding grounds in the spring and their influence on subsequent survey results.

Population estimate

The number of cranes in the survey area was 1,924. Crane density on occupied plots (2.2 cranes/occupied plot) was similar to the 2014 density in NW MN (2.4). No cranes were observed on about ½ of the survey area during this survey. In future surveys, we could delineate areas where we believe there are more breeding cranes.

Survey evaluation

The amount of potential nesting cover per plot did not explain crane density in EC MN. This was likely due to the definition of nesting cover we used in the survey as most plots contained at least some nesting cover. Additional years of data would be needed to develop a potential stratification variable.

The lack of crane groups suggests that this portion of the overall population may have not been present on the survey area in 2014. Alternatively, they may have not been present on the plots; however, we did not observe as many cranes during transit between plots in 2014, suggesting that some nonbreeders had not yet reached the breeding grounds.

The pilot year of this survey provided useful information on cranes in EC MN. This knowledge could be used to design a better sandhill crane breeding population survey if there was a defined need in the future.

ACKNOWLEDGEMENTS

This project was funded by a grant from the U.S. Fish and Wildlife Service Webless Migratory Bird Program and the MNDNR. Special thanks to pilot John Heineman, who once again did an exceptional job flying the helicopter and helping with the survey. Chris Scharenbroich prepared maps for the survey.

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Table 1. Social and breeding classification of sandhill crane observations in east-central Minnesota, 2014.

Social class[a]	Count	Count by breeding status	Percent of total	Percent of pairs or singles
Pairs (x2)	26		48.1	
Breeding birds		14	(25.9)	53.8
Status unknown		12	(22.2)	46.2
Singles	25		46.3	
Breeding birds		15	(27.8)	60.0
Status unknown		10	(18.5)	40.0
Groups	3		5.6	
Total	54		100	

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

Table 2. Population estimate (N) by indicated breeding status for sandhill cranes in east-central Minnesota, May 2014.

Status	Plots surveyed	Total plots	n plots with cranes	Minimum cranes/plot	Maximum cranes/plot	Avg. birds/plot	SE birds/plot	$\hat{N}$	SE	LCB (90%)	UCB (90%)	CV %
Breeding birds[a]	115	4,098	17	1	3	0.3	0.05	1,033	205	696	1,371	20
Groups	115	4,098	1	3	3	0.0	0.02	107	92	3	259	86
Status unknown[b]	115	4,098	12	1	5	0.2	0.05	784	210	438	1,130	27
Total	115	4,098	24	1	6	0.5	0.08	1,924	334	1,375	2,473	17

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

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

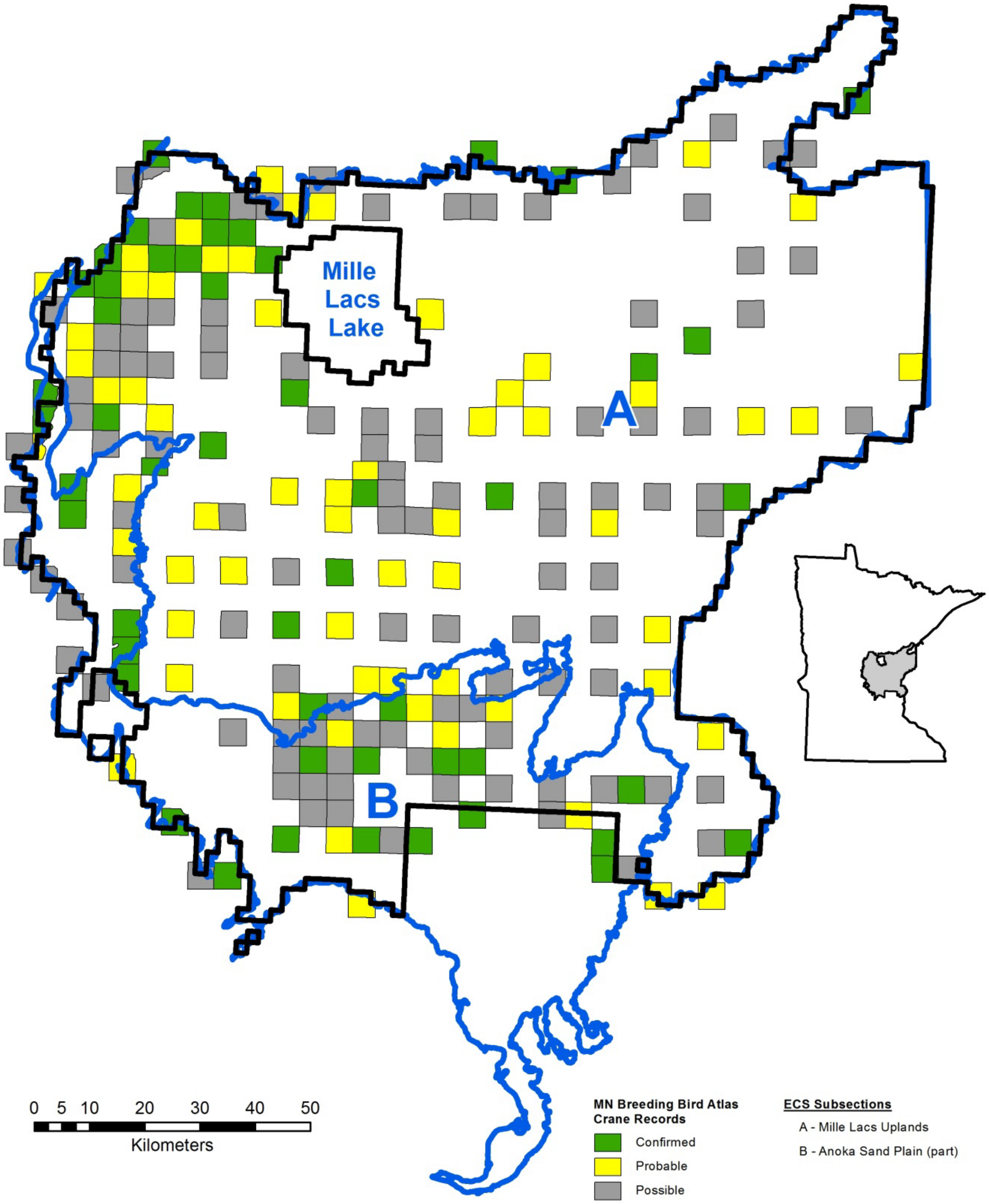

Figure 2**.** Location of east-central Minnesota sandhill crane survey area (heavy black line) relative to Ecological Classification System (ECS) subsections. A portion of the Anoka Sand Plain extending to the south was not surveyed because it was in the Twin Cities Metropolitan area. Minnesota Breeding Bird Atlas townships that were surveyed and contained sandhill cranes are shown.

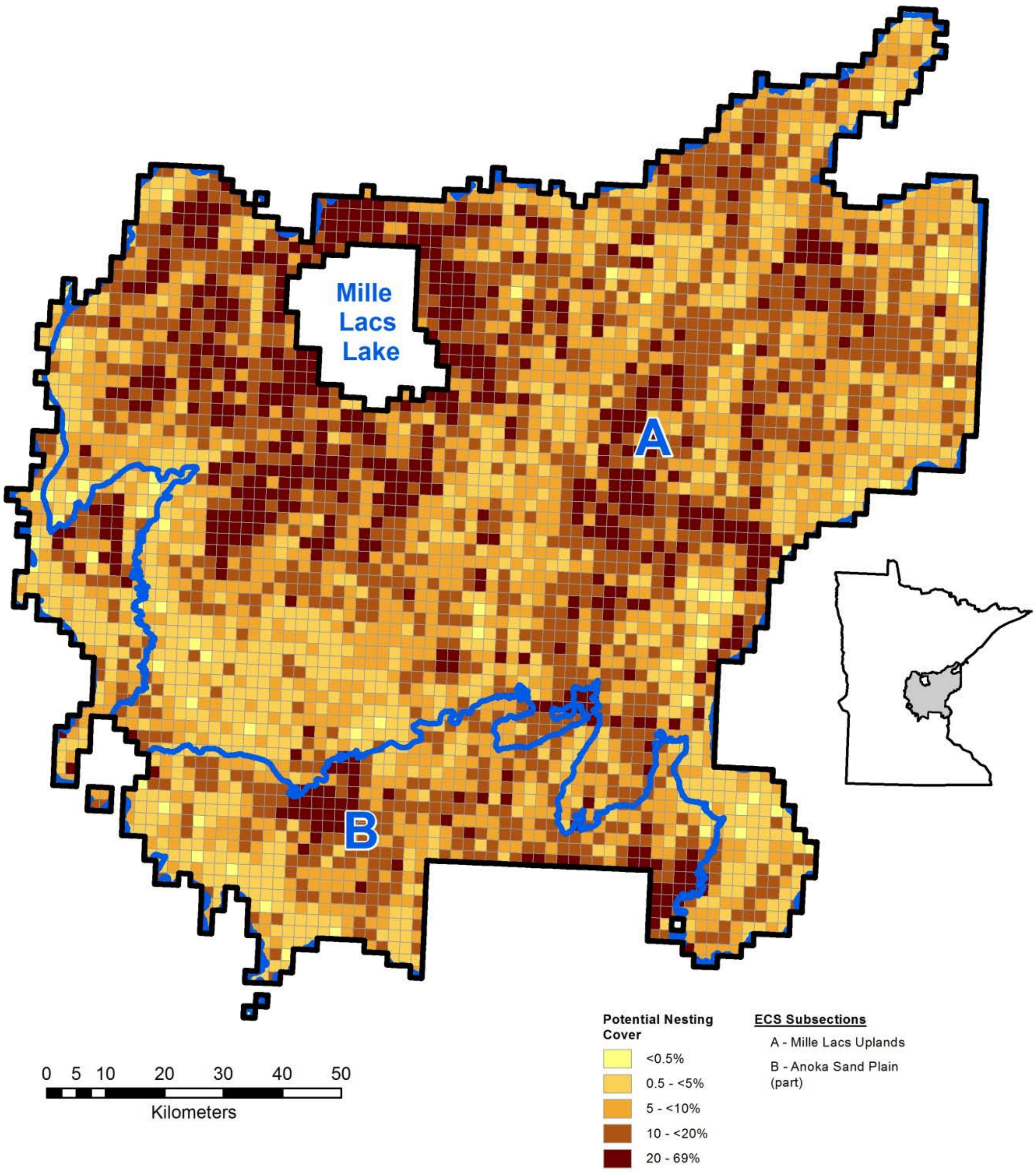

Figure 2. Percent of potential nesting cover (NLCD emergent herbaceous wetland) by primary sampling unit (4-km^2 plots) in the sandhill crane May survey area, east-central Minnesota.

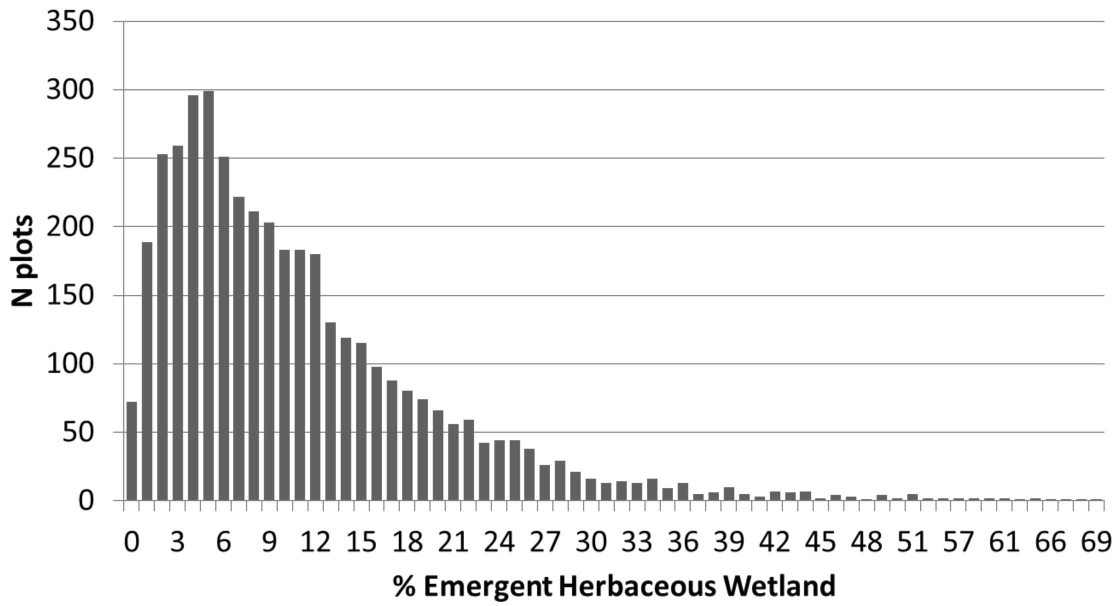

Figure 3. Number of plots by percent of National Land Cover Data cover class 95 (emergent herbaceous wetland) habitat in the plot, east central Minnesota sandhill crane survey area, 2014.

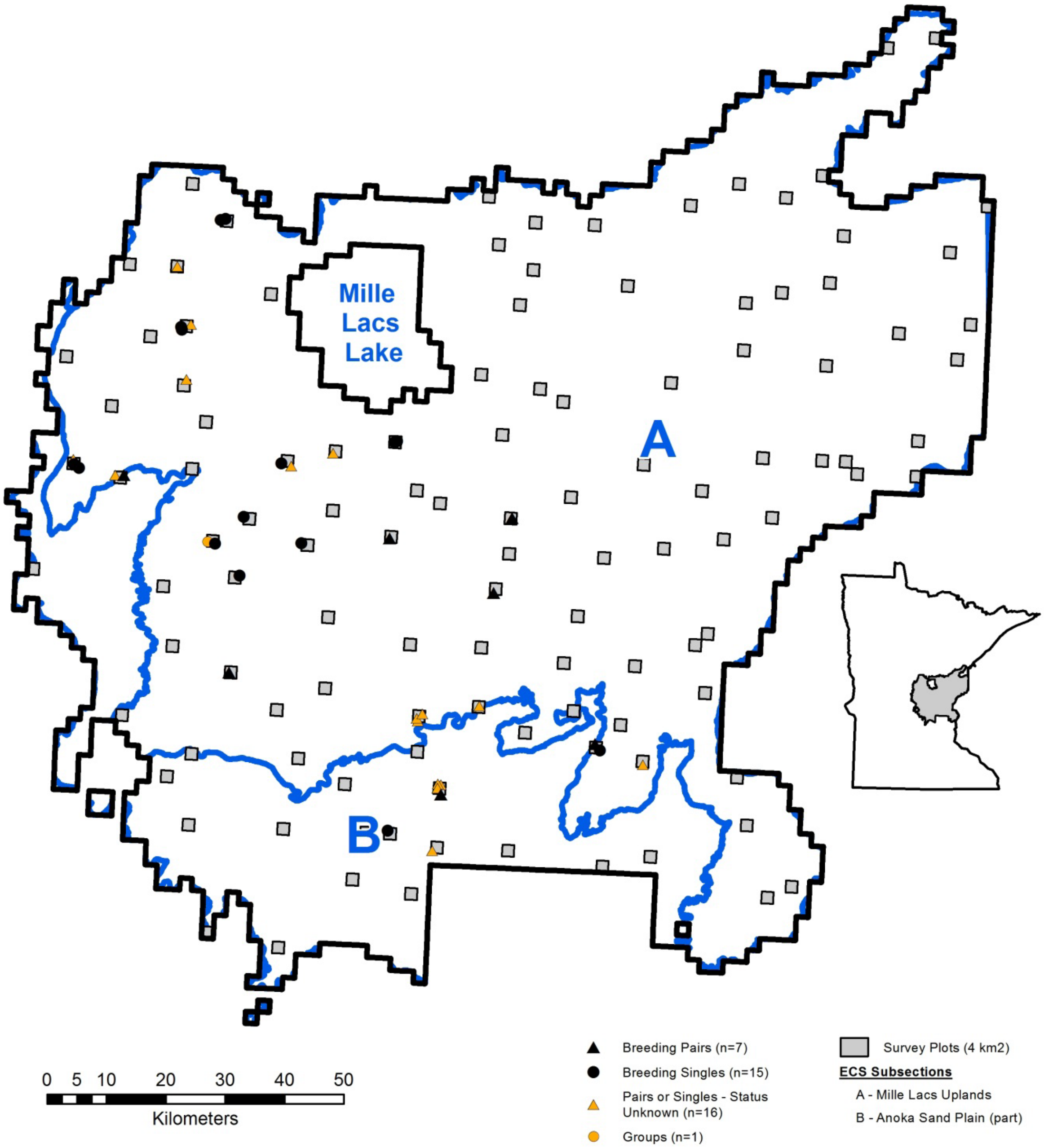

Figure 4. Distribution of sample plots (n = 115) and sandhill crane observations by type in the 2014 MNDNR spring aerial survey, east-central Minnesota. Each sample plot was 4 km^2 and the SACR survey area was 16,362 km^2.

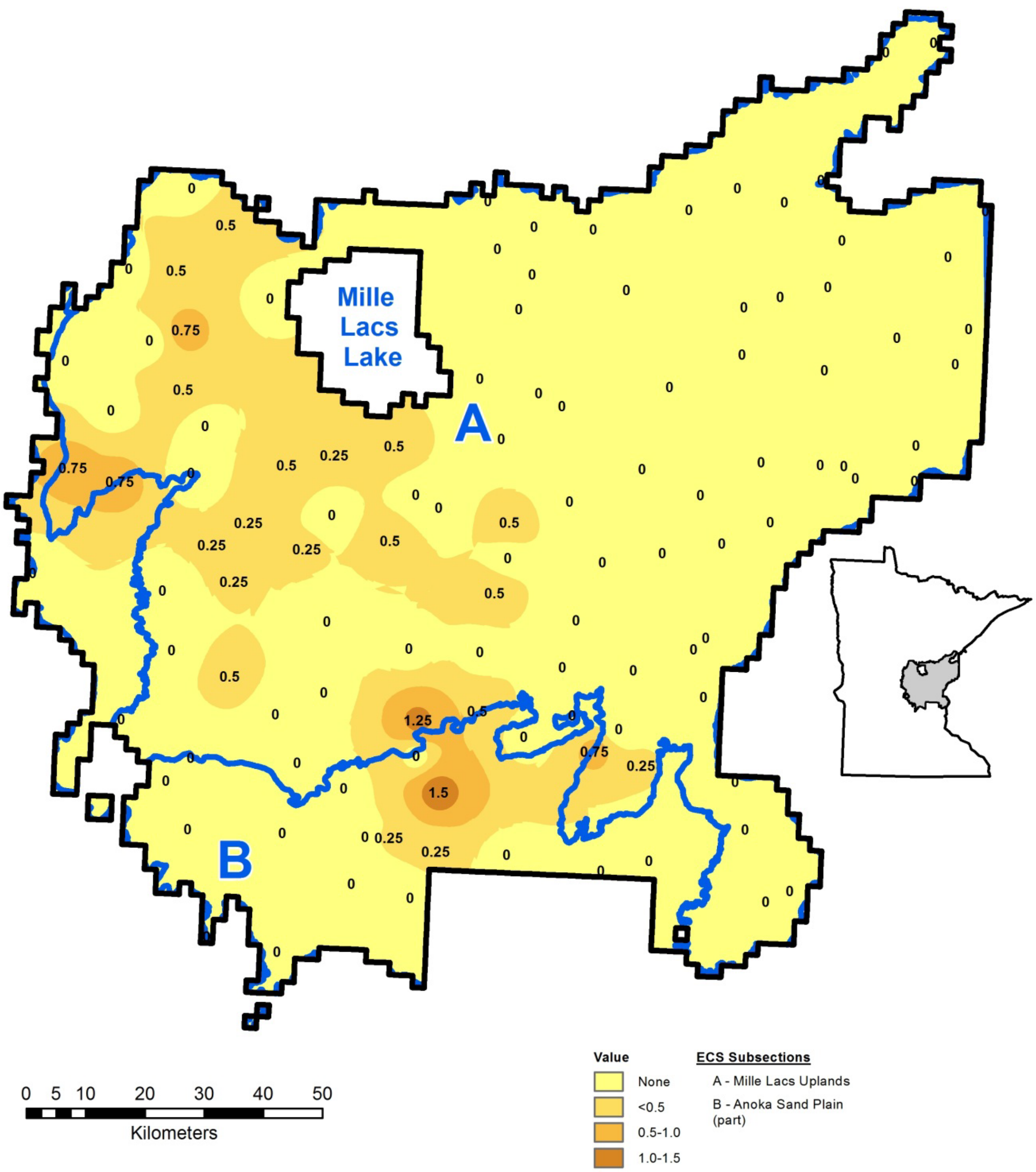

Figure 5. Densities (cranes/km^2) of breeding sandhill cranes (singles + pairs) in the east-central Minnesota crane survey area, 2014.

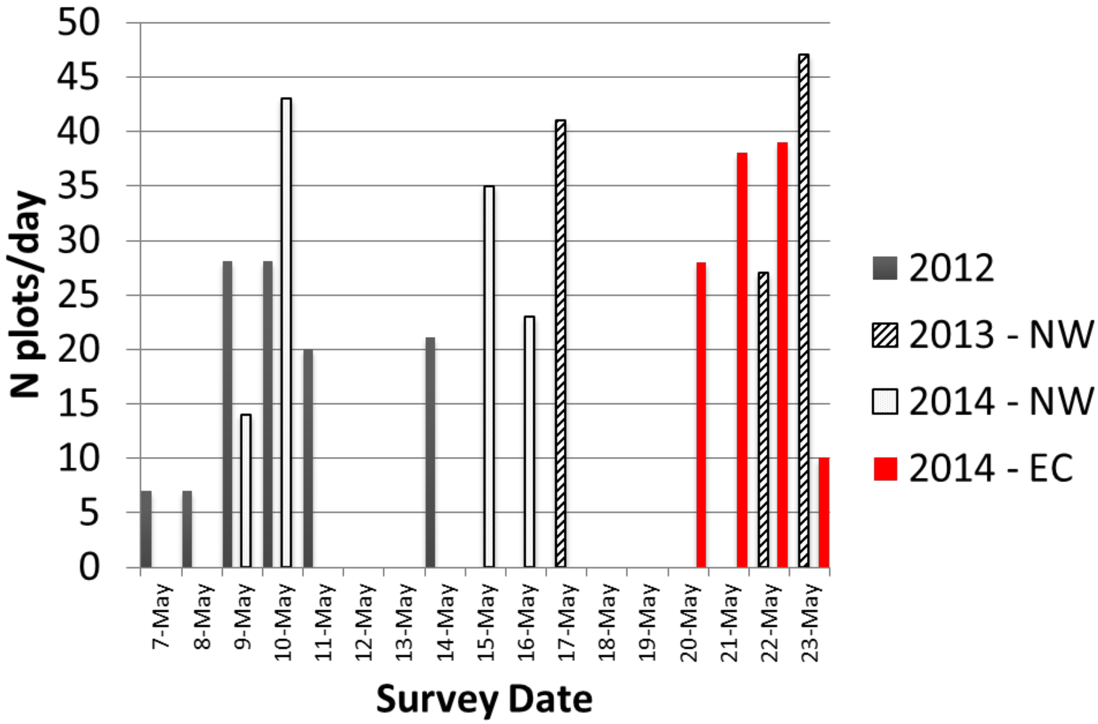

Figure 6. Number of plots surveyed by calendar date during the northwest (2012-2014, Lawrence et al. 2014) and east-central (2014) Minnesota sandhill crane breeding population survey. A total of 115 plots were flown in each area and year.

HUNTING HARVEST STATISTICS

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2013 SMALL GAME HUNTER MAIL SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources (DNR), Division of Fish and Wildlife, Wildlife Research unit annually conducts a self-administered mail back survey of small game hunters. Annual harvest estimates from survey data provide guidance for future hunting regulations and season structure. This mail survey was initiated in 1976 as a means to gather small game harvest information.

METHODS

A postcard survey (Figure 1) was mailed in early March and respondents who returned it within three weeks were eliminated from follow-up mailings. Recipients were asked if they hunted small game in 2013-14. Respondents who hunted were asked: (1) the total number of days they hunted small game, (2) the number bagged by species, (3) the number of days hunted by species and (4) the county in which they hunted most for each species listed (Figure 1).

The sampling frame consisted of individuals who purchased a small game hunting license (any type) for the 2013-14 small game hunting season (N= 258,581). A stratified random sample (n= 7,000, 2.7%), allocated proportionally by license type (n=9) was drawn from the Minnesota DNR electronic database. License type was used as strata and included the following small game license types: Resident Senior Citizen, Resident Youth, Resident Adult, Resident Individual Sport, Resident Combination Sport, Resident Lifetime, Resident Lifetime Sport, Nonresident Youth, and Nonresident Adult. For analysis, license types were pooled into “Resident” (N= 252,550) and “Nonresident” (N= 6,031) (Figure 2). A free youth license was added to the sampling frame for 2011-12 (20,960) and 2012-13 (20,987) but that license has since been discontinued. Estimates for those years have been recalculated without the youth license so that those estimates are comparable from year to year. The percent of respondents who said they hunted or did not hunt is reported in Table 1.

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

RESULTS

Of the 7,000 mailed surveys, 125 surveys were undeliverable; 3,589 surveys were returned for an adjusted response rate of 52%. Estimated number of hunters declined for geese, crows, ring-necked pheasants, rabbits and hares (Table 2). Success rates for all species were fairly similar to last year as was estimated take per hunter (Tables 3 and 4). License sales decreased about 5% from the previous year (Figure 2). Pheasant stamp sales were down about 17% (Table 5), most likely in response to predictions of low numbers from the August roadside survey. Total estimated harvest for the top four small game species in Minnesota is presented in

Figure 3. Total estimated harvest for all small game species is presented in Table 5. Survey results for selected species taken by Non-resident hunters are presented in Table 6.

Note that all estimates were based on a survey of approximately 2% of all small game license holders. This project was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

2013 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2013 - Feb 2014)? ☐ No ☐ Yes (Please check box)
2. Indicate the **total number of days** spent hunting small game of all species listed below, in Minnesota. ________
3. For the species you hunted indicate your harvest, number of days hunted, and county in which you hunted most for each species, even if **None** were bagged. Report only game **you personally** bagged and retrieved in Minnesota. **Do not** include birds taken on shooting preserves or game farms.

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

Dear Small Game Hunter: We have not received a reply to our first request. Please, we need information on your 2013-2014 season. Please fill this out and mail.

You have been selected at random from among Minnesota's small game hunting license buyers to assist us in evaluating the 2013-2014 small game hunting season **(March 2013-February 2014)**. We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2013 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. No envelope or stamp is necessary; just tear along the perforation and drop into a mailbox.

THANK YOU FOR YOUR COOPERATION

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

Figure 1. Sample of Small Game Hunter survey card.

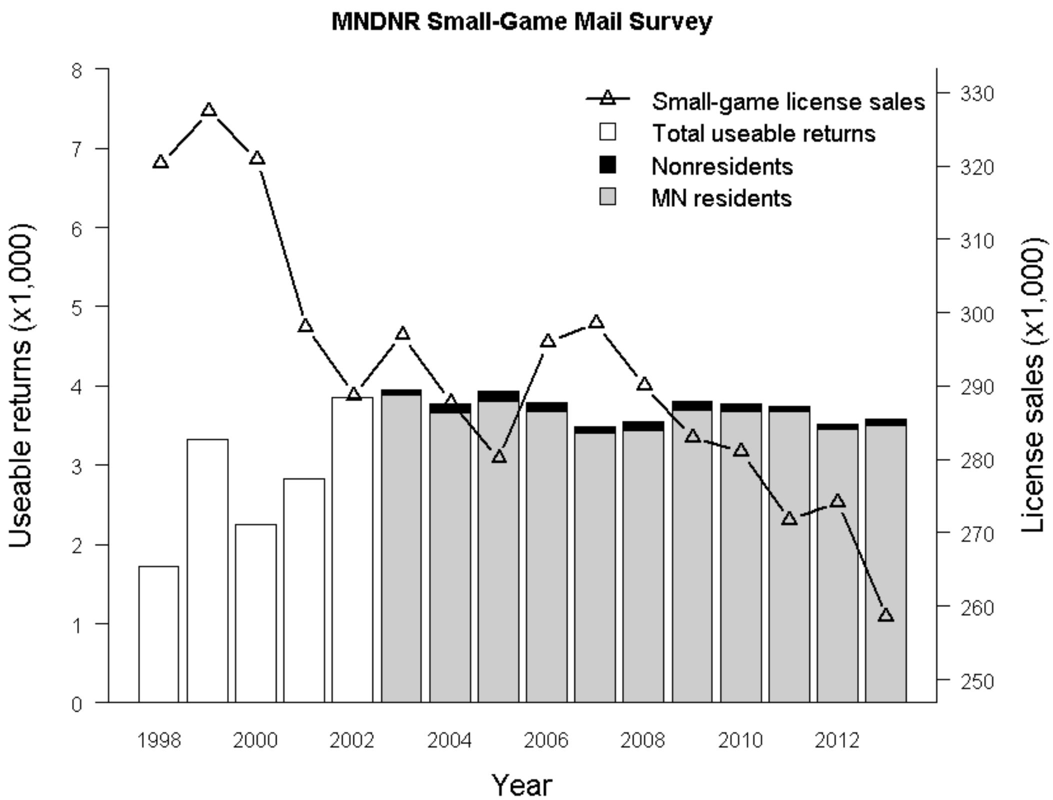

Figure 2. Number of Minnesota small game license sold and usable returned surveys, 1998-2013. Includes resident and non-resident licenses, and excludes duplicate and free licenses.

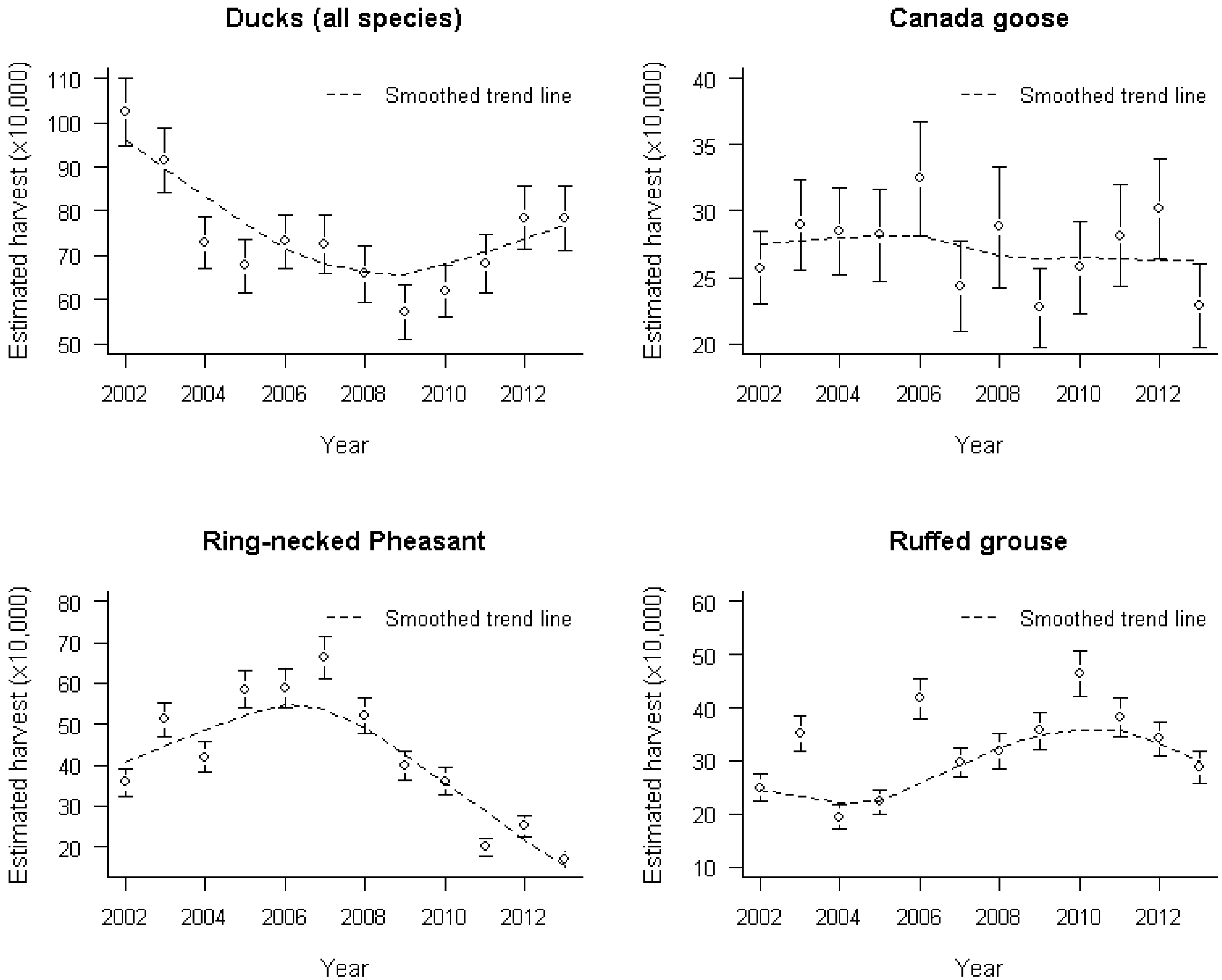

Figure 3. Summary of top four small game species harvested in Minnesota, 2002-2013.

Table 1. Percent of respondents who hunted small game, 2004-05 through 2013-2014 [a].

		Returns from mail survey	Projections from license sales
2004-05	Hunted Did not hunt	2,934 (78%) 847 (22%) 3,781 (100 %)	223,275 64,450 287,725
2005-06	Hunted Did not hunt	3,035 (77%) 900 (23%) 3,935 (100 %)	216,000 64,156 280,156
2006-07	Hunted Did not hunt	2,994 (79%) 795 (21%) 3,789 (100 %)	233,759 62,139 295,898
2007-08	Hunted Did not hunt	2,894 (78%) 822 (22%) 3,716 (100 %)	232,505 65,961 298,467
2008-09	Hunted Did not hunt	2,678 (75%) 873 (25%) 3,551 (100 %)	218,753 71,311 290,064
2009-10	Hunted Did not hunt	2,850 (75%) 952 (25%) 3,802 (100 %)	212,126 70,857 282,983
2010-11	Hunted Did not hunt	2,824 (75%) 953 (25%) 3,777 (100 %)	210,129 70,911 281,040
2011-12	Hunted Did not hunt	2,761 (74%) 987 (26%) 3,748 (100 %)	214,137 76,549 290,686
2012-13	Hunted Did not hunt	2,669 (76%) 851 (24%) 3,520 (100 %)	223,808 71,360 295,168
2013-14	Hunted Did not hunt	2,586 (72%) 1,003 (28%) 3,589 (100 %)	186,317 72,264 258,581

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

Table 2. Estimated number of statewide hunters by species, 2001-02 through 2013-14.

	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12[β]	2012-13[β]	2013-14
Ducks	109,241	111,619	101,487	104,634	92,634	87,075	87,468	81,358	77,480	72,770	76,090	80,770	76,950
Canada goose	76,322	78,574	74,855	74,728	69,416	66,224	62,649	59,222	55,520	53,430	57,220	58,900	51,160
Other geese	6,502	5,981	7,373	5,327	4,628	4,529	3,695	4,411	3,280	3,650	2,710	3,830	2,810
American coot	3,901	4,411	3,912	5,099	4,129	4,529	3,454	4,166	4,090	4,610	3,480	3,990	3,820
Common snipe	1,382	2,243	1,429	1,902	1,210	2,187	1,928	1,797	1,340	1,340	1,160	1,160	1,370
Rails / gallinules	406	673	150	228	0	547	482	408	370	220	230	500	140
Crow [*]	11,542	12,859	12,263	12,404	11,890	10,777	8,514	10,047	10,640	9,380	10,360	11,480	8,570
American woodcock	11,542	11,962	12,789	12,023	11,035	13,510	10,843	12,171	11,760	10,790	9,430	13,310	12,030
Mourning dove [γ]				15,524	11,107	12,886	13,172	11,599	10,500	10,640	8,970	9,230	10,380
Ring-necked pheasant	84,694	91,284	105,023	104,406	110,852	118,703	118,311	106,763	99,440	89,140	72,840	76,950	62,110
Ruffed grouse	101,194	90,686	93,513	79,141	76,037	91,682	90,600	86,505	87,230	92,490	88,620	91,260	81,130
Spruce grouse	8,778	7,327	8,727	7,305	7,048	9,840	10,602	8,332	9,750	8,860	10,210	7,400	10,810
Sharp-tailed grouse	8,372	6,355	6,921	6,164	4,913	6,560	6,827	6,616	5,510	7,140	6,190	6,570	6,700
Gray partridge	6,828	6,579	7,975	5,327	6,265	6,013	6,667	4,411	4,240	3,720	2,400	3,080	2,450
Gray squirrel	26,010	25,494	29,190	23,438	24,563	25,459	25,863	22,382	22,260	23,740	23,280	24,710	21,690
Fox squirrel	15,281	14,878	19,936	15,372	15,094	15,619	14,779	13,233	13,180	15,630	12,060	14,220	12,030
Eastern cottontail	17,150	15,700	21,441	18,644	20,148	20,070	19,598	17,644	16,300	15,030	12,300	16,390	14,550
White-tailed jackrabbit	3,251	2,467	3,009	3,044	2,065	2,577	2,891	2,451	1,790	2,230	2,320	1,750	1,220
Snowshoe hare	6,502	5,682	5,567	4,338	3,346	5,545	4,257	4,574	3,500	3,800	3,250	4,820	3,750
Raccoon (Sept - Feb)	6,340	5,981	5,868	6,316	4,841	8,747	9,558	7,433	7,300	8,260	8,040	8,570	7,640
Raccoon[‡] (March -Aug)	4,145	3,589	4,589	3,348	2,705								
Red fox (Sept -Feb)	5,608	7,476	7,222	5,783	5,980	6,248	5,783	5,800	7,820	7,220	6,030	5,820	5,910
Red fox[‡] (March -Aug)	2,682	2,243	2,182	1,370	1,282								
Gray fox	1,544	1,271	1,505	1,674	997	2,030	1,928	1,879	1,790	1,640	1,390	1,580	1,730
Coyote	10,648	12,261	15,122	16,133	18,653	17,024	16,064	19,278	19,280	19,420	17,940	21,050	17,650
Badger	406	748	451	533	783	859	482	490	370	600	310	330	500

[*]Crow season added in 1989. [‡] Raccoon and red fox season continuous May 1994 thru March 15, 2006. [γ] Mourning dove season added 2004. [β] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.

Table 3. Estimated harvest per hunter for respondents reporting that they hunted a particular species, 2001-02 through 2013-14.

	Estimated harvest per hunter												
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12[β]	2012-13[β]	2013-14
Ducks	9.1	9.2	9.0	6.9	7.3	8.4	8.1	8.1	7.4	8.5	9.0	9.7	10.2
Canada geese	4.0	3.3	3.9	3.8	4.1	4.9	3.9	4.9	4.1	4.8	4.9	5.1	4.5
Other geese	1.2	1.9	1.7	1.5	1.9	1.5	2.1	3.2	1.9	1.1	1.8	2.3	2.5
American coot	4.5	4.6	2.8	4.0	3.9	5.6	4.6	5.7	3.6	5.7	3.0	4.2	4.0
Common snipe	1.3	1.5	1.8	1.1	4.4	1.9	2.0	1.2	1.1	1.4	1.2	1.2	1.7
Rails/gallinules	0.6	2.6	0.5	0.3	0	2.4	5.3	0.4	0.8	0.3	1.7	0.2	0.5
Crow *	7.7	5.6	6.7	5.8	7.8	6.4	6.4	5.2	5.3	6.1	7.9	7.9	7.9
American woodcock	2.3	2.4	2.4	3.5	2.5	3.2	2.6	2.4	3.0	2.8	2.6	2.3	2.7
Mourning dove[γ]				6.2	7	6.7	7.7	11.4	10.5	9.4	8.2	10.0	7.8
Ring-necked pheasant	3.2	3.9	4.9	4.0	5.3	4.9	5.5	4.9	4.0	4.0	2.7	3.3	2.7
Ruffed grouse	3.3	2.8	3.8	2.5	2.9	4.5	3.2	3.7	4.1	5.0	4.3	3.7	3.6
Spruce grouse	1.1	1.6	2.1	1.3	1.4	2.7	1.7	2.0	2.0	1.7	1.8	1.6	1.2
Sharp-tailed grouse	1.2	1.3	1.7	1.7	1.3	1.8	2.0	2.1	1.7	2.4	1.9	1.6	1.1
Gray partridge	1.5	1.7	2.8	2.4	2.6	1.9	1.6	2.2	1.9	2.5	1.6	1.7	1.0
Gray squirrel	5.6	5.2	6.0	5.7	5.0	5.5	5.2	5.4	4.9	5.9	5.0	5.1	3.9
Fox squirrel	4.1	4.5	4.2	4.1	4.1	4.2	3.2	3.9	4.1	3.9	4.0	3.5	2.8
Eastern cottontail	3.6	3.3	4.3	4.6	4.5	3.9	4.0	4.5	3.5	3.6	2.8	3.9	2.8
White-tailed jackrabbit	2.6	1.6	2.4	2.3	2.7	1.6	3.3	2.6	1.5	3.2	2.2	1.1	1.5
Snowshoe hare	3.3	1.9	2.2	1.8	3.1	3.0	1.4	2.5	1.5	1.8	2.6	3.5	1.7
Raccoon (Sept - Feb)	9.4	10.0	8.5	9.0	6.0	7.2	4.9	9.7	9.1	9.4	5.5	5.6	6.1
Raccoon[‡] (March -Aug)	4.4	5.4	4.7	6.1	2.7								
Red fox (Sept -Feb)	1.2	1.5	1.8	1.1	1.7	1.3	1.1	0.8	1.3	1.2	1.2	1.4	0.9
Red fox[‡] (March -Aug)	1.5	1.7	0.6	0.6	0.9								
Gray fox	0.4	0.4	0.4	1.1	0.9	1.8	0.3	1.3	1.0	1.5	0.8	0.2	0.2
Coyote	1.1	1.2	1.3	1.1	2.1	1.2	2.1	2.4	2.4	2.3	1.9	2.5	1.3
Badger	0.6	1.7	0.7	1.0	1.2	1.3	0.3	1.0	2.0	1.0	0.8	1.0	0.6

[*]Crow season added in 1989. [‡] Raccoon and red fox season continuous May 1994 thru March 15, 2006. [γ] Mourning dove season added 2004. [β] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.

Table 4. Mean harvest for successful hunters and hunter success rates (%), 2003-04 through 2013-14.

	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 [β]	2012-13 [β]	2013-14
Ducks	10.4 (87)	8.6 (81)	8.9 (83)	9.9 (84)	9.5 (85)	9.8 (83)	9.2(80)	10.3 (83)	10.5 (85)	11.1 (87)	11.7 (87)
Canada geese	5.1 (76)	5.2 (73)	5.5 (74)	6.3 (78)	5.5 (71)	6.4 (77)	5.6 (73)	6.1 (80)	6.3 (78)	6.5 (78)	5.8 (77)
Other geese	2.7 (653)	3.3 (46)	4.5 (43)	2.7 (55)	4.2 (50)	6.3 (50)	3.5 (55)	2.6 (41)	3.4 (51)	4.4 (52)	5.5 (46)
American coot	3.7 (77)	5.5 (73)	5.1 (76)	7.2 (78)	6.3 (74)	6.9 (82)	5.5 (65)	7.2 (79)	4.4 (69)	5.2 (81)	5.2 (75)
Common snipe	2.3 (79)	1.6 (68)	4.7 (94)	2.6 (75)	2.9 (71)	1.7 (73)	1.8 (61)	2.2 (67)	1.6 (73)	2.1 (57)	2.1 (79)
Rails / gallinules	1.0 (50)	1.0 (33)	0.0 (0.0) *	4.3 (57)	6.4 (83)	1.0 (40)	1.3 (60)	1.0 (33)	5.0 (33)	1.0 (17)	1.0 (50)
Crow	7.9 (85)	6.4 (91)	9.1 (86)	7.2 (89)	7.3 (88)	5.9 (88)	5.9 (90)	6.7 (91)	8.9 (88)	8.8 (90)	9.4 (84)
American woodcock	3.3 (72)	5.3 (65)	3.6 (70)	3.9 (83)	3.7 (69)	3.3 (74)	4.1 (73)	3.6 (76)	3.8 (70)	3.4 (68)	3.8 (70)
Mourning dove [γ]		7.9 (79)	8.7 (80)	8.2 (81)	9.8 (79)	13.2 (87)	11.4 (92)	11.1 (85)	10.5 (78)	12.5 (80)	9.2 (85)
Ring-necked pheasant	6.3 (77)	5.7 (70)	7.0 (76)	6.6 (75)	7.1 (78)	6.4 (77)	5.8 (69)	5.6 (72)	4.4 (63)	4.9 (67)	4.2 (64)
Ruffed grouse	5.1 (74)	3.9 (63)	4.4 (68)	5.9 (77)	4.7 (69)	5.0 (74)	5.5 (74)	6.6 (76)	5.9 (74)	5.2 (71)	5.2 (68)
Spruce grouse	3.3 (63)	2.3 (54)	2.4 (61)	3.8 (71)	3.1 (54)	3.0 (68)	3.1 (64)	2.4 (71)	3.0 (61)	2.8 (57)	2.4 (51)
Sharp-tailed grouse	3.3 (52)	3.1 (54)	2.4 (55)	3.3 (56)	4.4 (46)	3.2 (64)	3.0 (58)	3.5 (68)	3.1 (61)	3.4 (48)	3.2 (33)
Gray partridge	4.1 (69)	3.6 (66)	5.0 (52)	2.8 (69)	3.0 (55)	3.4 (65)	3.3 (58)	4.2 (58)	3.2 (52)	3.1 (54)	2.5 (38)
Gray squirrel	7.0 (85)	6.9 (83)	5.8 (86)	6.4 (87)	5.9 (88)	6.2 (88)	5.8 (86)	7.0 (84)	6.3 (78)	6.3 (80)	5.0 (77)
Fox squirrel	5.1 (83)	4.8 (85)	5.0 (83)	5.0 (85)	3.9 (83)	4.6 (83)	4.8 (85)	4.6 (86)	5.4 (74)	4.4 (80)	3.7 (75)
Eastern cottontail	5.2 (84)	5.8 (80)	5.4 (83)	4.6 (85)	4.8 (84)	5.3 (85)	4.3 (83)	4.4 (81)	4.1 (69)	5.5 (71)	3.5 (79)
White-tailed jackrabbit	3.3 (73)	3.0 (75)	3.2 (83)	2.5 (64)	4.5 (72)	3.8 (70)	2.1 (71)	4.6 (70)	3.5 (63)	2.3 (48)	5.2 (29)
Snowshoe hare	3.5 (61)	3.0 (61)	4.6 (68)	3.8 (80)	2.2 (62)	3.5 (71)	2.6 (60)	2.6 (69)	3.8 (69)	5.0 (69)	2.9 (58)
Raccoon (Sept -Feb)	9.6 (86)	9.9 (92)	6.5 (93)	7.7 (94)	5.4 (90)	10.6 (91)	9.6 (95)	10.0 (94)	6.1 (89)	6.1 (93)	6.9 (89)
Raccoon[‡] (March -Aug)	5.6 (85)	6.7 (91)	3.1 (87)								
Red fox (Sept -Feb)	3.5 (51)	2.8 (38)	3.7 (46)	2.1 (60)	2.3 (46)	1.5 (49)	2.4 (54)	2.3 (54)	2.4 (49)	2.7 (50)	2.0 (44)
Red fox[‡] (March -Aug)	1.1 (52)	1.4 (44)	1.6 (56)								
Gray fox	1.3 (30)	2.6 (41)	1.9 (50)	2.7 (65)	1.0 (29)	3.3 (39)	2.5 (42)	4.0 (36)	2.5 (33)	1.0 (16)	1.5 (17)
Coyote	2.7 (49)	2.5 (45)	4.11 (50)	2.4 (51)	4.4 (49)	4.4 (54)	4.6 (52)	4.0 (57)	4.0 (47)	5.1 (49)	2.7 (50)
Badger	1.0 (67)	1.2 (86)	1.2 (100)	1.6 (82)	1.0 (33)	1.2 (83)	2.5 (80)	1.0 (100)	1.5 (50)	1.0 (100)	1.0 (57)

[‡] Raccoon and red fox season continuous May 1994 thru March 15, 2006. [γ] Mourning dove season added 2004. * No hunters surveyed reported Rails/Gallinules in bag.
[β] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.

Table 5. Statewide (resident and non-resident) small game hunting license sales and estimated hunter harvest, 2002-03 through 2013-14.

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 [β]	2012-13 [β]	2013-14
Small game license sales [a]	288,729	296,939	287,725	280,156	295,898	298,467	290,064	282,983	282,227	271,768	264,063	258,581
State duck stamp sales	119,677	118,757	114,003	102,143	101,792	100,134	95,675	89,942	88,069	89,681	90,052	90,483
Pheasant stamp sales	102,097	121,456	114,653	117,301	129,546	129,315	123,270	110,456	104,286	86,868	90,541	74,668
Estimated harvest [b]												
Ducks	1,024,662	914,398	727,206	676,741	730,559	708,491	658,186	572,220	619,600	681,550	784,360	782,810
Canada geese	256,937	289,689	284,714	281,829	324,498	243,705	288,411	227,160	257,530	281,630	301,550	229,120
Other geese	11,125	12,755	8,150	9,025	6,658	7,723	13,895	6,250	3,940	4,800	8,820	7,130
American coot	20,114	10,993	20,345	15,938	24,909	16,061	23,871	14,810	26,340	10,520	16,720	15,130
Common snipe	3,432	2,558	2,130	5,336	4,221	3,933	2,210	1,490	1,940	1,390	1,420	2,310
Rails / gallinules	1,723	75	75	0	1,329	2,569	163	300	80	390	80	70
Crow	71,753	82,285	71,943	92,742	69,188	54,319	51,742	56,350	57,300	81,500	90,260	67,440
American woodcock	28,230	30,438	41,479	27,919	39,907	27,866	29,210	35,430	29,770	24,980	30,360	31,920
Mourning dove [d]			96,559	77,749	85,950	101,161	132,577	109,940	100,230	74,000	92,760	80,480
Ring-necked pheasant	357,833	511,462	419,712	585,299	587,580	655,443	522,071	398,130	359,400	198,500	250,140	169,100
Ruffed grouse	249,386	350,674	194,687	224,309	417,153	293,544	318,338	357,420	465,580	383,150	341,320	288,410
Spruce grouse	11,943	18,327	9,204	10,079	26,568	17,705	16,997	19,130	14,960	18,640	11,980	13,110
Sharp-tailed grouse	8,516	11,835	10,417	6,387	11,939	13,790	13,695	9,530	16,820	11,600	10,650	7,130
Gray partridge	10,921	22,250	12,572	16,289	11,545	11,000	9,660	8,040	9,150	3,950	5,160	2,380
Gray squirrel	133,589	174,848	132,659	122,078	140,788	133,194	121,534	109,790	138,920	115,840	126,110	84,010
Fox squirrel	67,100	84,529	62,410	62,187	66,068	47,736	51,079	53,970	61,690	48,100	49,750	33,940
Eastern cottontail	51,967	93,054	86,508	90,062	77,872	78,588	79,927	57,760	53,870	34,640	64,140	40,710
White-tailed jack rabbit	4,046	7,161	6,940	5,493	4,149	9,482	6,446	2,610	7,220	5,180	1,910	1,870
Snowshoe hare	10,909	11,969	7,895	10,406	16,801	5,789	11,343	5,360	6,770	8,430	16,800	6,200
Raccoon (Sept -Feb)	60,049	49,878	56,970	29,191	62,891	46,739	72,026	66,700	77,690	44,080	48,340	46,690
Raccoon [c] (Mar –Aug)	19,524	21,752	20,456	7,331								
Red fox (Sept –Feb)	11,438	13,000	6,072	10,166	7,872	6,188	4,408	10,270	8,780	7,120	7,990	5,190
Red fox [c] (Mar –Aug)	3,746	1,287	836	1,141								
Gray fox	521	602	1,758	927	3,593	559	2,443	1,860	2,380	1,160	250	430
Coyote	14,223	19,961	18,230	38,612	20,769	34,377	45,689	46,070	44,050	33,410	51,990	23,630
Badger	1,272	302	533	924	1,091	159	490	750	600	230	330	290

Harvest estimates in this table, and the number of hunters and mean take per hunter in Table 5, are calculated from different questions on the survey form. The sample used in calculations differs from one estimator to the next. This is because some respondents give specific answers to one question but not to a related one. A formula is used to calculate the total estimated take for each species that appear in this table. In most years the formula produces results rather close to those obtained by multiplying the average take per hunter times the number of hunters. However, in other years (e.g., 1985) results of the two methods are quite divergent, perhaps as a result of an unusual sample. This is being investigated further, and as a result, numbers may change somewhat in future reports. The most current report of survey findings will have the best data available at that time. A youth-free license was part of the sampling frame for the 2011-12 and 2012-13 seasons but was discontinued for 2013-14. The harvest statics for those years have been recomputed by removing the youth free license from both the sampling frame and the respondents' database. The estimates are now more comparable over time.

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

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

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Nonresident licenses issued [a]	5,852	6,291	6,385	5,897	7,356	7,858	7,114	6,934	6,695	6,312	6,456	6,031
Questionnaires:												
Number mailed	130	123	182	210	185	185	226	196	163	169	166	162
Number not delivered	9	17	13	10	11	11	15	10	6	11	11	10
Number (percent) returned	75 (66)	68 (64)	114 (67)	134 (67)	115 (62)	101 (58)	89 (42)	105 (54)	107 (66)	91 (54)	71 (43)	81 (50)
Estimated nonresidents and (percent) of all licensed nonresidents hunting:												
Ducks	2,263 (39)	2,498 (40)	2,394 (37)	2,040 (35)	2,344 (32)	2,256 (29)	2,293 (32)	1,849 (27)	2,003 (29.9)	2,430 (38.5)	2,360 (36.6)	2,010 (33.3)
Canada goose	1,092 (19)	1,388 (24)	1,368 (21)	1,818 (31)	2,083 (28)	934 (12)	1,587(22)	726 (10)	1,314 (19.6)	1,620 (25.6)	1,360 (21.1)	1,270 (21.0)
Ruffed grouse	2,029 (35)	2,313 (40)	1,824 (29)	1,774 (30)	1,953 (26)	1,867 (24)	1,940 (27)	1,915 (28)	2,503 (37.4)	1,460 (23.1)	2,820 (43.7)	2,010 (33.3)
Ring-necked pheasant	1,404 (24)	2,128 (36)	2,679 (42)	2,572 (44)	3,776 (51)	2,645 (34)	3,116 (44)	1,519 (22)	2,003 (29.9)	1,780 (28.2)	1,910 (29.6)	1,420 (23.5)
Raccoon [b, c]	0 (0)	0 (0)	0 (0)	44 (0.7)	0 (0)	78 (1.0)	0 (0)	0 (0)	63 (0.9)	0 (0)	0 (0)	80 (1.2)
Estimated nonresident take:												
Ducks	17,556	17,855	19,269	12,149	12,173	22,718	15,463	11,755	17,055	13,840	20,380	20,410
Canada goose	5,852	5,736	6,214	3,946	3,580	3,501	5,762	3,698	6,334	4,050	2,270	3,650
Ruffed grouse	9,207	9,437	7,924	6,429	11,522	7,236	6,938	8,651	12,600	8,980	10,090	4,990
Ring-necked pheasant	7,647	9,344	11,174	13,656	16,079	17,661	10,642	6,274	8,076	4,860	6,820	3,430
Raccoon [b, c]	0	0	0	887	0	3,268	0	0	593	0	0	1,280

[a] Excludes duplicate licenses and nonresident shooting preserve licenses.
[b] In 2002, 2003, 2004, 2006, 2008, 2009, 2011 and 2012 no non-residents reported hunting/harvesting raccoons.
[c] In 2013 only one non-resident reported hunting/harvesting raccoons. The extrapolated estimate is not reliable.

The following information has been excerpted from: U.S. Fish and Wildlife Service. Migratory bird hunting activity and harvest during the 2012 - 2013 and 2013-14 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A. The entire report is available on-line at http://www.fws.gov/migratorybirds/NewsPublicationsReports.html

Table 1. Species composition of the Minnesota waterfowl harvest, 2012 and 2013. (from: Raftovich, R.V., S. Chandler, and K.A. Wilkins. 2014. Migratory Bird Hunting activity and harvest during the 2012-13 and 2013-14 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2014. 64 pp).

	Minnesota Harvest					Mississippi Flyway Harvest		
Species	2012	% of Harvest	2013	% of Harvest	Percent change in Harvest 12-13	2012	2013	Percent change Harvest 12-13
Mallard	197,316	26.33	166,366	27.37	-19	1,882,553	1,837,000	-2
Domestic mallard	0	0	0	0	0	647	1,277	+49
American black duck	587	0.08	0	0	0	20,688	24,951	+17
Black x mallard	587	0.08	0	0	0	2,074	5,633	+63
Gadwall	18,792	2.51	15,254	2.51	-23	1,240,234	1,009,467	-23
American wigeon	9,983	1.33	4,767	0.78	-109	137,133	95,602	-43
Green-winged teal	56,376	7.52	33,368	5.49	-69	932,461	848,357	-10
Blue-winged /cinnamon teal	123,322	16.46	115,360	18.98	-7	932,096	942,908	+1
Northern shoveler	15,856	2.12	15,731	2.59	-1	391,133	355,367	-10
Northern pintail	5,285	0.71	8,104	1.33	35	156,593	155,104	-1
Wood duck	184,396	24.61	149,681	24.63	-23	780,024	774,961	-1
Redhead	22,315	2.98	19,544	3.22	-14	99,179	121,598	+18
Canvasback	4,111	0.55	8,104	1.33	49	52,081	76,103	+-32
Greater scaup	2,936	0.39	3,814	0.63	23	40,968	49,064	+17
Lesser scaup	17,617	2.35	10,011	1.65	-76	307,579	97,873	-214
Ring-necked duck	75,755	10.11	31,838	5.25	-137	324,658	240,898	-35
Goldeneye	4,111	0.55	1,430	0.24	-187	26,055	29,593	+12
Bufflehead	3,523	0.47	14,777	2.43	76	67,418	88,370	+24
Ruddy duck	2,349	0.31	0	0	0	20,443	8,933	-129
Scoters	0	0	0	0	0	3,989	3,091	-29
Hooded merganser	4,111	0.55	9,057	1.49	55	45,886	45,416	-1
Other mergansers	0	0	0	0	0	7,214	13,174	+45
Total Duck Harvest (retrieved kill)	749,300 ±13%		608,800 ±14%		- 23	7,522,700 ±5%	6,882,900 ±8%	-9

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

Table 2. Top 10 states in number of **adult duck hunters**, 2013, and number of hunter-days and retrieved duck kill. (from: Raftovich, R.V., S. Chandler, and K.A. Wilkins. 2014. Migratory Bird Hunting activity and harvest during the 2012-13 and 2013-14 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2014. 64 pp).

State	Number of active duck hunters	Duck hunter days afield	Total duck harvest	Seasonal duck harvest per hunter
Louisiana	77,600 ± 14%	766,200 ± 19%	2,390,500 ± 21%	30.8 ± 25%
Wisconsin	53,100 ± 15%	370,500 ± 19%	455,700 ± 16%	8.6 ± 22%
Minnesota	52,200 ± 11%	312,100 ± 12%	607,800 ± 14%	11.6 ± 18%
California	47,000 ± 11%	403,200 ± 11%	1,062,400 ± 14%	22.6 ± 18%
Texas	46,400 ± 24%	360,600 ± 46%	1,049,300± 42%	22.6 ± 49%
Arkansas	44,900 ± 11%	305,200 ± 15%	933,700 ± 17%	20.8 ± 20%
North Dakota	32,100 ± 8%	161,200 ± 8%	466,700 ± 9%	14.6 ± 11%
Michigan	31,800 ± 15%	197,300 ± 22%	296,200 ± 26%	9.3 ± 30%
Illinois	28,500 ± 12%	248,600 ± 17%	396,800 ± 18%	13.9 ± 22%
North Carolina	26,400 ± 17%	165,000 ± 17%	279,700 ± 17%	10.6 ± 24%
Mississippi Flyway		3,107,200 ± 7%	6,882,900 ± 8%	
United States		6,196,900 ± 5%	13,716,400 ± 6%	

Table 3. Top 10 states in number of **adult goose hunters**, 2013, and number of hunter-days and retrieved goose kill. (from: Raftovich, R.V., S. Chandler, and K.A. Wilkins. 2014. Migratory Bird Hunting activity and harvest during the 2012-13 and 2013-14 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2014. 64 pp).

State	**Number of active goose hunters**	**Goose hunter days afield**	**Total goose harvest**	**Seasonal goose harvest per hunter**
Minnesota	42,400 ± 14%	239,500 ± 19%	191,600 ± 19%	4.5 ± 24%
Wisconsin	30,000 ± 16%	220,500 ± 20%	86,300 ± 22%	2.9 ± 27%
Texas	30,300 ± 26%	90,500 ± 38%	148,800 ± 36%	4.9 ± 45%
California	29,800 ± 13%	201,800 ± 16%	162,200 ± 19%	5.4 ± 23%
Michigan	26,400 ± 18%	159,900 ± 25%	148,200 ± 35%	5.6 ± 39%
North Dakota	24,800 ± 9%	117,500 ± 11%	199,600 ± 15%	8.0 ± 18%
Ohio	23,500 ± 18%	160,300 ± 23%	128,500 ± 18%	5.5 ± 25%
Illinois	23,100 ± 15%	173,100 ± 21%	117,800 ± 23%	5.1 ± 27%
Maryland	21,800 ± 8%	130,000 ± 13%	163,000 ± 14%	7.5 ± 16%
Pennsylvania	21,800 ± 17%	114,200 ± 20%	109,400 ± 26%	5.0 ± 31%
Mississippi Flyway		1,497,500 ± 8%	1,195,500 ± 12%	
United States [b]		3,301,400 ± 6%	3,360,400 ± 6%	

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

HUNTER ACTIVITY AND GOOSE HARVEST DURING THE AUGUST 2013 CANADA GOOSE HUNT IN MINNESOTA

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

The first August Canada goose season in Minnesota was held 10 - 25 August 2013, (16 days) in a portion of west-central Minnesota hereafter called the August Goose Zone (AGZ; Fig. 1). The AGZ was determined using the number of agricultural depredation complaints (primarily the number of Canada goose depredation shooting permits issued by Minnesota Department of Natural Resources (DNR) Area Wildlife Managers), and a series of meetings with DNR Area Managers, the DNR Canada goose sub-committee, and the DNR Waterfowl Committee. The primary purpose of the August Canada goose hunt is to decrease local populations of Canada geese in areas of the state that have large numbers of Canada goose depredation complaints. The season also offers additional Minnesota Canada goose hunting opportunities.

During the August season the daily bag limit was 10 Canada geese per day within the AGZ, with no possession limit. Shooting hours were 1/2-hour before sunrise to 1/2-hour after sunset. Goose hunters were required to obtain a $4.00 permit to participate in the August season. This is the same permit required to hunt in the September Goose Season. This report documents results of the 2013 August goose hunter mail questionnaire survey (Appendix A).

METHODS

Permittees were randomly selected to receive a post-season hunter survey. We used a stratified design (with 2 strata based on a permit-sales-date of 8/4 as a cutpoint, i.e., stratum 1 = permit sold prior to 8/4, stratum 2 = permits sold between 8/4 and 8/25). Only 22% of stratum 1 respondents hunted in Aug, vs. 61% in stratum 2. Questionnaires were sent to 2,400 permit holders following the August season. Questionnaires were individually numbered and up to 3 questionnaires were mailed to individuals who had not responded. Completed questionnaires were double key-punched to reduce data-entry errors.

We surveyed hunters as to the number of days hunted, the county they hunted in the most, the number of geese shot and retrieved, and the number of geese knocked down and not retrieved during the August goose season. Hunters were also asked to indicate whether or not they had hunted during the ½-hour after sunset period, and how many geese they shot during that period.

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

RESULTS AND DISCUSSION

The DNR License Bureau reported that 13,740 Special Canada Goose Season permits were sold prior to 26 August 2013. Response rate to the survey was 66%. Among those respondents, 48% indicated that they hunted during the August season. Active hunters were afield an average of 3.1 days, harvested 1.2 geese per day hunted, and retrieved 3.8 geese per hunter (Table 1). The number and percentage of hunters that hunted in each county in Minnesota is presented in Appendix B.

From the survey, we estimate that 6,570 active hunters shot and retrieved 25,050 Canada geese during the 2013 August season (Table 1). Data from the survey also indicate that hunters knocked down and lost 2,420 geese, for a loss rate of 8.8%.

We asked hunters to indicate whether they had hunted geese during the ½-hour after sunset. A total of 29% of hunters reported hunting in the ½-hour after sunset period, and 1,960 geese, or 8% of the total geese, were harvested during this period.

This was the first year the August goose hunt was held in Minnesota. Spring 2013 was very late, with very cold temperatures and extensive areas of snow cover through May. This appeared to severely impact Canada goose reproduction within the AGZ (Rave 2013) and likely decreased hunter participation and success in 2013.

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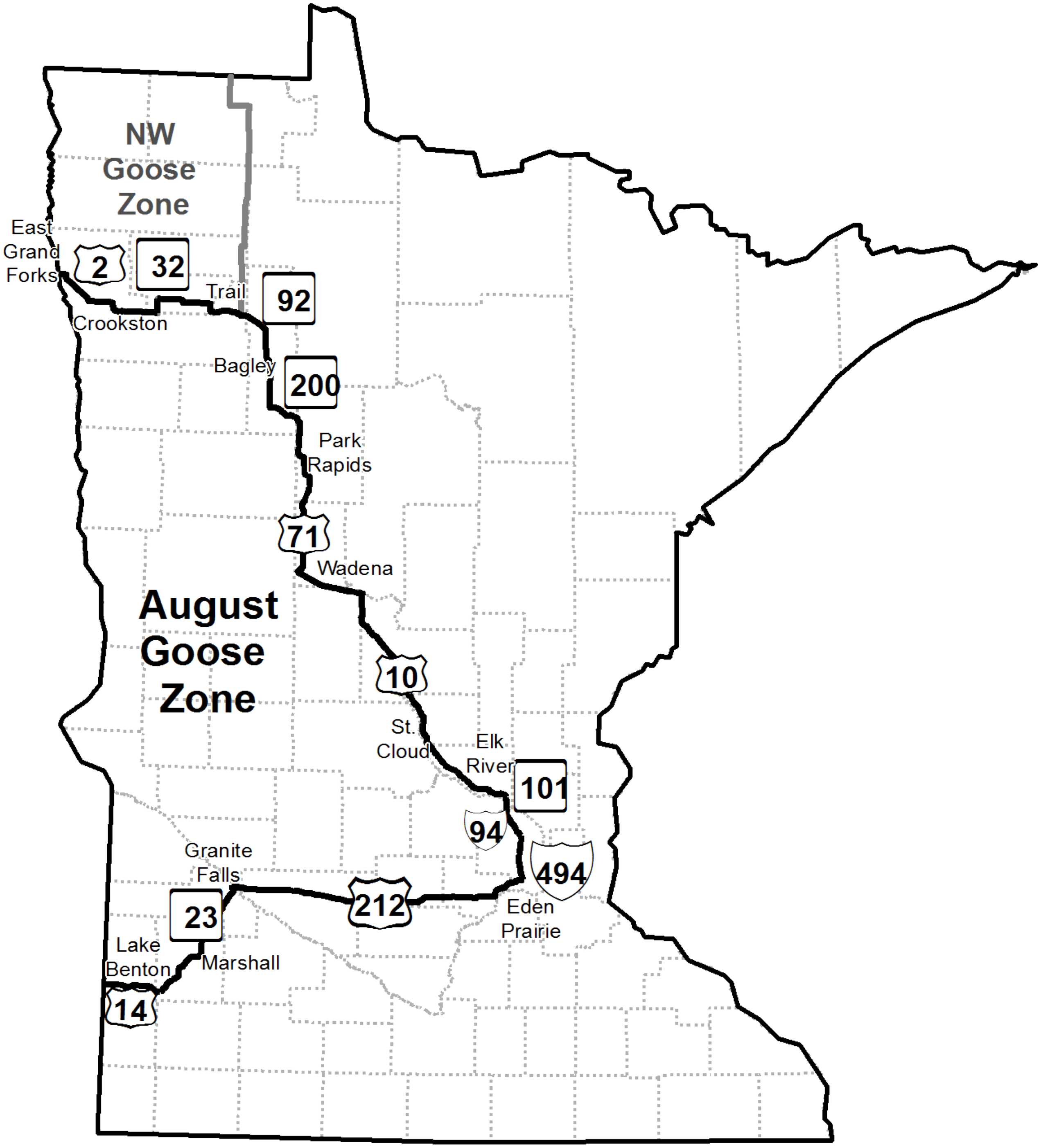

Figure 1. August Goose Zone in relation to the Northwest (NW) Goose Zone within Minnesota, 2013.

Table 1. Permit sales, hunter activity, and harvest[a] during the August Canada Goose season (10 - 25 August) in Minnesota, 2013.

Parameter	Total
Total permits sold [b]	13,740
Questionnaires delivered	2,380
Useable questionnaires returned	1,570
% responding	66.2
Active hunters	750
% active hunters	48.0
Days hunted per active hunter	3.0
Geese shot and retrieved per active hunter	3.8
Unretrieved harvest per active hunter	0.37
% Unretrieved harvest	8.8
EXPANDED:	
Active hunters	6,570
Hunter days	20,328
Retrieved harvest	**25,050**
Est. unretrieved harvest	2,420
Total harvest	27,480

[a]Harvest estimates not adjusted for memory/exaggeration bias.
[b]Special goose permits sold prior to August 26

Appendix A. Questions asked on the 2013 August Canada Goose Season Hunter Survey.

1. Did you hunt Canada geese in Minnesota during August 10 – 25, 2013? Yes / No

   If NO, please disregard all remaining questions and return this survey card.
2. How many days did you hunt Canada geese in Minnesota during August 10 – 25, 2013? _________
3. In what county did you hunt Canada geese most often during August 10 – 25, 2013? _________
4. How many Canada geese did you personally shoot and retrieve in Minnesota? _______
5. How many Canada geese did you personally knock down but could NOT retrieve? _______
6. Did you hunt Canada geese in Minnesota during the ½ hour after sunset period? Yes / No
7. If yes, how many Canada geese did you shoot and retrieve during the ½ hour after sunset period? _______

Appendix B. Number and percent of active August Canada goose hunters in the August Canada Goose Hunt survey in each county within the August Goose Zone, Minnesota, 2013.

	Hunters			Hunters	
County	N	%	County	N	%
BECKER	15	0.022	POPE	25	0.037
BENTON	1	0.001	RED LAKE	0	0
BIG STONE	17	0.025	RENVILLE	7	0.01
CARVER	38	0.057	SHERBURNE	12	0.018
CHIPPEWA	8	0.012	STEARNS	105	0.157
CLAY	7	0.01	STEVENS	15	0.022
CLEARWATER	2	0.003	SWIFT	14	0.021
GRANT	14	0.021	TODD	22	0.033
HENNEPIN	16	0.024	TRAVERSE	2	0.003
HUBBARD	2	0.003	WADENA	1	0.001
KANDIYOHI	41	0.061	WILKIN	1	0.001
LAC QUI PARLE	16	0.024	WRIGHT	59	0.088
LINCOLN	8	0.012	YELLOW MEDICINE	8	0.012
LYON	4	0.006			
MAHNOMEN	2	0.003			
McLEOD	36	0.054			
MEEKER	35	0.052			
MORRISON	9	0.013			
NORMAN	0	0			
OTTERTAIL	44	0.066			
POLK	2	0.003			

HUNTER ACTIVITY AND GOOSE HARVEST DURING THE AUGUST AND SEPTEMBER 2013 EARLY CANADA GOOSE HUNTS IN MINNESOTA

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

The August and September Canada goose seasons in Minnesota were 10-24 August, and 1 - 20 September, 2013 respectively. During the August season the daily bag limit was 10 Canada geese per day within a portion of the state, the Intensive Harvest Zone (IHZ; Fig 1), with no possession limit. Shooting hours were 1/2-hour before sunrise to 1/2-hour after sunset. During the September season the daily bag limit was 10 Canada geese per day in the IHZ, and 5 geese per day in the rest of the state. Shooting hours were 1/2 hour before sunrise to sunset. Taking of Canada geese was prohibited on or within 100 yards of all surface waters in the Northwest Goose Zone, in the Carlos Avery Wildlife Management Area (Anoka County) and on Swan Lake (Nicolette County). Goose hunters in both the August and September seasons were required to obtain a $4.00 permit to participate in the September season. This report documents results of the 2013August and September goose hunter mail questionnaire survey (Appendix A).

METHODS

Permittees were randomly selected to receive a post-season hunter survey. Questionnaires were sent to 3,045 permit holders following the September season. Questionnaires were individually numbered, and up to 3 questionnaires were mailed to individuals who had not responded. Completed questionnaires were double key-punched to reduce data-entry errors.

The questionnaire asked hunters the number of days hunted, number of geese shot and retrieved, number of geese knocked down and not retrieved, in each of the August and September goose seasons. Hunters were asked to indicate the number of days during the two seasons that they hunted over water, and not over water, and the number of geese they shot under each scenario. Finally, the questionnaire asked hunters a series of questions to gauge their satisfaction with the August and September Canada goose hunting seasons in Minnesota. We used the R programming language (ver. 2.9.2; R Development Core Team [RDCT] 2009) to summarize responses to the survey.

RESULTS AND DISCUSSION

The DNR License Bureau reported that 27,778 Special Canada Goose Season permits were sold prior to 22 September, 2013. Response rate to the survey was 46%. Among those respondents, 25% indicated that they hunted during the August season, and 61% indicated they hunted during the September season.

Responses from the survey indicate that 6,810 hunters participated in the August hunt (Table 1), while 16,840 participated in the September hunt (Table 2). A total of 18,570 hunters hunted during either the August and/or September Early goose season. Hunters shot and retrieved 23,570 Canada geese during the 2013 August season, and 81,230 during the 2013 September season for a total early season estimated goose harvest of 104,800 geese (Table 3). Prior to the implementation of the Harvest Information Program, the U.S. Fish and Wildlife

Service adjusted their mail survey statistics by a memory and prestige response bias factor of 0.848 for geese bagged in the Mississippi Flyway (Voelzer et al. 1982:56). Multiplying August and September Canada goose harvest by the adjustment factor would indicate a 2013 retrieved harvest of 88,870 geese.

We asked hunters how many days they hunted overwater and how many days they hunted away from water. A total of 40% of hunters statewide hunted over water in August and September, and 32% of all days spent hunting during the August and September seasons were overwater. The survey indicates that 21% of the geese harvested in the two early seasons (22,470 total geese) were harvested by hunters overwater. These results were similar to the results obtained in the 2012 survey.

The estimated harvest from the Intensive Harvest Zone during the August and September seasons was 23,600 and 37,300 Canada geese respectively (total 60,900 Canada geese). Another 43,900 Canada geese was harvested in the rest of the state during the September season.
In 2013, sixty percent of all geese in the August season were harvested in the first week, and 40% the second. Thirty-two percent of geese during the September season were harvested in the first week of the season, followed by 38% in the second week, and 30% harvested the third.
We asked hunters how satisfied they were (1=very low,…, 7=very high) relative to overall hunting experience, number of geese bagged, number of geese seen, and regulations. Mean satisfaction in 2013 for the August season was: overall experience 4.6, geese bagged 3.8, number of geese seen 3.9, and regulations 5.1. Mean satisfaction in 2013 for the September season was: overall experience 5.2 (5.1 in 2012), geese bagged 4.3 (3.9 in 2012), number of geese seen 4.4 (4.4 in 2012), and regulations 5.1 (5.1 in 2012).

We asked hunters how strongly they supported overwater hunting (1=strongly oppose,…, 5=strongly support) at 3 locations in Minnesota: The Northwest Goose Zone (NW), Swan Lake (SL), and at Carlos Avery Wildlife Management Area (CA). Mean support for the 3 areas was NW 3.1, SL 3.2, and CA 3.2.

Finally we asked hunters how they felt about the 10 Canada goose daily bag in the Intensive Harvest zone during the August and September seasons. Five % of respondents felt the limit was too low, 46% of respondents felt the limit was about right, 14% felt the limit was too high, and 35% of respondents had no opinion.

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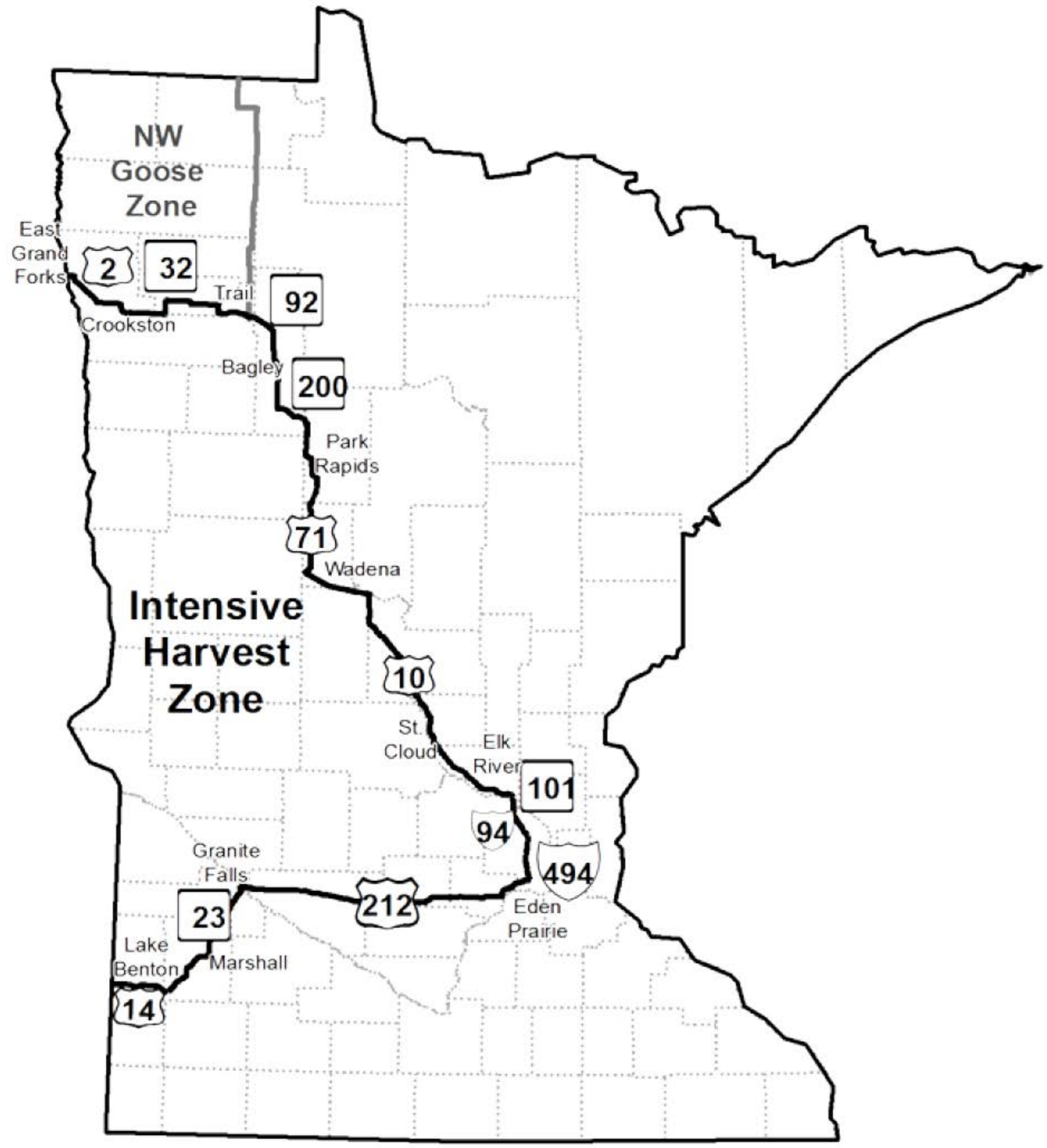


Figure 1. Intensive Harvest Zone in relation to the Northwest (NW) Goose Zone within Minnesota, 2013.

Table 1. Permit sales, hunter activity, and harvest[a] during the August Canada Goose season (10 – 25 August) in Minnesota, 2013.

Parameter	Total
Total early goose permits sold	27,778
Questionnaires delivered	3,045
Useable questionnaires returned	1,400
% responding	46.0
Days hunted per active hunter	3.1
Geese shot and retrieved per active hunter	3.5
Unretrieved harvest per active hunter	0.5
% unretrieved harvest	12.8
EXPANDED:	
Active hunters	6,810
Hunter days	21,230
Retrieved harvest	23,570
Est. unretrieved harvest	3,490
Total harvest	27,060

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

Table 2. Permit sales, hunter activity, and harvest[a] during the September Canada Goose season (1 – 21 September) in Minnesota, 2013.

Parameter	Total
Total permits sold	27,778
Questionnaires delivered	3,100
Useable questionnaires returned	1,400
% responding	46.0
Days hunted per active hunter	3.9
Geese shot and retrieved per active hunter	4.8
Unretrieved harvest per active hunter	0.4
% unretrieved harvest	8.4
EXPANDED:	
Active hunters	16,840
Hunter days	64,970
Retrieved harvest	81,230
Est. unretrieved harvest	7,440
Total harvest	88,670

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

Table 3. Retrieved harvest estimates by zone during the September Canada Goose season in Minnesota, 2000 – 2009. Total retrieved harvest estimates during the September Canada Goose season in Minnesota, 2010-2012. Total retrieved harvest during the August and September Canada Goose Seasons, combined, in Minnesota, 2013.

Year	Northwest	West	Southeast	Twin Cities Metro	Remainder	Total Geese Harvested	Number of Hunters	Geese/ Hunter day	Geese/ Hunter
2000	2,750	18,909	1,183	15,594	51,685	**90,121**	33,202	0.63	2.71
2001	2,047	27,663	538	8,164	62,608	**101,021**	28,265	0.82	3.57
2002	1,568	22,075	848	8,504	50,769	**83,764**	26,089	0.68	3.20
2003	2,805	17,779	2,357	9,890	48,157	**80,988**	30,415	0.74	2.66
2004	4,326	16,843	1,197	11,090	56,480	**89,936**	29,657	0.80	3.03
2005	4,888	15,304	1,717	11,139	61,218	**94,266**	27,865	0.89	3.38
2006	6,826	17,987	1,461	11,844	53,321	**91,439**	28,405	0.86	3.22
2007	7,948	14,952	1,469	11,702	58,243	**94,314**	25,379	0.91	3.72
2008	5,530	16,168	2,580	13,656	62,827	**100,748**	27,392	0.98	3.73
2009	4,442	10,294	2,023	12,794	48,609	**78,151**	25,189	0.85	3.10
2010						**107,907**	26,848	0.98	4.00
2011						**123,700**	26,000	1.21	4.80
2012						**108,300**	25,900	0.98	4.20
2013						**104,800**	18,570	1.25	4.82

2013 September Special Canada Goose Season Hunter Survey

You are being asked to provide information to help us evaluate the harvest of Canada geese in Minnesota during August 10 – 25 or September 1-20, 2013. Your cooperation is important. Please return this survey card even if you did not hunt Canada geese. THANK YOU! Ed Boggess, Director, Division of Fish and Wildlife, MN DNR.

1. Did you hunt Canada geese during either the August 10-25 Intensive Harvest Zone or September 1-20, 2013 September Canada goose season? (Please check one for each month.)
August ____ Yes ____ No **September** ____ Yes ____ No

If you answered NO, to question 1, you may skip to question 7.

2. Indicate the number of days hunted, total harvest of geese, and total number of geese knocked down but not retrieved in each season and goose zone during August and September 2013.

Goose Season/zone *(see map for goose-zone boundaries)*	**Number of days hunted**	**Total geese personally shot and retrieved**	**Total geese personally knocked down but not retrieved**
August 10-25 (Intensive Harvest zone)			
September 1-20 (Intensive Harvest zone)			
September 1-20 (Remainder of State zone)			

3. Did you personally hunt geese overwater (for example with decoys floating in or along the shore of a wetland or pass shooting next to a wetland) during either the August or September 1 Canada goose season?
______Yes ______No (If No, please proceed to Question 4.)
If Yes:
How many days did you personally hunt overwater? _______ days
How many geese did you personally shoot while hunting overwater? _______ geese

4. During the 2013 August and September Canada goose seasons, how many geese did you personally harvest during each of the following periods:

Saturday Aug. 10–Friday Aug. 16 _______geese
Saturday Aug. 17–Sunday Aug. 25 _______geese
Sunday Sept. 1–Friday Sept. 6 _______geese
Saturday Sept. 7 – Friday Sept.13 _______geese
Saturday Sept. 14 – Friday Sept. 20 _______geese

5. If you hunted geese during the 2013 **August** Canada goose season, how satisfied or dissatisfied were you with the following? (*Please circle one response for each.*) If you did not hunt during this season please skip to question 6.

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

6. If you hunted geese during the 2013 **September** Canada goose season, how satisfied or dissatisfied were you with the following? (*Please circle one response for each.*)

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

7. Canada goose hunting is currently not allowed within 100 yards of surface water in the September goose season in the Northwest goose zone, Carlos Avery Wildlife Management area, and an area around Swan Lake. Do you support or oppose maintaining these restrictions?

Maintain water restrictions	Strongly oppose	Oppose	Neither support nor oppose	Support	Strongly support
Northwest goose zone	1	2	3	4	5
Carlos Avery WMA	1	2	3	4	5
Swan Lake area	1	2	3	4	5

8. The Minnesota DNR increased the daily bag limit in the Intensive Harvest zone during the August and September seasons this year. Which one statement describes how you feel about the daily goose bag limit used in the Intensive Harvest zone (10 Canada geese per day)?

- ❑ The daily limit was too low.
- ❑ The daily limit was about right.
- ❑ The daily limit was too high.
- ❑ No opinion.

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

Comments:

2014 LIGHT GOOSE CONSERVATION ORDER HARVEST IN MINNESOTA

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

INTRODUCTION

This report documents results of the 2014 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 1 March - 30 April 2014. 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 1,278 permits was issued and 759 responses (60 %) to the questionnaire were obtained (Table 1). In calculating harvest estimates, we assumed that the 519 non-respondents participated in the conservation action and took light geese in the same manner as respondents (i.e., tallies were expanded by 1.68). Harvest was again concentrated in the southwest portion of the state with some also being taken in west-central Minnesota. Five hundred sixty people attempted to take light geese during the 61-day conservation order period. Active participants pursued light geese for 2,580 days and 2,880 light geese were shot and retrieved. This was an average retrieved take of 5.1 geese per active participant. Another 210 light geese were estimated wounded and not retrieved.

Unplugged shotguns were used by 270 (48.8 %) individuals to take 2,060 (71.5%) geese, of which 770 (26.7%) were taken with the 4th, 5th, or 6th shell. Electronic calls were used by 160 (27.8%) participants to take 1,710 (59.4%) light geese. During the 1/2 hour after sunset period, 550 (19.1%) geese were harvested by 200 (36.2%) active hunters.

The method used for hunting white geese was 37.7% over decoys, 26.7% pass shooting, and 35.6 % sneaking geese.

ACKNOWLEDGMENTS

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

Figure 1. Light Goose Conservation Order hunter mail questionnaire, 2014.

MINNESOTA 2014 LIGHT GOOSE HARVEST SURVEY
For the Period of March 1 - April 30, 2014 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, 2014. Your cooperation is important. Please return this survey card even if you did not hunt light geese. Please answer the following questions to the best of your ability. **Answer only for your Minnesota 2014 hunting experience.** THANK YOU! Ed Boggess, Director, Division of Fish and Wildlife, MN DNR.

1. Did you hunt light geese in Minnesota during March 1 - April 30, 2014? 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, 2014? ___________
3. In what county did you hunt light geese most often during March 1 - April 30, 2014? ___________
4. How many light geese did you personally shoot and retrieve in Minnesota? ___________
5. How many light geese did you personally shoot, but were UNABLE to retrieve? ___________
6. Did you hunt light geese in Minnesota with a gun(s) that was holding more than 3 shells? Yes / No
7. If yes, how many light geese did you shoot with a gun holding more than 3 shells? ___________
8. How many light geese did you shoot and retrieve with the 4th, 5th, or 6th shell? ___________
9. Did you hunt light geese in Minnesota with the aid of an electronic caller? Yes / No
10. If yes, how many light geese did you shoot and retrieve with the aid of an electronic caller? ___________
11. Did you hunt light geese in Minnesota during the ½ hour after sunset period? Yes / No
12. If yes, how many light geese did you shoot and retrieve during the ½ hour after sunset period? ___________
13. What method of hunting did you use most often? Check one
    ☐. hunt over decoys. ☐ pass shoot. ☐. Sneak

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2002 - 2014

	Year												
Statistic	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total permits sold	1,997	1,438	1,424	1,383	1,363	1,292	1,406	1,670	952	994	1,048	1,405	1,278
Useable returns	1,375	1,071	1,095	998	955	921	910	1,057	671	659	675	810	759
Response rate (%)	69.0	74.0	77.0	72.0	70.0	71.0	65.0	63.0	72.3	67.1	65.3	58.3	60.0
Active hunters (%)	60.5	38.5	48.5	44.7	37.3	39.8	54.9	66.0	40.8	45.7	56.9	54.9	44.0
Estimated total hunters	1,209	553	690	618	516	514	773	1,103	389	455	600	770	560
Estimated hunter days	5,517	2,600	3,372	2,643	2,665	2,302	3,404	4,647	1,475	1,830	2,270	3,070	2,580
Mean days/hunter	4.6	4.7	4.9	4.3	5.2	4.5	4.4	4.2	3.8	4.0	3.8	4.0	4.6
Estimated harvest (shot & retrieved)	3,516	2,005	2,735	1,395	1,360	1,786	2,409	4,366	559	1,554	2,620	2,430	2,880
Mean harvest/hunter	2.9	3.6	4.0	2.3	2.6	3.5	3.1	4.0	1.4	3.4	4.4	3.2	5.1
Estimated crippling losses	637	253	315	150	163	172	302	640	70	145	210	370	210
Percent using unplugged guns	46.4	50.6	48.2	44.0	42.3	43.6	46.7	46.8	44.9	44.2	43.0	49.4	48.8
Est. number hunters using uplugged guns	560	280	333	272	215	224	361	516	175	201	260	380	270
Est. number geese **shot** with unplugged guns	2,137	996	1,385	777	689	1,032	1,275	2,413	348	742	1,510	1,670	2,060
Est. harvest with shell 4-5-6	615	401	491	269	287	277	339	822	131	311	460	620	770
Percent using electronic calls	11.8	15.7	19.3	17.8	14.4	17.1	19.1	23.5	25.9	21.3	22.2	24.5	27.8
Est. number hunters using e-calls	142	87	133	110	73	88	148	260	101	97	130	190	160
Est. harvest while using e-calls	512	474	326	268	280	329	566	1,171	192	531	460	620	1,710
Percent hunting 1/2-hr after sunset	45.5	41.2	38.4	42.7	43.9	38.3	42.3	43.1	39.7	39.7	42.4	33.4	36.2
Est. number hunting after 1/2-hr sunset	550	228	265	264	223	197	326	475	154	180	250	260	200
Est. harvest 1/2-hr after sunset	841	267	311	242	246	209	511	713	87	238	240	260	550

MINNESOTA’S WILD TURKEY HARVEST - 2014

Steve Merchant, Wildlife Populations and Regulations Manager

This report summarizes the fall 2013 and spring 2014 wild turkey harvest information. The fall turkey season was 30 days in length (September 28- October 27) and allowed for an unlimited number of hunters to take one wild turkey of either sex. The spring turkey season regulated harvest and distributed hunting pressure by allocating permits across 12 permit areas (PAs; Figure 1) and 8 time periods using a quota system for the first 3 time periods. During spring, adult hunters interested in pursuing turkeys for the first 3 time periods were required to apply for a permit through a lottery system but youth hunters were able purchase a permit over-the-counter, and hunt in any permit area. Preference for this lottery system was determined by the number of years a valid but unsuccessful application had been submitted since last receiving a permit. Hunters could apply individually or in a group of up to 4 hunters. Successful applicants were notified through U.S. Mail and unsuccessful applicants were awarded a preference point. Hunters could simply purchase a permit for the last 5 seasons. Persons with an archery turkey license could hunt the last 5 time periods in their entirety. The goal of this system was to provide quality turkey hunting opportunities by managing hunter interference rates while allowing hunters to take the harvestable surplus of turkeys.

Fall 2013 Turkey Season – The number of permits issued to hunters declined from 10,779 permits in 2012 to 8,193 in 2013(Table 1, Figure 2). Hunters still needed to select and hunt within one of the twelve permit areas. There were 1,078 turkeys harvested during Fall 2013, which was a 38 percent decline from 2012 (Table 1). Hunter success rates averaged 13.2%, which was below the 5-year average (18%). Fewer hunters contributed in part to the lower harvest , however the lower hunter success rates are likely due to fewer hatch-year turkeys in the population, and perhaps a lower total turkey population due to 2 consecutive years of inclement weather during the nesting/brood periods.

Spring 2014 Turkey Season – There were 48,204 permits issued during the spring season, including 14,003 general/landowner permits, 12,179 youth permits, 4,899 archery permits, and 17,123 surplus permits (Table 6). Hunters registered 11,447 turkeys (Table 3 and 5), which was the third highest harvest recorded and near the 5-year average (Figure 3). Success rates by license type are found in Table 5. The winter of 2013-14 saw deep snow and extreme cold in portions of the turkey range. The impact of the extended winter weather on turkey populations is unknown, but some winter losses were reported. For the second year in a row snow remained on the ground during the first or second seasons in some portions of the turkey range, and it is again reasonable to believe that the weather likely affected hunter effort and turkey activity.

Table 1. Permits available and issued, applicants, registered harvest, and hunter success rates for fall wild turkey seasons 1990 – 2013, Minnesota.

Year	Permits available	Applicants	Permits issued	Registered harvest	Hunter success (%)[a]
1990	1,000	4,522	951	326	34
1991	2,200	2,990	2,020	552	27
1992	2,200	2,782	2,028	588	29
1993	2,400	3,186	2,094	605	29
1994	2,500	3,124	2,106	601	29
1995	2,500	3,685	2,125	648	30
1996	2,500	4,453	2,289	685	30
1997	2,580	4,574	2,378	698	29
1998	2,710	4,526	2,483	828	33
1999	2,890	5,354	2,644	865	33
2000	3,090	5,263	2,484	735	30
2001	2,870	4,501	2,262	629	28
2002	3,790	5,180	2,945	594	20
2003	3,870	5,264	2,977	889	30
2004	4,380	5,878	3,277	758	23
2005	4,410	4,542	2,978	681	23
2006	4,290	4,167	2,802	618	22
2007	4,490	4,464	2,837	695	24
2008	7,560	5,834	4,981	1,187	24
2009	9,330	7,738	5,019	1,163	23
2010	10,430	6,869	6,607	1,353	20
2011	10,430	3,538	5,382	953	18
2012	Unlimited	N/A	10,779	1,753	16
2013	Unlimited	N/A	8,193	1,078	13

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

Table 2. Permits issued, registered harvest, and hunter success during the 2014 Minnesota spring wild turkey season.

Permit Area	Regular Permits Issued[a]	Total Harvest
501	8319	3,084
502	706	236
503	3545	1,313
504	794	315
505	2864	1,033
506	1114	398
507	7898	2,875
508	3463	1,140
509	222	106
510	2404	903
511	124	36
512	39	8

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

Table 3. Permits available, permits issued, and registered harvest from 1978 – 2014 for all spring wild turkey hunting seasons in Minnesota.

Year	Permits			Registered harvest	Success (%)[a]
	Available	Issued	Issued (%)		
1978	420	411	97.9	94	23
1979	840	827	98.5	116	14
1980	1,200	1,191	99.3	98	8
1981	1,500	1,437	95.8	113	8
1982	2,000	1,992	99.6	106	5
1983	2,100	2,079	99.0	116	6
1984	3,000	2,837	94.6	178	6
1985	2,750	2,449	89.1	323	13
1986	2,500	2,251	90.0	333	15
1987	2,700	2,520	93.3	520	21
1988	3,000	2,994	99.8	674	23
1989	4,000	3,821	95.5	930	24
1990	6,600	6,126	92.8	1,709	28
1991	9,170	8,607	93.9	1,724	20
1992	9,310	9,051	97.2	1,691	19
1993	9,625	9,265	96.3	2,082	23
1994	9,940	9,479	95.4	1,975	21
1995	9,975	9,550	95.7	2,339	25
1996	12,131	10,983	90.5	2,841	26
1997	12,530	11,610	92.7	3,302	28
1998	14,035	13,229	94.3	4,361	33
1999	18,360	16,387	89.3	5,132	31
2000	20,160	18,661	92.6	6,154	33
2001	22,936	21,404	93.3	6,383	30
2002	24,136	22,607	93.7	6,516	29
2003	25,016	22,770	91.0	7,666	34
2004	27,600	25,261	91.5	8,434	33
2005	31,748	27,638	87.1	7,800	28
2006	32,624	27,876	85.4	8,241	30
2007[b]	33,976	28,320	83.4	9,412	33
2008[b]	37,992	31,942	84.1	10,994	34
2009[b]	42,328	36,193	85.5	12,210	34
2010[b]	55,982	46,548[c]	83.0	13,467	29
2011[b]	Unlimited	43,521[c]	N/A	10,055	23
2012[b]	Unlimited	38,906[c]	N/A	11,325	29
2013[b]	Unlimited	34,281[c]	N/A	10,390	30
2014[b]	Unlimited	43,305[c]	N/A	11,447	25

[a] Success rates not adjusted for non-participation
[b] Youth hunt data included
[c] Permits issued to archery hunters were not included. There were 2,462, 3,911, 4,550, and 4,899 permits issued to archers in 2011, 2012, 2013, and 2014 respectively.

Table 4. Permits available and issued by license type (resident and non-resident) and time period for the spring 2014 wild turkey season, Minnesota.

		Permits issued		
Time period	Permits available	General lottery[a]	Surplus	Youth[b]
A	5,921	4,927	4	NA
B	5,921	4,084	1,052	NA
C	5,921	4,977	3	NA
D	Unlimited	5	8,253	NA
E	Unlimited	3	2,397	NA
F	Unlimited	0	1,213	NA
G	Unlimited	1	2,777	NA
H	Unlimited	6	1,385	NA
Total[a]	Unlimited	14,003	17,123	12,179

[a] includes landowner licenses.
[b] Youth permits were good for all time periods.

Table 5 Total harvest by time-period, spring 2014 wild turkey season, Minnesota.

Time period	Total Harvest	Percent Harvest
A	2631	23.0
B	2143	18.7
C	1701	14.9
D	2450	21.4
E	816	7.1
F	428	3.7
G	795	6.9
H	482	4.2
Total	11,447	100

Table 6. 2014 Total permits sold, harvest and success rate by type of license.

	Total Permits Sold	Harvest	Success Rate
Lottery	14,003	4,769	34
Surplus	17,123	3,917	23
Youth	12,179	2,206	18
Archery	4899	504	10
Total	48,204	11,447	24

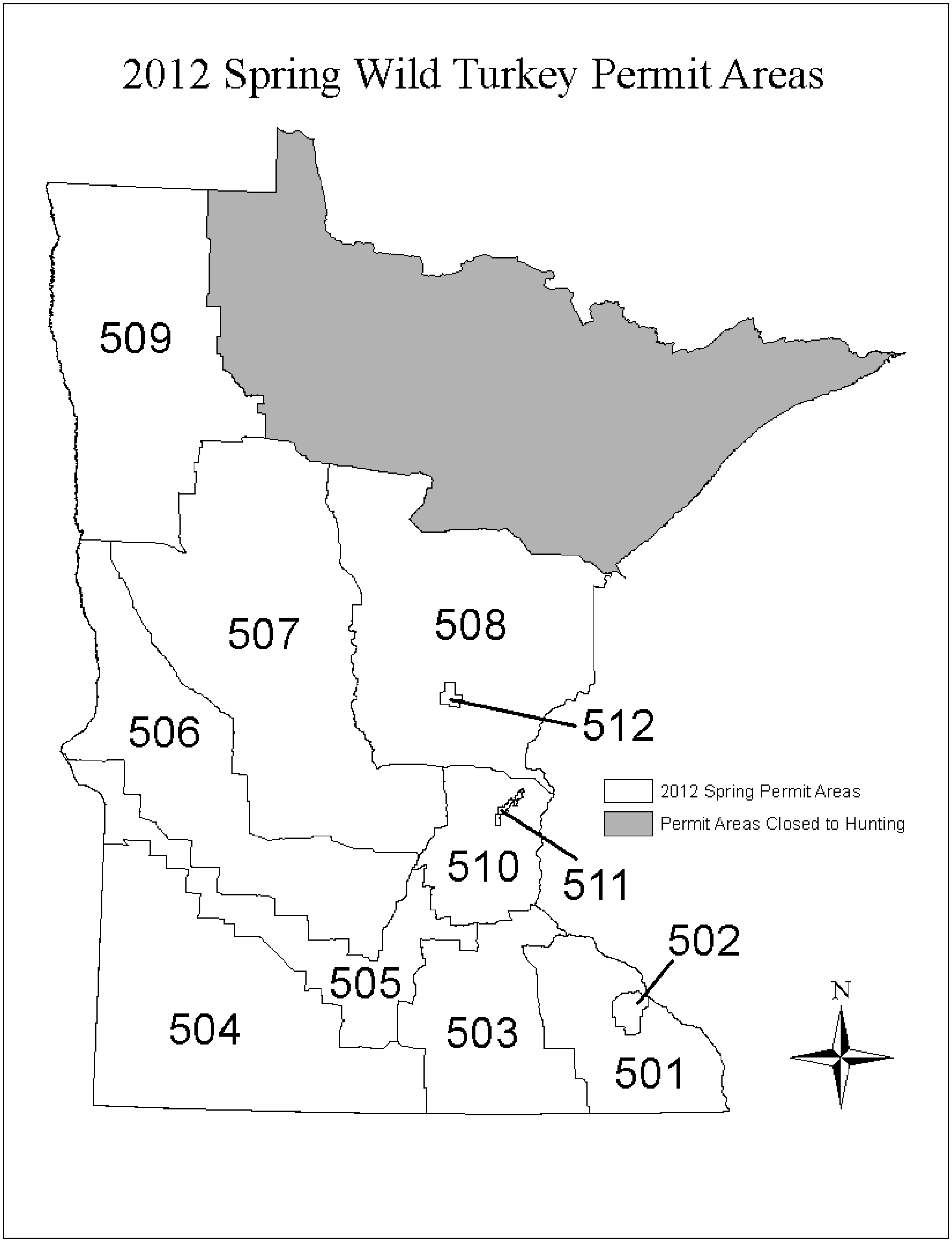


Figure 1. Permit areas open for hunting during the 2014 spring turkey hunting season, Minnesota.

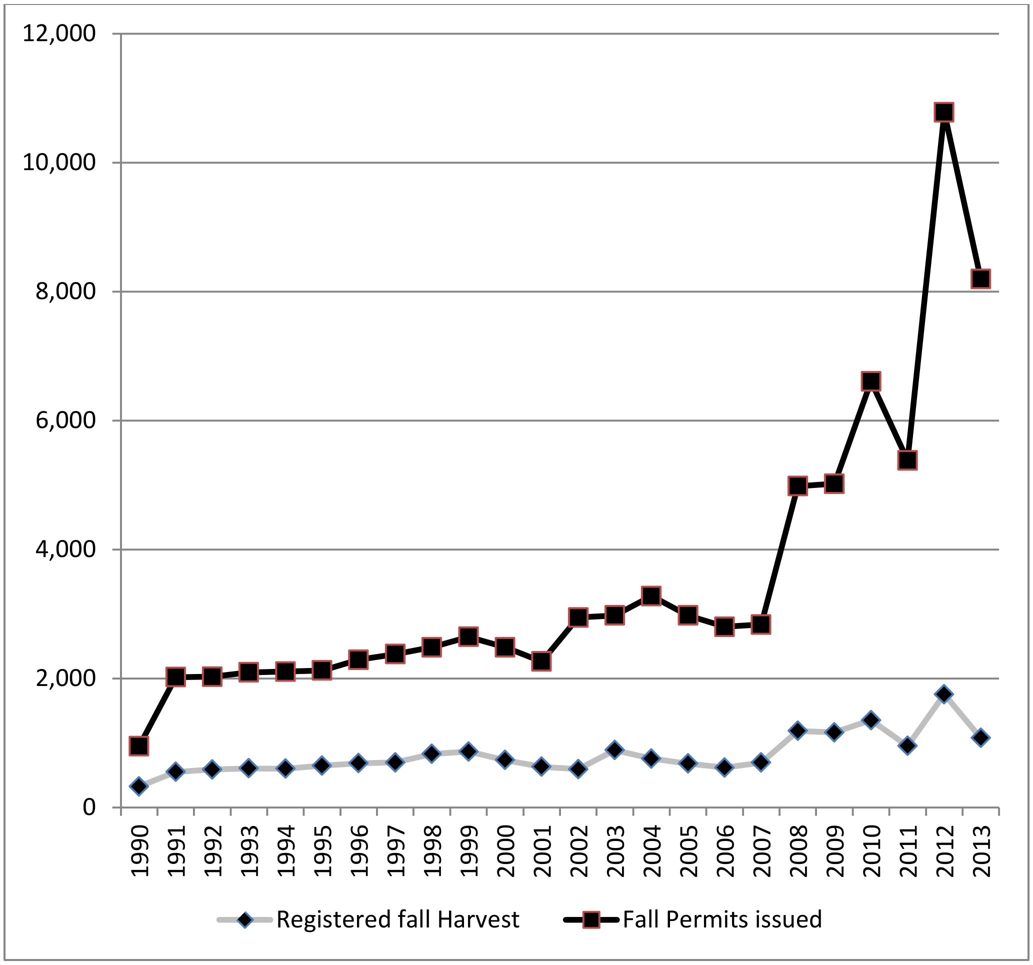


Figure 2. Permits issued and registered harvest for fall wild turkey seasons, 1990-2013, Minnesota.

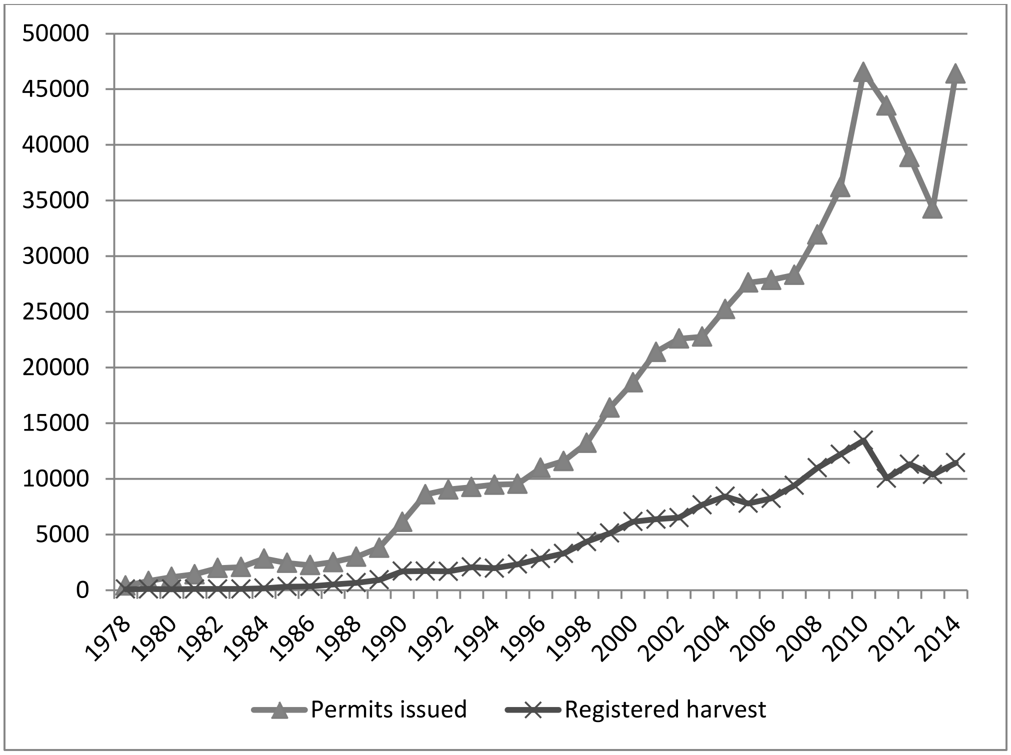


Figure 3. Permits issued and registered harvest for spring wild turkey seasons, 1978-2014, Minnesota.

2013 MINNESOTA PRAIRIE-CHICKEN HARVEST SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Prairie-chicken (*Tympanuchus cupido pinnatus*) hunting season dates and permit areas were modified in 2013 in an attempt to increase hunter success and satisfaction. I estimated harvest, hunter success, and satisfaction from a postcard survey that is conducted annually. Although fewer hunters went afield (estimated at 93 and the lowest since 2005), hunter success (0.60) and satisfaction (3.7 on a scale of 1-5) were higher than in recent years. Harvest was estimated at 96 prairie-chickens, and 17 sharp-tailed grouse (*Tympanuchus phasianellus*) were harvested during prairie-chicken hunts.

INTRODUCTION

Prairie-chicken (*Tympanuchus cupido pinnatus*) hunting was closed in 1943 because of population declines resulting from habitat loss. However, hunting was reopened in 2003 because prairie-chicken populations were considered robust enough to allow a limited season. During 2003-2005, a limited-entry 5-day hunting season was opened in 7 permit areas in western Minnesota. Permits were awarded through a lottery system, with a bag and season limit of 2 prairie-chickens. In 2006, 4 new permit areas were added and the number of permits was increased in some areas. Surplus licenses were offered for sale after the lottery for the first time in 2011, and in 2013, the permit areas were revised again. These most recent changes eliminated 801A and 802A, modified 803A to include portions of the former 802A and 803A, and added 812A and 813A to expand hunting eastward (Fig. 1a,b). The number of available permits was also reduced in some permit areas to more closely reflect opportunities to harvest prairie-chickens in each permit area. The season was lengthened from 5-days to 9-days to provide hunting opportunity on >1 weekend, and moved forward several weeks to open 28 September and close 6 October. The earlier season was an attempt to improve hunter success and satisfaction by providing hunting opportunities before pheasant season opened.

Prairie-chicken hunting in Minnesota is a privilege that is only available to residents. Landowners or tenants of ≥40 acres of grassland within a permit area are eligible to apply for a landowner lottery that awards 20% of the available permits in a permit area. Extra landowner permits are then included with the regular lottery. Any landowner not receiving a permit through the landowner lottery can participate in the regular lottery. The lottery gives preference to persons that have applied for a permit unsuccessfully for the most years. Upon selection, lottery winners must purchase a prairie-chicken hunting permit before hunting. Although sharp-tailed grouse (*Tympanuchus phasianellus*) hunting is closed south of highway 2 (i.e., permit areas 804A–813A), licensed prairie-chicken hunters may also take sharp-tailed grouse while hunting prairie-chickens. Harvest is documented each year in this annual report.

METHODS

Lottery applicants, winners, and permit purchases are recorded by the Electronic Licensing System (ELS). Registration of harvested birds has not been mandatory except during 2003-2006, so I determined harvest through a postcard survey. I sent a postcard to each lottery winner the week before hunting season. Three weeks later I sent another postcard to people who had not yet responded. Postcards contained 5 questions: did you hunt, and if so, for how many days, how many prairie-chickens did you harvest, how many sharp-tailed grouse did you harvest during prairie-chicken hunts, and how satisfied were you (on a scale of 1-5)?

Only responses from lottery winners who purchased a hunting permit were considered. I compared responses from the first mailing to responses from the second mailing to examine possible nonresponse bias. I assumed that non-respondents would have had the same response as respondents to the second mailing when estimating the number of hunters, birds harvested, birds per harvester, and hunter success due to detected nonresponse bias. Each of these metrics was calculated by permit area and summed for all areas.

RESULTS & DISCUSSION

The combined quota for the 11 permit areas during 2013 was 126, and 277 individuals applied in the lottery (Table 1). Only 2 permit areas (804A and 813A) had fewer applicants than permits available, and all 5 surplus permits were purchased. Of the 131 lottery winners, 97 later purchased a permit, of whom, 4 were landowners.

Seventy-eight permit purchasers (83%) responded to the survey and 3 surveys were undeliverable; 56 (59%) responded to the first mailing and 22 (23%) to the second mailing. This response rate is slightly lower than survey response rates during the last two years (90% in 2011, and 95% in 2012), but similar to 2010 (84%). Respondents to the first mailing were more likely than respondents to the second mailing to have hunted (98% vs. 90% of respondents), hunted a similar number of days (2.1 vs. 2.2), were more likely to have harvested a prairie-chicken (66% vs. 52%), tended to harvest more chickens (1.2 vs. 0.8 birds per hunter), harvested a similar number of sharp-tails (0.1 vs. 0.5 birds per hunter), and tended to be more satisfied (mean 3.9 vs. 3.3, median 4 vs. 3), with 85% and 76% of respondents reporting satisfaction scores $\geq$3, respectively. Thus, hunters that were more successful and satisfied were more likely to respond to the survey, indicating a nonresponse bias.

I attempted to correct for the nonresponse bias this year, which differed from previous years with similar results in first and second mailings, and when it was assumed that non-respondents would have had similar responses to all respondents. Instead, I assumed that non-respondents would have had similar responses to those received from the second mailing (i.e., class method of correction). This assumption may not eliminate nonresponse bias if non-respondents were less successful and less satisfied than respondents to the second mailing, but should more closely approximate the actual harvest and hunter numbers than assuming similar responses of non-respondents and all respondents.

Seventy-four respondents reported that they hunted prairie-chickens (Table 2). I estimated the total number of hunters to be 93 (i.e., purchasers who went afield) after accounting for hunting by non-respondents. Hunters reported harvesting 83 prairie-chickens during the 9-day season. I estimated total harvest as 96 prairie-chickens, with an estimated 56 hunters bagging ≥1 chicken. Survey respondents reported harvesting 17 sharp-tailed grouse while hunting prairie-chickens from permit areas 803A, 804A, and 805A (Fig. 1).

Prairie-chicken hunter success and satisfaction during 2013 were higher than during recent years (Table 3). Improvements in satisfaction and success may be due to the earlier season, younger birds (for success but not necessarily satisfaction), less interference with other hunters (i.e., no overlap with pheasant season), and changes in the permit areas to provide new opportunities. Successful hunters reported higher average satisfaction (4.4) than respondents that were not successful (2.6). However, some hunters (n = 11) reported that they preferred the later season (i.e., did not like the season changes this year). Although we cannot exclude the possibility that non-respondents had lower satisfaction than respondents to the second mailing, survey results support the conclusion that the changes to the hunting season improved hunter success and satisfaction of prairie-chicken hunters overall.

ACKNOWLEDGEMENTS

I would like to thank Laura Gilbert for preparing and mailing the postcards and entering data. I would also like to thank Mike Larson for his assistance in transitioning prairie-chicken data management and report writing responsibilities, as well as for commenting on the report. Funding for this survey was partially provided by the Federal Aid in Wildlife Restoration Act, Minnesota project W-69-S-14.

Table 1. Prairie-chicken hunt lottery applicants, winners, and hunting permit purchasers in Minnesota during 2013.

Permit area	Permits available	No. of applicants	Lottery winners No.[b]	Lottery winners Proportion	Permit purchasers[a] No.	Permit purchasers[a] Proportion	Surplus purchasers[c]
803A	10	18	10	0.56	8	0.80	0
804A	12	11	11	1.00	8	0.73	1
805A	12	70	13	0.19	12	0.92	0
806A	12	33	15	0.45	13	0.87	0
807A	20	39	20	0.51	16	0.80	0
808A	15	31	18	0.58	18	1.00	0
809A	15	22	17	0.77	6	0.35	0
810A	15	32	15	0.47	7	0.47	0
811A	5	13	6	0.46	3	0.50	0
812A	5	7	5	0.71	5	1.00	0
813A	5	1	1	1.00	1	1.00	4
All	126	277	131	0.47	97	0.74	5

[a] Lottery winners who purchased a hunting permit.
[b] The number of permits may exceed the quota when the last applicant selected in the lottery belongs to a hunting party.
[c] Number of people purchasing a surplus permit after the lottery because the permit quota was not met during the lottery.

Table 2. Prairie-chicken harvest in Minnesota during 2013.

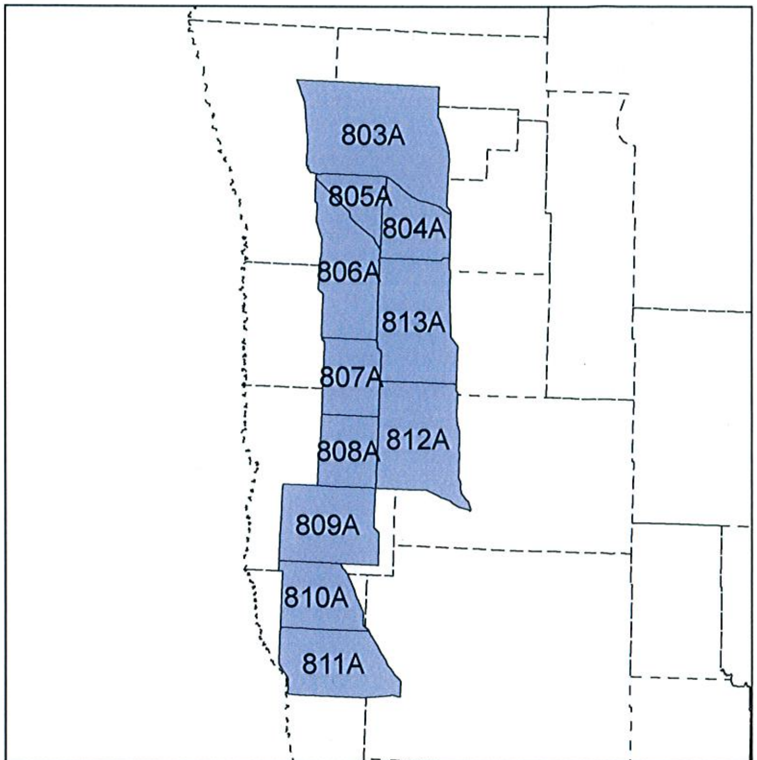
Permit area	No. of hunters[a]		Birds harvested		Birds per harvester[b]	Success rate[c]
	Self-reported	Estimated	Self-reported	Estimated		
803A	5	7	10	11	1.8	0.86
804A	7	8	6	7	1.4	0.63
805A	10	12	14	15	1.7	0.75
806A	8	12	11	14	1.8	0.67
807A	12	16	13	16	1.6	0.63
808A	14	17	17	19	1.9	0.59
809A	4	6	5	6	1.5	0.67
810A	5	6	4	5	2.5	0.33
811A	3	3	0	0	NA	NA
812A	5	5	3	3	1.5	0.4
813A	1	1	0	0	NA	NA
All	74	93[d]	83	96[d]	1.7[d]	0.60[d]

[a] Permit purchasers who hunted.
[b] Estimated number of birds harvested per successful hunter.
[c] Proportion of estimated hunters harvesting ≥1 prairie-chicken.
[d] Assumed that non-respondents were represented by respondents in the second mailing.

Table 3. Summary of prairie-chicken hunting in Minnesota during 2003–2013.

Year	Permits available	Applicants	Hunters[a]	Birds harvested	Success rate[b]	Hunter satisfaction[c]
2003	100	853	92	130	0.75	4.4
2004	101	759	87	58	0.45	3.6
2005	110	500	86	94	0.63	4.0
2006	182	512	149	109	0.49	3.6
2007[d]	187	519		122	0.53	
2008	186	535	137	133	0.58	3.9
2009	186	512	143	118	0.52	3.4
2010	186	421	136	78[e]	0.32	3.0
2011	186	264	138	103	0.45	3.4
2012	186	298	158	86	0.39	3.4
2013	126	277	93[f]	96[f]	0.60[f]	3.7[f]

[a] Estimated number who went hunting, not permit purchasers.
[b] Proportion of hunters harvesting ≥1 prairie-chicken.
[c] Mean on a scale of 1–5.
[d] A hunter survey was not conducted during 2007; results are from the Electronic Licensing System, which documented 150 permit purchasers.
[e] One hunter reported harvesting 10 prairie-chickens in 2010.
[f] Assumed that non-respondents were represented by respondents in the second mailing.



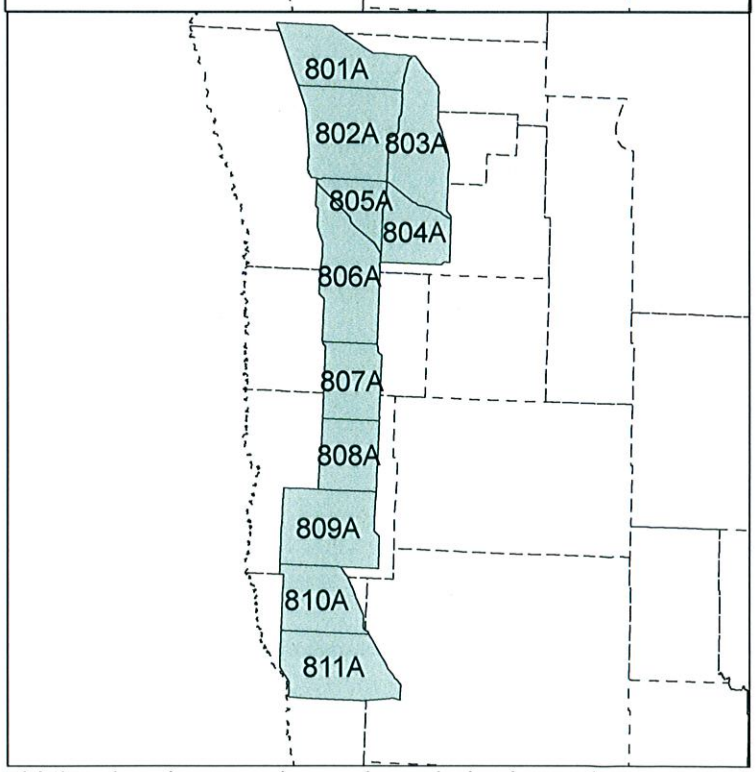


Figure 1a. Prairie-chicken hunting permit area boundaries in northwestern Minnesota during 2013 (top) compared to 2012 (bottom). County boundaries are indicated by dashed lines. Permit areas 812A and 813A were added, 801A was eliminated, and 802A and portions of 803A were combined into a revised permit area 803A.

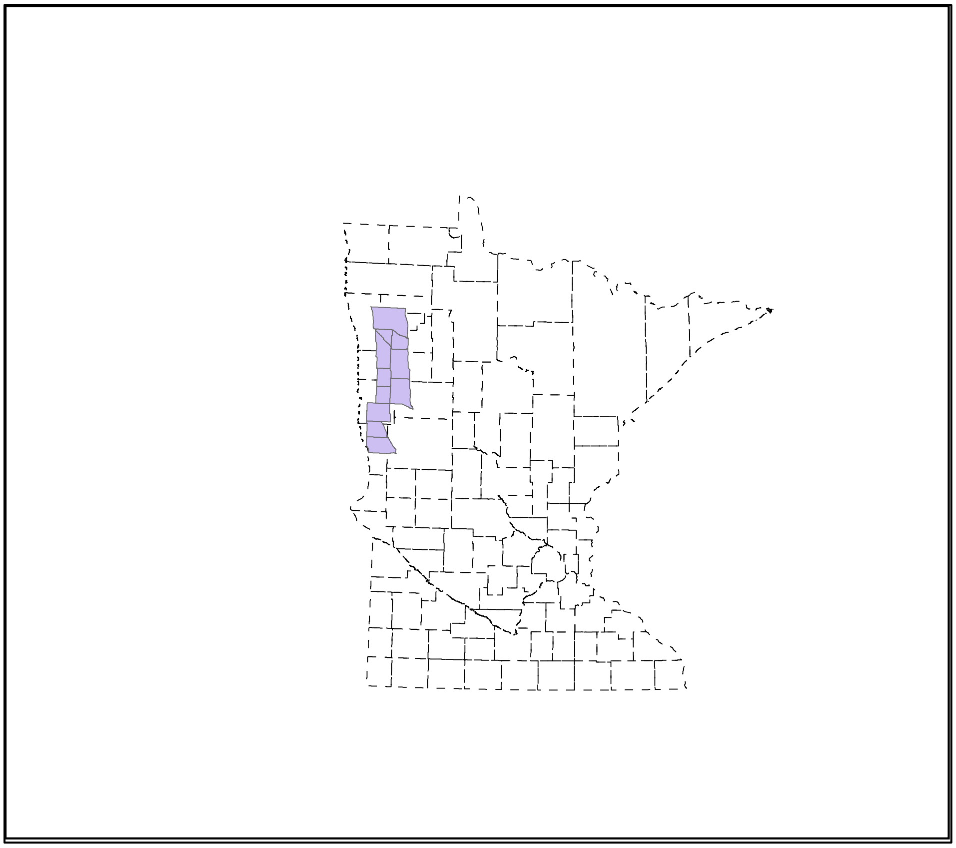


Figure 1b. Northwestern location of prairie-chicken hunting permit areas within the state relative to county boundaries (dashed lines).

STATUS OF MINNESOTA BLACK BEARS, 2013

Final Report to Bear Committee
March 13, 2014

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

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

INTRODUCTION

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

METHODS

Successful hunters must register their bears at designated registration stations. Stations are not staffed by DNR personnel. Harvest data are a simple tally of these registrations, which for the most part are done electronically. Hunters also are required to submit a tooth from harvested bears (compliance ≈ 70%), which is used to estimate age, and thus harvest age structure. We used harvest age structure accumulated since 1980 to reconstruct minimum population size (Downing population reconstruction) and thereby assess population trend.

RESULTS

Permit applications for bear licenses seem to have stabilized at a higher level during 2010-2013 than before that, when permit availability was higher (Table 1 and Figure 1). The reduced permit availability seems to have driven up sales of no-quota licenses, which were the highest on record in 2012 and second highest in 2013.The estimated number of hunters in the field (6,300) was the lowest since 1989, and the total harvest (1,866) was the lowest since 1988. Statewide success rate was the same as last year (30%), but quota area success rate (37%) was the highest since the very poor food year of 1995. High success rate in the quota zone is related in part to reduced numbers of hunters (i.e., competition).

The number of available quota zone permits was reduced 38% from 2012 to 2013 (Tables 2, 3); this reduction was distributed fairly uniformly across Bear Management Units (BMUs) (Figure 2). This followed a reduction of 15% from 2011 to 2012. These reductions were aimed at increasing the bear population in the quota zone. This was the third year of a system whereby all available licenses for the quota zone were sold (those not purchased by permittees selected in the lottery were purchased later as surplus).

As permit allocations have been reduced, the percentage of 1^{st} -year applicants drawn in the lottery diminished (Table 4). In 2009, some 1^{st} -year applicants (preference level 1) were drawn in all BMUs. In 2013, 1^{st} year applicants were drawn only in BMU 22 (BWCAW). Less than 50% of 2^{nd} -year applicants were drawn in all but 2 BMUs, and no 2^{nd} year applicants were drawn in 2 BMUs (44 and 45).

The statewide harvest and harvest for the quota zone were the lowest since 1988. Three BMUs (12, 24, 26) had record low harvests. BMU 11 had the lowest harvest since 2006, but the no-quota zone as a whole had a fairly normal harvest. The percent of the total statewide harvest contained within the no-quota zone has sharply increased with reduction of quota zone permits, reaching a record this year (26%).

The statewide harvest and harvest for the quota zone were the lowest since 1988 (Table 5, Figure 3). Three BMUs (12, 24, 26) had record low harvests. BMU 11 had the lowest harvest since 2006, but the no-quota zone as a whole had a fairly normal harvest. The percent of the total statewide harvest contained within the no-quota zone has sharply increased with reduction of quota zone permits, reaching a record this year (26%).

Hunting success was the highest since the early-mid 1990s in the quota zone as a whole, and in 4 quota zone BMUs; one additional BMU (51) had the highest success since it was established by splitting the quota and no-quota zones in 1987 (Table 6). These high success rates are likely a reflection of low hunter density (and possibly more hunter effort, given the decreased opportunity to be drawn for a permit). For the first time hunter numbers could be estimated for the individual BMUs in the no-quota zone, based on where hunters indicated they planned to hunt when they purchased their license. This enabled a derivation of hunting success for BMUs 10, 11, and 52. This system, though, needs improvement as many no-quota hunters selected portions of the quota zone.

During years of normal fall food abundance, about 70% of the harvest occurs during the 1^{st} week of the bear season, and ~83% occurs by the end of the 2^{nd} week (Table 7). This year (2013), harvesting was delayed: only 61% in the first week and 76% after the 2^{nd} week.

The number of wildlife and enforcement personnel submitting bear nuisance tally forms each month was higher than normal, but the total number of registered complaints (623) was about average (mean = 586) since the institution of the nuisance bear policy took effect in 2000 (Tables 8, 9 and Figure 4). Also, as typical, only 25 bears were known killed as nuisances, 3 were translocated, and 32 killed in vehicle collisions.

The abundance of wild bear foods in 2013 (Table 11)was the highest in 15 years (since the summer of 1998). This was in sharp contrast to 2012, when bear foods were the scarcest they had been since the catastrophic food failure of 1995 (Table 10, 11, 12, Figure 5). Statewide food survey results show that it is typical for fruiting to be better than average the year after food failures, as witnessed in 1985/1986, 1990/1991, 1995/1996, and now 2012/2013. High bear food indices this year were primarily due to abundant summer berries particularly across the northern tier of survey areas. In contrast to summer foods, productivity of key fall foods (hazel, oak, and dogwood ― those that affect hunting success) were average or a bit above average across most of the bear range in 2013.

A combination of fall food abundance and number of hunters accounts for 84% of the yearly variation in the bear harvest since 1984 (Figure 6). Predictions of the number of bears killed by hunters, based solely on these 2 factors, have been more accurate since 2000 (R^2= 0.95). Since then, actual bear harvest has only once differed from predicted harvest by >10%.

Following a 15-year period of relative abundance and stability, bear food production exhibited a wider swing in 2012 and 2013 than observed since 1996 (Figure 7). Back-to-back years of poor foods followed by abundant foods often result in a partial synchronization of reproduction among female bears, resulting in alternating years of small and large cohorts being born for the next several years: 2014 reproduction is likely to reflect the excellent 2013 summer food crop.

Sex ratios of harvested bears (Figure 8) reflect both the sex ratio of the living population (which varies with harvest pressure) as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions and hunter density). In 2013, 3 BMUs had record high (or tied with record high) sex ratios (%M)(BMUs 13, 25, 26), as did the state as a whole (62%). However, no BMU showed a consistent trend in sex ratios (BMU 26 shows a generally increasing trend from 2007 to 2013, but not so going back before that).

Statewide, ages of harvested females declined dramatically during the past 3 decades (Figure 9), as evidenced by a declining median age and increasing proportion of the harvest composed of 1–2 year-olds (Figure 11). Median age of harvested females was 2.8 years old in 2013, with signs that this downward trend is leveling off. Median ages of harvested males has remained at about 2 years old for the past 20 years (Figure 10). Variation in female median ages within individual BMUs is too great to discern short-term trends. The low, male-skewed harvest this year resulted in smaller sample sizes of female ages per BMU, and hence more erratic median ages. Notably, though, BMU 11 (no quota) has less erratic female median ages through time than adjacent BMU 12, and BMU 52 (no quota) has similar female median ages as adjacent BMU 51.

Ages of harvested bears are now used as the principal means of monitoring population trends (Figure 12). Although hunters are required to submit a tooth from their harvested bear, >25% do not comply, and this missing sample, if somewhat different in age composition than the submitted teeth, may affect the resulting analyses. This year, for the first time, hunters could register their bear either by phone or internet, but if they did so, they were required to complete their registration by obtaining a tooth envelope at a registration station. These hunters, though, had poorer compliance with tooth submission than hunters who registered their bear and received a tooth envelope at the registration station in one step. Compliance in tooth submission also varied considerably among BMUs. Compliance was notably poor in the no-quota zone (Figure 13).

DISCUSSION

Ages of harvested bears accumulated since 1980 were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting). This was scaled upwards (to include bears that died of other causes), using tetracycline mark–recapture estimates as a guide (Figure 14). Whereas both the tetracycline-based and reconstructed populations showed an increase during the 1990s, followed by a decline during the 2000s, the shapes of the 2 trajectories differed somewhat (the reconstructed population curves were less steep). Therefore, it was not possible to exactly match the curve from the reconstruction to all 4 tet-based estimates, so a group of curves were scaled to differing degrees to intersect different sets of tet- estimates. Both the tetracycline and age-reconstructed estimates showed a population decline of ~30% from 2001 to 2008. A light harvest in 2008 enabled the population to grow slightly, but it declined again after heavier harvests in 2009, 2010, and 2012. It appears that the light harvest of 2013 enabled the population to increase slightly. This conclusion remains tentative, however, as population estimates for the most recent 3 years are not directly obtained from population reconstruction, but may be derived from relationships between harvest and prior reconstructed population estimates.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1993-2013.

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Permit applications	27365	30127	29922	30405	27353	30245	29384	29275	26824	21886	16431	16466	16153	15725	16345	17362[a]	17571[a]	18647[a]	19184[a]	18103[a]	18107[a]
Permits available	8630	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050[b]	6000	3750
Licenses purchased (total)	9224	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589
Quota area [c]	7528	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188
Quota surplus/military [c]									235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578
No-quota area [c]	1696	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965[h]	2823
% Licenses bought																					
Of permits available [d]	87.2	86.4	86.2	88.0	84.9	82.0	79.5	82.2	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6	100	100	100
Of permits issued [d]						84.4	87.2	83.9	69.8	66.3	65.7	68.3	67.1	68.9	70.0	67.2	73.8	74.5	80.7	82.7	85.0
Estimated no. hunters [e]	8600	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9100	8600	6300
Harvest	3003	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866
Harvest sex ratio (%M) [f]	56	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59	61	59	62
Success rate (%)																					
Total harvest/hunters [g]	35	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29	23	30	30
Quota harvest/licenses	34	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30	24	33	37

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907; 2013 = 2129).

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

[c] Quota area established in 1982. No-quota area established in 1987. Surplus licenses from undersubscribed quota areas sold beginning in 2000; originally open only to unsuccessful permit applicants, but beginning in 2003, open to all. In 2011, surplus licenses offered for all lottery licenses not purchased by July 31. Free licenses for 10 and 11 year-olds were available beginning 2009 (2009 = 45; 2010 = 86; 2011 = 72; 2012 = 67; 2013 = 85 [including surplus youth]).

[d] Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued. Beginning in 2008, some permits were issued for area 99; these are no-hunt permits, just to increase preference, and are not included in this calculation. In 2011-13, all unpurchased licenses were put up for sale, and all were bought.

[e] Number of licensed hunters x percent of license-holders hunting. Percent hunting is based on data from bear hunter surveys conducted during 1981–91, 1998 (86.8%), 2001(93.9%) and 2009 (95.3%). The estimated no. of hunters in 2011-13 may be under-estimated because a large no. of people bought surplus licenses 1 month before the season, so they were more apt to hunt.

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

[g] Success rates in 2001–2012 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because no-quota hunters could take 2 bears. In 2013, hunters could take 2 bears only if they bought 2 licenses (1 quota + 1 no-quota): of 30 people who bought 2 licenses, only 2 killed 2 bears.

[h] Record high number of no-quota area licenses purchased.

Figure 1. Relationship between licenses sold and hunting success (note inverted scale) in quota zone, 1987-2013 (non-quota zone first partitioned out in 1987). Number of licenses explains 35% of variation in hunting success during this period (P= 0.0001). Large variation in hunting success is also attributable to food conditions.

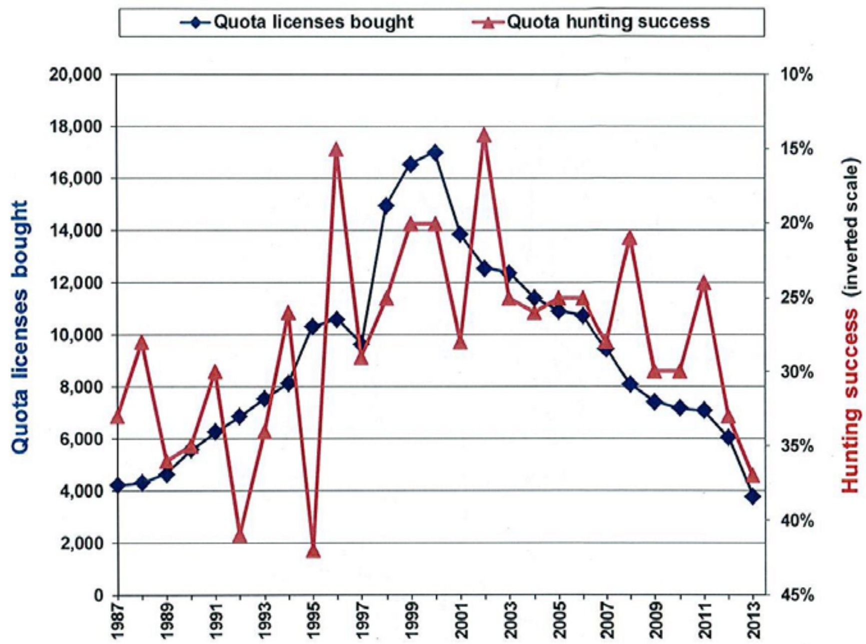


Figure 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone. BMU 10 is renamed this year (previously grouped with BMU 11, then separated as BMU 11b), in preparation for possibly making BMU 11 a quota area.

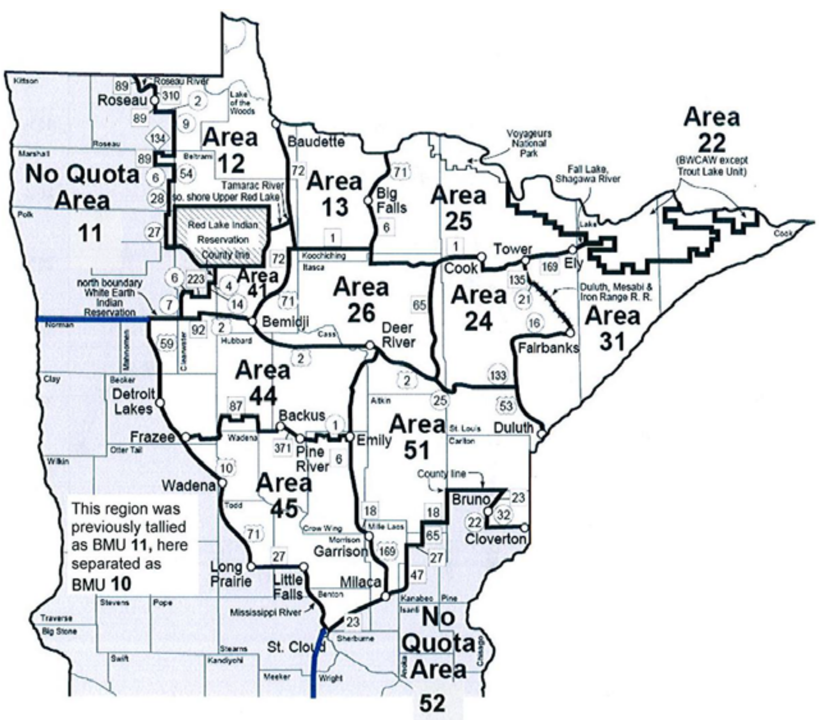


Table 2. Number of bear hunting quota area permits available, 2009-2013 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2013	2012	2011		2010	2009
			After reduct.[a]	Before reduct.		
12	200	300	350	450	450	450
13	250	400	450	600	600	600
22	50	100	100	125	100	150
24	200	300	350	500	550	650
25	500	850	900	1200	1200	1250
26	350	550	650	900	900	1000
31	550	900	1000	1300	1300	1300
41	150	250	300	400	400	400
44	450	700	850	1100	1100	1100
45	150	200	250	400	400	600
51	900	1450	1850	2500	2500	2500
Total	3750	6000	7050	9475	9500	10000

[a] Beginning in 2011, all licenses not purchased by permittees were sold (Table 3). In order not to increase the number of hunters, 2011 permit allocations were reduced by the mean percentage of licenses that were purchased in each BMU in 2009–2010. The table shows the permit allocation before and after this reduction. In 2012 and 2013, permits were allocated based on this new procedure.

Table 3. Number of quota BMU permit applicants and surplus licenses bought, 2009- 2013[a]. Shaded values indicate undersubscribed areas (applications < permits available).

BMU	2013			2012			2011[b]			2010		2009	
	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Surplus	Apps	Surplus
12	707	160	44	813	244	60	834	267	84	903	5[c]	876	
13	664	213	37	719	325	76	751	366	84	753		700	
22	55	36	14	83	56	43	90	71	31	114		91	0[d]
24	763	170	30	888	253	47	918	294	56	971		843	
25	1575	432	69	1625	713	137	1763	712	190	1811	5[c]	1694	
26	1695	303	47	1666	458	92	1894	512	139	1959		1874	
31	2261	478	72	2406	758	146	2505	826	174	2414		2423	
41	575	135	15	592	208	42	688	253	47	718		685	
44	2682	386	65	2619	612	88	3010	697	154	2923		2787	
45	1205	141	9	1135	170	30	1019	208	42	937		941	
51	3796	734	166	3650	1154	296	4086	1478	372	3950	1[c]	3822	
Total[e]	15978	3188	568	16196	4951	1057	17558	5684	1373	17453		16736	

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] In 2011-13, all licenses not purchased by permittees were sold as "surplus". Surplus = Permits available (Table 2) minus Bought license (±4 to account for groups applying together).
[c] Courtesy licenses issued by Commissioner, not actual surplus.
[d] No 2nd choice applicants bought a license for BMU 22, so it remained undersubscribed.
[e] Beginning in 2008, applicants could apply for area 99 in order to increase future preference, but not buy a license; these are not included in this total.

Table 4. Percentage of quota BMU lottery applicants with preference level 1 (1^{st} year applicants) who were drawn for a bear permit, 2009- 2013. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn, in which case the success of preference level 2 lottery applicants is also shown.

BMU	2013		2012		2011		2010		2009
	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1
12	0	49	0	80	2		23		29
13	4		33		51		77		84
22	89		100		100		88		100
24	0	41	0	75	14		49		75
25	0	81	28		35		60		72
26	0	7	0	49	0	77	15		32
31	0	45	0	84	11		35		43
41	0	43	0	86	6		31		37
44	0	0[a]	0	28	0	55	0	90	3
45	0	0[a]	0	29	0	67	24		61
51	0	53	1		25		52		58

[a] No preference level 2 applicants were drawn, and only a portion of level 3 applicants were drawn (BMU 44 = 68%; BMU 45 = 75%).

Table 5. Minnesota bear harvest tally[a] for 2013 by Bear Management Unit (BMU) and sex compared to harvests during 2008-2012 and record high and low harvests (since establishment of each BMU).

BMU	2013				2012	2011	2010	2009	2008	5-year mean	Record low harvest (yr)	Record high harvest (yr)
	M	(%M)	F	Total								
Quota												
12	45	(73)	17	62[d]	82	106	95	140	101	105	63 (87)	263 (01)
13	73	(77)[m]	22	95[e]	112	119	155	149	129	133	71 (88)	258 (95)
22	3	(33)	6	9	8	11	9	7	7	8	3 (03)	41 (89)
24	55	(72)	21	76[f]	108	122	124	151	100	121	93 (96)	288 (95)
25	126	(64)[n]	71	197[g]	254	317	307	344	298	304	149 (96)	584 (01)
26	80	(66)[n]	41	121[h]	238	167	232	228	137	200	131 (96)	513 (95)
31	117	(59)	80	197[g]	363	358	363	384	248	343	157 (88)	697 (01)
41	21	(53)	19	40[g]	70	54	71	104	77	75	38 (96)	201 (01)
44	115	(64)	66	181	188	130	248	255	196	203	130 (11)	643 (95)
45	26	(54)	22	48	67	32	58	42	72	54	32 (11)	178 (01)
51	206	(59)	143	349	471	288	501	416	344	404	247 (91)	895 (01)
Total	867	(63)	508	1375[i]	1961	1704	2163	2220	1709	1951	1192 (88)	4288 (01)
No Quota[b]												
11	84	(62)	52	136[j]	224	219	178	315	172	222	38 (87)	351 (05)
10[c]	7	(78)	2	9	14	3	11	9	3	8		
52	204	(59)	142	346	405[k]	205	347	257	251	293	105 (02)	405 (12)
Total	295	(60)	196	491	643	427	536	581	426	523	198 (87)	678 (95)
State	1162	(62)[n]	704	**1866**[i]	2604	2131	2699	2801	2135	2474		4956 (95)

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes may differ from the registered sex:
2011: 1450 [97%] unchanged, 12 $M_{(reg)} \rightarrow F_{(tooth)}$, 38 F→M
2012: 1821 [98%] unchanged, 15 $M_{(reg)} \rightarrow F_{(tooth)}$, 28 F→M
2013: 1338 [97%] unchanged, 13 $M_{(reg)} \rightarrow F_{(tooth)}$, 23 F→M.
Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2011: 72%; 2012: 73%; 2013: 75%).
Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally. The number of missing registrations was greatly reduced in 2011–2013.

Year	Quota area	No-quota area
2008	23	4
2009	19	14
2010	20	8
2011	11	2
2012	6	1
2013	5	1

[b] Some hunters with no-quota licenses hunted in the quota area, and their kills were assigned to the BMU where they apparently hunted:
2008: 14; 2009: 3; 2010: 14; 2011: 14; 2012: 8; 2013: 11.
Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear, but these were recorded in the BMU where they were assigned, not the BMU of the indicated harvest block, presuming most were misreported kill locations.

[c] Previously called BMU 11b.

[d] Record low harvest since this area was established in 1987.
[e] Lowest harvest since 1991.
[f] Record low harvest since this area was established in 1989.
[g] Lowest harvest since 1996.
[h] Record low harvest since this area was established in 1991.
[i] Lowest since 1988 (quota—no-quota split in 1987).
[j] Lowest harvest since 2006.
[k] Record high harvest.
[m] Record high %males.
[n] Ties record high %males (since quota—no-quota split).

Figure 3. Trends in statewide bear harvest and proportions of harvest in the no-quota zones, 1987-2013.

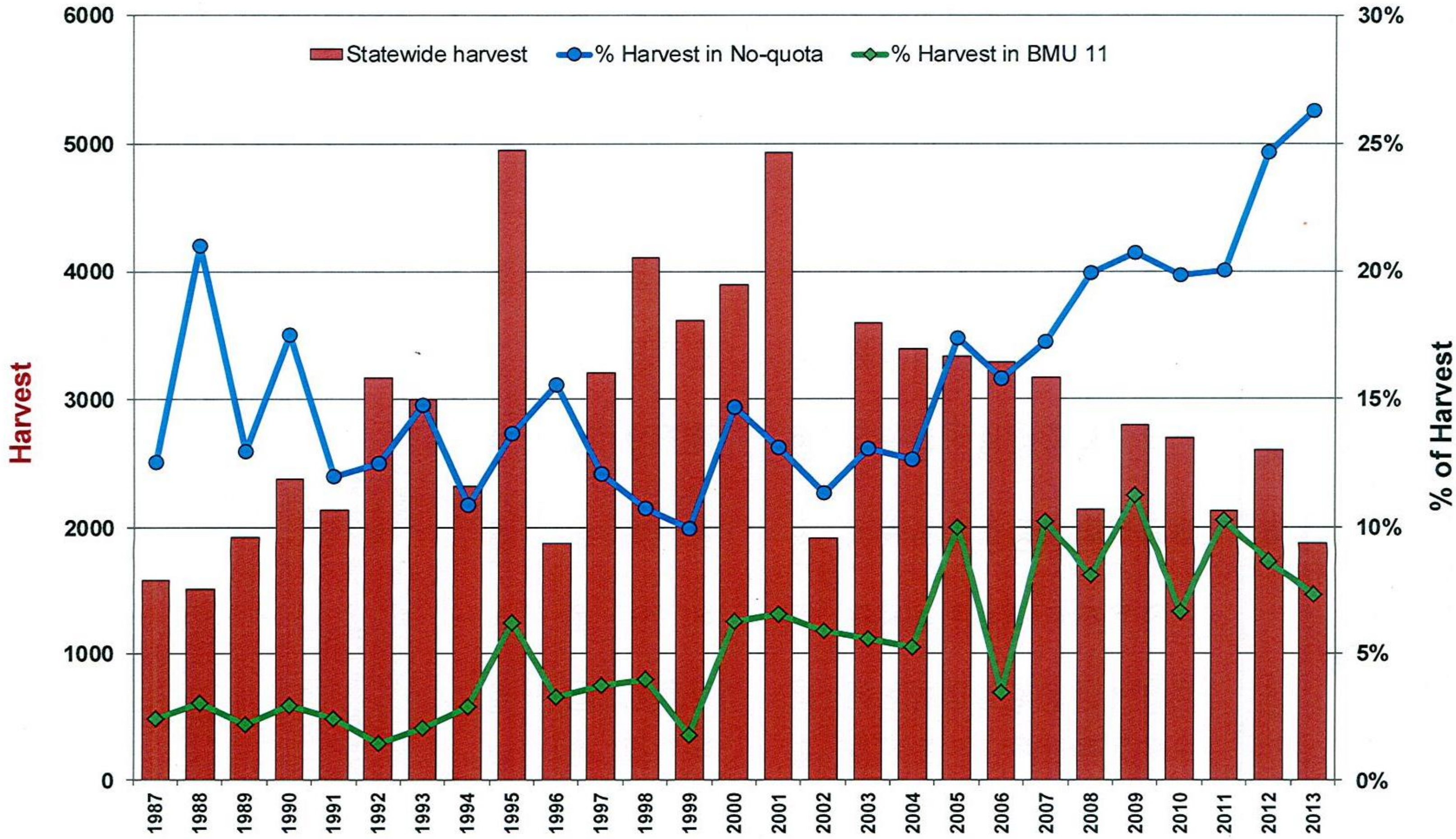


Table 6. Bear hunting success (%) by BMU, measured as the registered harvest (excluding second bear) divided by the number of licenses sold[a], 2008-2013.

BMU	Max success (yr) (excl 2013)		Mean success 2008-2012	2013	2012	2011	2010	2009	2008
12	49	(95)	32	30	27	30	30	39	32
13	59	(95)	30	38[d]	28	26	34[c]	32	28
22	21	(92)	11	18[e]	8	11	14	16[c]	8
24	45	(92)	30	38[e]	36[e]	35[e]	29	31[d]	20
25	47	(92)	33	39[d]	30	35	34	36	28[f]
26	59	(95)	30	34	43[d]	26	34	31	17[f]
31	55	(92)	34	36	40[d]	36	36	38[c]	21[f]
41	50	(95)	27	26	28	18	25	34	27
44	43	(95)	24	40[d]	27	15[f]	28	30	21
45	24	(95)	18	32	33[b]	13	21[d]	11[f]	11[f]
51	37	(95)	23	39[g]	32[d]	16[f]	27	23	19
Quota	42	(95)	28	37[d]	33[d]	24	30	30	21
11[h]				15					
10[h]				12					
52[h]				19					
No Quota	32	(95)	19	17	20	15[f]	20	22	17[f]
Statewide	40	(95)	25	28	28	22	27	28[c]	20

[a] Harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the proportion of license-holders that hunted are unreliable. No-quota hunters could take 2 bears during 2008-2012, so their success was calculated by whether or not they shot at least 1 bear. No-quota hunters could take only 1 bear in 2013. Statewide estimates of harvest/hunters are presented in Table 1.

[b] Highest success since establishment of this BMU in 1994
[c] Highest success since 1997 (until this year).
[d] Highest success since 1995 (until this year).
[e] Highest success since 1992 (until this year)
[f] Lowest success since 2002 (until this year).
[g] Highest success since establishment of this BMU in 1987.

[h] For the first time, in 2013, an attempt was made to differentiate the number of no-quota hunters by BMU. When no-quota hunters bought licenses, they recorded the deer block where they anticipated hunting. Those who selected blocks in or adjacent to BMUs 10 (3%), 11 (30%), or 52 (63%) were categorized as such; those hunters who selected blocks in the quota zone(127= 4%) were distributed in no-quota zones proportional to those who selected blocks in the no-quota zone (note: 5 of them harvested a bear in the no-quota zone, 4 harvested a bear in the quota zone,1 harvested a bear in the quota zone with a quota zone license, and the remainder were unsuccessful); 10 hunters chose blocks in SE Minnesota, 9 of whom lived in the area, but none harvested a bear.

Table 7. Cumulative bear harvest (% of total harvest) by date, 1992-2013.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
1993	Wed		67	80	94
1994	Thu		67	78	92
1995	Fri		72	87	97
1996	Sun		56[a]	70	87
1997	Mon		76	88	97
1998	Tue		76	87	96
1999	Wed		69	81	95
2000	Wed	57	72	82	96
2001	Wed	67	82	88	98
2002	Sun		57[a]	69	90
2003	Mon		72	84	96
2004	Wed		68	82	95
2005	Thu		72	81	94
2006	Fri		69	83	96
2007	Sat		69	82	96
2008	Mon		58[a]	71	92
2009	Tue		74	86	96
2010	Wed		69	84	96
2011	Thu		65	78	93
2012	Sat		68	83	96
2013	Sun		61	76	94

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

Table 8. Number of people participating in nuisance bear survey, 1993-2013.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1993	83	84	82	88	82	81	68
1994	77	88	82	86	83	68	61
1995	74	77	79	83	80	72	61
1996	71	83	84	77	75	67	54
1997	61	69	69	64	62	60	43
1998	34	67	71	63	55	41	33
1999	52	52	40	47	44	39	16
2000	60	58	50	54	42	37	33
2001 [a]	52	54	50	49	42	32	21
2002	50	44	43	46	35	29	19
2003	36	39	34	29	27	25	14
2004	28	33	34	32	32	24	13
2005	35	36	42	36	35	26	20
2006	28	39	46	43	30	29	24
2007	46	41	39	35	40	31	21
2008	31	35	37	33	23	20	17
2009	44	51	41	40	39	35	28
2010	36	40	33	27	28	23	16
2011	30	34	29	31	29	27	21
2012	56	52	47	40	38	32	23
2013	63	56	62	49	42	42	32

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

Table 9. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1993-2013, including number of bears killed and translocated, and bears killed in vehicular collisions.

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of personnel participating in survey [a]	88	88	83	84	69	71	52	60	54	50	39	34	42	46	46	37	51	40	34	56	63
Complaints examined on site	1010	696	1568	337	661	226	189	105	122	75	81	75	61	57	63	59	65	70	37 [h]	113	69
Complaints handled by phone [b]				959	2196	743	987	618	660	550	424	507	451	426	380	452	535	514	396 [h]	722 [i]	623
Total complaints received				1296	2857	969	1176	723	782	625	505	582	512	483	443	511	600	584	433 [h]	835	692
• % Handled by phone				74%	77%	77%	84%	85%	84%	88%	84%	87%	88%	88%	86%	88%	89%	88%	91%	86%	90%
Bears killed by:																					
• Private party or DNR	111	67	232	27	93	31	25	25	22	12	13	25	28	11	21	22	23	22	9 [h]	16	24
• Hunter before season [c]																					
– from nuisance survey	21	28	81	6	32	23	5	7	4	0	3	3	6	2	18	3	4	3	3	11	0
– from registration file	30	25	138	18	35	31	24	43	20	11	8	4	13	6	25	5	15	10	5	12	0
• Hunter during/after season [d]	8	3	13	0	4	3	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1
• Permittee [e]	6	3	57	4	7	11	7	2	6	4	6	1	5	4	5	1	3	5	0	0	1 [j]
Bears translocated	180	171	295	64	115	24	29	1	6	3	1	3	3	3	1	3	2	2	2	0	3
• % bears translocated [f]	18	25	19	19	17	11	15	1	5	4	1	4	5	5	2	5	3	3	5	0	4
Bears killed by cars [g]	54	40	68	42	52	61	60	39	43	26	25	16	22	18	20	27	18	28	15 [h]	33	32

Table 9 footnotes:

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

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

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

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

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

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

[g] Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from confiscation records. Values shown for 2005-2013 are either from the forms or from the confiscation records, whichever was greater (they differed very little)(2013: 32 confiscations, 28 reported in nuisance survey).

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

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

[j] 4 permits issued, 1 bear killed.

Figure 4. Trends in nuisance bear complaints, nuisance bears killed and moved, and percentage of complaints handled by phone, 1981-2013, showing dramatic effect of change in nuisance bear policy.

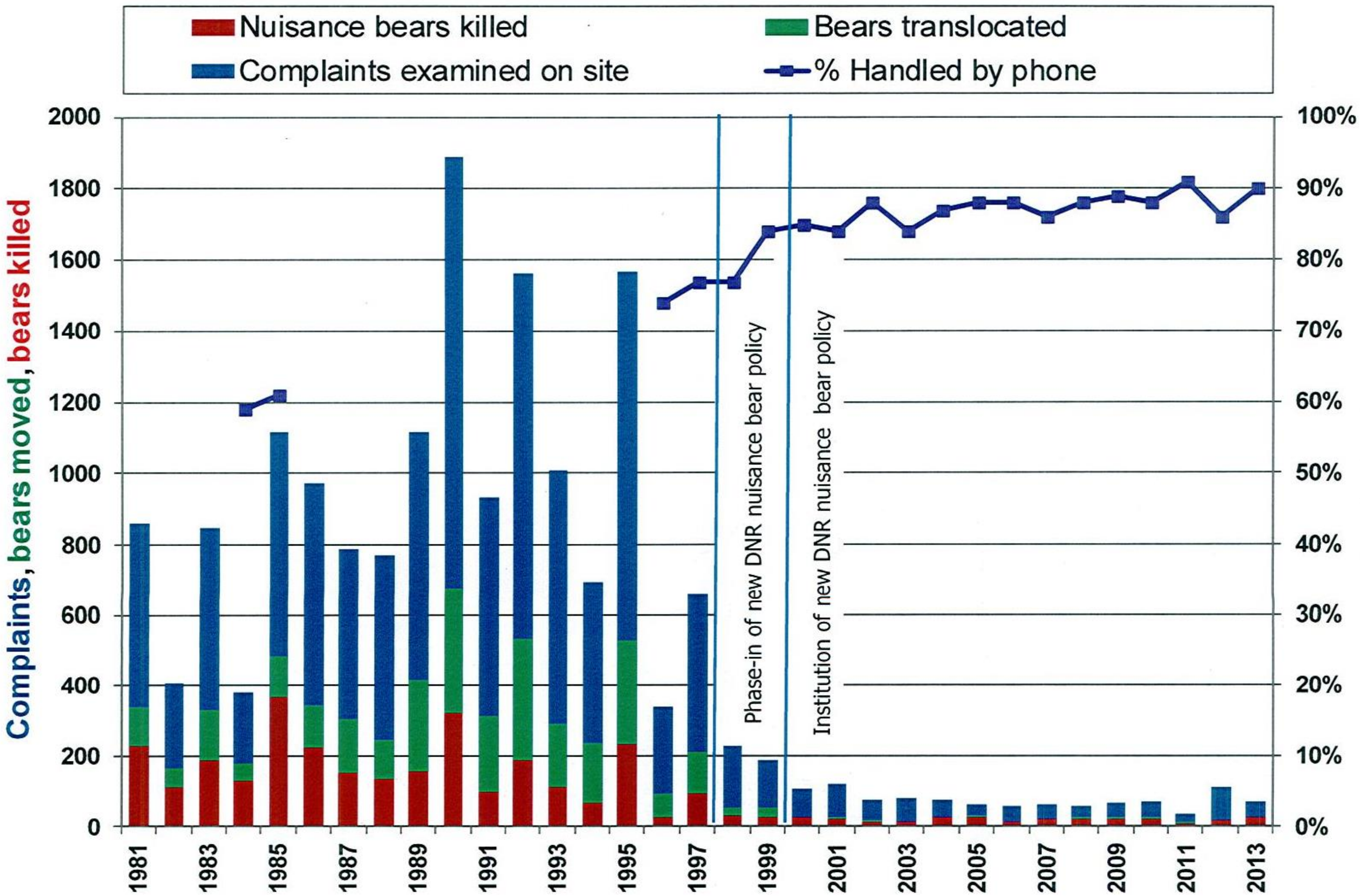
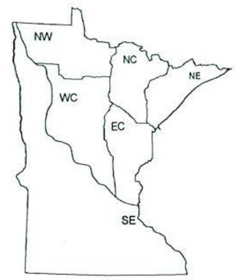


Table 10. Regional bear food indices[a] in Minnesota's bear range, 1984-2013. Shaded blocks indicate particularly lob (<45; pink) or high (≥ 70; green) values.

	Survey Area						
Year	NW	NC	NE	WC	EC	SE[b]	Entire Range
1984	32.3	66.8	48.9	51.4	45.4		51.8
1985	43.0	37.5	35.3	43.5	55.5		42.7
1986	83.9	66.0	54.7	74.7	61.1		67.7
1987	62.7	57.3	46.8	67.4	69.0		61.8
1988	51.2	61.1	62.7	54.4	47.3		56.0
1989	55.4	58.8	48.1	47.8	52.9		51.6
1990	29.1	39.4	55.4	44.0	47.9		44.1
1991	59.7	71.2	64.8	72.1	78.9		68.4
1992	52.3	59.9	48.6	48.1	63.3		58.2
1993	59.8	87.8	75.0	73.9	76.8		74.3
1994	68.6	82.3	61.3	81.5	68.2		72.3
1995	33.8	46.5	43.9	42.0	50.9		44.4
1996	89.5	93.2	88.4	92.2	82.1		87.6
1997	58.2	55.5	58.8	62.0	70.1		63.9
1998	56.9	72.8	66.4	72.3	84.5		71.1
1999	63.7	59.9	61.1	63.2	60.6		62.0
2000	57.7	68.0	54.7	69.2	67.4		62.3
2001	40.6	48.7	55.6	62.2	66.0		55.8
2002	53.1	63.4	60.4	68.6	68.3		66.8
2003	59.1	57.5	55.2	58.6	49.7		58.8
2004	57.0	60.5	61.1	70.3	67.9		64.4
2005	53.4	65.9	61.4	59.9	72.6		62.3
2006	51.0	64.9	53.4	51.0	52.1		56.9
2007	68.4	79.0	67.3	67.6	70.0		69.4
2008	58.6	74.1	64.7	66.6	71.4		65.4
2009	59.9	67.8	63.2	69.2	69.5		66.5
2010	70.0	71.3	79.0	60.8	57.3		68.0
2011	61.4	59.6	57.9	66.7	63.5		62.5
2012	49.1	50.3	59.4	50.5	41.5		50.7
2013	71.9	77.1	76.0	59.1	63.2	57.3	71.8



[a] Each composite "bear food index" value listed here represents the sum of the average indices for 14 species, calculated based on all surveys conducted in that survey area that year. Likewise, the range-wide mean is based on all surveys completed in the state that year and is not an average of the survey area means.
[b] Surveys were first compiled for the SE area in 2013. Bear range shows increasing expansion into this area.

Table 11. Regional mean index values[a] for bear food species in 2013 compared to the previous 29-year mean (1984-2012) in Minnesota's bear range. Shading indicates particularly high (green) or low (pink) fruit abundance relative to average (≥ 1 point difference for individual foods; ≥ 5 points difference for composite scores).

	NW		NC		NE		WC		EC		SE[d]	Entire Range	
FRUIT	29yr mean	2013 n = 12[b]	29yr mean	2013 n = 14	29yr mean	2013 n = 6	29yr mean	2013 n = 11	29yr mean	2013 n = 6	2013 n = 6	29yr mean	2013 n =41[c]
SUMMER													
Sarsaparilla	4.5	6.9	5.9	5.0	5.4	4.5	4.6	3.9	5.5	3.2	2.0	5.1	4.7
Pincherry	3.2	2.6	4.3	6.2	4.0	6.0	3.9	2.4	3.7	2.3	2.0	3.8	4.3
Chokecherry	5.5	8.6	5.3	9.2	4.3	7.4	5.4	5.1	4.6	4.6	3.7	5.1	7.0
Juneberry	4.9	8.4	4.7	10.2	4.9	6.8	3.8	3.7	3.9	4.3	3.0	4.4	6.9
Elderberry	1.4	1.4	3.1	1.9	3.6	3.7	3.1	3.0	3.3	3.0	4.0	3.0	2.6
Blueberry	4.9	7.9	5.3	9.3	4.8	5.8	3.7	3.4	3.6	2.5	2.0	4.3	5.7
Raspberry	6.6	6.7	8.1	8.8	7.9	9.4	7.1	6.6	7.0	7.2	6.2	7.3	7.5
Blackberry	1.3	0.3	2.3	1.0	1.0	1.5	3.4	2.5	4.4	5.8	5.5	2.9	2.6
FALL													
Wild Plum	2.0	2.5	1.8	2.3	1.0	2.5	2.6	2.5	2.4	3.3	5.0	2.1	2.9
HB Cranberry	5.1	6.2	4.3	4.8	3.6	5.2	3.7	3.3	3.5	4.8	2.0	4.0	4.9
Dogwood	6.0	8.2	5.7	6.1	5.0	5.0	5.7	7.1	5.9	6.6	5.6	5.6	6.7
Oak	3.5	4.0	3.0	4.1	1.7	3.0	5.9	5.9	5.9	4.2	8.6	4.4	5.0
Mountain Ash	1.6	1.6	2.6	2.9	4.6	8.2	1.8	2.0	2.2	3.0	2.7	2.6	4.3
Hazel	6.3	6.6	7.7	5.3	7.3	7.0	8.1	7.7	7.8	8.4	5.0	7.4	6.7
TOTAL	56.8	71.9	64.1	77.1	59.1	76.0	62.8	59.1	63.7	63.2	57.3	62.0	71.8

[a] Food abundance indices were calculated by multiplying species abundance ratings x fruit production ratings.

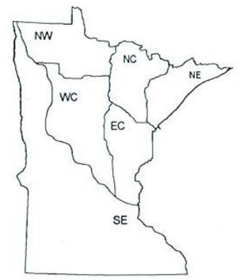
[b] n = Number of surveys used to calculate area-specific means

[c] Sample size for the entire range does not equal the sum of the sample sizes of 5 survey areas because some surveys were conducted on the border of 2 or more areas and were included in calculations for both.

[d] Surveys were first compiled for the SE area in 2013.

Table 12. Regional productivity indices[a] for 3 important fall foods (oak, hazel, and dogwood) in Minnesota's bear range, 1984-2013. Shading indicates particularly low (≤ 5.0; yellow) or high (≥ 8.0; tan) values.

	Survey Area						
Year	NW	NC	NE	WC	EC	SE[b]	Entire Range
1984	4.2	7.6	7.0	6.2	7.0		6.5
1985	4.9	2.8	4.2	4.7	5.3		4.4
1986	7.2	5.0	4.0	7.0	6.2		6.2
1987	8.0	7.8	7.3	7.6	8.0		7.7
1988	5.5	7.2	7.3	6.8	6.1		6.7
1989	6.0	5.3	4.1	5.7	6.4		5.8
1990	3.3	4.2	6.4	5.7	6.4		5.2
1991	6.2	6.2	5.4	7.2	7.7		6.7
1992	4.7	5.0	4.4	4.4	6.8		5.1
1993	5.3	7.1	6.7	6.2	7.7		6.5
1994	7.1	7.8	5.8	7.8	7.1		7.2
1995	4.8	4.8	5.1	4.6	5.3		4.9
1996	8.7	8.6	8.1	9.2	8.5		8.6
1997	5.8	5.4	5.1	6.8	6.5		6.2
1998	5.8	6.0	6.3	7.1	7.8		6.7
1999	6.4	5.1	5.9	6.6	6.0		6.2
2000	5.8	7.7	7.2	7.5	8.5		7.0
2001	3.4	4.1	5.7	6.0	6.5		5.2
2002	8.7	7.1	6.6	8.8	8.2		8.1
2003	6.3	6.0	5.5	6.2	6.0		6.1
2004	6.1	5.4	5.4	6.4	6.1		5.9
2005	5.8	5.8	6.1	6.4	7.0		6.2
2006	6.7	6.1	6.0	6.7	5.8		6.3
2007	6.0	5.8	5.7	6.6	6.4		6.2
2008	6.6	7.3	6.2	7.0	8.9		7.1
2009	5.1	6.2	5.3	6.3	6.5		6.0
2010	7.7	6.4	6.5	6.2	5.4		6.6
2011	5.8	6.5	6.2	7.0	7.4		6.5
2012	6.2	6.3	6.3	6.5	4.8		6.1
2013	6.8	6.0	5.7	6.7	6.9	6.2	6.3



[a] Each value represents the sum of the average production scores for hazel, oak, and dogwood, calculated based on all surveys conducted in that survey area that year. Means were calculated using all surveys completed in the state, not by averaging values from the 5 food survey areas.
[b] Surveys were first compiled for the SE area in 2013.

Figure 5. Productivity of key fall bear foods in Minnesota's primary bear range, 2013.

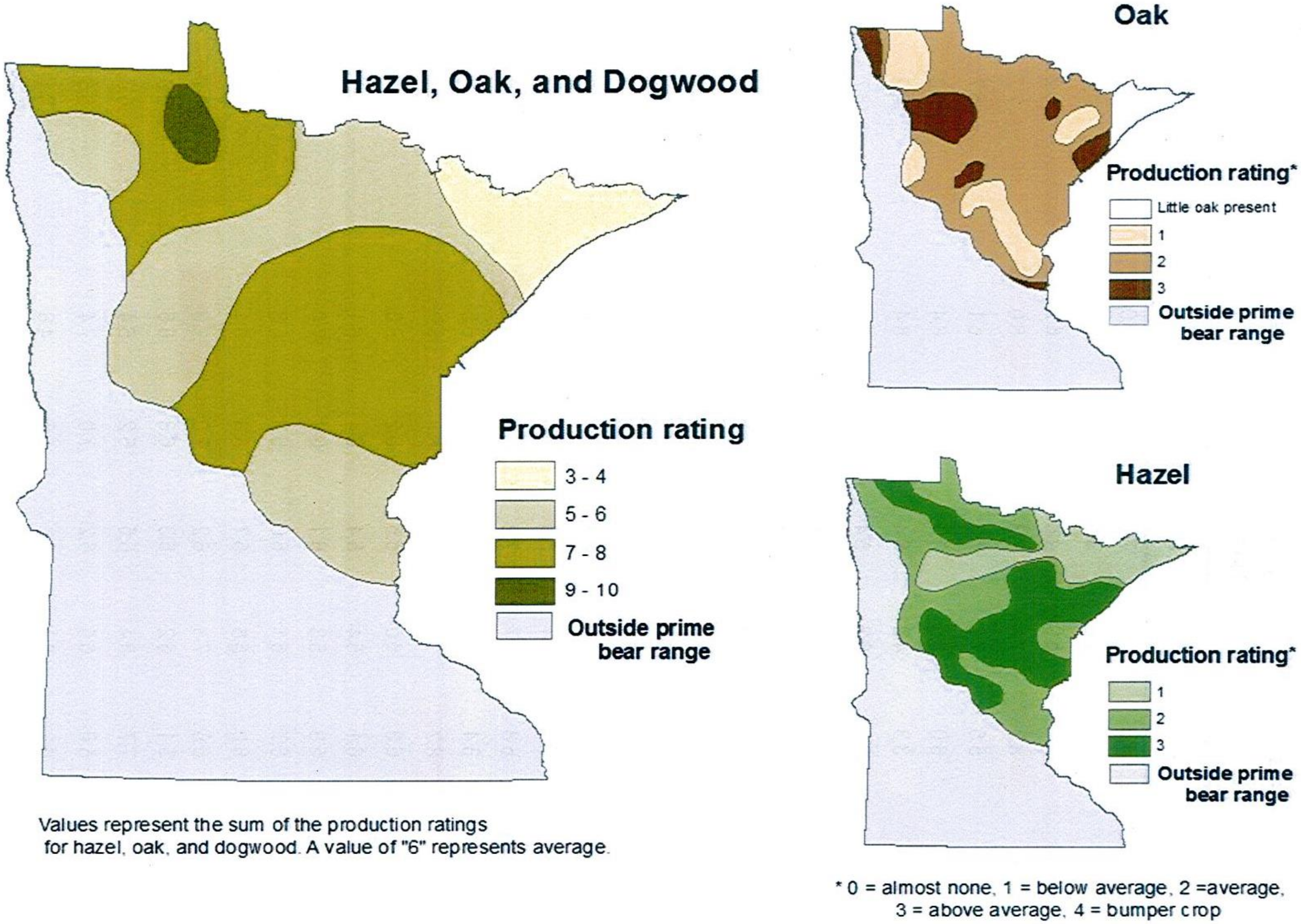
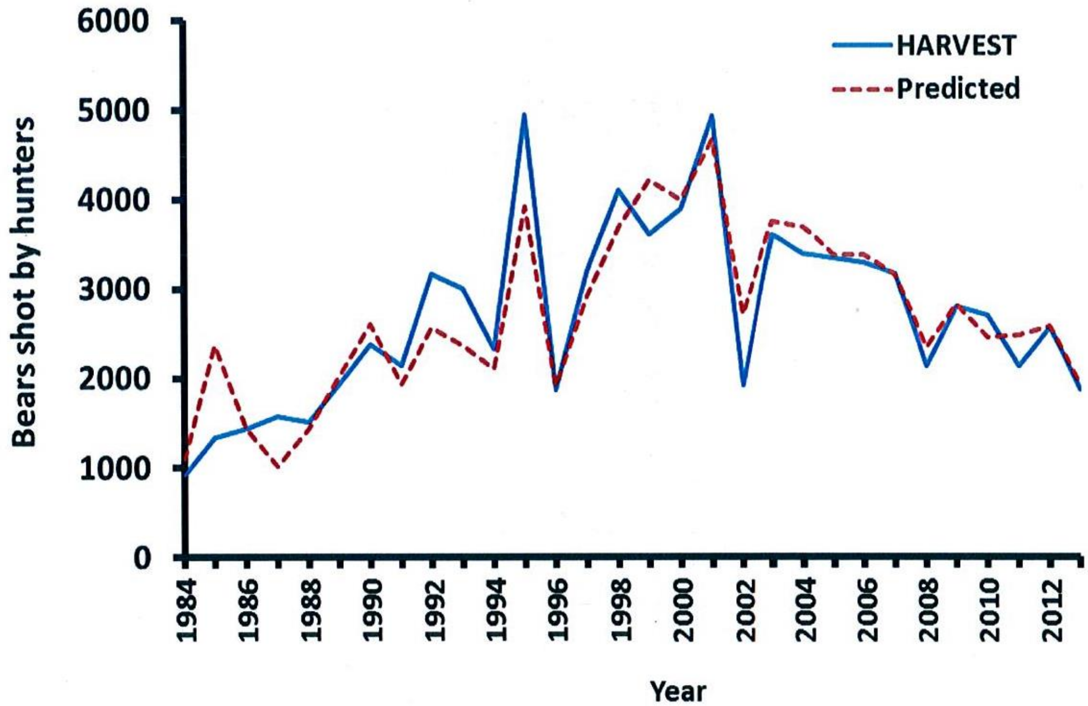


Figure 6. Number of bears harvested vs. number predicted based on fall food abundance and the number of hunters: 1984-2013 (top; $R^2 = 0.84$); 2000-2013 (bottom; $R^2 = 0.95$).



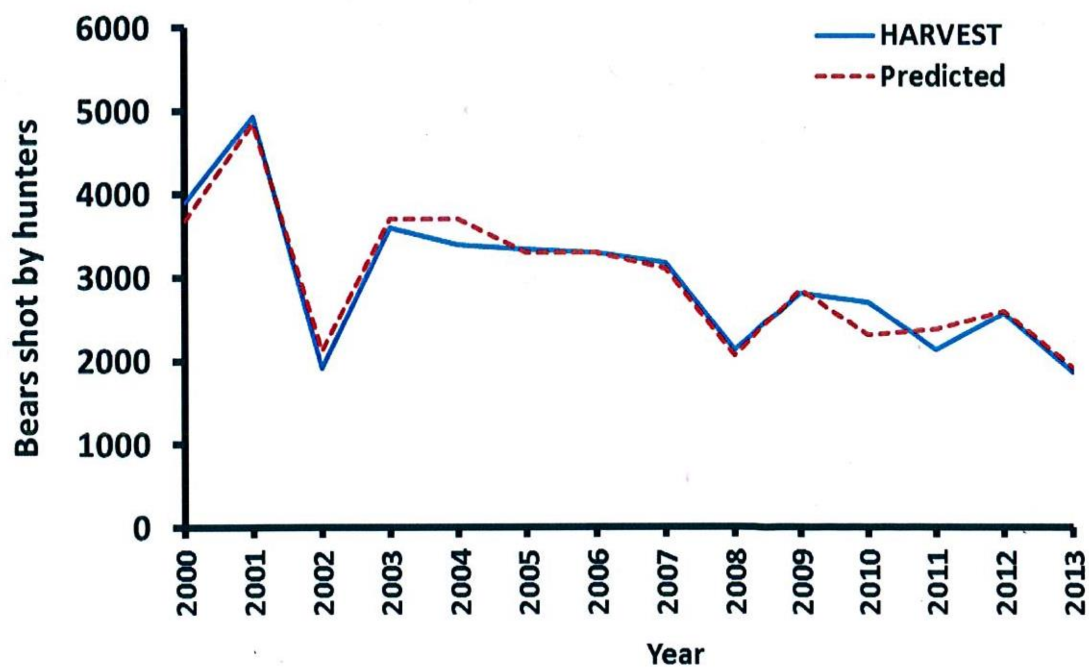


Figure 7. Trends in year-to-year variability of bear food index across Minnesota's bear range, 1984-2013. Bear food abundance was somewhat higher in 2013 and lower in 2012 than in any of the previous 15 years, but less extreme than the variation observed during 1984-1996.

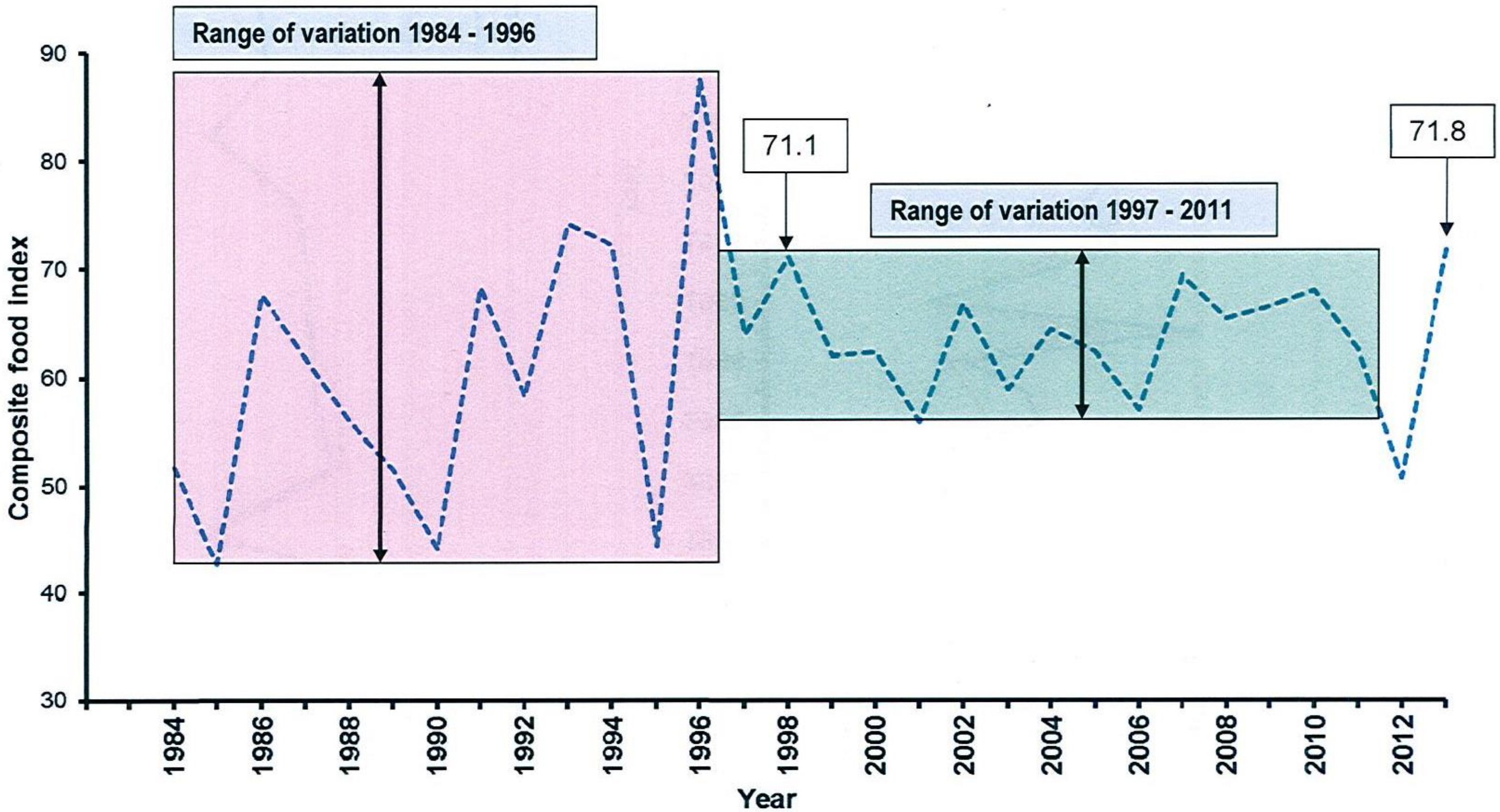


Figure 8. Sex ratio of harvested bears by BMU, 2007-2013.

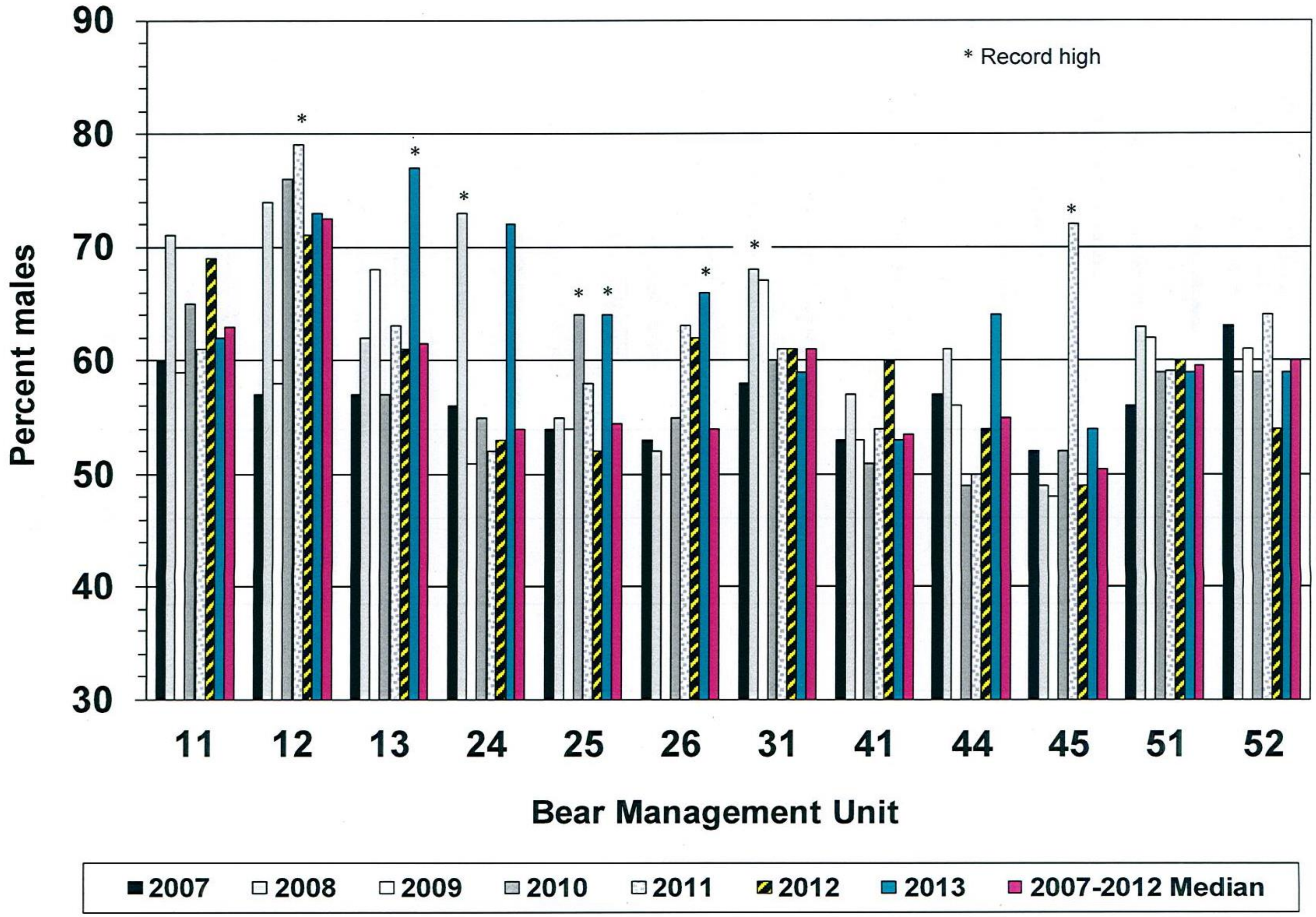


Figure 9. Median ages of harvested female bears by BMU, 2007-2013.

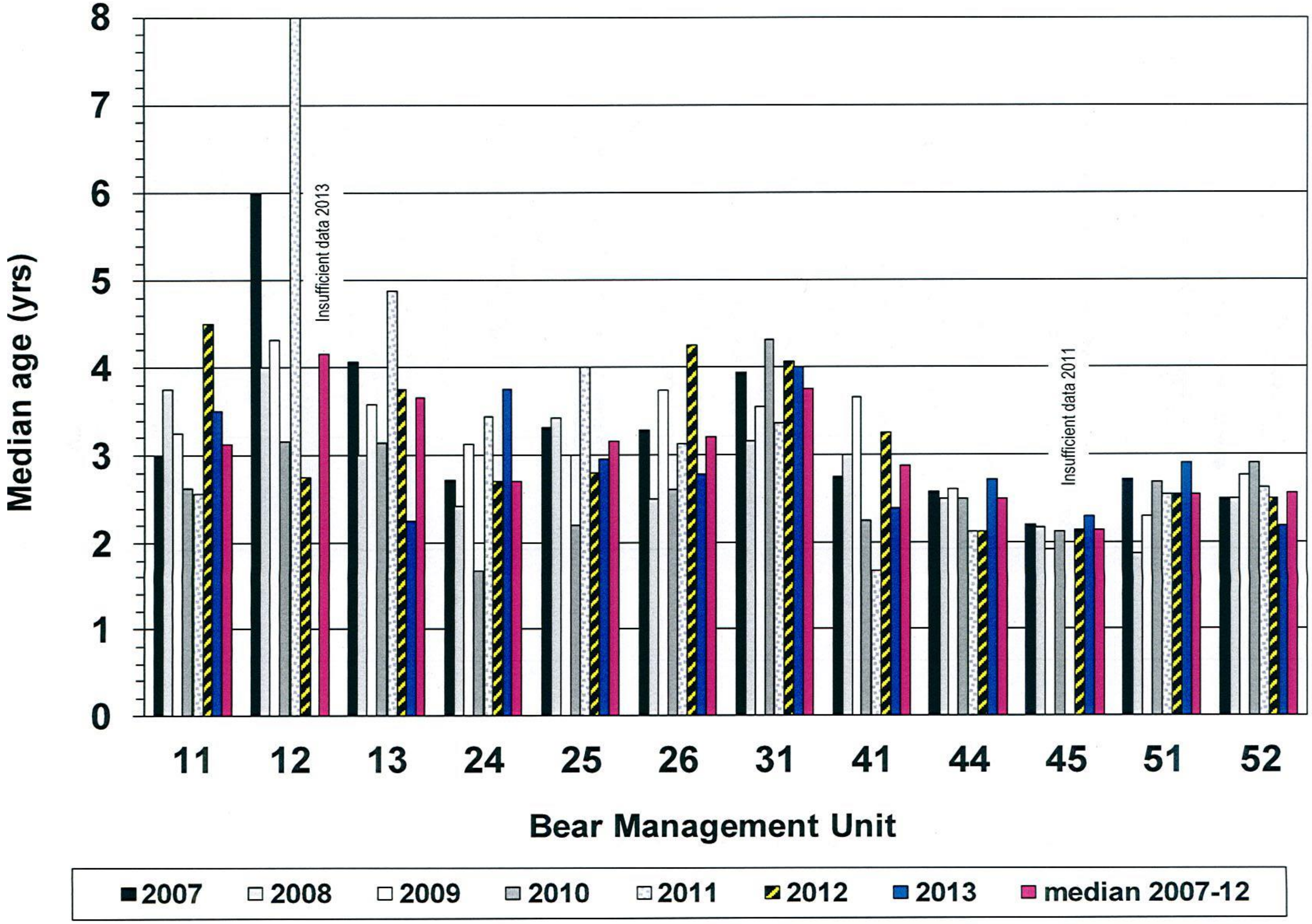


Figure 10. Statewide harvest structure: median ages (yrs) by sex, 1982-2013.

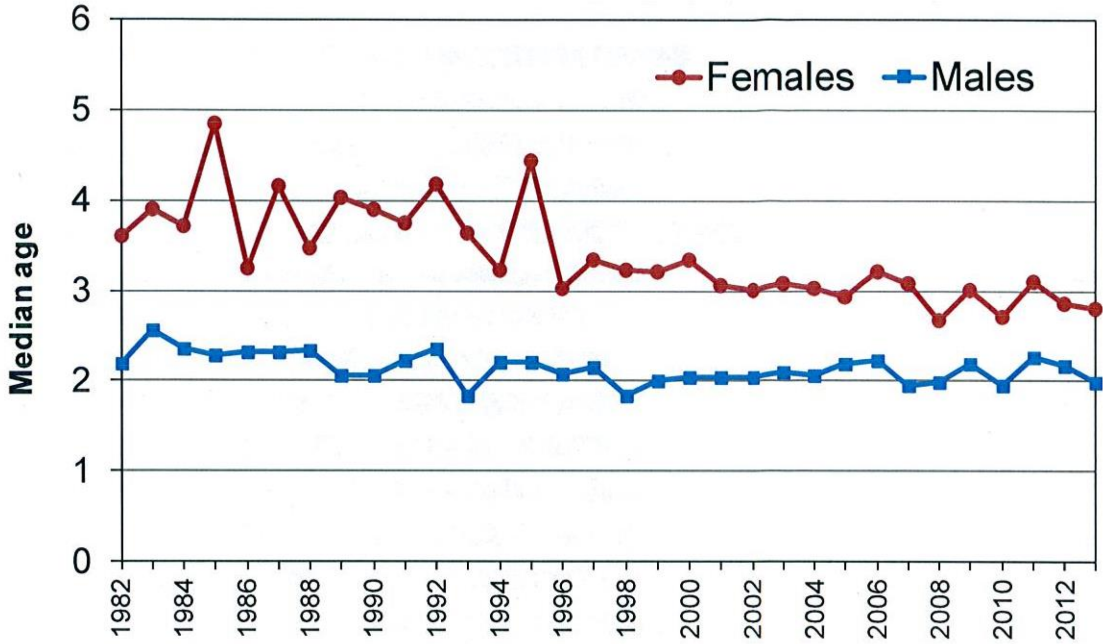


Figure 11. Statewide harvest structure: proportions of each sex in age category, 1982-2013. Trend lines are significant.

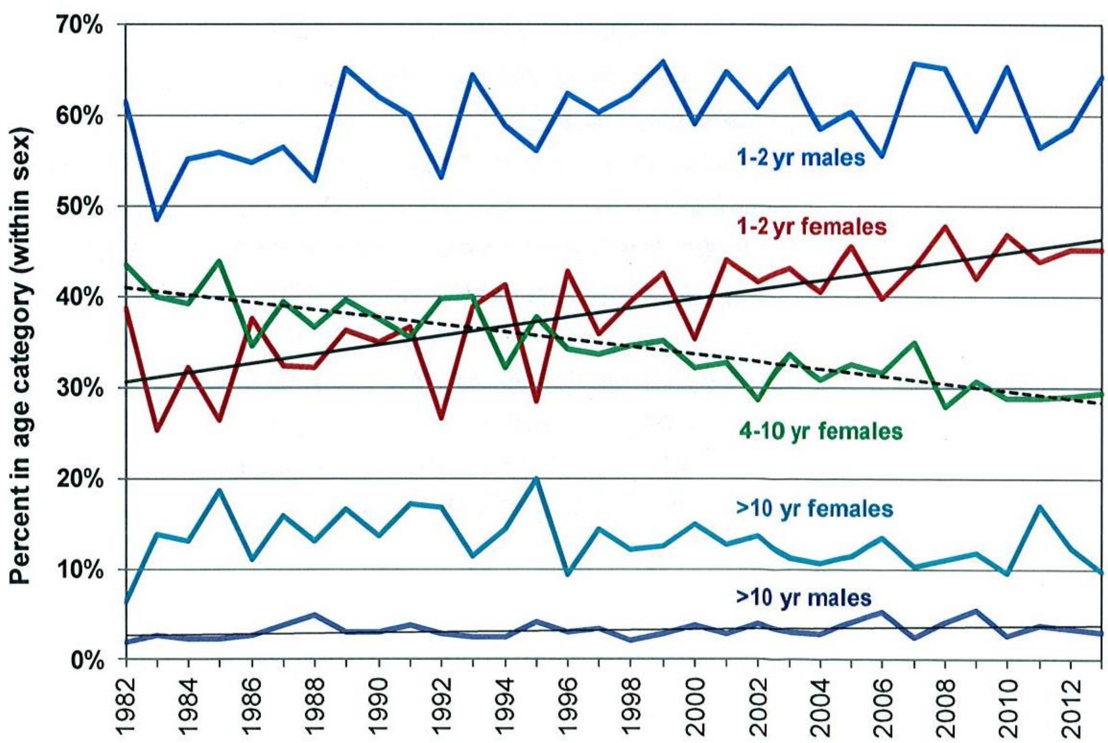


Figure 12. Percent of hunters submitting bear teeth for aging (now vital for population reconstruction, see Figure 14). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993) and when non-compliant hunters were sent a reminder and second tooth envelope (2009).

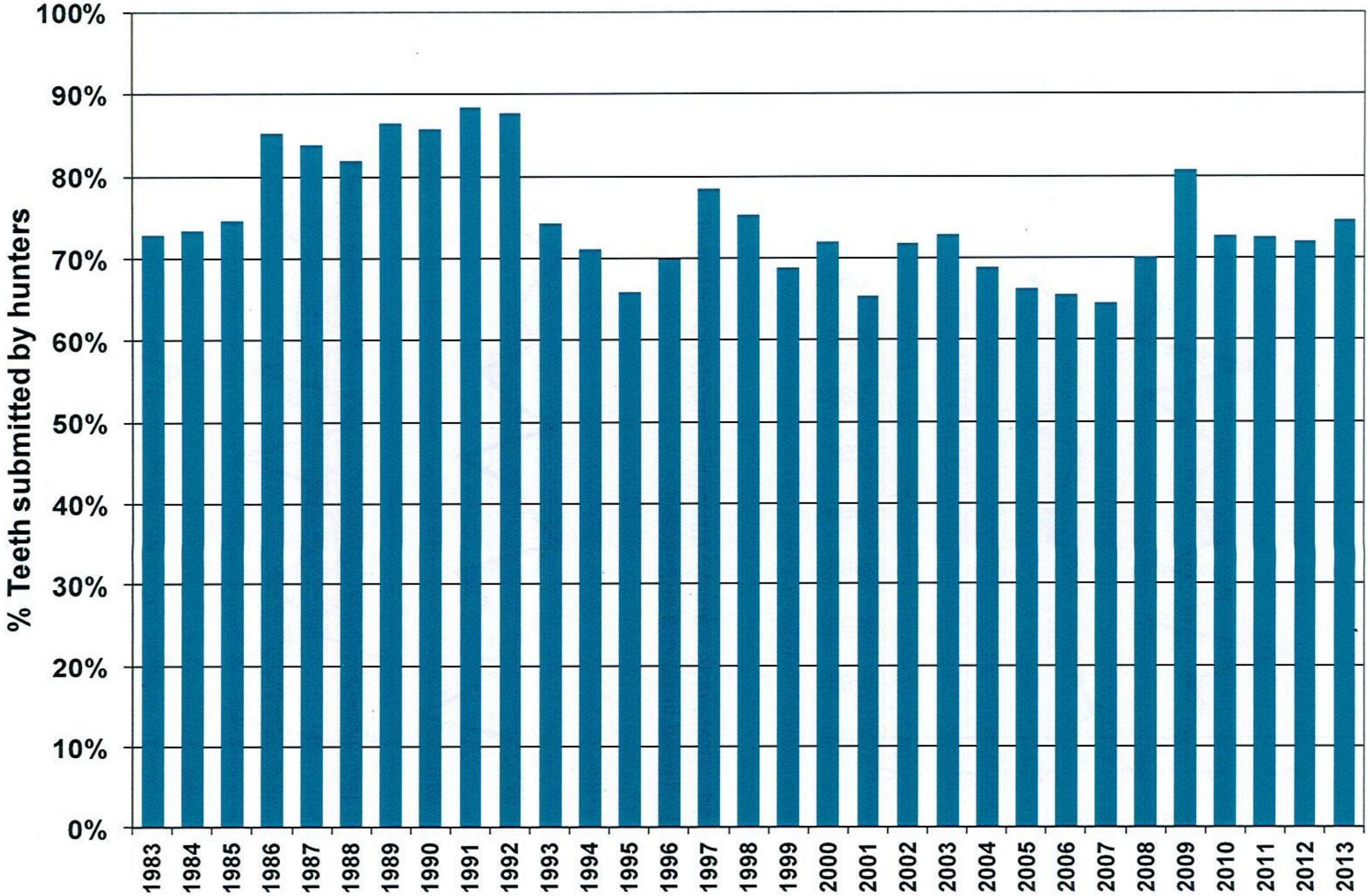
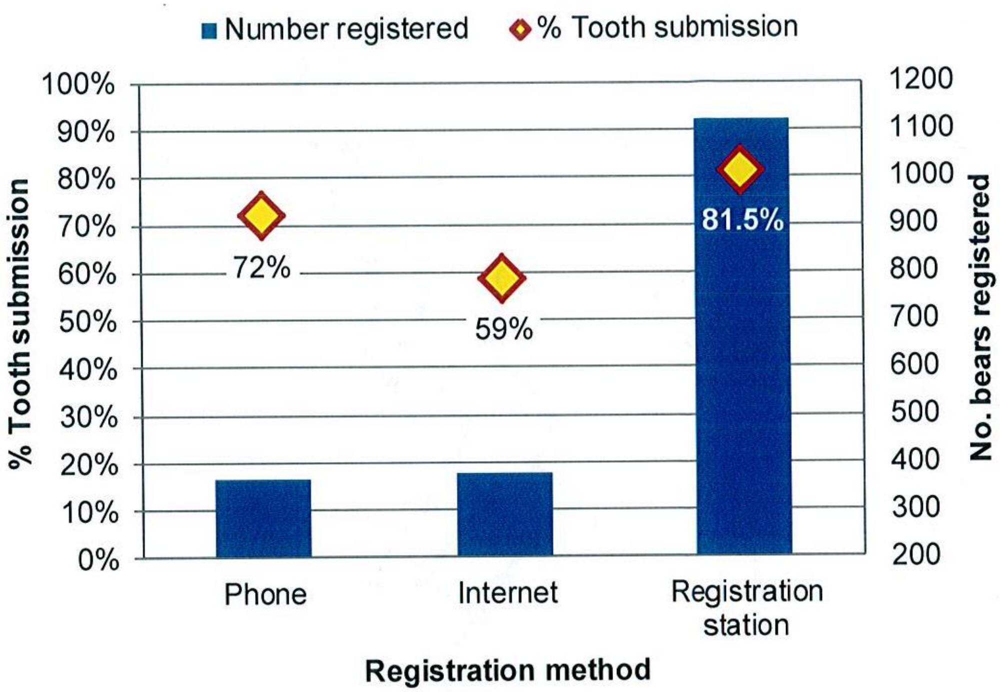


Figure 13. Percent of hunters who submitted a bear tooth in 2013, by method of registration (top panel) and by BMU (bottom panel). For the first time, in 2013, hunters could register their bear by phone or internet, but to complete the registration process they were supposed to go to a registration station and obtain a tooth envelope.



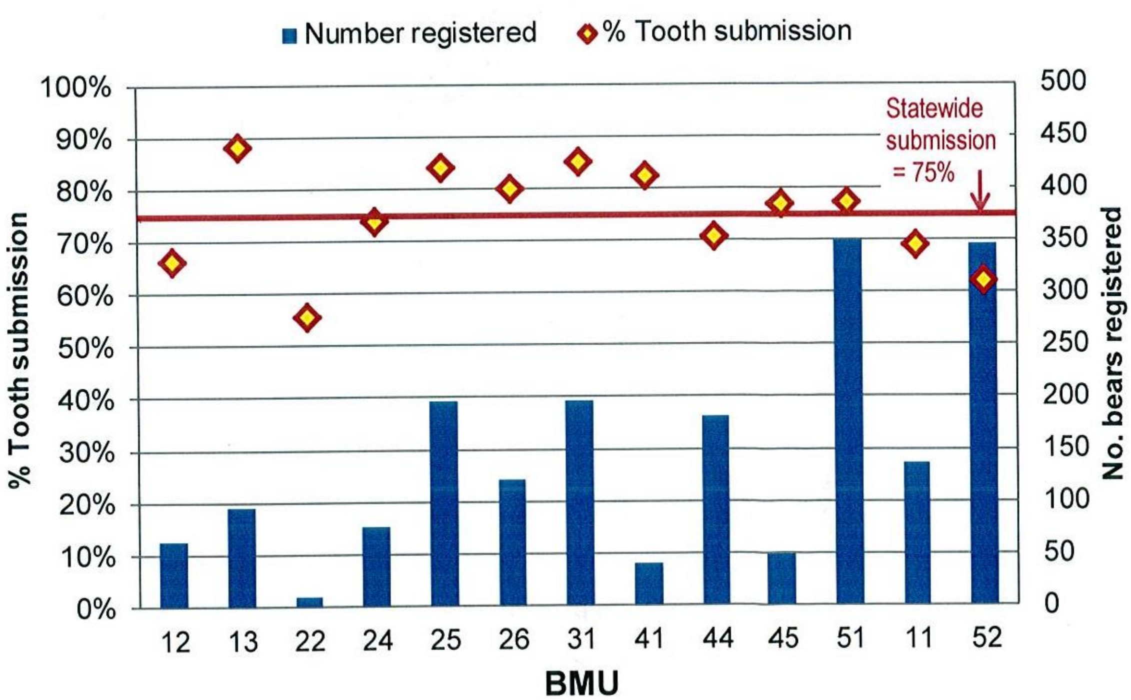
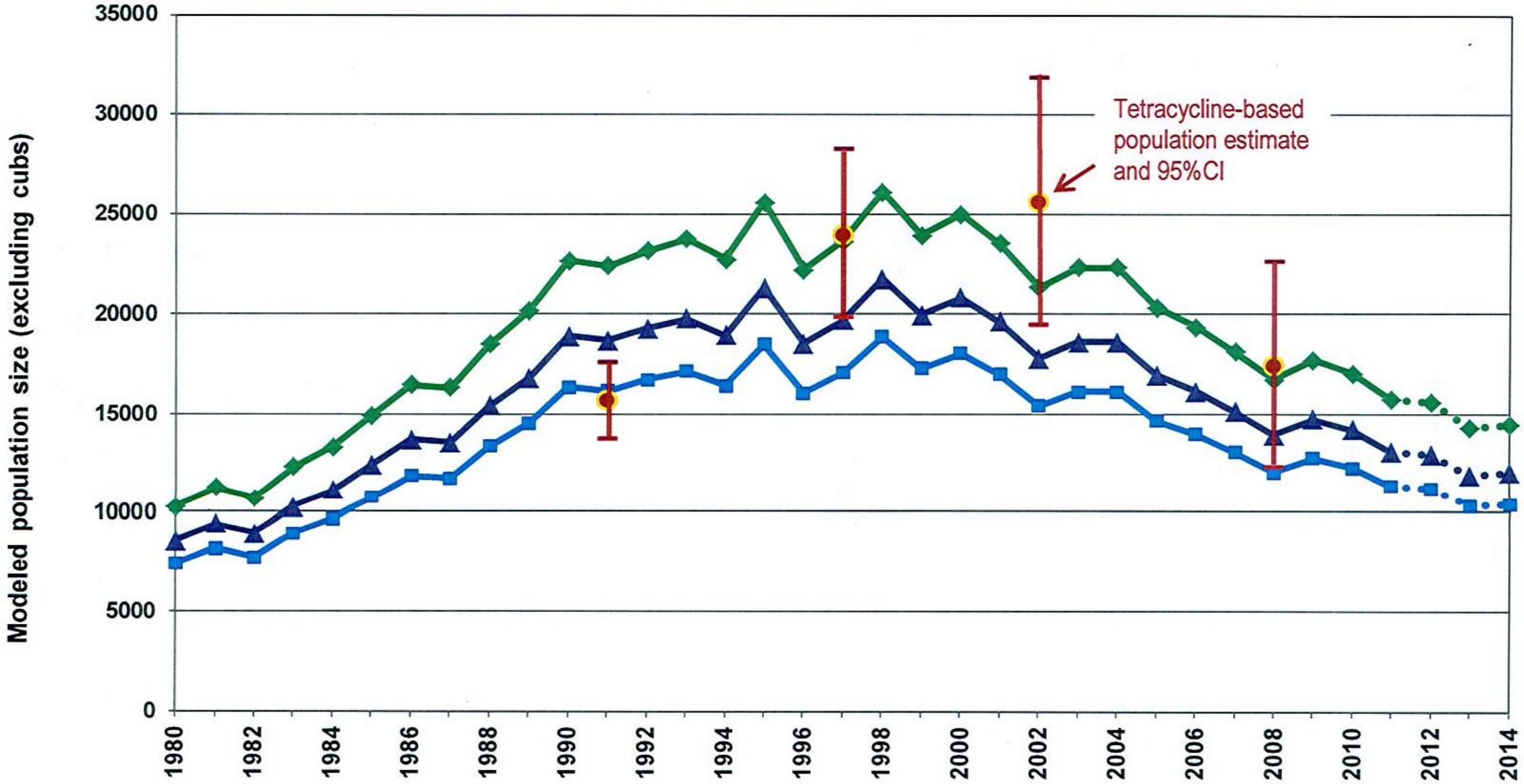


Figure 14. Statewide population trend derived from Downing reconstruction using the harvest age structures from 1980-2013. Curves were scaled (elevated) to various degrees to attempt to match the tetracycline-based mark-recapture estimates. Estimates for 2012-2014 were derived from population growth rates extrapolated from the reconstruction analyses (hence the break in the curves).



2013 MINNESOTA DEER HARVEST REPORT

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

INTRODUCTION

The white-tailed deer may be considered Minnesota's most popular wildlife species. Each year, 500,000 hunters harvest close to 200,000 deer. In 2013, hunters registered 172,781 deer.

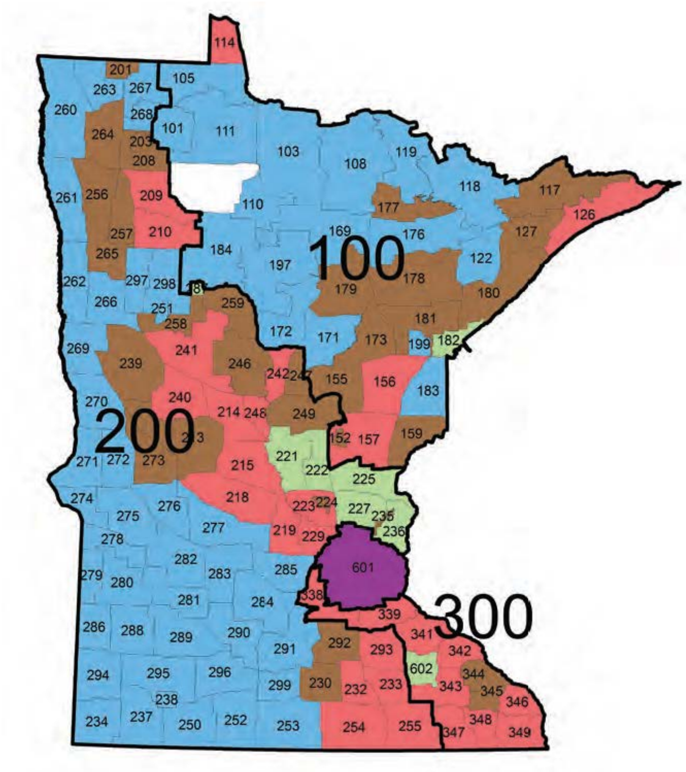
METHODS

Every deer taken by hunting in Minnesota must be registered. In 2013, hunters were required to register deer within 48 hours of harvest and before processing. Deer may be registered at any of the 825 to nearly 900 "Big Game Registration" stations available throughout the state. Starting in 2011, deer could also be registered using the interest and telephone except in areas under Disease Management tag restrictions (PA 602). Implementation of electronic licensing (ELS) has improved the efficiency and accuracy of deer harvest estimates and provides a more timely release of harvest information. Registered deer are recorded as adult buck, fawn buck, adult doe, or fawn doe. Additional information gathered at time of registration includes date of kill, deer permit area, and season.

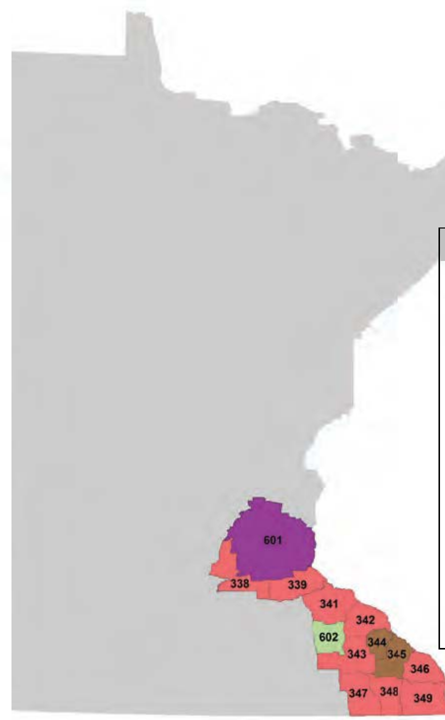
RESULTS

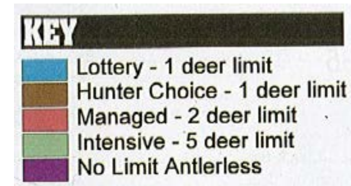
Outcomes of the 2013 deer harvest are presented in the following tables.

STATEWIDE (A) LICENSE



LATE SOUTHEAST (B) LICENSE





2013 Minnesota Deer Seasons

ZONE	DATES
Archery	Sept 14-Dec 31
Firearm Option Statewide (A)*	
100 Series	Nov. 9-24
200 Series	Nov. 9-17
300 Series	Nov. 9-17
Firearm Option Late Southeast (B)**	Nov. 23-Dec 1
Muzzleloader****	Nov. 30-Dec. 15
Metro Deer Management Area (601)*** (Any 2013 firearms or muzzleloader.)	Nov. 9-Dec 1
Chronic Wasting Disease Area (602)*** (Any 2013 firearms or muzzleloader.)	Nov. 9-Dec 1
Youth Season	Oct. 17-20

Figure 1. 2013 Firearms and Archery Deer Seasons.

Table 1. Statewide Firearms, Archery, and Muzzleloader Harvest, License Sales, and Success Rates, 2002-2013.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
REGULAR FIREARMS												
Resident License Sales	367,964	344,875	309,698	291,298	299,774	285,286	376,006	377,077	379,866	382,668	391,822	391,967
Non-Resident License Sales	10,835	11,334	12,036	12,523	12,520	12,520	11,883	11,759	11,908	11,955	12,483	12,496
Bonus Permit Sales	105,699	194,201	183,186	184,566	167,343	145,522	190,156	140,920	143,763	142,049	89,750	97,402
Multi-Zone Buck License Sales	35,658	32,929	32,359	28,233	15,984	15,051	N/A	N/A	N/A	N/A	N/A	N/A
Youth License Sales	2,884	34,463	51,347	50,501	49,599	49,242	50,397	56,678	59,726	60,943	62,949	64,748
All Season Deer License Sales	22,125	30,998	46,008	59,090	75,511	76,385	N/A	N/A	N/A	N/A	N/A	N/A
Total License Sales	545,165	648,800	634,634	626,211	620,731	584,006	628,442	586,434	595,263	597,615	557,004	566,613
Registered Buck Harvest[1]	101,333	110,440	116,612	95,594	95,695	97,528	85,646	83,820	88,027	76,003	84,729	77,564
Antlerless Permits Offered	365,667	31,625	30,760	28,830	18,925	18,830	32,325	60,100	60,083	15,252	33,340	36,816
Antlerless Permits Issued	192,907	25,386	24,111	25,656	18,925	18,830	32,325	60,100	60,083	60,083	33,340	36,816
Antlerless Permits App.	202,086	30,253	28,454	31,403	31,403	31,403	31,403	90,882	86,783	86,783	72,236	68,811
Registered AL Harvest[1]	102,280	147,420	123,278	119,363	135,981	118,860	98,147	78,525	78,525	88,197	71,140	67,885
Registered Total Harvest[1]	203,613	257,860	239,890	214,957	231,676	216,388	183,793	162,345	174,104	164,200	155,869	145,449
Registered % Successful[2]	37.3	39.7	37.8	34.3	37.3	37.1	35.1	32.1	35.6	32.9	32.0	29.7
ARCHERY												
Resident License Sales	57,532	59,339	50,601	50,293	49,595	52,780	87,872	88,707	91,156	90,252	95,259	92,717
Non-Resident License Sales	1,275	1,428	1,144	1,207	1,286	1,509	1,509	1,610	1,638	1,718	1,814	1,952
Youth Archery Sales	N/A	3,748	7,261	7,489	7,688	7,663	9,005	9,157	9,577	10,306	11,276	12,212
Mgmt Permit License Sales	18,126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total License Sales	76,933	60,767	59,006	58,989	58,569	61,952	99,033	99,474	102,371	102,276	108,349	106,881
Total Harvest - All-Season License		2,356	3,489	4,563	8,284	6,900	N/A	N/A	N/A	N/A	N/A	N/A
Total Archery Harvest	14,744	21,691	20,726	23,538	25,360	24,161	22,632	20,629	22,057	20,444	21,605	19,388
Registered % Successful[2]	19.2	22.3	29.2	24.6	24.8	24.3	18.5	17.5	17.8	17.0	18.8	14.5
MUZZLELOADER												
Total Muzzleloader License Sales	11,764	9,142	10,512	9,226	10,781	9,867	64,673	63,282	55,640	59,384	58,363	51,092
Estimated All-Season Hunters	--	12,020	14,168	23,293	23,293	26,813	N/A	N/A	N/A	N/A	N/A	N/A
Total Muzzleloader Harvest	3,505	9,466	9,289	15,421	13,507	12,138	9,572	7,929	9,023	7,416	7,779	7,045
Registered % Successful[2]	29.8	44.7	37.6	47.4	39.6	28.2	13.4	11.3	16.2	12.4	12.4	12.7
Antlerless Permits Offered									5,792	1,997	1,635	2,144
Antlerless Permits App.									7,260	2,615	4,629	3,544
TOTAL Registered Harvest	222,050	290,525	260,604	255,736	270,778	260,434	221,837	194,186	207,313	192,331	186,634	172,781

[1] Does not include free landowner licenses

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

Table 2. Deer Harvest by License Type and Zone, 2013.

Firearms/Zone	Hunters	Harvest			Overall Success
		Bucks	Antlerless	Total	
1	179,148	29,042	20,114	49,156	26.8%
2	238,975	42,172	38,156	80,328	31.6%
3A	25,235	4,211	4,133	8,344	30.1%
3B	12,408	867	3,292	4,159	29.9%
CWD	1,946	489	856	1,345	53.7%
Free Landowner[1]	4,781	0	1,416	1,416	29.7%
Depredation[1]	124	0	230	230	73.4%
Muzzleloader[2]	51,092	2,449	4,596	7,045	12.7%
Archery[3]	106,881	7,460	11,928	19,388	14.5%
TOTAL[4]	**509,547**	**87,865**	**84,916**	**172,781**	**31.1%**

[1] Includes deer taken during regular firearms, muzzleloader, and archery seasons.
[2] Total number of people who bought only a muzzleloader license was 6,989.
[3] Includes Camp Ripley. Total number of people who bought only an archery license was 32,495.
[4] Due to the fact that a hunter can buy multiple licenses, hunter numbers and success rates are calculated using unique MNDNR numbers.

Table 3. Firearms Harvest and Harvest per Square Mile by Permit Area, 2013. Includes all firearm licenses.

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
101	1A	330	3	20	0	353	496	0.67	0.05	0.71
103	1A	691	21	115	11	838	1,824	0.38	0.08	0.46
105	1A	876	20	105	14	1,015	932	0.94	0.15	1.09
108	1A	910	22	146	17	1,095	1,701	0.53	0.11	0.64
110	1A	837	72	369	61	1,339	530	1.58	0.95	2.52
111	1A	444	11	57	4	516	1,440	0.31	0.05	0.36
114	1A	41	2	17	3	63	412	0.10	0.05	0.15
117	1A	37	2	8	0	47	1,129	0.03	0.01	0.04
118	1A	569	13	41	4	627	1,445	0.39	0.04	0.43
119	1A	577	10	89	8	684	946	0.61	0.11	0.72
122	1A	333	13	75	3	424	622	0.54	0.15	0.68
126	1A	383	33	225	17	658	979	0.39	0.28	0.67
127	1A	85	3	46	6	140	587	0.14	0.09	0.24
152	1A	76	25	73	18	192	62	1.23	1.88	3.12
155	1A	1294	242	910	156	2,602	639	2.03	2.05	4.07
156	1A	1335	343	1138	248	3,064	834	1.60	2.07	3.67
157	1A	2164	583	1832	430	5,009	904	2.39	3.15	5.54
159	1A	1093	208	724	150	2,175	575	1.90	1.88	3.78
169	1A	1315	140	613	82	2,150	1,202	1.09	0.69	1.79
171	1A	1023	110	435	85	1,653	729	1.40	0.86	2.27
172	1A	1476	168	596	114	2,354	786	1.88	1.12	2.99
173	1A	695	144	454	91	1,384	617	1.13	1.12	2.24
176	1A	1412	60	294	44	1,810	1,150	1.23	0.35	1.57
177	1A	810	98	455	72	1,435	553	1.47	1.13	2.60
178	1A	1750	229	1051	160	3,190	1,325	1.32	1.09	2.41
179	1A	1539	269	1088	162	3,058	939	1.64	1.62	3.26
180	1A	806	63	382	36	1,287	999	0.81	0.48	1.29
181	1A	964	136	599	77	1,776	746	1.29	1.09	2.38
182	1A	433	96	322	68	919	280	1.55	1.74	3.28
183	1A	1157	123	508	75	1,863	675	1.71	1.05	2.76
184	1A	2580	260	952	165	3,957	1,318	1.96	1.04	3.00
197	1A	910	64	284	54	1,312	1,343	0.68	0.30	0.98
199	1A	88	8	34	2	132	152	0.58	0.29	0.87
201	2A	94	9	46	13	162	169	0.56	0.40	0.96
203	2A	64	3	26	4	97	132	0.49	0.25	0.74
208	2A	187	23	78	12	300	379	0.49	0.30	0.79
209	2A	457	105	364	90	1,016	641	0.71	0.87	1.58
210	2A	738	122	502	111	1,473	635	1.16	1.16	2.32
213	2A	1583	341	797	212	2,933	1,161	1.36	1.16	2.53
214	2A	1330	381	1014	358	3,083	566	2.35	3.10	5.45
215	2A	1196	327	752	277	2,552	730	1.64	1.86	3.49
218	2A	965	263	682	165	2,075	912	1.06	1.22	2.28
219	2A	596	119	349	106	1,170	427	1.40	1.34	2.74
221	2A	1072	346	785	329	2,532	647	1.66	2.26	3.91
222	2A	836	287	655	236	2,014	413	2.03	2.85	4.88
223	2A	581	115	281	118	1,095	385	1.51	1.33	2.84
224	2A	87	10	49	3	149	49	1.77	1.26	3.04
225	2A	1270	387	943	321	2,921	635	2.00	2.60	4.60
227	2A	847	217	559	162	1,785	491	1.72	1.91	3.63

Table 3. (Continued)

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
229	2A	225	38	99	28	390	313	0.72	0.53	1.24
230	2A	246	47	132	35	460	464	0.53	0.46	0.99
232	2A	218	64	162	29	473	380	0.57	0.67	1.24
233	2A	194	23	89	23	329	386	0.50	0.35	0.85
234	2A	191	19	85	11	306	637	0.30	0.18	0.48
235	2A	61	5	23	6	95	37	1.66	0.92	2.58
236	2A	546	120	337	77	1,080	404	1.35	1.32	2.68
237	2A	246	22	89	9	366	737	0.33	0.16	0.50
238	2A	70	4	22	11	107	98	0.72	0.38	1.10
239	2A	1223	240	739	177	2,379	1,110	1.10	1.04	2.14
240	2A	1474	388	1054	301	3,217	694	2.12	2.51	4.64
241	2A	2778	746	2250	591	6,365	1,047	2.65	3.43	6.08
242	2A	503	130	446	97	1,176	307	1.64	2.19	3.83
246	2A	1670	361	1150	247	3,428	860	1.94	2.04	3.99
247	2A	572	140	482	79	1,273	263	2.17	2.66	4.83
248	2A	360	84	260	72	776	229	1.58	1.82	3.40
249	2A	1024	280	686	199	2,189	729	1.40	1.60	3.00
250	2A	320	21	115	9	465	730	0.44	0.20	0.64
251	2A	81	10	22	6	119	68	1.19	0.56	1.75
252	2A	314	29	131	12	486	735	0.43	0.23	0.66
253	2A	434	35	140	16	625	987	0.44	0.19	0.63
254	2A	533	67	290	51	941	946	0.56	0.43	0.99
255	2A	416	71	239	63	789	774	0.54	0.48	1.02
256	2A	452	69	206	50	777	654	0.69	0.50	1.19
257	2A	325	36	198	23	582	426	0.76	0.60	1.37
258	2A	769	134	471	108	1,482	381	2.02	1.87	3.89
259	2A	1300	260	849	173	2,582	546	2.38	2.35	4.73
260	2A	307	17	69	10	403	1,252	0.25	0.08	0.32
261	2A	174	10	32	3	219	796	0.22	0.06	0.28
262	2A	177	22	71	15	285	677	0.26	0.16	0.42
263	2A	346	14	79	12	451	513	0.67	0.20	0.88
264	2A	620	70	329	48	1,067	672	0.92	0.67	1.59
265	2A	442	62	239	54	797	495	0.89	0.72	1.61
266	2A	332	26	107	28	493	625	0.53	0.26	0.79
267	2A	188	6	30	4	228	472	0.40	0.08	0.48
268	2A	293	7	24	6	330	239	1.22	0.15	1.38
269	2A	192	17	60	11	280	652	0.29	0.14	0.43
270	2A	171	15	44	8	238	758	0.23	0.09	0.31
271	2A	222	25	86	16	349	646	0.34	0.20	0.54
272	2A	204	9	59	10	282	544	0.38	0.14	0.52
273	2A	445	79	211	66	801	634	0.70	0.56	1.26
274	2A	200	17	85	16	318	381	0.53	0.31	0.84
275	2A	350	30	130	24	534	777	0.45	0.24	0.69
276	2A	493	50	211	28	782	575	0.86	0.50	1.36
277	2A	1174	135	531	107	1,947	876	1.34	0.88	2.22
278	2A	328	24	150	26	528	422	0.78	0.47	1.25
279	2A	222	25	127	13	387	346	0.64	0.48	1.12

Table 3. (Continued)

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
280	2A	251	21	141	16	429	676	0.37	0.26	0.63
281	2A	447	42	126	24	639	579	0.77	0.33	1.10
282	2A	114	5	22	3	144	780	0.15	0.04	0.18
283	2A	284	19	70	18	391	640	0.44	0.17	0.61
284	2A	315	33	129	14	491	853	0.37	0.21	0.58
285	2A	368	47	145	29	589	580	0.63	0.38	1.01
286	2A	283	43	175	29	530	458	0.62	0.54	1.16
287	2A	100	41	130	23	294	51	1.97	3.83	5.80
288	2A	401	35	215	23	674	630	0.64	0.43	1.07
289	2A	182	17	91	24	314	820	0.22	0.16	0.38
290	2A	412	43	186	35	676	666	0.62	0.40	1.02
291	2A	665	80	274	48	1,067	832	0.80	0.48	1.28
292	2A	450	92	203	43	788	517	0.87	0.65	1.52
293	2A	466	112	306	69	953	512	0.91	0.95	1.86
294	2A	324	32	141	16	513	689	0.47	0.27	0.75
295	2A	477	23	145	22	667	855	0.56	0.22	0.78
296	2A	329	24	126	11	490	675	0.49	0.24	0.73
297	2A	149	6	48	6	209	449	0.33	0.13	0.47
298	2A	558	37	113	14	722	677	0.82	0.24	1.07
299	2A	269	21	112	13	415	389	0.69	0.37	1.07
338	3A	160	38	121	25	344	472	0.34	0.39	0.73
338	3B	27	16	57	10	110	472	0.06	0.18	0.23
339	3A	166	38	120	28	352	406	0.41	0.46	0.87
339	3B	18	21	54	14	107	406	0.04	0.22	0.26
341	3A	406	91	272	60	829	483	0.84	0.88	1.72
341	3B	81	75	215	60	431	483	0.17	0.72	0.89
342	3A	404	82	286	45	817	374	1.08	1.10	2.18
342	3B	90	61	252	76	479	374	0.24	1.04	1.28
343	3A	354	74	235	57	720	486	0.73	0.75	1.48
343	3B	71	36	157	47	311	486	0.15	0.49	0.64
344	3A	292	42	209	41	584	190	1.54	1.54	3.08
344	3B	51	26	113	28	218	190	0.27	0.88	1.15
345	3A	306	38	136	21	501	335	0.91	0.58	1.49
345	3B	64	44	130	38	276	335	0.19	0.63	0.82
346	3A	607	103	386	89	1,185	328	1.85	1.76	3.61
346	3B	138	86	300	80	604	328	0.42	1.42	1.84
347	3A	324	59	218	36	637	434	0.75	0.72	1.47
347	3B	81	51	171	34	337	434	0.19	0.59	0.78
348	3A	466	73	347	43	929	332	1.40	1.39	2.79
348	3B	70	40	186	32	328	332	0.21	0.78	0.99
349	3A	726	115	488	110	1,439	499	1.45	1.43	2.88
349	3B	176	144	486	124	930	499	0.35	1.51	1.86

Table 3. (Continued)

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless /Sq. Mile	Total/ Sq. Mile
601	Metro	1281	434	1518	299	3,532	1,756	0.73	1.28	2.01
602	CWD	489	218	495	143	1,345	304	4.21	7.40	11.62
Total		**77,564**	**13,312**	**44,734**	**9,839**	**145,449**	**83,265**	**0.93**	**0.82**	**1.75**

Table 4. Firearm Harvest using Bonus and Disease Management Permits, 2013.
Managed Permit Areas.

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
114	1A	1	8	2	11
126	1A	21	139	12	172
156	1A	183	579	135	897
157	1A	290	938	230	1,458
209	2A	55	219	59	333
210	2A	68	294	63	425
214	2A	184	467	189	840
215	2A	157	376	136	669
218	2A	105	296	73	474
219	2A	53	169	57	279
223	2A	45	155	57	257
229	2A	17	49	12	78
232	2A	31	69	11	111
233	2A	12	44	17	73
240	2A	189	524	161	874
241	2A	366	1,198	312	1,876
242	2A	73	244	59	376
248	2A	30	128	31	189
254	2A	35	141	26	202
255	2A	35	122	33	190
293	2A	50	147	43	240
338	3A	18	62	18	98
338	3B	4	22	3	29
339	3A	27	73	15	115
339	3B	9	30	8	47
341	3A	58	170	39	267
341	3B	36	120	32	188
342	3A	48	204	32	284
342	3B	36	137	42	215
343	3A	44	154	39	237
343	3B	20	89	29	138
346	3A	62	248	64	374
346	3B	38	137	39	214
347	3A	38	136	24	198
347	3B	22	92	21	135
348	3A	46	225	29	300
348	3B	19	78	14	111
349	3A	74	308	69	451
349	3B	63	235	67	365
Total		**2,662**	**8,826**	**2,302**	**13,790**

Intensive Permit Areas

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
182	1A	65	211	50	326
221	2A	221	512	222	955
222	2A	176	412	165	753
225	2A	248	581	204	1,033
227	2A	152	383	120	655
236	2A	81	232	52	365
287	2A	34	86	19	139
601	Metro	105	339	80	524
602	CWD	117	261	90	468
Total		**1,199**	**3,017**	**1,002**	**5,218**

Table 5. Early Antlerless Season Harvest by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
345	7	27	7	41
346	16	66	15	97
Total	**23**	**93**	**22**	**138**

Table 6. Summary of Firearms Special Hunts, 2013. Includes regular, youth, and bonus permits.

			Harvest				
Area	**Dates**	**Permits Issued**	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
900 - Cascade River State Park[1]	11/9-11/24	NA*	0	0	1	7	8
901 - Rice Lake Nat. Wildlife Refuge[1]	11/16-11/24	40*	6	0	4	7	17
902 - St. Croix State Park[1]	11/15-11/18	400*	63	13	58	7	141
903 - Savanna Portage State Park[1]	11/16-11/18	20*	1	0	1	7	9
904 - Gooseberry Falls State Park[1]	11/9-11/24	40*	2	2	6	7	17
905 - Split Rock Lighthouse State Park[1]	11/9-11/24	30*	4	0	7	7	18
906 - Tettegouche State Park[1]	11/9-11/24	125*	7	0	7	7	21
907 - Scenic State Park[1]	11/9-11/24	30*	2	1	0	7	10
908 - Hayes Lake State Park[1]	11/9-11/24	75*	3	0	2	7	12
909 - Lake Bemidji State Park[1]	11/9-11/24	30**	0	1	7	7	15
910 - Zippel Bay State Park[1]	11/9-11/24	55**	0	5	6	7	18
911 - Judge CR Magney State Park[1]	11/9-11/24	N/A*	1	0	1	7	9
912 - Schoolcraft State Park[1]	11/9-11/24	N/A*	0	2	0	7	9
913 - Lake Carlos State Park[1]	11/9-11/10	20**	0	2	5	7	14
914 - William O'Brien State Park[1]	11/9-11/10	60*	13	2	13	7	35
915 - Lake Bronson State Park[1]	11/9-11/10	30*	4	2	3	7	16
916 - Maplewood State Park[1]	11/9-11/12	100*	25	5	7	7	44
917 - Old Mill State Park[1]	11/9-11/12	10*	2	0	1	7	10
918 - Lake Alexander SNA[1]	11/9-11/17	40*	1	3	7	7	18
919 - Glacial Lakes State Park[1]	11/14-11/17	30**	2	5	9	7	23
920 - Zumbro Falls Woods SNA - A[1]	11/9-11/17	12**	0	1	4	7	12
921 - Forestville/Mystery Cave State Park[1]	11/9-11/10	130#	18	11	33	7	69
392 - Lake Louise State Park[1]	11/16-11/17	25***	2	3	9	7	21
923 - Zumbro Falls Woods SNA -B[1]	11/23-12/1	12**	0	0	8	7	15
924 - Whitewater State Game Refuge[1]	11/9-11/11	50**	0	1	0	7	8
925 - Vermillion Highlands WMA[1]	11/9-11/22	25*	4	1	1	7	13
926 - Carver Park Reserve[1]	11/16-11/17	110*	5	1	3	7	16
927 - Whitewater State Park[1]	11/23-11/24	50#	7	6	37	7	57
929 - Frontenac State Park - B[1]	11/23-11/25	60#	6	6	20	7	39
931 - City of Grand Rapids[1]	11/9-11/24	N/A*	9	4	10	7	30
932 - Lake Elmo Park Reserve[1]	11/9-11/11; 11/16-11/17	50*	21	2	22	7	52
933 - Murphy-Hanrehan Park Reserve[1]	11/23-11/24	80*	4	3	9	7	23
934 - Whitewater State Game Refuge - B[1]	11/23-12/1	75***	0	0	18	7	25
Total			**212**	**82**	**319**	**231**	**844**

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

#Antler Point Restriction

Table 7. Free Landowner Firearms Harvest by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
155	0	6	0	6
156	1	14	2	17
157	6	29	10	45
159	1	4	1	6
173	1	3	1	5
177	1	10	0	11
178	5	13	1	19
179	3	13	2	18
180	0	3	1	4
181	1	9	0	10
201	1	1	0	2
208	2	4	0	6
209	7	5	4	16
210	3	13	1	17
213	22	44	13	79
214	12	61	22	95
215	10	26	9	45
218	5	5	3	13
219	1	3	1	5
221	9	19	12	40
222	5	4	2	11
223	0	2	4	6
225	4	17	3	24
227	2	4	1	7
229	0	1	1	2
230	0	1	0	1
232	2	4	0	6
233	1	2	1	4
236	0	2	1	3
239	8	21	9	38
240	10	38	13	61
241	28	65	17	110
242	0	0	1	1
246	5	38	4	47
247	1	3	1	5
248	2	1	2	5
249	14	48	13	75
254	0	2	1	3
255	0	5	2	7
256	3	13	0	16
257	1	17	4	22
258	0	5	2	7
259	2	9	2	13
264	4	11	2	17
265	1	8	4	13
273	1	1	0	2
292	3	7	5	15
293	2	2	1	5
338	1	0	0	1
339	1	2	0	3
341	3	10	3	16
342	3	24	5	32
343	1	9	1	11
344	5	7	3	15
345	6	20	6	32
346	4	39	6	49
347	0	5	2	7
348	3	13	2	18
349	10	35	14	59
602	3	4	0	7
Total	**230**	**784**	**221**	**1,235**

Table 8. Archery Harvest by Permit Area, 2013.
Includes Regular, Youth, and Bonus Permits. Does not include most 900-series hunts.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	7	0	2	0	9
103	3	0	0	0	3
105	15	0	10	1	26
108	10	2	18	2	32
110	17	5	10	0	32
111	2	2	3	0	7
114	1	0	4	0	5
117	0	1	5	0	6
118	15	1	21	0	37
119	5	1	13	1	20
122	3	0	8	0	11
126	11	2	19	1	33
127	1	0	2	2	5
152	4	1	2	1	8
155	42	6	55	7	110
156	50	8	101	12	171
157	112	29	162	33	336
159	50	8	25	4	87
169	20	4	36	3	63
171	20	8	13	0	41
172	47	10	52	8	117
173	16	0	14	3	33
176	46	4	24	0	74
177	15	5	15	0	35
178	55	6	41	6	108
179	64	6	74	9	153
180	29	2	35	1	67
181	43	9	42	6	100
182	136	104	418	81	739
183	37	4	42	1	84
184	93	8	71	6	178
197	16	3	23	4	46
199	3	0	3	0	6
201	2	1	1	1	5
203	0	0	1	0	1
208	1	1	3	0	5
209	24	10	41	5	80
210	23	6	63	10	102
213	197	9	92	13	311
214	90	10	150	16	266
215	156	25	203	28	412
218	127	39	242	35	443
219	126	26	148	22	322
221	96	66	275	61	498
222	68	36	190	37	331
223	173	36	153	28	390
224	24	2	5	0	31

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
225	150	73	266	50	539
227	219	85	381	74	759
229	64	17	65	10	156
230	47	3	20	1	71
232	40	6	32	5	83
233	49	7	78	3	137
234	29	1	15	1	46
235	9	2	14	1	26
236	206	68	271	55	600
237	26	0	13	4	43
238	10	0	5	1	16
239	61	10	46	6	123
240	85	10	151	19	265
241	157	45	312	32	546
242	84	30	165	23	302
246	49	17	30	5	101
247	56	10	43	12	121
248	35	8	54	8	105
249	66	13	46	7	132
250	52	4	28	0	84
251	4	1	3	1	9
252	51	3	27	2	83
253	70	2	33	2	107
254	82	11	77	11	181
255	90	16	103	14	223
256	14	1	9	0	24
257	10	1	8	0	19
258	28	5	29	4	66
259	42	7	22	3	74
260	6	0	3	0	9
261	12	0	9	1	22
262	33	1	19	2	55
263	10	0	3	0	13
264	22	0	8	2	32
265	17	1	8	0	26
266	15	3	13	2	33
267	6	1	5	1	13
268	5	0	7	0	12
269	16	2	14	0	32
270	20	0	8	0	28
271	20	0	16	0	36
272	19	0	8	1	28
273	32	3	29	3	67
274	21	3	10	1	35
275	34	2	17	0	53
276	52	1	43	3	99
277	169	13	106	11	299

Table 8. (Continued)

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
278	39	3	22	2	66
279	18	0	11	1	30
280	15	1	23	1	40
281	46	2	42	5	95
282	27	1	13	1	42
283	46	5	28	3	82
284	44	6	23	2	75
285	74	3	51	3	131
286	31	3	18	3	55
288	53	5	57	2	117
289	29	2	25	1	57
290	58	5	38	2	103
291	128	17	99	8	252
292	91	11	40	6	148
293	113	18	113	20	264
294	21	1	18	3	43
295	47	8	51	3	109
296	40	7	25	3	75
297	1	0	1	0	2
298	10	2	4	1	17
299	65	11	46	5	127
338	67	12	91	11	181
339	66	11	80	11	168
341	114	16	172	25	327
342	108	19	149	19	295
343	153	30	219	38	440
344	62	4	23	9	98
345	83	5	29	6	123
346	149	23	168	13	353
347	70	14	100	19	203
348	102	18	136	12	268
349	170	14	135	28	347
601	639	278	1010	193	2,120
602	79	51	153	32	315
970	58	24	81	18	181
971	55	10	49	13	127
Total	**7,460**	**1,632**	**8,945**	**1,351**	**19,388**

970 = Camp Ripley First Hunt
971 = Camp Ripley Second Hunt

Table 9. Archery Harvest using Bonus and Disease Management Permits by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
114	0	3	0	3
126	2	15	1	18
156	5	78	9	92
157	17	113	23	153
182	96	386	76	558
209	8	30	5	43
210	5	53	4	62
214	5	126	11	142
215	20	153	21	194
218	24	188	26	238
219	17	112	16	145
221	57	246	51	354
222	31	174	34	239
223	26	118	21	165
225	65	228	44	337
227	70	328	67	465
229	9	47	6	62
232	3	26	5	34
233	4	61	3	68

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
236	60	244	51	355
240	5	118	12	135
241	30	252	24	306
242	20	115	20	155
248	4	37	6	47
254	5	55	8	68
255	13	75	9	97
293	11	92	15	118
338	11	71	8	90
339	7	69	10	86
341	14	150	20	184
342	15	126	16	157
343	25	183	31	239
346	19	141	11	171
347	12	85	15	112
348	13	120	8	141
349	12	114	24	150
601	250	905	176	1331
602	44	143	31	218
Total	**1,034**	**5,580**	**918**	**7,532**

Table 10. Summary of Archery Special Hunts, 2013. Includes Regular, Youth, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
970 - Camp Ripley	10/26 - 10/27	2,500	58	81	24	18	181
971 - Camp Ripley	11/2 - 11/3	2,500	55	49	10	13	127
972 - Crow-Hassan Park Reserve	11/8- 11/10	130	0	1	0	0	1
973 - Murphy-Hanrehan Park Reserve	11/8- 11/10	180	0	1	1	0	2
974 - Cleary Lake Regional Park	11/8- 11/10	55	0	0	0	0	0
975 - Vermillion Highlands WMA	9/14-11/3	65	0	2	1	0	3
976 - City of New Ulm	10/19 - 12/31	50	2	22	3	5	32
977 - City of Red Wing	9/14 - 12/31	Unl.	4	24	6	8	42
978 - City of Sandstone	9/14 - 12/31	Unl.	1	3	1	0	5
979 - City of Fergus Falls	9/14 - 12/31	30	2	12	2	1	17
981 - City of Mankato	9/14 - 12/31	40	0	0	0	1	1
982 - City of Granite Falls	9/14 - 12/31	10	0	0	0	0	0
983 - City of Ortonville	9/14 - 12/31	30	1	11	2	1	15
984 - City of Canby	9/14 - 12/31	20	0	1	1	0	2
985 - City of Bemidji	9/14 - 12/31	40	1	14	6	0	21
987 - Greenleaf State SRA	9/14 - 12/31	Unl.	0	0	0	0	0
988 - City of Tower	11/30 - 12/15	5	0	1	0	0	1
989 - Cedar Mountain SNA	9/14 - 12/31	Unl.	0	0	0	0	0
991 - East Minnesota River Refuge	9/14 - 12/31	Unl.	2	5	0	0	7
992 - City of Hallock	9/14 - 12/31	30	0	3	1	1	5
993 - City of Cook	9/14 - 12/31	25	1	7	1	2	11
994 - Camp Ripley Deployed Soldier	9/30 - 10/2	300	0	0	0	0	0
995 - City of Grand Rapids	9/14 - 12/31	Unl.	2	38	9	8	57
Total			**129**	**275**	**68**	**58**	**530**

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

Table 11. Free Landowner Archery Harvest by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total	Permit Area	Fawn Male	Adult Female	Fawn Female	Total
155	0	1	0	1	215	1	4	1	6
178	1	0	0	1	219	0	2	0	2
213	0	7	0	7	240	1	4	0	5
239	1	0	0	1	241	1	3	1	5
249	2	3	0	5	255	0	1	1	2
258	0	1	0	1	293	0	1	0	1
265	0	2	0	2	338	0	1	0	1
292	0	1	2	3	341	0	1	0	1
344	0	1	0	1	342	1	1	1	3
345	2	6	0	8	343	0	3	0	3
221	1	0	0	1	346	0	5	0	5
225	0	1	1	2	347	0	1	0	1
227	0	1	0	1	348	0	2	1	3
236	1	0	0	1	349	0	4	3	7
157	0	3	0	3					
214	0	1	0	1	**Total**	**12**	**61**	**11**	**84**

Table 12. Muzzleloader Harvest by Permit Area, 2013.
Includes Regular, Muzzleloader, Youth, and Bonus permits. Does not include Park hunts.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
117	0	0	4	0	4	232	18	10	32	6	66
118	22	0	5	0	27	233	16	5	28	5	54
119	4	0	3	0	7	234	15	5	7	2	29
122	3	0	1	0	4	235	3	1	6	2	12
126	9	4	17	3	33	236	16	12	38	16	82
127	1	1	2	0	4	237	33	1	11	1	46
152	0	0	3	0	3	238	2	0	2	0	4
155	14	4	24	5	47	239	39	6	44	5	94
156	14	5	27	6	52	240	31	13	62	14	120
157	27	14	55	7	103	241	51	23	142	32	248
159	2	1	11	1	15	242	13	11	44	5	73
169	10	1	12	0	23	246	24	8	40	10	82
171	8	1	10	1	20	247	10	5	23	8	46
172	20	6	13	5	44	248	14	8	15	3	40
173	6	2	9	4	21	249	28	9	36	7	80
176	11	2	5	1	19	250	20	1	21	2	44
177	5	0	10	2	17	251	3	0	3	0	6
178	14	1	23	5	43	252	18	4	8	1	31
179	25	3	35	6	69	253	24	2	31	2	59
180	14	1	8	3	26	254	32	9	60	5	106
181	10	1	11	2	24	255	18	0	37	5	60
182	2	2	10	3	17	256	16	1	9	1	27
183	10	2	10	3	25	257	14	2	12	3	31
184	34	4	28	9	75	258	13	8	20	3	44
197	8	1	6	0	15	259	25	10	61	12	108
199	1	0	1	0	2	260	26	1	1	2	30
201	5	1	7	1	14	261	19	0	2	0	21
203	2	0	2	0	4	262	15	0	4	1	20
208	7	1	6	0	14	263	27	1	4	0	32
209	15	3	33	4	55	264	31	2	26	5	64
210	12	2	26	4	44	265	15	4	21	1	41
213	60	19	95	20	194	266	25	5	9	0	39
214	43	23	61	12	139	267	10	0	2	0	12
215	38	25	100	22	185	268	13	0	2	1	16
218	46	22	97	16	181	269	24	1	6	1	32
219	38	22	75	10	145	270	23	2	5	1	31
221	34	26	76	15	151	271	17	1	11	0	29
222	33	9	60	11	113	272	10	0	2	0	12
223	22	6	41	6	75	273	25	4	22	1	52
224	0	0	2	0	2	274	19	1	14	2	36
225	31	26	70	15	142	275	34	4	20	0	58
227	29	21	64	10	124	276	42	5	30	4	81
229	15	5	14	5	39	277	65	7	58	7	137
230	8	3	17	2	30	278	38	4	20	2	64

Table 12. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
279	17	1	12	0	30
280	16	3	8	0	27
281	27	4	23	0	54
282	16	0	0	0	16
283	19	1	8	2	30
284	27	0	14	1	42
285	19	1	17	1	38
286	16	3	21	2	42
287	5	3	20	0	28
288	41	1	27	0	69
289	22	0	10	1	33
290	33	7	23	1	64
291	39	8	29	4	80
292	17	12	24	2	55
293	34	13	43	5	95
294	34	3	16	2	55
295	48	2	27	2	79

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
296	23	1	14	2	40
297	3	0	1	0	4
298	10	0	0	0	10
299	18	0	21	1	40
338	5	7	34	2	48
339	5	5	16	2	28
341	18	15	56	11	100
342	22	16	74	14	126
343	30	12	52	7	101
344	18	10	40	3	71
345	11	2	10	4	27
346	29	10	78	15	132
347	20	4	50	10	84
348	14	9	52	8	83
349	31	15	103	19	168
601	8	8	42	9	67
602	7	21	37	12	77
TOTAL	**2,449**	**665**	**3,261**	**541**	**6,916**

Table 13. Muzzleloader Harvest using Bonus and Disease Management Permits by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
214	9	28	6	43
215	17	58	9	84
218	15	58	7	80
219	14	31	3	48
221	15	52	9	76
222	9	35	8	52
223	4	23	4	31
225	15	39	7	61
227	16	39	5	60
229	1	6	2	9
232	4	16	3	23
233	3	16	4	23
236	9	25	10	44
240	8	37	8	53

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
293	6	21	2	29
338	3	20	0	23
339	2	11	2	15
341	10	35	8	53
342	9	52	10	71
343	7	32	5	44
346	6	45	10	61
347	2	27	4	33
348	6	28	7	41
349	6	60	15	81
601	6	26	8	40
602	21	35	12	68
293	6	21	2	29
TOTAL	**267**	**1,111**	**215**	**1,593**

Table 14. Summary of Muzzleloader Special Hunts, 2013.
Includes Regular, Youth, All-Season, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
935 - Jay Cook SP[1]	12/7-12/11	120*	2	3	9	0	14
936 - Crow Wing SP[1]	12/13-12/15	40***	1	4	3	0	8
937 - Soudan Mine and Lake Vermilion SP[1]	11/30-12/15	20*	1	1	3	0	5
938 - City of Tower[1]	11/30-12/15	20*	0	0	0	0	0
939 - Lake Shetek SP[1]	12/7-12/8	15**	0	3	3	3	9
941 - Nerstrand Big Woods SP[1]	12/7-12/8	50***	0	5	3	7	15
942 - Sibley SP[1]	11/30-12/1	50**	1	0	6	1	8
943 - Myre Big Island Lake[1]	11/30-12/1	40**	1	3	18	3	25
944 - Vermillion Highlands WMA[1]	11/30-12/15	25*	1	2	1	1	5
945 -Camp Ripley[1]	12/2-12/4	100*	15	3	11	5	34
946 -City of Grand Rapids[1]	11/30-12/15	Unl.*	1	0	1	0	2
947 -Lake Bemidji State Park[1]	12/6-12/8	30*	1	0	1	2	4
Total			**24**	**24**	**59**	**22**	**129**

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

Table 15. Free Landowner Muzzleloader Harvest by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
157	0	1	0	1
173	0	1	0	1
179	0	1	0	1
208	0	1	0	1
213	3	10	2	15
214	2	2	1	5
215	0	4	0	4
218	0	1	0	1
221	3	0	0	3
225	0	2	0	2
233	0	1	0	1
240	0	3	0	3
241	1	4	4	9
246	0	1	0	1
249	1	2	0	3

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
255	0	0	1	1
256	0	1	0	1
257	0	2	0	2
264	0	3	2	5
265	0	1	0	1
292	0	1	0	1
339	0	1	0	1
341	1	5	0	6
342	0	5	1	6
343	0	1	0	1
344	0	1	0	1
346	1	9	1	11
347	0	3	1	4
348	0	2	0	2
349	0	2	1	3
Total	**12**	**71**	**14**	**97**

Table 16. Summary of Youth Hunts and Youth Season, 2013

.			Harvest				
Area	**Dates**	**Permits Issued**	**Adult Male**	**Adult Female**	**Fawn Male**	**Fawn Female**	**Total**
950 - Camp Ripley Archery	10/11-10/13	175	4	3	1	2	10
951 - Afton SP	11/9-11/10	20	6	7	2	3	18
952 - Sibley SP	10/26-10/27	10	1	3	3	1	8
953 - Zipple Bay SP	10/12-10/13	20	0	0	0	0	0
954 - Lake Bemidji SP	10/19-10/20	20	1	3	0	1	5
955 - Lake Alexander Preserve	10/11 - 10/13	20	0	2	1	0	3
956 - St. Croix SP	11/2-11/3	100	10	1	1	0	12
957 - Rydell NWR	10/19-10/20	20	0	1	0	0	1
958 - Savanna Portage SP	10/26-10/27	20	2	1	0	1	4
959 - Buffalo River SP	11/9-11/10	14	2	1	0	0	3
960 - Tettegouche SP	10/19-10/20	10	0	1	0	0	1
961 - Itasca SP	10/12-10/13	75	0	2	1	2	5
962 - Great River SP	10/26-10/27	30	0	0	0	0	0
965 - Banning SP	11/2-11/3	6	0	3	1	0	4
966 - Blue Mounds SP	12/7-12/8	5	1	0	1	0	2
967 - Camden SP	11/2-11/3	10	3	1	1	0	5
968 - Lake Shetek SP	10/26-10/27	10	4	0	0	1	5
969 - Twin Lakes SNA	10/19 - 10/20	3	0	0	0	0	0
Total		**568**	**34**	**29**	**12**	**11**	**86**

Youth Deer Season - October 17 - 20, unlimited permits

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	6	5	2	1	14
105	25	15	3	5	48
111	4	11	1	1	17
201	6	0	1	0	7
203	3	2	0	0	5
208	11	9	3	1	24
209	14	22	1	0	37
256	19	12	3	0	34
257	15	9	3	2	29
260	15	9	4	3	31
263	13	16	4	1	34
264	23	29	5	4	61
267	9	12	2	1	24
268	9	5	2	1	17
299	1	0	0	0	1
338	7	6	1	1	15
339	5	3	3	3	14
341	23	14	6	5	48
342	11	12	4	2	29
343	19	7	3	1	30
344	15	13	5	4	37
345	16	9	5	5	35
346	23	17	8	3	51
347	12	11	4	5	32
348	14	11	3	2	30
349	23	11	9	4	47
601	11	9	7	1	28
602	11	16	4	4	35
Total	**363**	**295**	**96**	**60**	**814**

Table 17. Total Deer Harvest by Permit Area, 2013.
Includes all license types, permits, and special hunts.

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	354	31	5	1	391
103	699	120	22	11	852
105	927	131	23	22	1,103
108	934	166	24	19	1,143
110	865	385	78	61	1,389
111	457	72	14	5	548
114	44	21	2	3	70
117	37	17	3	0	57
118	606	67	14	4	691
119	586	105	11	9	711
122	339	84	13	3	439
126	403	261	39	21	724
127	87	50	4	8	149
152	80	78	26	19	203
155	1350	989	252	168	2,759
156	1399	1266	356	266	3,287
157	2303	2049	626	470	5,448
159	1145	760	217	155	2,277
169	1345	661	145	85	2,236
171	1051	458	119	86	1,714
172	1543	661	184	127	2,515
173	717	477	146	98	1,438
176	1469	323	66	45	1,903
177	830	480	103	74	1,487
178	1819	1115	236	171	3,341
179	1628	1197	278	177	3,280
180	849	425	66	40	1,380
181	1017	652	146	85	1,900
182	571	750	202	152	1,675
183	1204	560	129	79	1,972
184	2707	1051	272	180	4,210
197	934	313	68	58	1,373
199	92	38	8	2	140
201	107	54	12	15	188
203	69	31	3	4	107
208	206	96	28	13	343
209	510	460	119	99	1,188
210	773	591	130	125	1,619
213	1840	984	369	245	3,438
214	1463	1225	414	386	3,488
215	1390	1055	377	327	3,149
218	1138	1021	324	216	2,699
219	760	572	167	138	1,637
221	1202	1136	438	405	3,181
222	937	905	332	284	2,458
223	776	475	157	152	1,560
224	111	56	12	3	182
225	1451	1279	486	386	3,602
227	1095	1004	323	246	2,668

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
229	304	178	60	43	585
230	301	169	53	38	561
232	276	226	80	40	622
233	259	195	35	31	520
234	235	107	25	14	381
235	73	43	8	9	133
236	768	646	200	148	1,762
237	305	113	23	14	455
238	82	29	4	12	127
239	1323	829	256	188	2,596
240	1590	1267	411	334	3,602
241	2986	2704	814	655	7,159
242	600	655	171	125	1,551
246	1743	1220	386	262	3,611
247	638	548	155	99	1,440
248	409	329	100	83	921
249	1118	768	302	213	2,401
250	392	164	26	11	593
251	88	28	11	7	134
252	383	166	36	15	600
253	528	204	39	20	791
254	647	427	87	67	1,228
255	524	379	87	82	1,072
256	501	236	74	51	862
257	364	227	42	28	661
258	810	520	147	115	1,592
259	1367	932	277	188	2,764
260	354	82	22	15	473
261	205	43	10	4	262
262	225	94	23	18	360
263	396	102	19	13	530
264	696	392	77	59	1,224
265	474	268	67	55	864
266	372	129	34	30	565
267	213	49	9	6	277
268	320	38	9	8	375
269	232	80	20	12	344
270	214	57	17	9	297
271	259	113	26	16	414
272	233	69	9	11	322
273	502	262	86	70	920
274	240	109	21	19	389
275	418	167	36	24	645
276	587	284	56	35	962
277	1408	695	155	125	2,383
278	405	192	31	30	658
279	257	150	26	14	447
280	282	172	25	17	496
281	520	191	48	29	788

Table 17. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
282	157	35	6	4	202
283	349	106	25	23	503
284	386	166	39	17	608
285	461	213	51	33	758
286	330	214	49	34	627
287	108	151	44	23	326
288	495	299	41	25	860
289	233	126	19	26	404
290	503	247	55	38	843
291	832	402	105	60	1,399
292	558	267	115	51	991
293	613	462	143	94	1,312
294	379	175	36	21	611
295	572	223	33	27	855
296	392	165	32	16	605
297	153	50	6	6	215
298	578	117	39	15	749
299	353	179	32	19	583
338	266	309	74	49	698
339	260	273	78	58	669
341	642	729	203	161	1,735
342	635	784	185	158	1,762
343	627	670	155	150	1,602
344	438	398	87	85	1,008
345	480	390	107	90	1,067
346	946	1081	262	226	2,515
347	507	550	132	104	1,293
348	666	732	143	97	1,638
349	1126	1267	305	290	2,988
392	2	9	3	4	18
601	1281	1518	434	299	3,532
602	489	495	218	143	1,345
900	0	1	0	0	1
901	6	4	0	1	11
902	63	58	13	16	150
903	1	1	0	0	2
904	2	6	2	2	12
905	4	7	0	0	11
906	7	7	0	0	14
907	2	0	1	0	3
908	3	2	0	0	5
909	0	7	1	2	10
910	0	6	5	3	14
911	1	1	0	0	2
912	0	0	2	0	2
913	0	5	2	1	8
914	13	13	2	6	34
915	4	3	2	0	9
916	25	7	5	1	38
917	2	1	0	0	3

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
918	1	7	3	2	13
919	2	9	5	2	18
920	0	4	1	1	6
921	18	33	11	7	69
923	0	8	0	1	9
924	0	0	1	0	1
925	4	1	1	1	7
926	5	3	1	2	11
927	7	37	6	8	58
929	6	20	6	8	40
931	9	10	4	4	27
932	21	22	2	4	49
933	4	9	3	3	19
934	0	18	0	1	19
935	2	9	3	0	14
936	1	3	4	0	8
937	1	3	1	0	5
939	0	3	3	3	9
941	0	3	5	7	15
942	1	6	0	1	8
943	1	18	3	3	25
944	1	1	2	1	5
945	15	11	3	5	34
946	1	1	0	0	2
947	1	1	0	2	4
950	4	3	1	2	10
951	6	7	2	3	18
952	1	3	3	1	8
954	1	3	0	1	5
955	0	2	1	0	3
956	10	1	1	0	12
957	0	1	0	0	1
958	2	1	0	1	4
959	2	1	0	0	3
960	0	1	0	0	1
961	0	2	1	2	5
965	0	3	1	0	4
966	1	0	1	0	2
967	3	1	1	0	5
968	4	0	0	1	5
970	58	81	24	18	181
971	55	49	10	13	127
972	0	1	0	0	1
973	0	1	1	0	2
975	0	2	1	0	3
976	2	22	3	5	32
977	4	24	6	8	42
978	1	3	1	0	5
979	2	12	2	1	17
981	0	0	0	1	1

Table 17. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
983	1	11	2	1	15
984	0	1	1	0	2
985	1	14	6	0	21
988	0	1	0	0	1
991	2	5	0	0	7
992	0	3	1	1	5
993	1	7	1	2	11
995	2	38	9	8	57
999	6	2	1	0	9
TOTAL	**87,865**	**57,281**	**15,763**	**11,872**	**172,781**

Table 18. Estimated firearm hunter numbers, density, and harvest by Permit Area, 2013.
Excludes data from all 900-series hunts.

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ $mile^2$	Harvest/ $mile^2$	Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ $mile^2$	Harvest/ $mile^2$
101	1,961	496	4.0	0.7	221	5,405	647	8.4	3.9
103	3,152	1,824	1.7	0.5	222	5,132	413	12.4	4.9
105	3,963	932	4.3	1.1	223	3,219	385	8.4	2.8
108	4,863	1,701	2.9	0.6	224	721	49	14.7	3.0
110	4,301	530	8.1	2.5	225	7,051	635	11.1	4.6
111	2,676	1,440	1.9	0.4	227	4,859	491	9.9	3.6
114	212	412	0.5	0.2	229	1,525	313	4.9	1.2
117	174	1,129	0.2	0.0	230	1,507	464	3.2	1.0
118	3,349	1,445	2.3	0.4	232	1,405	380	3.7	1.2
119	3,520	946	3.7	0.7	233	1,094	386	2.8	0.9
122	1,984	622	3.2	0.7	234	874	637	1.4	0.5
126	2,088	979	2.1	0.7	235	324	37	8.8	2.6
127	637	587	1.1	0.2	236	3,212	404	8.0	2.7
152	939	62	15.2	3.1	237	1,174	737	1.6	0.5
155	7,823	639	12.2	4.1	238	317	98	3.2	1.1
156	9,587	834	11.5	3.7	239	7,701	1,110	6.9	2.1
157	13,643	904	15.1	5.5	240	7,493	694	10.8	4.6
159	7,284	575	12.7	3.8	241	14,809	1,047	14.1	6.1
169	9,415	1,202	7.8	1.8	242	3,001	307	9.8	3.8
171	6,712	729	9.2	2.3	246	11,512	860	13.4	4.0
172	10,732	786	13.6	3.0	247	3,695	263	14.0	4.8
173	4,855	617	7.9	2.2	248	2,183	229	9.6	3.4
176	7,487	1,150	6.5	1.6	249	6,190	729	8.5	3.0
177	4,286	553	7.8	2.6	250	1,558	730	2.1	0.6
178	10,657	1,325	8.0	2.4	251	568	68	8.3	1.7
179	9,929	939	10.6	3.3	252	1,445	735	2.0	0.7
180	5,922	999	5.9	1.3	253	2,204	987	2.2	0.6
181	6,440	746	8.6	2.4	254	2,719	946	2.9	1.0
182	2,616	280	9.3	3.3	255	1,931	774	2.5	1.0
183	7,773	675	11.5	2.8	256	2,541	654	3.9	1.2
184	14,312	1,318	10.9	3.0	257	1,926	426	4.5	1.4
197	5,717	1,343	4.3	1.0	258	4,348	381	11.4	3.9
199	559	152	3.7	0.9	259	7,665	546	14.0	4.7
201	549	169	3.2	1.0	260	1,921	1,252	1.5	0.3
203	336	132	2.6	0.7	261	788	796	1.0	0.3
208	1,201	379	3.2	0.8	262	1,066	677	1.6	0.4
209	2,799	641	4.4	1.6	263	1,846	513	3.6	0.9
210	4,558	635	7.2	2.3	264	3,685	672	5.5	1.6
213	8,931	1,161	7.7	2.5	265	2,106	495	4.3	1.6
214	7,900	566	14.0	5.4	266	2,203	625	3.5	0.8
215	6,694	730	9.2	3.5	267	1,068	472	2.3	0.5
218	5,561	912	6.1	2.3	268	1,310	239	5.5	1.4
219	3,551	427	8.3	2.7	269	1,311	652	2.0	0.4

Table 18. (Continued).

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
270	1,040	758	1.4	0.3
271	1,074	646	1.7	0.5
272	1,169	544	2.1	0.5
273	2,890	634	4.6	1.3
274	1,071	381	2.8	0.8
275	2,170	777	2.8	0.7
276	3,172	575	5.5	1.4
277	6,355	876	7.3	2.2
278	2,028	422	4.8	1.3
279	1,168	346	3.4	1.1
280	1,563	676	2.3	0.6
281	2,441	579	4.2	1.1
282	849	780	1.1	0.2
283	1,610	640	2.5	0.6
284	1,689	853	2.0	0.6
285	2,491	580	4.3	1.0
286	1,527	458	3.3	1.2
287	656	51	12.9	5.8
288	1,899	630	3.0	1.1
289	1,062	820	1.3	0.4
290	2,340	666	3.5	1.0
291	3,920	832	4.7	1.3

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
292	2,904	517	5.6	1.5
293	2,644	512	5.2	1.9
294	1,257	689	1.8	0.7
295	2,277	855	2.7	0.8
296	1,753	675	2.6	0.7
297	1,084	449	2.4	0.5
298	3,618	677	5.3	1.1
299	1,574	389	4.0	1.1
338	2,097	472	4.4	1.0
339	1,900	406	4.7	1.1
341	4,364	483	9.0	2.6
342	4,061	374	10.9	3.5
343	3,222	486	6.6	2.1
344	2,944	190	15.5	4.2
345	3,026	335	9.0	2.3
346	4,470	328	13.6	5.5
347	3,086	434	7.1	2.2
348	3,832	332	11.5	3.8
349	5,953	499	11.9	4.7
601	2,976	1,756	1.7	2.0
602	1,968	304	6.5	4.4
Total	**465,454**	**83,265**	**5.6**	**1.8**

Table 19. Deer harvest per square mile by season, 2013.

Permit Area	Area Size (sq mi)	Archery Harvest/mi²	Firearm Harvest/mi²	Muzz. Harvest/mi²	EA Harvest/mi²	Youth Harvest/mi³	Total Harvest/mi²
101	496	0.02	0.71	0.03		0.03	0.79
103	1,824	0.00	0.46	0.01			0.47
105	932	0.03	1.09	0.02		0.05	1.18
108	1,701	0.02	0.64	0.01			0.67
110	530	0.06	2.52	0.03			2.62
111	1,440	0.00	0.36	0.01		0.01	0.38
114	412	0.01	0.15	0.00			0.17
117	1,129	0.01	0.04	0.00			0.05
118	1,445	0.03	0.43	0.02			0.48
119	946	0.02	0.72	0.01			0.75
122	622	0.02	0.68	0.01			0.71
126	979	0.03	0.67	0.03			0.74
127	587	0.01	0.24	0.01			0.25
152	62	0.13	3.12	0.05			3.29
155	639	0.17	4.07	0.07			4.32
156	834	0.20	3.67	0.06			3.94
157	904	0.37	5.54	0.11			6.03
159	575	0.15	3.78	0.03			3.96
169	1,202	0.05	1.79	0.02			1.86
171	729	0.06	2.27	0.03			2.35
172	786	0.15	2.99	0.06			3.20
173	617	0.05	2.24	0.03			2.33
176	1,150	0.06	1.57	0.02			1.66
177	553	0.06	2.60	0.03			2.69
178	1,325	0.08	2.41	0.03			2.52
179	939	0.16	3.26	0.07			3.49
180	999	0.07	1.29	0.03			1.38
181	746	0.13	2.38	0.03			2.55
182	280	2.64	3.28	0.06			5.98
183	675	0.12	2.76	0.04			2.92
184	1,318	0.14	3.00	0.06			3.19
197	1,343	0.03	0.98	0.01			1.02
199	152	0.04	0.87	0.01			0.92
201	169	0.03	0.96	0.08		0.04	1.11
203	132	0.01	0.74	0.03		0.04	0.81
208	379	0.01	0.79	0.04		0.06	0.91
209	641	0.12	1.58	0.09		0.06	1.85
210	635	0.16	2.32	0.07			2.55
213	1,161	0.27	2.53	0.17			2.96
214	566	0.47	5.45	0.25			6.16
215	730	0.56	3.49	0.25			4.31
218	912	0.49	2.28	0.20			2.96
219	427	0.75	2.74	0.34			3.84
221	647	0.77	3.91	0.23			4.92
222	413	0.80	4.88	0.27			5.96
223	385	1.01	2.84	0.19			4.05
224	49	0.63	3.04	0.04			3.71
225	635	0.85	4.60	0.22			5.67
227	491	1.54	3.63	0.25			5.43

Table 19. (Continued).

Permit Area	Area Size (sq mi)	Archery Harvest/mi²	Firearm Harvest/mi²	Muzz. Harvest/mi²	EA Harvest/mi²	Youth Harvest/mi³	Total Harvest/mi²
229	313	0.50	1.24	0.12			1.87
230	464	0.15	0.99	0.06			1.21
232	380	0.22	1.24	0.17			1.64
233	386	0.35	0.85	0.14			1.35
234	637	0.07	0.48	0.05			0.60
235	37	0.71	2.58	0.33			3.62
236	404	1.49	2.68	0.20			4.37
237	737	0.06	0.50	0.06			0.62
238	98	0.16	1.10	0.04			1.30
239	1,110	0.11	2.14	0.08			2.34
240	694	0.38	4.64	0.17			5.19
241	1,047	0.52	6.08	0.24			6.84
242	307	0.98	3.83	0.24			5.05
246	860	0.12	3.99	0.10			4.20
247	263	0.46	4.83	0.17			5.47
248	229	0.46	3.40	0.18			4.03
249	729	0.18	3.00	0.11			3.29
250	730	0.12	0.64	0.06			0.81
251	68	0.13	1.75	0.09			1.97
252	735	0.11	0.66	0.04			0.82
253	987	0.11	0.63	0.06			0.80
254	946	0.19	0.99	0.11			1.30
255	774	0.29	1.02	0.08			1.38
256	654	0.04	1.19	0.04		0.05	1.32
257	426	0.04	1.37	0.07		0.07	1.55
258	381	0.17	3.89	0.12			4.18
259	546	0.14	4.73	0.20			5.06
260	1,252	0.01	0.32	0.02		0.02	0.38
261	796	0.03	0.28	0.03			0.33
262	677	0.08	0.42	0.03			0.53
263	513	0.03	0.88	0.06		0.07	1.03
264	672	0.05	1.59	0.10		0.09	1.82
265	495	0.05	1.61	0.08			1.75
266	625	0.05	0.79	0.06			0.90
267	472	0.03	0.48	0.03		0.05	0.59
268	239	0.05	1.38	0.07		0.07	1.57
269	652	0.05	0.43	0.05			0.53
270	758	0.04	0.31	0.04			0.39
271	646	0.06	0.54	0.04			0.64
272	544	0.05	0.52	0.02			0.59
273	634	0.11	1.26	0.08			1.45
274	381	0.09	0.84	0.09			1.02
275	777	0.07	0.69	0.07			0.83
276	575	0.17	1.36	0.14			1.67
277	876	0.34	2.22	0.16			2.72
278	422	0.16	1.25	0.15			1.56
279	346	0.09	1.12	0.09			1.29

Table 19. (Continued).

Permit Area	Area Size (sq mi)	Archery Harvest/mi^2	Firearm Harvest/mi^2	Muzz. Harvest/mi^2	EA Harvest/mi^2	Youth Harvest/mi^3	Total Harvest/mi^2
280	676	0.06	0.63	0.04			0.73
281	579	0.16	1.10	0.09			1.36
282	780	0.05	0.18	0.02			0.26
283	640	0.13	0.61	0.05			0.79
284	853	0.09	0.58	0.05			0.71
285	580	0.23	1.01	0.07			1.31
286	458	0.12	1.16	0.09			1.37
287	51	0.08	5.80	0.55			6.43
288	630	0.19	1.07	0.11			1.37
289	820	0.07	0.38	0.04			0.49
290	666	0.15	1.02	0.10			1.27
291	832	0.30	1.28	0.10			1.68
292	517	0.29	1.52	0.11			1.92
293	512	0.52	1.86	0.19			2.56
294	689	0.06	0.75	0.08			0.89
295	855	0.13	0.78	0.09			1.00
296	675	0.11	0.73	0.06			0.90
297	449	0.00	0.47	0.01			0.48
298	677	0.03	1.07	0.01			1.11
299	389	0.33	1.07	0.10			1.49
338	472	0.38	0.96	0.10		0.03	1.48
339	406	0.41	1.13	0.07		0.03	1.65
341	483	0.68	2.61	0.21		0.10	3.59
342	374	0.79	3.46	0.34		0.08	4.67
343	486	0.91	2.12	0.21		0.06	3.30
344	190	0.52	4.23	0.37		0.19	5.31
345	335	0.37	2.32	0.08	0.12	0.10	2.99
346	328	1.08	5.46	0.40	0.30	0.16	7.39
347	434	0.47	2.25	0.19		0.07	2.98
348	332	0.81	3.78	0.25		0.09	4.93
349	499	0.70	4.75	0.34		0.09	5.87
601	1,756	0.00	2.01	0.00			2.01
602	304	0.00	4.42	0.00			4.42
Total	**83,265**	**0.20**	**1.76**	**0.08**	**0.00**	**0.01**	**2.05**

Note: This table excludes harvest data from all 900-series special hunts.

Table 20. Harvest using Depredation Permits, by Permit Area, 2013.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
342	3	11	2	16
345	6	49	9	64
346	16	66	11	93
349	8	44	5	57
TOTAL	**33**	**170**	**27**	**230**

Table 21. 2013 Firearm Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
101	1	553	1	548	5	**49**	**0.0%**
	2	35	0	0	35		
	3	7	0	0	7		
	5	2	0	0	2		
		597	**1**	**548**	**49**		
103	1	489	0	489	0	**243**	**0.0%**
	2	825	0	700	125		
	3	115	0	0	115		
	4	2	0	0	2		
	5	1	0	0	1		
		1,432	**0**	**1,189**	**243**		
103	1	1,489	1	1,354	135	**196**	**0.0%**
	2	49	0	0	49		
	3	8	0	0	8		
	4	1	0	0	1		
	5	1	0	0	1		
	9	2	0	0	2		
		1,550	**1**	**1,354**	**196**		
108	1	317	0	317	0	**98**	**0.0%**
	2	341	1	341	0		
	3	332	0	332	0		
	4	312	0	312	0		
	5	203	0	106	97		
	9	1	0	0	1		
		1,506	**1**	**1,408**	**98**		
110	1	1,877	0	24	1,853	**1,970**	**0.0%**
	2	106	1	0	106		
	3	9	1	0	9		
	4	2	0	0	2		
		1,994	**2**	**24**	**1,970**		
118	1	271	0	271	0	**24**	**0.0%**
	2	306	1	306	0		
	3	322	0	322	0		
	4	63	0	39	24		
		962	**1**	**938**	**24**		
119	1	335	0	335	0	**97**	**0.0%**
	2	560	0	560	0		
	3	514	0	495	19		
	4	77	0	0	77		
	5	1	0	0	1		
		1,487	**0**	**1,390**	**97**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
122	1	567	0	500	67	**248**	**0.0%**
	2	169	0	0	169		
	3	10	0	0	10		
	4	1	0	0	1		
	5	1	0	0	1		
		748	**0**	**500**	**248**		
169	1	3,407	2	1,991	1,416	**2,953**	**0.0%**
	2	1,497	2	0	1,497		
	3	30	0	0	30		
	4	9	0	0	9		
	5	1	0	0	1		
		4,944	**4**	**1,991**	**2,953**		
171	1	1,948	5	1,921	27	**1,471**	**0.0%**
	2	1,429	1	0	1,429		
	3	11	0	0	11		
	4	3	0	0	3		
	9	1		0	1		
		3,392	**6**	**1,921**	**1,471**		
172	1	2,952	0	2,952	0	**1,954**	**0.0%**
	2	2,347	3	675	1,672		
	3	279	0	0	279		
	4	2	0	0	2		
	9	1	0	0	1		
		5,581	**3**	**3,627**	**1,954**		
176	1	1,454	7	1,454	0	**985**	**0.0%**
	2	1,123	0	297	826		
	3	153	0	0	153		
	4	3	0	0	3		
	9	3	0	0	3		
		2,736	**7**	**1,751**	**985**		
183	1	2,850	5	619	2,231	**2,422**	**0.0%**
	2	174	3	0	174		
	3	17	2	0	17		
		3,041	**10**	**619**	**2,422**		
184	1	5,581	5	1,285	4,296	**5,387**	**0.0%**
	2	1,067	1	0	1,067		
	3	20	0	0	20		
	4	3	0	0	3		
	5	1		0	1		
		6,672	**6**	**1,285**	**5,387**		
197	1	1,761	1	1,069	692	**1,478**	**0.0%**
	2	770	0	0	770		
	3	16	0	0	16		
		2,547	**1**	**1,069**	**1,478**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
199	1	175	0	46	129	**148**	**0.0%**
	2	18	0	0	18		
	3	1	0	0	1		
		194	**0**	**46**	**148**		
234	1	272	1	45	227	**270**	**0.0%**
	2	42	0	0	42		
	3	1	0	0	1		
		315	**1**	**45**	**270**		
237	1	141	0	141	0	**184**	**0.0%**
	2	183	1	16	167		
	3	15	0	0	15		
	4	1	0	0	1		
	5	1	0	0	1		
		341	**1**	**157**	**184**		
238	1	65	0	29	36	**96**	**0.0%**
	2	55	0	0	55		
	3	5	0	0	5		
		125	**0**	**29**	**96**		
250	1	261	1	261	0	**358**	**0.0%**
	2	345	0	23	322		
	3	34	0	0	34		
	4	1	0	0	1		
	5	1	0	0	1		
		642	**1**	**284**	**358**		
251	1	220	0	93	127	**193**	**0.0%**
	2	66	0	0	66		
		286	**0**	**93**	**193**		
252	1	218	0	218	0	**357**	**0.0%**
	2	254	0	17	237		
	3	118	0	0	118		
	4	1	0	0	1		
	5	1	0	0	1		
		592	**0**	**235**	**357**		
253	1	500	1	500	0	**174**	**0.6%**
	2	310	0	193	117		
	3	52	0	0	52		
	4	4	0	0	4		
		866	**1**	**693**	**173**		
258	1	282	0	282	0	**429**	**0.0%**
	2	416	0	138	278		
	3	149	0	0	149		
	4	2	0	0	2		
		849	**0**	**420**	**429**		
260	1	418	0	317	101	**294**	**0.0%**
	2	193	1	0	193		
		611	**1**	**317**	**294**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
261	1	146	0	49	97	**137**	**0.0%**
	2	39	0	0	39		
	3	1	0	0	1		
		186	**0**	**49**	**137**		
262	1	286	0	100	186	**276**	**0.0%**
	2	89	0	0	89		
	3	1	0	0	1		
		376	**0**	**100**	**276**		
263	1	442	1	409	33	**289**	**0.0%**
	2	256	2	0	256		
		698	**3**	**409**	**289**		
266	1	578	0	338	240	**471**	**0.0%**
	2	230	0	0	230		
	3	1	0	0	1		
		809	**0**	**338**	**471**		
267	1	343	1	261	82	**96**	**0.0%**
	2	14	0	0	14		
		357	**1**	**261**	**96**		
268	1	478	3	415	63	**97**	**0.0%**
	2	29	0	0	29		
	3	4	0	0	4		
	5	1	0	0	1		
		512	**3**	**415**	**97**		
269	1	342	3	318	24	**229**	**0.0%**
	2	199	1	0	199		
	3	4	0	0	4		
	4	2	0	0	2		
		547	**4**	**318**	**229**		
270	1	172	0	172	0	**182**	**0.0%**
	2	190	0	25	165		
	3	16	0	0	16		
	4	1	0	0	1		
		379	**0**	**197**	**182**		
271	1	255	0	114	141	**273**	**0.0%**
	2	117	0	0	117		
	3	13	0	0	13		
	4	1	0	0	1		
	5	1	0	0	1		
		387	**0**	**114**	**273**		
272	1	255	1	255	0	**236**	**0.0%**
	2	229	0	13	216		
	3	17	0	0	17		
	4	2	0	0	2		
	9	1	0	0	1		
		504	**1**	**268**	**236**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
274	1	199	0	199	0	**217**	**0.0%**
	2	244	0	66	178		
	3	38	0	0	38		
	4	1	0	0	1		
		482	**0**	**265**	**217**		
275	1	332	1	332	0	**459**	**0.0%**
	2	347	1	24	323		
	3	122	0	0	122		
	4	13	0	0	13		
	5	1	0	0	1		
		815	**2**	**356**	**459**		
276	1	726	0	318	408	**1,180**	**0.0%**
	2	727	0	0	727		
	3	40	0	0	40		
	4	4	0	0	4		
	5	1	0	0	1		
		1,498	**0**	**318**	**1,180**		
277	1	1,336	2	871	465	**2,285**	**0.0%**
	2	1,780	1	0	1,780		
	3	34	0	0	34		
	4	5	0	0	5		
	5	1	0	0	1		
		3,156	**3**	**871**	**2,285**		
278	1	399	4	399	0	**515**	**0.0%**
	2	532	0	124	408		
	3	97	2	0	97		
	4	7	0	0	7		
	5	1	0	0	1		
	9	2	0	0	2		
		1,038	**6**	**523**	**515**		
279	1	297	0	68	229	**483**	**0.0%**
	2	231	0	0	231		
	3	19	0	0	19		
	4	3	0	0	3		
	9	1	0	0	1		
		551	**0**	**68**	**483**		
280	1	216	0	195	21	**366**	**0.0%**
	2	286	0	0	286		
	3	57	0	0	57		
	4	1	0	0	1		
	9	1	0	0	1		
		561	**0**	**195**	**366**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
281	1	374	0	374	0	**427**	**0.0%**
	2	542	0	171	371		
	3	50	0	0	50		
	4	6	0	0	6		
		972	**0**	**545**	**427**		
282	1	74	0	74	0	**23**	**0.0%**
	2	76	0	76	0		
	3	43	0	24	19		
	4	4	0	0	4		
		197	**0**	**174**	**23**		
283	1	243	0	243	0	**183**	**0.0%**
	2	283	0	204	79		
	3	98	0	0	98		
	4	6	0	0	6		
		630	**0**	**447**	**183**		
284	1	207	0	207	0	**277**	**0.0%**
	2	277	0	239	38		
	3	152	0	0	152		
	4	85	0	0	85		
	5	2	0	0	2		
		723	**0**	**446**	**277**		
285	1	732	0	215	517	**1,012**	**0.0%**
	2	479	0	0	479		
	3	12	0	0	12		
	4	4	0	0	4		
		1,227	**0**	**215**	**1,012**		
286	1	229	1	121	108	**541**	**0.0%**
	2	277	0	0	277		
	3	143	0	0	143		
	4	13	0	0	13		
		662	**1**	**121**	**541**		
288	1	284	0	233	51	**541**	**0.0%**
	2	282	0	0	282		
	3	148	0	0	148		
	4	59	0	0	59		
	9	1	0	0	1		
		774	**0**	**233**	**541**		
289	1	136	0	133	3	**265**	**0.0%**
	2	150	0	0	150		
	3	86	0	0	86		
	4	25	0	0	25		
	5	1	0	0	1		
		398	**0**	**133**	**265**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
290	1	390	0	390	0	**515**	**0.0%**
	2	561	0	221	340		
	3	173	0	0	173		
	4	2	0	0	2		
		1,126	**0**	**611**	**515**		
291	1	798	0	798	0	**873**	**0.0%**
	2	830	0	144	686		
	3	182	0	0	182		
	4	2	0	0	2		
	5	2	0	0	2		
	9	1	0	0	1		
		1,815	**0**	**942**	**873**		
294	1	233	0	40	193	**451**	**0.0%**
	2	232	0	0	232		
	3	24	0	0	24		
	4	2	0	0	2		
		491	**0**	**40**	**451**		
295	1	394	0	394	0	**350**	**0.0%**
	2	457	0	270	187		
	3	158	0	0	158		
	4	5	0	0	5		
		1,014	**0**	**664**	**350**		
296	1	235	0	235	0	**361**	**0.0%**
	2	276	0	162	114		
	3	240	1	0	240		
	4	6	0	0	6		
	9	1	0	0	1		
		758	**1**	**397**	**361**		
297	1	229	0	130	99	**192**	**0.0%**
	2	91	0	0	91		
	3	2	0	0	2		
		322	**0**	**130**	**192**		
298	1	867	0	846	21	**585**	**0.0%**
	2	550	0	0	550		
	3	11	0	0	11		
	4	3	0	0	3		
		1,431	**0**	**846**	**585**		
299	1	285	0	285	0	**351**	**0.0%**
	2	302	0	59	243		
	3	108	0	0	108		
		695	**0**	**344**	**351**		
TOTAL		**68,811**	**71**	**32,633**	**36,178**	**36,816**	

Table 22. 2013 Muzzleloader Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
101	1	6	0	6	0	**1**	**0.0%**
	2	1	0	0	1		
		7	**0**	**6**	**1**		
103	1	24	0	24	0	**7**	**14.3%**
	2	17	0	11	6		
	3	1	0	0	1		
		42	**0**	**35**	**6**		
105	1	30	0	27	3	**4**	**0.0%**
	2	1	0	0	1		
		31	**0**	**27**	**4**		
108	1	9	0	9	0	**2**	**0.0%**
	2	10	0	10	0		
	3	3	0	3	0		
	4	4	0	2	2		
		26	**0**	**24**	**2**		
110	1	26	0	0	26	**30**	**0.0%**
	2	4	0	0	4		
		30	**0**	**0**	**30**		
118	1	8	0	8	0	**1**	**0.0%**
	2	9	0	9	0		
	3	7	0	7	0		
	4	1	0	0	1		
		25	**0**	**24**	**1**		
119	1	8	0	8	0	**3**	**0.0%**
	2	17	0	17	0		
	3	19	0	16	3		
		44	**0**	**41**	**3**		
122	1	5	0	3	2	**2**	**0.0%**
		5	**0**	**3**	**2**		
169	1	64	0	31	33	**47**	**0.0%**
	2	14	0	0	14		
		78	**0**	**31**	**47**		
171	1	49	0	37	12	**29**	**0.0%**
	2	17	0	0	17		
		66	**0**	**37**	**29**		
172	1	82	0	82	0	**46**	**0.0%**
	2	46	0	0	46		
		128	**0**	**82**	**46**		
176	1	27	0	27	0	**15**	**0.0%**
	2	13	0	0	13		
	3	2	0	0	2		
		42	**0**	**27**	**15**		
183	1	79	0	24	55	**65**	**0.0%**
	2	10	0	0	10		
		89	**0**	**24**	**65**		
184	1	121	0	24	97	**113**	**0.0%**
	2	16	0	0	16		
		137	**0**	**24**	**113**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
197	1	32	0	16	16	**22**	**0.0%**
	2	6	0	0	6		
		38	**0**	**16**	**22**		
199	1	2	0	0	2	**2**	**0.0%**
		2	**0**	**0**	**2**		
234	1	29	0	1	28	**30**	**0.0%**
	2	2	0	0	2		
		31	**0**	**1**	**30**		
237	1	18	0	12	6	**16**	**0.0%**
	2	10	0	0	10		
		28	**0**	**12**	**16**		
238	1	2	0	1	1	**4**	**0.0%**
	2	3	0	0	3		
		5	**0**	**1**	**4**		
250	1	34	0	25	9	**42**	**0.0%**
	2	33	0	0	33		
		67	**0**	**25**	**42**		
251	1	8	0	3	5	**7**	**0.0%**
	2	2	0	0	2		
		10	**0**	**3**	**7**		
252	1	31	0	20	11	**43**	**0.0%**
	2	31	0	0	31		
	3	1		0	1		
		63	**0**	**20**	**43**		
253	1	65	0	50	15	**71**	**0.0%**
	2	52	0	0	52		
	3	4	0	0	4		
		121	**0**	**50**	**71**		
260	1	11	0	6	5	**6**	**0.0%**
	2	1	0	0	1		
		12	**0**	**6**	**6**		
261	1	15	0	3	12	**13**	**0.0%**
	2	1	0	0	1		
		16	**0**	**3**	**13**		
262	1	22	0	6	16	**24**	**0.0%**
	2	8	0	0	8		
		30	**0**	**6**	**24**		
263	1	21	0	15	6	**11**	**0.0%**
	2	5	0	0	5		
		26	**0**	**15**	**11**		
266	1	38	0	18	20	**29**	**0.0%**
	2	9	0	0	9		
		47	**0**	**18**	**29**		
267	1	14	0	11	3	**4**	**0.0%**
	2	1	0	0	1		
		15	**0**	**11**	**4**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
268	1	16	0	14	2	**3**	**0.0%**
	3	1	0	0	1		
		17	**0**	**14**	**3**		
269	1	37	0	26	11	**21**	**0.0%**
	2	10	0	0	10		
		47	**0**	**26**	**21**		
270	1	21	0	16	5	**18**	**0.0%**
	2	13	0	0	13		
		34	**0**	**16**	**18**		
271	1	27	0	8	19	**27**	**0.0%**
	2	8	0	0	8		
		35	**0**	**8**	**27**		
272	1	19	0	15	4	**14**	**0.0%**
	2	10	0	0	10		
		29	**0**	**15**	**14**		
274	1	43	0	31	12	**33**	**0.0%**
	2	20	0	0	20		
	3	1	0	0	1		
		64	**0**	**31**	**33**		
275	1	36	0	26	10	**41**	**0.0%**
	2	31	0	0	31		
		67	**0**	**26**	**41**		
276	1	83	0	18	65	**120**	**0.0%**
	2	52	0	0	52		
	3	3	0	0	3		
		138	**0**	**18**	**120**		
277	1	156	0	56	100	**215**	**0.0%**
	2	113	0	0	113		
	3	1	0	0	1		
	9	1	0	0	1		
		271	**0**	**56**	**215**		
278	1	75	0	61	14	**85**	**0.0%**
	2	70	0	0	70		
	3	1	0	0	1		
		146	**0**	**61**	**85**		
279	1	48	0	0	48	**67**	**0.0%**
	2	18	0	0	18		
	3	1	0	0	1		
		67	**0**	**0**	**67**		
280	1	24	0	13	11	**34**	**0.0%**
	2	23	0	0	23		
		47	**0**	**13**	**34**		
281	1	82	0	69	13	**73**	**0.0%**
	2	58	0	0	58		
	3	2	0	0	2		
		142	**0**	**69**	**73**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
282	1	4	0	4	0	**2**	**0.0%**
	2	6	0	6	0		
	3	3	0	1	2		
		13	**0**	**11**	**2**		
283	1	25	0	25	0	**17**	**0.0%**
	2	25	0	12	13		
	3	4	0	0	4		
		54	**0**	**37**	**17**		
284	1	25	0	25	0	**23**	**0.0%**
	2	22	0	7	15		
	3	8	0	0	8		
		55	**0**	**32**	**23**		
285	1	62	0	10	52	**88**	**0.0%**
	2	36	0	0	36		
		98	**0**	**10**	**88**		
286	1	33	0	6	27	**59**	**0.0%**
	2	27	0	0	27		
	3	5	0	0	5		
		65	**0**	**6**	**59**		
288	1	40	0	17	23	**59**	**0.0%**
	2	28	0	0	28		
	3	7	0	0	7		
	9	1	0	0	1		
		76	**0**	**17**	**59**		
289	1	23	0	11	12	**35**	**0.0%**
	2	19	0	0	19		
	3	3	0	0	3		
	4	1	0	0	1		
		46	**0**	**11**	**35**		
290	1	65	0	65	0	**85**	**0.0%**
	2	92	0	9	83		
	3	1	0	0	1		
	4	1	0	0	1		
		159	**0**	**74**	**85**		
291	1	129	0	103	26	**127**	**0.0%**
	2	99	0	0	99		
	3	2	0	0	2		
		230	**0**	**103**	**127**		
294	1	26	0	0	26	**49**	**2.0%**
	2	22	0	0	22		
		48	**0**	**0**	**48**		
295	1	67	0	67	0	**50**	**0.0%**
	2	57	0	10	47		
	3	3	0	0	3		
		127	**0**	**77**	**50**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
296	1	26	0	26	0	**39**	**0.0%**
	2	37	0	9	28		
	3	11	0	0	11		
		74	**0**	**35**	**39**		
297	1	10	0	5	5	**8**	**0.0%**
	2	3	0	0	3		
		13	**0**	**5**	**8**		
298	1	28	0	20	8	**15**	**0.0%**
	2	7	0	0	7		
		35	**0**	**20**	**15**		
299	1	47	0	37	10	**49**	**0.0%**
	2	37	0	0	37		
	3	2	0	0	2		
		86	**0**	**37**	**49**		
TOTAL		**3,544**	**0**	**1,400**	**2,143**	**2,144**	

Table 23. 2013 Special Permit Areas for Firearms Hunters.

Special Hunt	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	**Rejected**			
392 - Lake Louise State Park	1	53	0	53	0	**25**
	2	42	0	19	23	
	3	1	0	0	1	
	4	1	0	0	1	
		97	**0**	**72**	**25**	
901 - Rice Lake NWR	1	53	0	38	15	**40**
	2	24	0	0	24	
	3	1	0	0	1	
		78	**0**	**38**	**40**	
902 - Saint Croix State Park	1	611	0	452	159	**400**
	2	221	0	0	221	
	3	16	0	0	16	
	4	4	0	0	4	
		852	**0**	**452**	**400**	
903 - Savanna Portage State Park	1	22	0	11	11	**20**
	2	8	0	0	8	
	3	1	0	0	1	
		31	**0**	**11**	**20**	
904 - Gooseberry Falls State Park	1	47	0	11	36	**40**
	2	4	0	0	4	
		51	**0**	**11**	**40**	
905 - Split Rock Lighthouse State Park	1	25	0	0	25	**30**
	2	2	0	0	2	
	3	1	0	0	1	
		28	**0**	**0**	**28**	
906 - Tettegouche State Park	1	73	0	0	73	**125**
	2	5	0	0	5	
	3	2	0	0	2	
		80	**0**	**0**	**80**	
907 - Scenic State Park	1	33	0	6	27	**30**
	2	3	0	0	3	
		36	**0**	**6**	**30**	
908 - Hayes Lake State Park	1	28	0	0	28	**75**
		28	**0**	**0**	**28**	
909 - Lake Bemidji State Park	1	25	0	0	25	**30**
	2	1	0	0	1	
		26	**0**	**0**	**26**	
910 - Zippel Bay State Park	1	48	0	0	48	**55**
	2	5	0	0	5	
		53	**0**	**0**	**53**	
913 - Lake Carlos State Park	1	22	0	5	17	**20**
	2	2	0	0	2	
	3	1	0	0	1	
		25	**0**	**5**	**20**	

Table 23. Continued.

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
914 - William O'Brien State Park	1	104	0	83	21	**60**
	2	40	0	0	40	
	3	2	0	0	2	
		146	**0**	**83**	**63**	
915 - Lake Bronson State Park	1	31	0	12	19	**30**
	2	10	0	0	10	
	3	1	0	0	1	
		42	**0**	**12**	**30**	
916 - Maplewood State Park	1	151	0	151	0	**100**
	2	112	0	112	0	
	3	120	0	48	72	
	4	27	0	0	27	
	9	1	0	0	1	
		411	**0**	**311**	**100**	
917 - Old Mill State Park	1	23	0	22	1	**10**
	2	9	0	0	9	
		32	**0**	**22**	**10**	
918 - Lake Alexander Woods SNA	1	84	0	71	13	**40**
	2	26	0	0	26	
	9	1	0	0	1	
		111	**0**	**71**	**39**	
919 - Glacial Lakes State Park	1	30	0	5	25	**30**
	2	5	0	0	5	
	3	1	0	0	1	
		36	**0**	**5**	**31**	
920 - Zumbro Falls SNA	1	13	0	1	12	**12**
		13	**0**	**1**	**12**	
921 - Forestville/Mystery Cave State Park	1	175	0	89	86	**130**
	2	40	0	0	40	
	3	6	0	0	6	
		221	**0**	**89**	**132**	
923 - Zumbro Falls SNA	1	5	0	0	5	**12**
	2	7	0	0	7	
		12	**0**	**0**	**12**	
924 - Whitewater State Game Refuge	1	9	0	0	9	**50**
	2	9	0	0	9	
		18	**0**	**0**	**18**	
925 - Vermillion Highlands Research, Recreation, and WMA	1	25	0	25	0	**22**
	2	24	0	17	7	
	3	16	0	0	16	
		65	**0**	**42**	**23**	
926 - Carver Park Reserve	1	263	0	263	0	**110**
	2	154	0	62	92	
	3	19	0	0	19	
	4	2	0	0	2	
		438	**0**	**325**	**113**	

Table 23. Continued.

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
927 - Whitewater State Park	1	90	0	78	12	**50**
	2	34	0	0	34	
	3	3	0	0	3	
	4	1	0	0	1	
		128	**0**	**78**	**50**	
929 - Frontenac State Park - B	1	68	0	32	36	**60**
	2	24	0	0	24	
		92	**0**	**32**	**60**	
932 - Lake Elmo Park Reserve	1	100	0	97	3	**50**
	2	43	0	0	43	
	3	6	0	0	6	
		149	**0**	**97**	**52**	
933 - Murphy-Hanrehan Park Reserve	1	122	0	84	38	**80**
	2	37	0	0	37	
	3	7	0	0	7	
		166	**0**	**84**	**82**	
934 - Whitewater State Game Refuge	1	82	0	18	64	**75**
	2	11	0	0	11	
		93	**0**	**18**	**75**	
Total		**3,558**	**0**	**1,865**	**1,692**	**1,811**

Table 24. 2013 Special Permit Areas for Muzzleloader Hunts.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
935 - Jay Cooke SP	1	159	0	132	27	**120**
	2	78	0	0	78	
	3	14	0	0	14	
	4	1	0	0	1	
		252	**0**	**132**	**120**	
936 - Crow Wing SP	1	52	0	52	0	**40**
	2	54	0	54	0	
	3	36	0	20	16	
	4	23	0	0	23	
	5	1	0	0	1	
	9	2	0	0	2	
		168	**0**	**126**	**42**	
937 - Soudan Underground Mine and Lake Vermilion SP	1	17	0	4	13	**20**
	2	7	0	0	7	
		24	**0**	**4**	**20**	
938 - City of Tower	1	10	0	0	10	**20**
		10	**0**	**0**	**10**	
939 - Lake Shetek SP	1	30	0	30	0	**15**
	2	16	0	6	10	
	3	7	0	0	7	
		53	**0**	**36**	**17**	
941 - Nerstrand Big Woods SP	1	110	0	110	0	**50**
	2	81	0	71	10	
	3	37	0	0	37	
	4	3	0	0	3	
	9	1	0	0	1	
		232	**0**	**181**	**51**	
942 - Sibley SP	1	60	0	60	0	**50**
	2	60	0	11	49	
	3	1	0	0	1	
		121	**0**	**71**	**50**	
943 - Myre Big Island SP	1	30	0	30	0	**40**
	2	54	0	16	38	
	3	2	0	0	2	
		86	**0**	**46**	**40**	
944 - Vermilion Highlands WMA	1	32	0	32	0	**25**
	2	43	0	33	10	
	3	16	0	0	16	
		91	**0**	**65**	**26**	
947 - Lake Bemidji State Park	1	14	0	0	14	**25**
	2	7	0	0	7	
	3	4	0	0	4	
		25	**0**	**0**	**25**	
TOTAL		**1,062**	**0**	**661**	**401**	**405**

GRAND TOTAL		**76,975**	**71**	**36,559**	**40,414**	**41,176**

2013 MINNESOTA ELK HARVEST REPORT

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

INTRODUCTION

A limited number of licenses are offered to Minnesota residents to hunt elk. In 2013, there were two established zones: 1) Zone 20 - Kittson County Central and 2) Zone 30 - Kittson County Northeast (Figure 1). Zone 10 near Grygla, Minnesota, was closed in 2013 because the population was below goal (Figure 2). In 2013, there were four regular season hunts (September 14-22; September 28 – October 6; December 7-15; January 11-19, 2014). Hunts were held during the first season in both zones and during the remaining seasons only in zone 20. The early hunts are structured so that they fall within the breeding season when bull elk are most vulnerable and elk can be located by vocalizations. The later seasons are primarily used as a mechanism to harvest antlerless elk because patterns are more predictable, elk are in larger groups, and snow cover, when present, can aid in locating and tracking animals.

METHODS

All elk hunters are required to attend a mandatory orientation and if successful, they must register their animal through the local DNR office. Kill locations are mapped and various data are collected, including age/sex as well as biological samples for disease testing and other monitoring projects.

RESULTS

A total of 23 licenses were available and 974 individuals or parties applied for the opportunity to hunt elk (Table 1). As the number of either-sex licenses is limited, DNR receives an application for the area only. After winners are selected, the time period and license type is distributed through a second random drawing. In 2013, a total of 12 elk were harvested in the zones (Table 2). Long-term elk harvest for the zones is depicted in Table 3 on pages 3 and 4.

Table 1. License allocation and application numbers for three elk hunting zones, 2013.

Zone	Either-Sex	Antlerless	Bull-only	Total	Total Applicants
20 – Kittson Central	0	15	6	21	787
30 – Kittson NE	0	0	2	2	187
Total	**0**	**15**	**8**	**23**	**974**

Table 2. Distribution of the 2013 Minnesota elk harvest. License allocation totals represent the actual number sold, not the number authorized through rule.

Kittson County Central Hunt Zone (20)					
Season	Bulls-only Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken
September 14-22	2	3	2	2	4
Sept 28 –Oct 6	2	4	1	2	3
December 7-15	1	5	0	1	1
January 11-19	1	3	1	1	2
Total	3	13	4	6	10

Kittson County Northeast Hunt Zone (30)			
Season	Bulls-only Licenses	Bulls taken	Total elk taken
September 14-22	2	2	2
Total	2	1	2

Table 3. Grygla and Kittson County elk harvests, 1987-2013.

	Grygla			
	Bulls (or Either-Sex)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
1987	2	1	2	1
1996	2	2	7 (1 alternate)	6
1997	5 (2 alternate)	1	5 (2 alternate)	2
1998	4 (2 alternate)	2	0	0
2004	1	1	4	2
2005	1	0	4	0
2006	2	2	6	2
2007	0	0	6	6
2008	2	2	10	6
2009	2	3*	12	11
2010	2	1	5	3
2011	3	2	2	0
2012	2	1	3	0
2013	Closed	0	Closed	0
Total	**28**	**19**	**66**	**39**

	Kittson County (Combined)			
	Bulls (or Either-Sex)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
2008	1	1	10	10
2009	1	9[a]	4	5
2010	1	1	3	3
2011	2	3[b]	8[c]	4
2012	5	4[d]	13	3
2013	8	6	15	6
Total	**29**	**24**	**53**	**31**

a One additional bull (6x7) was wounded but not retrieved in 2009. It was found dead later and is counted in the total.

b One bull was a male calf and was legally tagged as an antlerless animal.

c Three unsuccessful hunters from the Grygla zone were invited to participate in the January extended season in Kittson County, however only 2 participated and were included in the number of antlerless permits issued.

d One bull was a sub-legal spike and was confiscated.

Figure 1. Kittson County Hunt Zones.

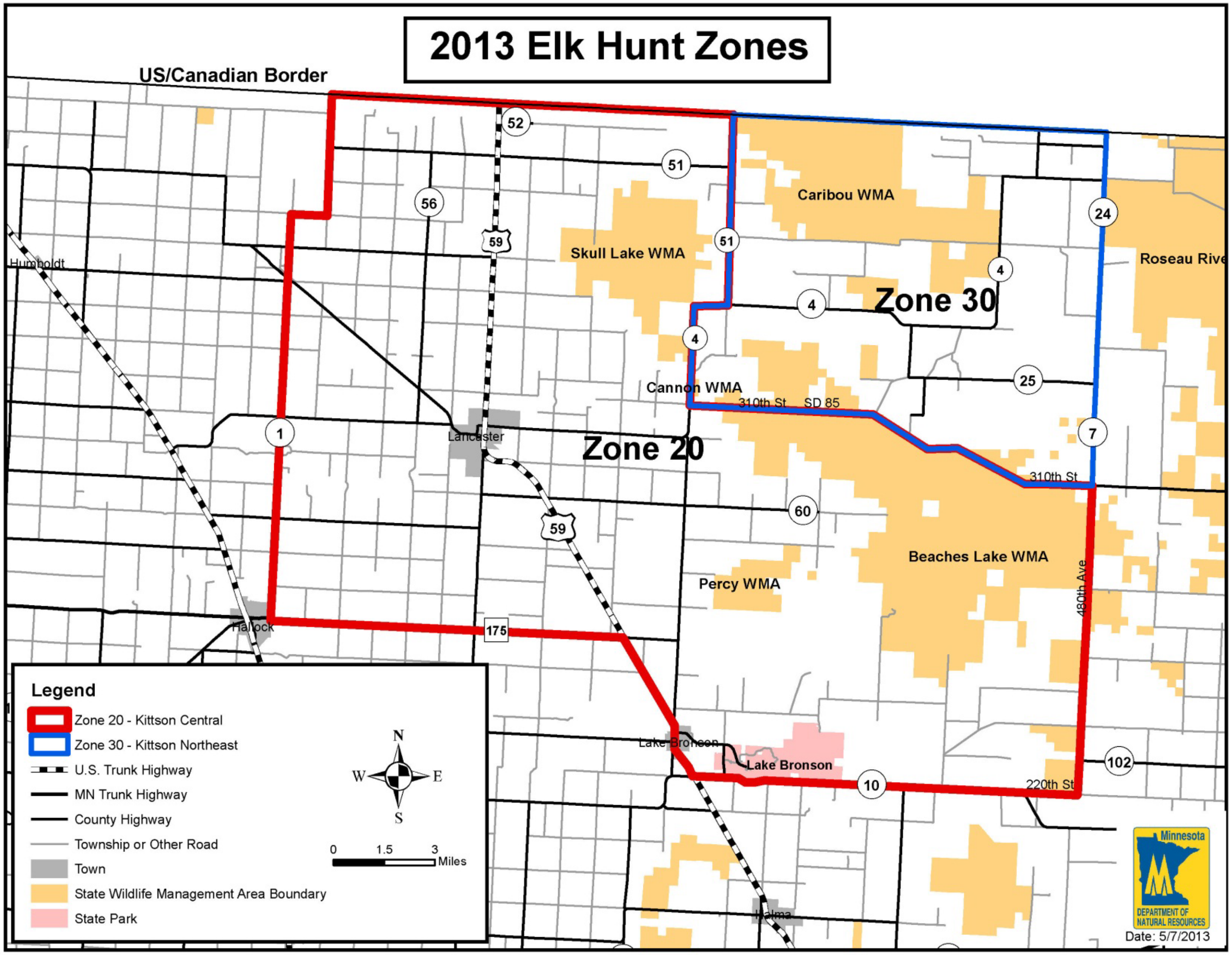
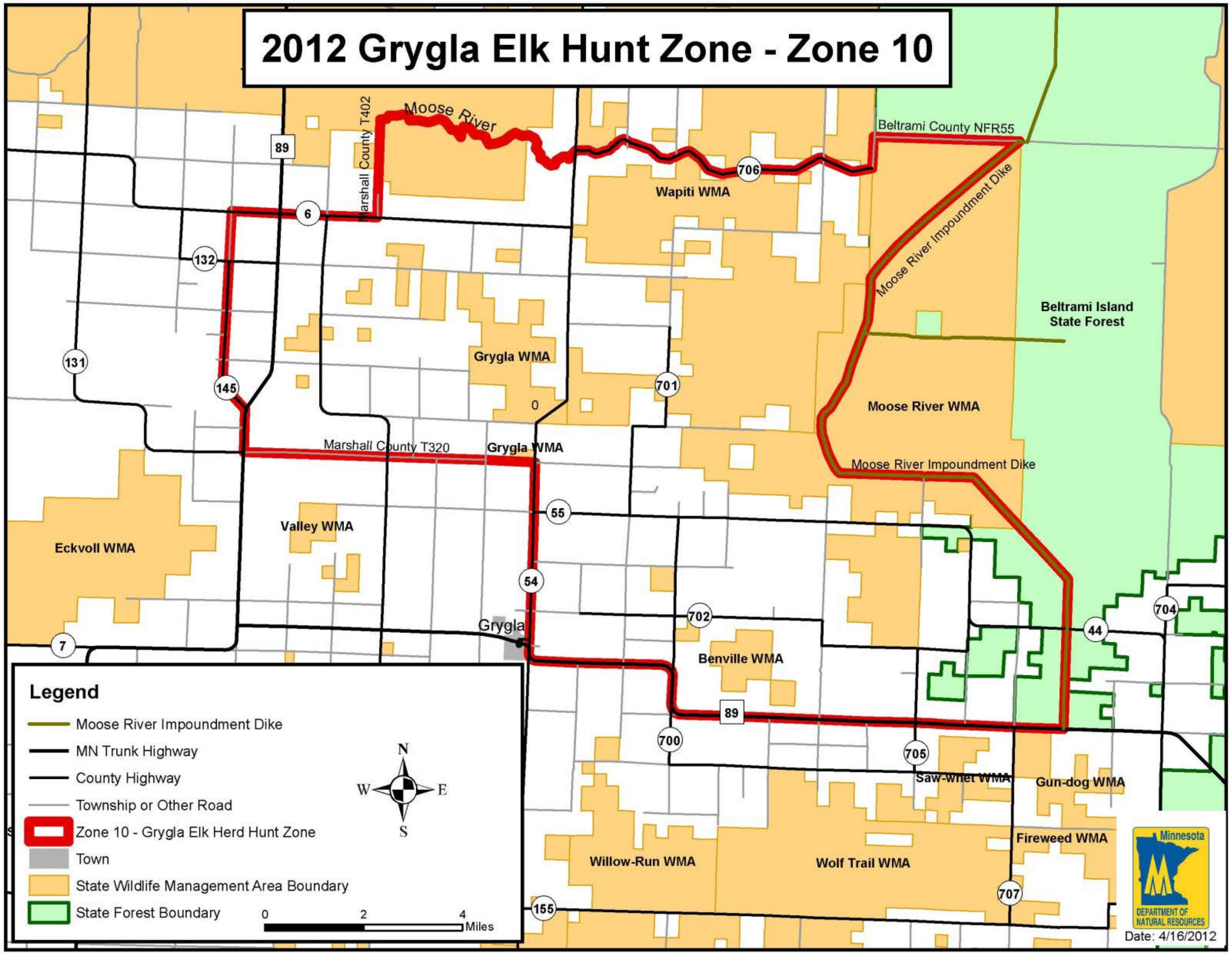


Figure 2. Grygla Hunt Zone.



MINNESOTA SANDHILL CRANE HARVEST REPORT, 2013

MNDNR

Margaret Dexter, Wildlife Research Unit

Two distinct populations of sandhill cranes (*Grus Canadensis*) occur in Minnesota. Sandhill cranes that breed and stage during fall in NW Minnesota are part of the Mid-continent population whereas sandhill cranes in the remainder of the state are part of the Eastern population. The Mid-continent population, including cranes in NW Minnesota is managed via a cooperative management plan with the U.S. Fish and Wildlife Service, Mississippi, Central, and Pacific Flyway Councils.

A limited season for Mid-continent sandhill cranes was opened in Minnesota's Northwest Goose Zone (Figure 1) beginning in 2010. The season was open from the first Saturday in September through the second Sunday in October (4 Sep – 10 Oct 2010 and 3 Sep – 9 Oct 2011). In 2012 the season was 15 September – 21 October. In 2013 the season was 14 September – 20 October. The daily bag limit remained at 2 per day but the possession limit increased from 4 to 6. Hunters were required to purchase a $3.00 sandhill crane permit. A sample of sandhill crane permit holders were selected to receive a harvest survey from the U.S. Fish and Wildlife Service after the season. This survey is used to monitor harvest levels and hunting activity (Table 1).

LITERATURE CITED

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

Kruse, K.L., J.A. Dubovsky, and T.R. Cooper. 2014. Status and harvests of sandhill cranes:Mid-Continent, Rocky Mountain, Lower Colorado River Valley and Eastern Populations. Administrative Report, U.S. Fish and Wildlife Service, Denver, Colorado. 41pp.) http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html

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

Year	Number of Permits	Active Hunters	Harvest
2010	1,954	964	830
2011	1,342	643	765
2012	1,032	410	407
2013	1,086	485	378

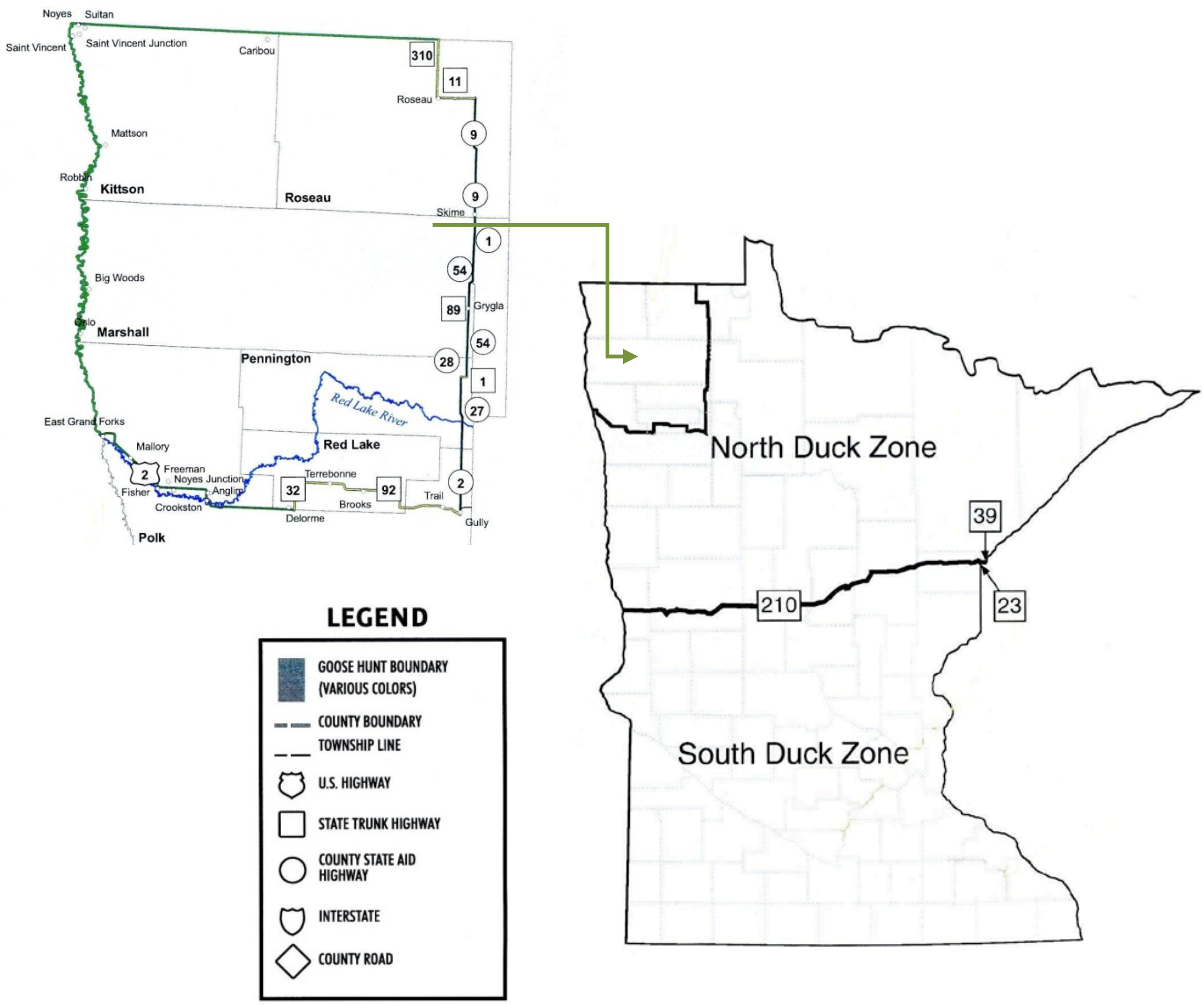


Figure 1. Sandhill crane hunting zone in Minnesota, 2010-2014.

TRAPPING HARVEST STATISTICS

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

2013 TRAPPER HARVEST SURVEY

Margaret Dexter, Wildlife Research Unit

INTRODUCTION

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

METHODS

The sampling frame consisted of all individuals with active MNDNR trapping licenses (all types) listed in the Electronic License System (ELS) database in late February 2014. There were 10,224 active trapping licenses in the ELS database, which consisted of 7,815 Resident Regular Trappers, 581 Resident Junior Trappers, 1,310 Resident Senior Trappers, 517 "active" Lifetime Trappers, and 11 Nonresident (MN landowners) license holders. License type was reclassified as "adult" (regular, lifetime, and non-resident) or "youth" for analysis purposes.

The MNDNR Trapper Harvest Survey is a census but the response rate is <100% (mean = 75%, range: 58–84%). Thus, uncertainty in harvest estimates is strictly a function of non-response (missing data) rather than random sampling. However, if non-response (unit and item) is completely random then data from respondents can be treated as a random sample, which is how the Trapper Harvest Survey has been analyzed historically. The critical assumption is that non-response is completely random (e.g., if you repeated the survey, non-respondents would be a random subset of licensed trappers). For consistency with previous analyses, the response data was treated as a random sample.

A postcard survey (Figure 1) was sent to all trapping license holders with a valid mailing address at the close of the license year. Trappers that returned the survey questionnaire within three weeks were marked returned and eliminated from follow-up mailings. A single follow-up mailing was sent to non-respondents.

Returned questionnaires were checked for completeness, consistency, and biological practicability. Cards were marked with numeric county codes corresponding to the trapper's written information. Data from each usable card was converted to an electronic database. Duel key-entry and quality control checks were used to minimize transcription errors. Data was tabulated using Viking Data Entry VDE+ software and statistically analyzed using R programming language (ver. 2.9.2; R Development Core Team [RDCT] 2009) to summarize responses.

RESULTS

There were 10,224 licensed trappers (99.2%) with deliverable addresses for the mail survey; 5,851 of these individuals returned useable questionnaires (response rate = 57.7%; Table 1, Figure 2). Seventy five percent of respondents (adults = 74%, youth = 81%) reported setting traps for at least one species (Table 1).

Historic trapper estimates are presented in Table 2 estimated number of trappers; Table 3 estimated take per successful trapper; and Table 4 estimated annual harvest, 2000-01 through 2013-2014.

This project was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

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

RETURN SERVICE REQUESTED

Presorted
First-Class Mail
U.S. Postage
Paid
Twin Cities, MN
Permit # 171

2013 Trapper Report 1

1. Did you set traps / snares in Minnesota during the 2013-2014 trapping season?
☐ No ☐ Yes (Please check one)
2. Indicate your harvest, the number of days you trapped for each species, the average number of traps you had set PER DAY for each species, and the county in which you trapped **most** for each species. Report only animals **YOU personally** trapped in Minnesota. Animals taken by hunting should **NOT** be reported here.

Species Trapped		*Number YOU Trapped All Season*	*# Days Trapped All Season*	*Average # Traps/Snares Set Per Day*	*County You Trapped In Most*
Muskrat	80				
Mink	32				
Gray Fox	96				
Striped skunk	34				
Coyote (brush wolf)	97				
Beaver (Mar-April '13)	81				
Beaver (Oct '13-Feb '14)	82				
Pine marten	37				
Otter	38				
Fisher	36				
Badger	35				
Long-tailed weasel	31				
Short-tailed weasel	30				
Opossum	10				
Bobcat	98				
Raccoon	94				
Red Fox	95				

Dear Trapper:

You are being asked as a trapping license buyer to assist us in evaluating the 2013-2014 trapping season (**March 2013-February 2014**). For Spring Beaver, please report only animals taken between March 2013 and April 2013. We need this information to estimate the season's harvest and to help set future furbearer trapping seasons. Similar to past years we are also asking for the **average number of traps you set per day** for each species. If a trap is set for multiple species, count the trap for both species when answering the question. For example, if you ran 20 mink/coon traps each day, enter 20 traps/day for both mink and coon.

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

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

THANK YOU FOR YOUR COOPERATION

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

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

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

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

POSTAGE WILL BE PAID BY ADDRESSEE

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

Figure 1. Trapper survey card 2013.

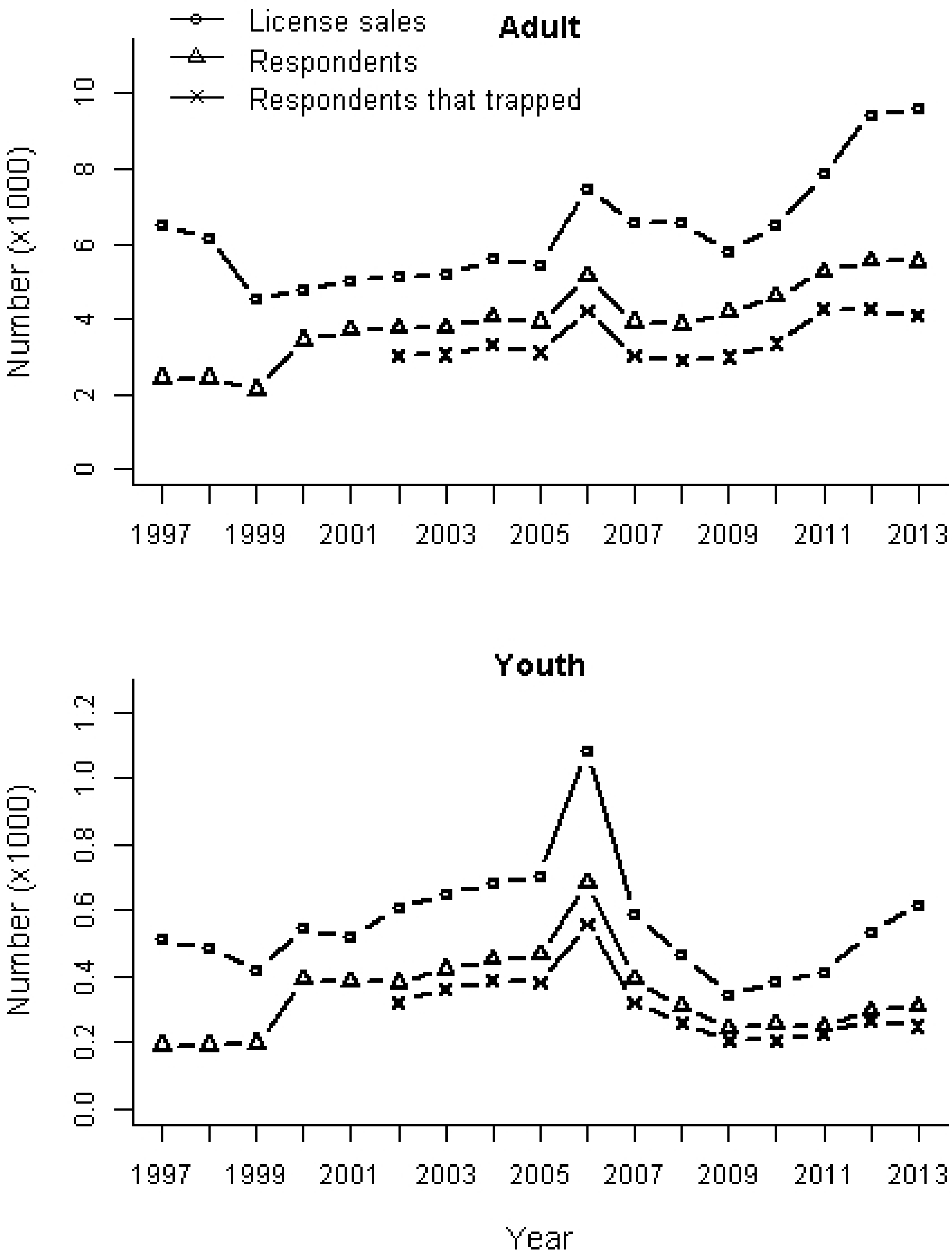


Figure 2. Trapper license sales and mail survey response by age class (Adult vs Youth), 1997-98 through 2013-14.

Table 1. Use of trapper licenses, 2001-02 through 2013-14.

		Returns from mail survey	Projections from license sales
2001-02	Trapped Did not trap	3,332 (81.5%) 754 (18.5%) 4,086 (100 %)	4,510 1,024 5,534 [a]
2002-03	Trapped Did not trap	3,344 (80.6%) 804 (19.4%) 4,148 (100 %)	4,615 1,111 5,726 [a]
2003-04	Trapped Did not trap	3,412 (81.1%) 793 (18.9%) 4,205 (100 %)	4,737 1,104 5,841 [a]
2004-05	Trapped Did not trap	3,697 (81.9%) 815 (18.1%) 4,512 (100 %)	5,136 1,135 6,271 [a]
2005-06	Trapped Did not trap	3,495 (81.0%) 875 (20.0%) 4,370 (100 %)	4,930 1,233 6,163 [a]
2006-07	Trapped Did not trap	4,782 (81.9%) 1,053 (18.1%) 5,835 (100 %)	7,008 1,549 8,557 [a]
2007-08	Trapped Did not trap	3,322 (77.2%) 980 (22.8%) 4,302 (100 %)	5,533 1,634 7,167 [a]
2008-09	Trapped Did not trap	3,154 (75.7%) 1,012 (24.3%) 4,166 (100 %)	5,319 1,708 7,027 [a]
2009-10	Trapped Did not trap	3,202 (72.7%) 1,202 (27.3%) 4,404 (100 %)	4,467 1,677 6,144 [a]
2010-11	Trapped Did not trap	3,546 (73.2%) 1,298 (26.8%) 4,844 (100 %)	5,032 1,843 6,875 [a]
2011-12	Trapped Did not trap	4,498 (81.5%) 1,019 (18.5%) 5,517 (100 %)	6,748 1,532 8,280 [a]
2012-13	Trapped Did not trap	4,537 (77.6%) 1,307 (22.4%) 5,844 (100 %)	7,747 2,236 9,983 [a]
2013-14	Trapped Did not trap	4,342 (74.6%) 1,480 (25.4%) 5,822 (100 %)	7,627 2,597 10,224 [a]

[a] excludes duplicates.

Table 2. Estimated number of trappers of various furbearers, 2000-01 through 2013-14.

	Estimated number of trappers													
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Muskrat	2052	2419	2137	2117	2269	2351	4228	2371	2393	2088	2760	4,320	4,110	3,410
Mink	1867	2117	1945	1917	2085	1864	3033	2168	2044	1541	1847	2,470	3,110	2,780
Short-tailed weasel	318	411	408	473	470	349	864	595	511	417	546	800	690	510
Long-tailed weasel	272	313	312	374	299	211	694	434	345	254	333	560	540	480
Raccoon (Sept -Feb)	1599	2249	2427	2384	2505	2315	3766	3189	3150	2320	2567	4,060	4,680	4,660
Raccoon (Mar -Aug)[a]	343	334	354	338	406	322								
Striped skunk	563	955	1052	1102	1161	1023	1644	1485	1488	949	1130	1,800	1,940	1,610
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	135	250	237	292	310	219	347	330	293	206	229	310	360	390
Opossum	484	610	754	934	1037	957	1511	1392	1169	701	645	830	1,100	1,110
Red fox (Sept -Feb)	986	1093	1319	1290	1179	991	1608	1320	1232	1006	1068	1,900	2,240	2,080
Red fox (Mar -Aug)[a]	89	91	111	113	110	85								
Gray fox	468	277	421	441	451	407	806	654	657	529	555	970	1,180	1,060
Coyote	491	606	813	812	826	857	1379	1203	1141	888	998	1,720	2,360	2,200
Beaver (Oct 13- Feb 14)	1695	2054	1844	1883	2171	1965	2659	2008	1877	1650	1722	2,360	2,620	2,710
Beaver (Mar 13- Apr 13)	1425	1345	1296	1233	1449	1455	1710	1408	1257	1260	1367	1,510	1,810	1,150

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

Table 3. Estimated take per trapper of various furbearers, 2000-01 through 2013-2014.

	Estimated take per successful trapper reporting that species													
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Muskrat	42	42	35	33	32	39	58	32	34	47	65	81	58	39
Mink	12	14	10	9	10	10	9	9	8	9	8	6	6	6
Short-tailed weasel	8	10	7	7	6	6	9	7	7	8	9	9	7	6
Long-tailed weasel	5	7	4	5	3	3	5	5	3	3	5	5	4	4
Raccoon (Sept -Feb)	20	27	25	22	23	21	21	23	23	19	22	24	17	16
Raccoon (Mar Aug)[a]	11	19	12	15	12	11								
Striped skunk	8	8	8	8	8	7	7	7	7	7	7	7	7	6
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	2	2	2	2	1	2	1	2	1	2	2	2	2	2
Opossum	11	8	11	12	14	12	14	12	10	7	7	5	6	6
Red fox (Sept -Feb)	6	6	6	5	4	4	4	3	3	3	3	4	3	3
Red fox (Mar -Aug)[a]	4	5	5	6	3	3								
Gray fox	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Coyote	4	4	4	5	4	5	4	4	4	4	4	5	5	5
Beaver (Oct 12-Feb 13)	15	18	13	12	13	13	13	11	11	11	10	11	9	9
Beaver (Mar 12 - Apr 12)	26	31	26	21	26	24	24	19	22	20	21	20	19	10

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

Table 4. Minnesota trapper license sales and estimated annual harvest, 2000-01 through 2013-2014[a]

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Trapper license sales [b]	5,337	5,534	5,725	5,841	6,271	6,163	8,557	7,167	7,027	6,158	6,885	8,280	9,998	10,224
Estimated harvest [c]														
Muskrat	85,555	100,819	75,190	69,131	72,079	91,271	243,360	75,439	80,157	98,524	180,505	352,030	242,120	120,500
Mink	22,590	28,684	19,894	16,716	21,478	18,048	26,084	18,626	16,647	13,207	13,853	15,770	18,460	14,710
Short-tailed weasel	2,586	4,160	2,895	3,519	2,679	2,223	8,145	4,155	3,515	3,128	4,914	7,300	4,500	2,360
Long-tailed weasel	1,354	2,243	1,138	1,781	1,007	651	3,494	2,013	1,118	838	1,732	3,020	2,030	1,410
Raccoon (Oct - Feb)	32,460	60,292	61,221	53,534	56,848	48,966	78,571	73,498	71,893	45,118	57,245	98,240	79,800	70,380
Raccoon (Mar -Aug)[f]	3,702	6,468	4,137	4,933	4,940	3,594								
Striped skunk	4,580	7,168	7,901	8,474	8,704	6,881	10,773	10,811	10,354	6,194	8,023	12,250	12,620	9,430
Eastern spotted skunk [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	205	407	358	552	455	339	461	499	424	316	344	490	570	600
Opossum	5,351	5,127	8,491	11,251	14,313	11,754	20,442	17	11,296	4,963	4,193	4,400	6,780	6,720
Red fox (Oct - Feb)	6,165	6,870	7,851	6,721	4,684	3,528	6,783	4,060	3,500	2,984	3,311	7,250	7,540	5,710
Red fox (Mar -Aug)[f]	357	447	612	635	334	222								
Gray fox	468	525	892	915	898	797	1,703	1,360	1,320	1,084	1,110	2,100	2,550	1,940
Coyote	2,112	2,369	3,641	3,805	3,607	3,915	5,315	5,355	4,532	3,797	4,292	8,780	11,130	9,010
Beaver (Oct 13- Feb 14)	24,802	35,963	23,592	22,801	28,716	26,029	33,966	21,813	21,075	18,178	17,048	26,620	24,590	23,220
Beaver (Mar 13-Apr 13)	37,455	41,829	33,721	26,363	37,861	35,252	41,652	26,286	27,815	25,008	29,118	29,500	34,600	10,110
Registered harvest														
Otter	1,578	2,301	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814	2,294	3,171	2,824
Lynx [g]	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Bobcat [e]	231	250	544	483	631	590	890	702	853	884	1,012	1,711	1,875	1,038
Fisher	1,674	2,119	2,660	2,517	2,552	2,388	3,251	1,682	1,712	1,259	903	1,473	1,293	1,146
Marten	1,629	1,928	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842	2,525	1,472	1,014

[a] Includes data for all seasons from October through April of years indicated.

[b] Separate licenses were issued for juveniles (13-17 years old) and adults (18 and older), beginning in 1982. Nonresident (MN Landowner) licenses started in 2004. Senior trapping licenses were first issued in 2007. Lifetime Licenses became available for free when renewing lifetime sports or small game licenses in 2007. As of April, 2013 - 10,224 trapping licenses were sold in 2013: 581 (5.7%) were junior licenses, 7,815 (76.4%) were Regular adult licenses, 1,310 (12.8%) were Senior licenses, 517 (5.1%) were Lifetime licenses, and 11 (<1%) were Nonresident (MN Landowner) licenses. Duplicate licenses excluded.

[c] Based upon trappers' responses to mail surveys.

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

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

MINNESOTA FUR BUYERS SURVEY FOR THE 2013-2014 HUNTING AND TRAPPING SEASON

Jason Abraham, Wildlife Season Setting/Furbearer Specialist
Margaret Dexter, Wildlife Policy and Research Unit

INTRODUCTION

Fur buyers are individuals licensed by the State of Minnesota to buy and sell raw fur. They are required to keep complete records of all transactions and activities related to buying, selling, and disposing of raw furs. Each year buyers are sent a questionnaire asking them to submit information regarding the “average” price they paid to trappers for various furbearers the previous season.

METHODS

In August 2014, questionnaires were mailed to the 54 licensed fur buyers in Minnesota. The survey asked them to report the number and type of fur purchased from Minnesota trappers and hunters in 2013-14 and the “average price” paid to those hunters and trappers based on all fur purchased. A total of 34 usable surveys were received, for a return rate of 63 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 2013-14 was $795,863.44, a 50 percent decrease from 2012-2013.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2013-14.

Species	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	16,443	5.00	10.50	8.72
Mink Female	1,207	5.00	22.00	13.72
Mink male	1,329	10.00	24.00	18.11
Raccoon	19,818	9.00	28.00	16.58
Red Fox	860	15.00	50.00	30.90
Gray Fox	171	10.00	25.25	21.27
Coyote	3,487	0.00	40.00	21.30
Bobcat	48	65.00	133.00	88.63
River Otter	201	20.00	80.00	61.32
Beaver 10-12	2,153	8.00	20.00	16.52
Beaver 3-4	2,329	8.00	17.75	14.77
L.T. Weasel	0	0.00	0.00	0.00
S.T. Weasel	165	1.00	5.00	2.35
Striped Skunk	148	2.00	7.00	4.14
Badger	132	7.00	30.00	13.72
Opossum	217	1.00	2.00	1.52
Fisher Male	72	40.00	86.40	73.50
Fisher Female	66	50.00	85.00	67.73
Marten Male	50	50.00	80.00	74.10
Marten Female	32	50.00	80.00	70.94
Deer Hides	11,892	3.00	10.00	6.09
Bear Hides	19	25.00	60.00	42.63

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 2003-04 through 2013-14.

	Average pelt prices paid hunters and trappers in Minnesota (dollars)										
Species	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Muskrat	2.05	1.9	2.81	5.79	2.96	1.85	4.43	5.33	5.86	7.91	8.72
Mink (female)	7.23	10.22	10.23	13.18	9.05	7.45	8.02	9.33	11.54	17.53	13.72
Mink (male)	11.41	11.34	14.29	18.04	12.32	9.14	9.37	13.66	14.68	18.27	18.11
S.T. Weasel	2.53	2.52	2.6	3.58	3.18	3.57	3.02	1.50	2.10	2.51	0.00
L.T. Weasel	3.34	3.05	2.56	4.35	5	2.21	3.12	2.87	4.02	4.10	2.35
Raccoon	11.45	10.49	9.61	11.92	14.32	9.34	9.18	10.87	12.57	16.60	16.58
Striped Skunk	4.66	3.95	3.77	4.46	5.27	2.56	3.66	3.29	3.55	5.00	4.14
Badger	14.23	12.94	13.4	15.71	13.92	7.70	8.81	10.43	13.47	14.54	13.72
Opossum	1.23	1.51	1.4	1.52	1.76	1.21	1.30	2.64	5.80	1.52	1.52
Red Fox	20.02	17.28	16.96	17.68	14.69	11.79	10.85	13.35	22.87	33.52	30.90
Gray Fox	13.64	12.58	15	22.36	30.09	14.08	11.55	14.64	15.11	19.20	21.27
Coyote	18.37	15.24	13.57	17.76	13.51	7.12	8.62	9.47	17.99	22.04	21.30
Bobcat	95.9	98.99	95.74	101.07	93.41	74.74	42.77	71.44	98.18	144.79	88.63
Beaver (fall-winter)	12.57	13.62	14.48	18.35	14.6	14.63	12.49	11.95	14.29	18.47	16.52
Beaver (spring)	11.09	13.8	16.49	14.81	17.77	9.36	14.47	14.50	19.96	12.80	14.77
Otter	85.33	87.23	88.89	42.85	29.49	24.33	35.65	34.53	51.40	72.12	61.32
Fisher (male)	27.15	30.02	36.03	76.33	63.09	22.27	34.45	38.19	47.69	62.38	61.32
Fisher (female)	25.71	27.47	31.46	67.82	48.24	37.22	34.90	37.31	39.59	63.02	67.73
Marten (male)	30.09	30.65	37.47	74.04	58.72	30.61	26.76	39.80	42.32	56.57	74.10
Marten (female)	26.7	27.42	31.53	66.09	50.05	28.19	29.95	36.57	39.49	54.29	70.94
Deer Hides	5.41	3.95	4.14	4.51	3.92	3.53	4.44	4.41	3.95	5.18	6.09
Bear Hides	41.55	46.61	39.3	43.03	36.57	29.81	43.00	33.38	28.79	30.28	42.63

REGISTERED FURBEARER HARVEST STATISTICS

Forest Wildlife Populations and Research Group
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REGISTERED FURBEARER HARVEST STATISTICS
2013-14 Report


Drawing by Gilbert Proulx

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring harvest is an important component of population management for some wildlife populations. For many species, harvest represents a large proportion of overall mortality. Obtaining harvest information can be useful for documenting changes in the distribution and abundance of animals, as well as the effects of changes in harvest seasons, harvest techniques, and habitat. The level of detail or accuracy necessary in harvest information may vary across species, depending on such factors as population density, harvest pressure, habitat sensitivity of the species, and reproductive potential.

In Minnesota, detailed harvest information is collected on 4 carnivores – fishers, martens, bobcats, and river otters. These species have lower reproductive potential, naturally occur at low to moderate densities, have comparatively restricted distributions, or may be more subject to effects of habitat change. Hence, detailed harvest information is desirable to help ensure sustainable populations. For the past 36 years such data has been collected for these species.

METHODS

Fur-harvesters are required to bring pelts from harvested animals (fisher, marten, bobcat, and otter) in to fur registration stations usually within 48 hours of the close of the season. Upon registration, information is collected on the sex, date, and harvest location (township), and the pelt is tagged to verify it has been registered.

RESULTS

Currently, harvest of fisher, marten, and bobcat is allowed in approximately the northern 60% of the state, while otter harvest is allowed statewide (Figure 1). The only change from the 2012 season structure was a reduction in the combined fisher/marten limit from 5 (but not more than 2 fishers) down to a combined limit of 2.

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

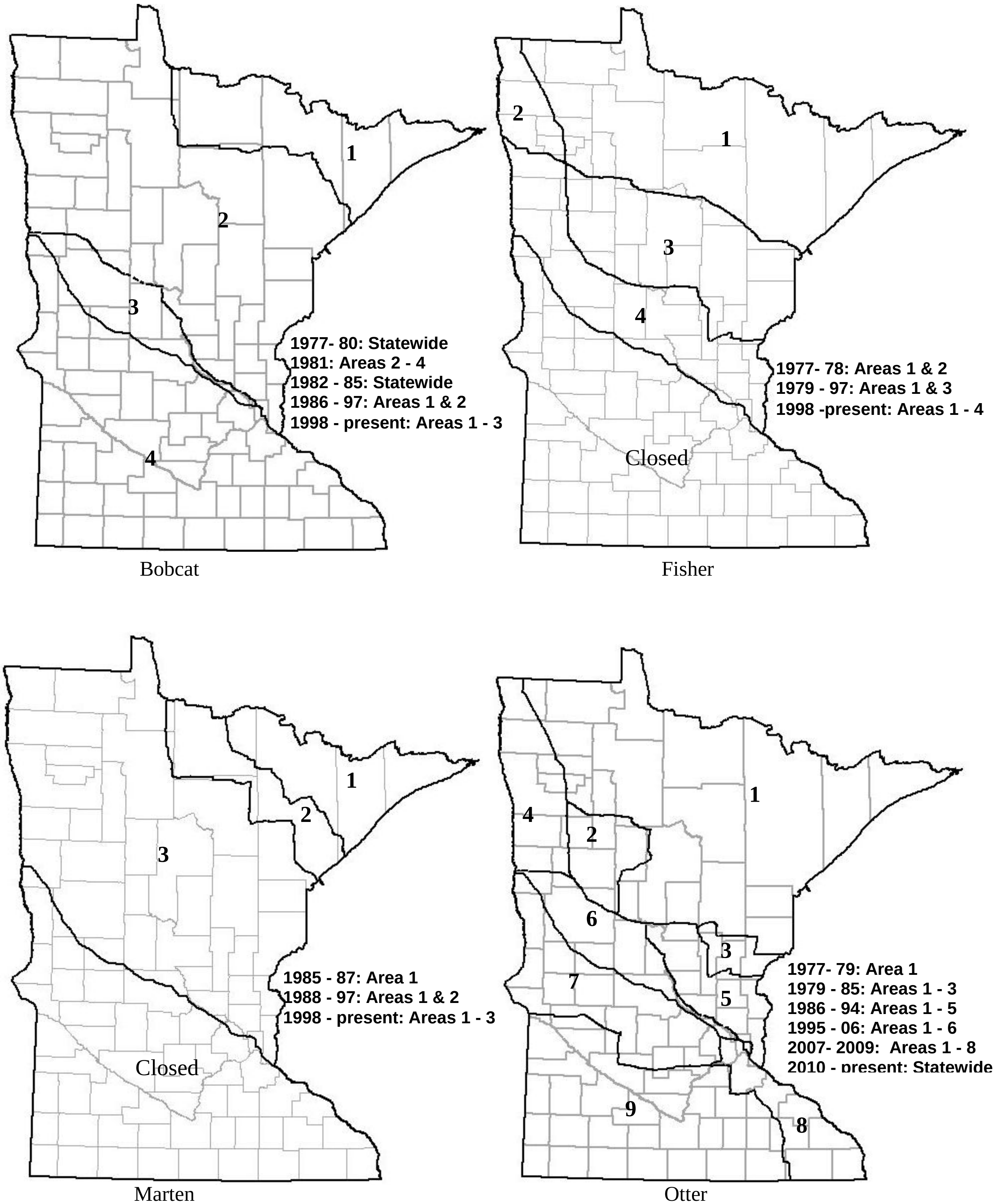

Figure 1. Open trapping areas for fisher, marten, bobcat, and otter, 1977 - present.

Table 1. Registered furbearer seasons and harvests, 1985-2013.

	Bobcat				Fisher				Marten				Otter			
Year	Season	Days	Limit	Harvest	Season	Days	Limit [a]	Harvest	Season	Days	Limit [a]	Harvest	Season[b]	Days	Limit[c]	Harvest
1985-86	11/30-1/19	51	5	119	11/30-12/15	16	1	678	11/30-12/15	16	1	430	11/16-12/15	30	3	559
1986-87	11/29 -1/3	36	5	160	11/29-12/14	16	1	1067	11/29-12/14	16	1	798	11/1-11/30	30	3	777
1987-88	11/28-1/3	37	5	212	11/28-12/13	16	1	1641	11/28-12/13	16	1	1363	10/24-11/29	37	3	1386
1988-89	11/26-1/1	37	5	141	11/26-12/11	16	1	1025	11/26-12/11	16	2	2072	10/29-11/27	30	3	922
1989-90	12/2-1/7	37	5	129	12/2-12/17	16	1	1243	12/2-12/17	16	2	2119	10/28-12/17	51	3	1294
1990-91	12/1-1/6	37	5	84	12/1-12/16	16	1	746	12/1-12/16	16	2	1349	10/27-1/6	71	3	888
1991-92	11/30-1/5	37	5	106	11/30-12/15	16	1	528	11/30-12/15	16	1	686	10/26-1/5	71	3	855
1992-93	11/28-1/3	37	5	168	11/28-12/13	16	1	778	11/28-12/13	16	2	1602	10/24-1/3	71	4	1368
1993-94	12/4-1/9	37	5	201	12/4-12/19	16	2	1159	12/4-12/19	16	2	1438	10/23-1/9	78	4	1459
1994-95	12/3-1/8	37	5	238	12/3-12/18	16	2	1772	12/3-12/18	16	2	1527	10/29-1/8	71	4	2445
1995-96	12/2-1/7	37	5	134	12/2-12/17	16	2	942	12/2-12/17	16	2	1500	10/28-1/7	71	4	1435
1996-97	11/30 -1/5	37	5	223	11/30-12/15	16	2	1773	11/30-12/15	16	2	1625	10/26-1/5	71	4	2219
1997-98	11/29-1/4	37	5	359	11/29-12/14	16	2	2761	11/29-12/14	16	2	2261	10/25-1/4	71	4	2145
1998-99	11/28-12/13	16	5	103	11/28-12/13	16	2	2695	11/28-12/13	16	2	2299	10/24-1/3	71	4	1946
1999-00	12/4-1/9	37	5	206	12/4-12/19	16	2	1725	12/4-12/19	16	4	2423	10/23-1/9	78	4	1635
2000-01	12/2-1/7	37	5	231	12/2-12/17	16	4	1674	12/2-12/17	16	4	1629	10/28-1/7	71	4	1578
2001-02	11/24-1/6	44	5	250	11/24-12/9	16	4	2119	11/24-12/9	16	4	1928	10/27-1/6	71	4	2301
2002-03	11/30-1/5	37	5	544	11/30-12/15	16	5	2660	11/30-12/15	16	5	2839	10/26-1/5	71	4	2145
2003-04	11/29-1/4	37	5	483	11/29-12/14	16	5	2521	11/29-12/14	16	5	3214	10/25-1/4	71	4	2766
2004-05	11/27-1/9	44	5	631	11/27-12/12	16	5	2552	11/27-12/12	16	5	3241	10/23-1/9	78	4	3450
2005-06	11/26-1/8	44	5	590	11/26-12/11	16	5	2388	11/26-12/11	16	5	2653	10/29-1/8	71	4	2846
2006-07	11/25-1/7	44	5	890	11/25-12/10	16	5	3251	11/25-12/10	16	5	3788	10/28-1/7	71	4	2720
2007-08	11/24-1/6	44	5	702	11/24-12/2	9	5	1682	11/24-12/2	9	5	2221	10/27-1/6	71	2/4	1861
2008-09	11/29-1/4	37	5	853	11/29-12/7	9	5	1712	11/29-12/7	9	5	1823	10/25-1/4	71	2/4	1938
2009-10	11/28-1/3	37	5	884	11/28-12/6	9	5	1259	11/28-12/6	9	5	2073	10/24-1/3	71	2/4	1544
2010-11	11/27-1/9	44	5	1012	11/27-12/5	9	2	903	11/27-12/5	9	5	1842	10/23-1/9	78	4	1814
2011-12	11/26-1/8	44	5	1711	11/26-12/4	9	2	1473	11/26-12/4	9	5	2525	10/22-1/8	78	4	2294
2012-13	11/24-1/6	44	5	1875	11/24-11/29	6	2	1293	11/24-11/29	6	5	1472	10/27-1/6	71	4	3171
2013-14	11/30-1/5	37	5	1038	11/30-12/5	6	2	1146	11/30-12/5	6	2	1014	10/26-1/5	71	4	2824

[a] Starting in 1997, the limit on fisher/marten became a combined limit. In years after, the combined limit for a given year is the higher of the 2 reported above (if different).

[b] In some years, otter season opens 1 week earlier in a north zone as compared to a south zone. Otter season dates in this table reflect the start of the north zone.

[c] From 2007-2009, otter limits differ between a southeast zone (limit=2; Area 8, Fig. 1) and the remainder of the open area (limit=4).

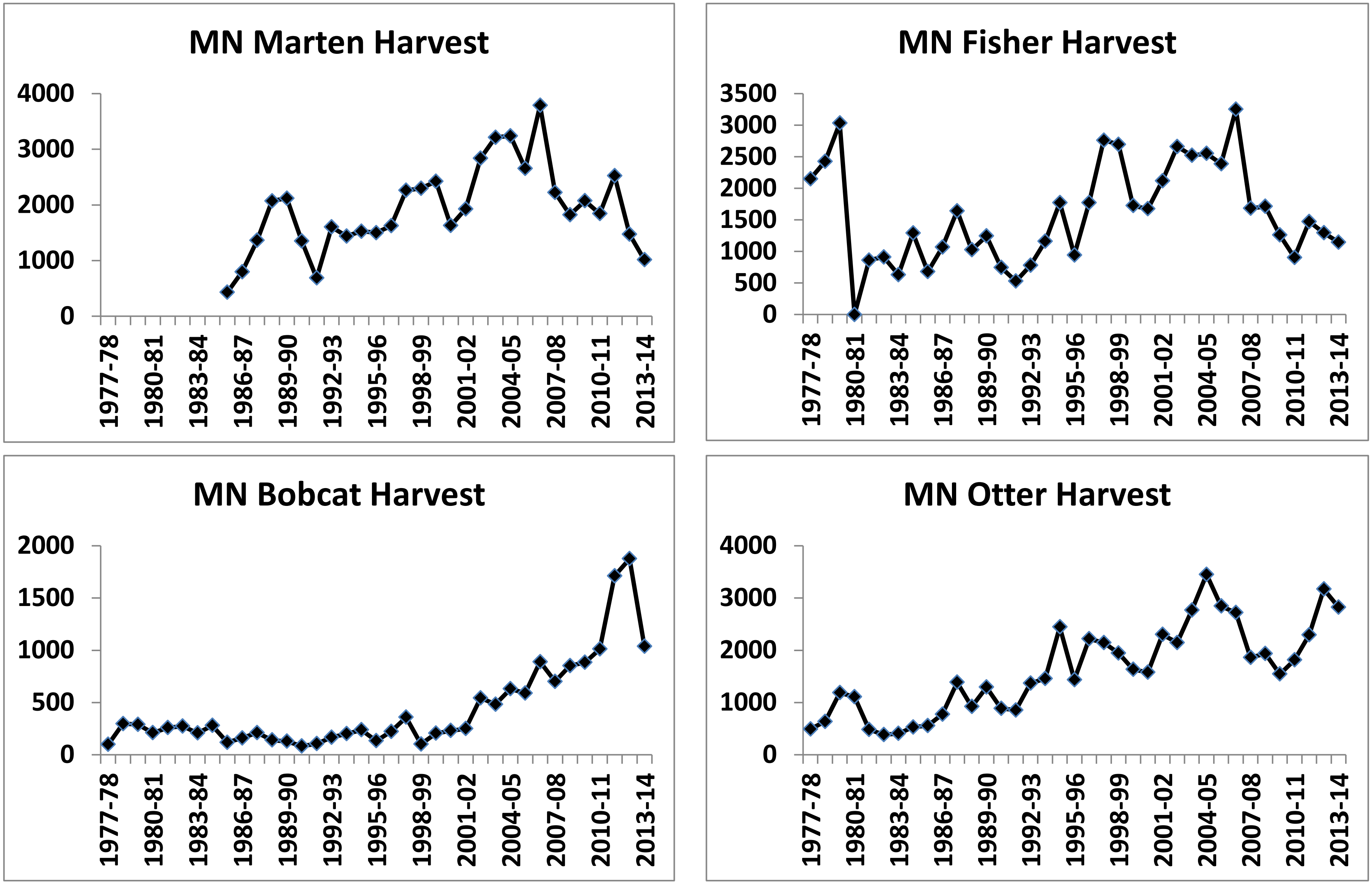

Figure 2. Harvest of registered furbearers in Minnesota, 1977-present.

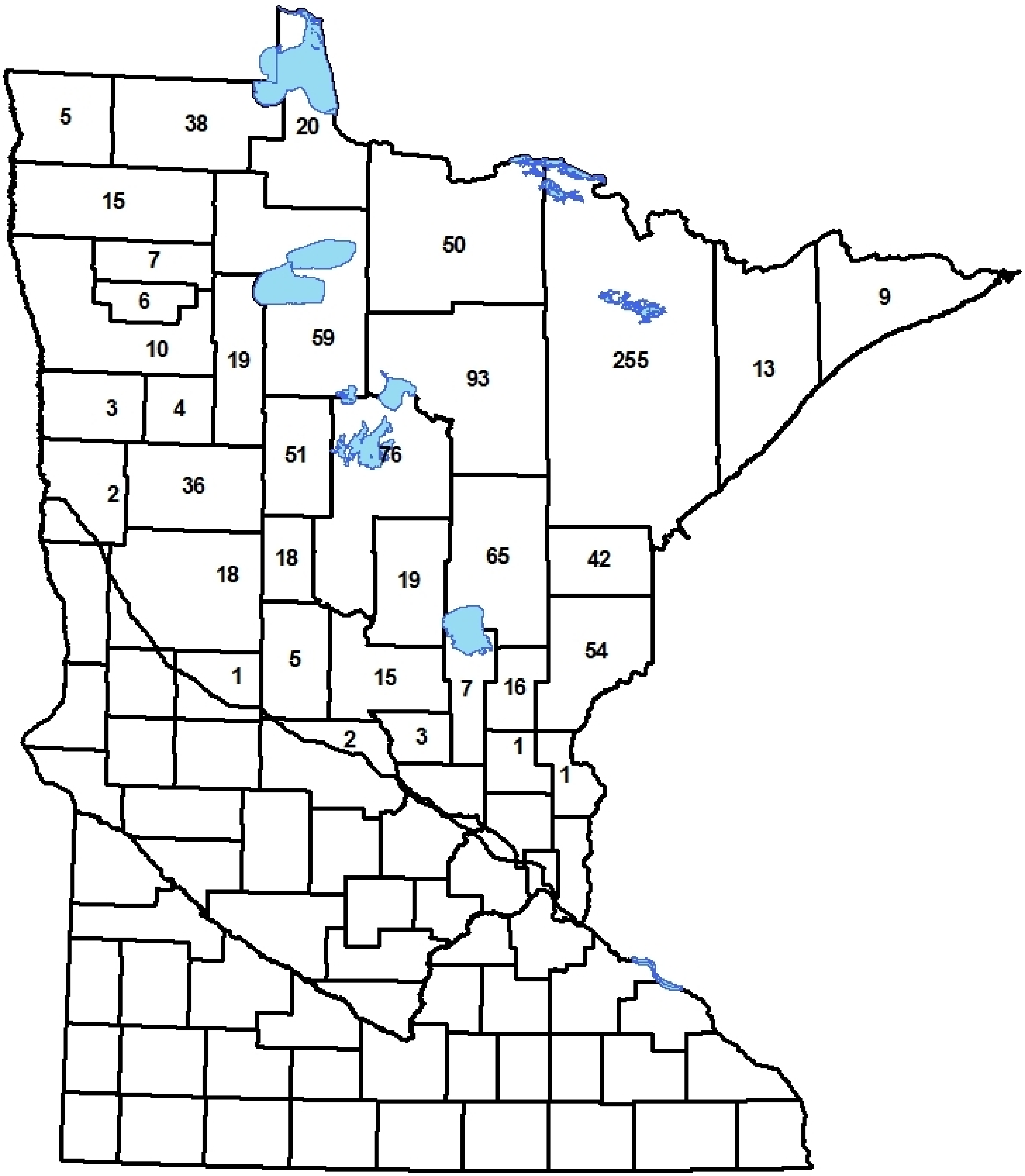

Figure 3. Bobcat harvest by county, 2013-14.

Table 2. Bobcat harvest by county and sex, 2013-14.

County	Sex* Male	Female	Unknown	Total	Harvest/ 100 Mile²
Aitkin	29	36		65	3.26
Anoka	0	0		0	0.00
Becker	15	21		36	2.49
Beltrami	32	27		59	1.93
Benton	2	1		3	0.73
Carlton	21	21		42	4.80
Cass	29	47		76	3.15
Chisago	0	1		1	0.23
Clay	1	1		2	0.19
Clearwater	11	8		19	1.85
Cook	4	5		9	0.56
Crow Wing	9	9	1	19	1.64
Douglas	1	0		1	0.14
Hubbard	26	25		51	5.10
Isanti	1	0		1	0.22
Itasca	40	53		93	3.18
Kanabec	11	5		16	3.00
Kittson	2	3		5	0.45
Koochiching	15	35		50	1.59
Lake	3	10		13	0.57
Lake of the Woods	7	12	1	20	1.12
Mahnomen	1	3		4	0.69
Marshall	6	9		15	0.83
Mille Lacs	3	4		7	1.03
Morrison	5	10		15	1.30
Norman	1	1	1	3	0.34
Otter Tail	9	9		18	0.81
Pennington	1	6		7	1.13
Pine	25	28	1	54	3.77
Polk	6	4		10	0.50
Red Lake	3	3		6	1.39
Roseau	15	23		38	2.26
St. Louis	92	163		255	3.78
Sherburne	0	0		0	0.00
Stearns	2	0		2	0.14
Todd	1	4		5	0.51
Wadena	9	9		18	3.31
Unknown	0	0		0	
Total	438	596	4	1038	

* 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, 2003-2013.

County	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Aitkin	19	37	32	46	56	64	82	73	121	142	65
Anoka	0	0	0	0	0	0	0	0	1	0	0
Becker	19	28	19	46	24	37	25	39	70	58	36
Beltrami	47	66	34	90	33	49	70	108	139	139	59
Benton	0	0	0	0	1	5	2	0	4	3	3
Carlton	20	27	25	34	25	45	44	37	94	63	42
Cass	48	56	103	137	50	98	115	117	164	150	76
Chisago	0	0	0	0	3	0	0	1	0	3	1
Clay	1	0	0	0	0	0	1	3	1	3	2
Clearwater	19	18	18	42	25	43	27	30	58	40	19
Cook	1	2	3	0	0	1	0	1	3	3	9
Crow Wing	15	19	18	27	21	36	38	29	64	65	19
Douglas	0	0	0	0	0	0	0	0	0	1	1
Hubbard	21	35	22	69	40	49	81	59	129	105	51
Isanti	2	0	1	0	0	0	0	0	0	0	1
Itasca	76	93	68	113	86	72	106	132	186	194	93
Kanabec	9	17	11	14	16	23	11	16	21	46	16
Kittson	8	6	3	5	4	9	4	9	10	7	5
Koochiching	25	14	22	16	37	31	25	54	66	82	50
Lake	0	1	2	1	0	1	2	7	15	21	13
Lake of the Woods	4	6	3	2	9	12	16	10	28	13	20
Mahnomen	3	7	2	7	8	0	4	2	9	7	4
Marshall	14	20	16	19	32	18	15	31	42	44	15
Mille Lacs	4	11	9	8	13	11	10	10	13	23	7
Morrison	14	18	18	17	23	28	13	23	25	35	15
Norman	0	0	0	1	0	0	1	0	3	6	3
Otter Tail	0	5	1	7	9	7	7	14	21	38	18
Pennington	0	6	3	2	11	9	6	5	4	13	7
Pine	44	59	47	59	87	101	49	50	94	135	54
Polk	2	4	1	3	0	4	9	9	17	20	10
Red Lake	1	0	6	1	0	0	7	16	20	25	6
Roseau	28	27	28	36	32	18	19	26	46	60	38
St. Louis	25	37	44	45	39	58	56	81	202	283	255
Sherburne	0	0	0	0	0	0	1	0	3	0	0
Stearns	0	0	0	0	1	0	0	0	0	0	2
Todd	6	5	7	12	6	14	10	9	14	16	5
Wadena	8	3	17	16	9	7	21	9	17	23	18
Unknown	0	4	7	15	2	3	7	2	7	9	0
Total	483	631	590	890	702	853	884	1012	1711	1875	1038

Table 4. Bobcat harvest by sex and week, 2013-14 season.

	Sex*				% of	Cumulative
Date	Male	Female	Unknown	Total	Total	%
Nov.30 - Dec.6	154	164	2	320	30.83	30.83
Dec.7 - Dec.13	71	98		169	16.28	47.11
Dec.14 - Dec.20	67	115		182	17.53	64.64
Dec.21 - Dec.27	73	105		178	17.15	81.79
Dec.28 - Jan.5**	64	107		171	16.47	98.27
Unknown	9	7	2	18	1.73	100.00
Total	438	596	4	1038	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, 1988-2013.

Number (%) of Takers	Number Taken					Total Takers
	1	2	3	4	5	
1988-89	88 (82)	11 (10)	7 (7)	1 (1)	1 (1)	108
1989-90	56 (69)	13 (16)	5 (6)	3 (4)	4 (5)	81
1990-91	47 (77)	9 (15)	1 (2)	4 (7)	0 (0)	61
1991-92	42 (64)	15 (23)	4 (6)	3 (5)	2 (3)	66
1992-93	69 (64)	21 (20)	9 (9)	5 (5)	2 (2)	106
1993-94	90 (70)	17 (13)	13 (10)	7 (5)	2 (2)	201
1994-95	103 (68)	25 (17)	12 (8)	6 (4)	5 (3)	151
1995-96	67 (74)	13 (14)	5 (6)	4 (4)	2 (2)	91
1996-97	115 (73)	28 (18)	85 (5)	2 (1)	4 (3)	157
1997-98	129 (61)	43 (20)	17 (8)	12 (6)	9 (5)	210
1998-99	59 (77)	11 (14)	2 (3)	3 (4)	1 (2)	76
1999-00	113 (76)	21 (14)	10 (6)	4 (3)	1(1)	149
2000-01	99 (69)	23 (16)	7 (5)	5 (4)	9 (6)	143
2001-02	101 (71)	23 (16)	12 (8)	1 (1)	5 (4)	142
2002-03	185 (60)	64 (21)	33 (10)	15 (5)	12 (4)	309
2003-04	171 (64)	40 (15)	25 (10)	20 (7)	11 (4)	267
2004-05	193 (59)	55 (17)	32 (10)	25 (7)	24 (7)	329
2005-06	198 (60)	67 (20)	33 (10)	15 (5)	18 (5)	331
2006-07	265 (57)	90 (19)	44 (9)	25 (5)	42 (9)	466
2007-08	212 (58)	71 (19)	30 (8)	16 (4)	38 (10)	367
2008-09	236 (55)	88 (21)	43 (10)	25 (6)	37 (9)	429
2009-10	223 (53)	80 (19)	40 (9)	30 (7)	51 (12)	424
2010-11	242 (50)	103 (21)	58 (12)	35 (7)	49 (10)	487
2011-12	351 (47)	126 (17)	86 (12)	62 (8)	118 (16)	743
2012-13	380 (45)	167 (20)	108 (13)	82 (10)	100 (12)	837
2013-14	350 (60)	112 (19)	51 (9)	44 (8)	26 (4)	583

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

Table 6. Bobcat harvest by method of take, 1986-2013.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
1986-87	160	119	74	89	1.3		41	26	31	1.3	
1987-88	214	177	83	118	1.5		37	17	26	1.4	
1988-89	140	94	67	76	1.2		46	33	32	1.4	
1989-90	129	90	70	49	1.8		39	30	28	1.4	
1990-91	83	61	73	43	1.4		22	27	17	1.3	
1991-92	102	59	58	31	1.9		43	42	33	1.3	
1992-93	168	133	79	85	1.6		35	21	23	1.5	
1993-94	201	147	73	88	1.7		54	27	41	1.3	
1994-95	238	189	79	120	1.6		49	21	31	1.6	
1995-96	134	73	54	53	1.4		61	46	38	1.6	
1996-97	203	133	66	91	1.5		70	34	53	1.3	
1997-98	357	313	88	176	1.8		44	12	34	1.3	
1998-99	103	95	92	67	1.4		8	8	8	1.0	
1999-00	206	155	75	114	1.4		51	25	36	1.4	
2000-01	231	140	61	85	1.6		91	39	58	1.6	
2001-02	250	208	83	116	1.8	41	42	17	27	1.6	68
2002-03	544	500	92	279	1.8	38	44	8	32	1.4	57
2003-04	483	415	86	230	1.8	46	68	14	40	1.7	65
2004-05	631	542	86	279	1.9	43	89	14	53	1.7	60
2005-06	583	435	75	250	1.7	37	148	25	85	1.7	65
2006-07	890	779	88	391	2.0	45	111	12	81	1.4	57
2007-08	702	524	75	266	2.0	40	178	25	110	1.6	48
2008-09	853	689	81	334	2.1	42	164	19	99	1.7	59
2009-10	884	736	83	340	2.2	43	148	17	91	1.6	58
2010-11	1012	817	81	372	2.2	40	195	19	123	1.6	50
2011-12	1708	1606	94	670	2.4	47	102	6	74	1.4	60
2012-13	1875	1681	90	721	2.3	46	194	10	130	1.5	52
2013-14	1038	879	85	490	1.8	40	159	15	107	1.5	55

[a] Total harvest reported here may not be equal to total harvest in other tables due to incomplete method-of-take data.

[b] Trapper/hunter reported sex ratios in this table are **NOT** adjusted according to results from DNR carcass analyses

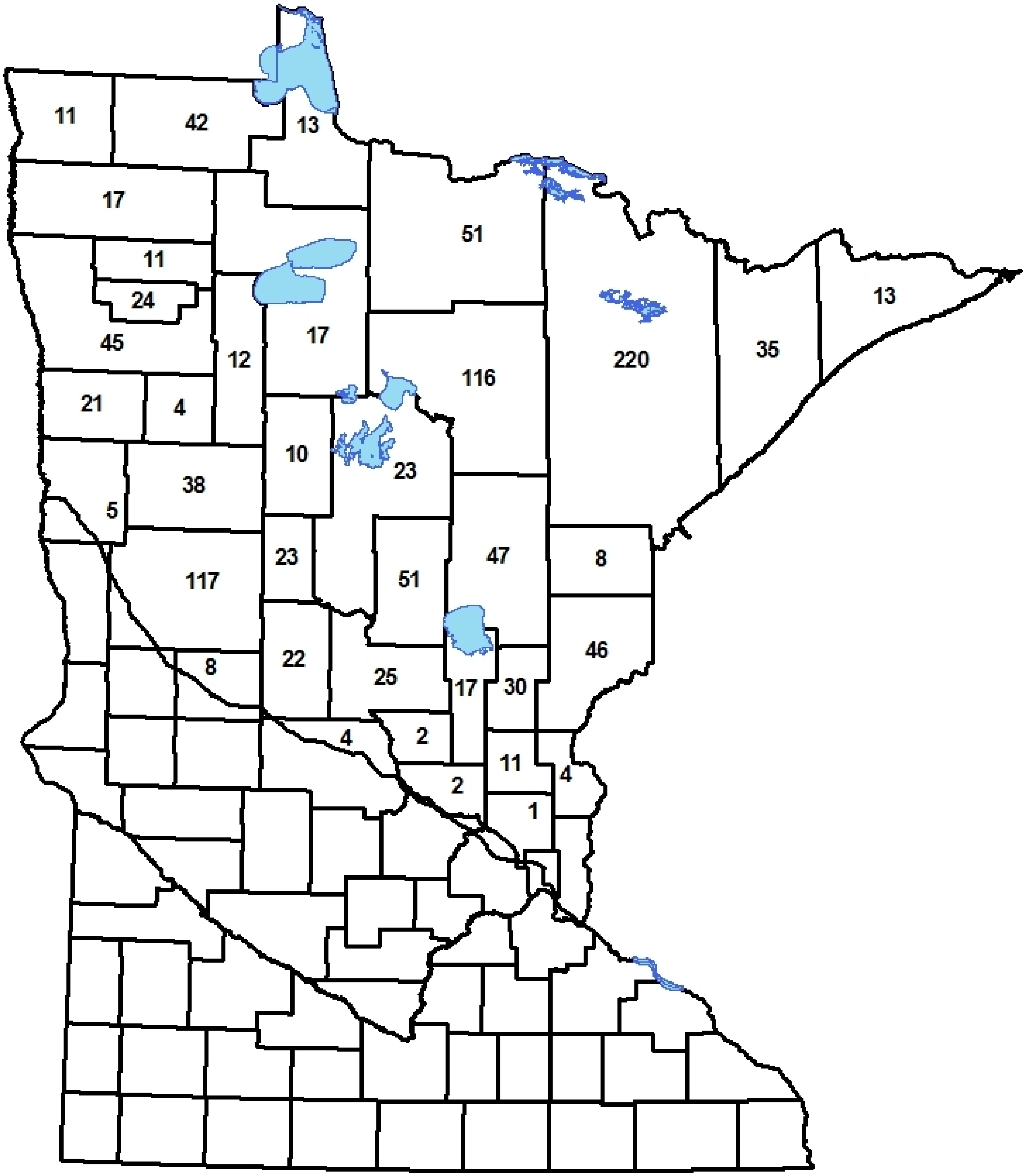

Figure 4. Fisher harvest by county, 2013.

Table 7. Fisher harvest by county and sex, 2013 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Aitkin	22	24	1	47	2.36
Anoka	1	0		1	0.22
Becker	18	20		38	2.63
Beltrami	12	5		17	0.56
Benton	1	1		2	0.48
Carlton	5	3		8	0.91
Cass	11	12		23	0.95
Chisago	3	1		4	0.90
Clay	4	1		5	0.47
Clearwater	5	7		12	1.17
Cook	7	6		13	0.81
Crow Wing	27	22	2	51	4.41
Douglas	4	4		8	1.11
Grant	0			0	0.00
Hubbard	4	6		10	1.00
Isanti	6	5		11	2.44
Itasca	55	61		116	3.97
Kanabec	16	14		30	5.63
Kittson	7	4		11	1.00
Koochiching	23	28		51	1.62
Lake	14	21		35	1.53
Lake of the Woods	9	4		13	0.73
Mahnomen	2	2		4	0.69
Marshall	9	8		17	0.94
Mille Lacs	9	8		17	2.50
Morrison	15	10		25	2.17
Norman	12	9		21	2.39
Otter Tail	57	57	3	117	5.26
Pennington	6	5		11	1.78
Pine	23	23		46	3.21
Polk	18	27		45	2.25
Red Lake	14	10		24	5.54
Roseau	24	18		42	2.50
St. Louis	107	113		220	3.27
Sherburne	1	1		2	0.44
Stearns	2	2		4	0.29
Todd	12	10		22	2.25
Wadena	15	8		23	4.23
Washington	0	0		0	0.00
Wilkin	0	0		0	0.00
Unknown	0	0		0	
Total	580	560	6	1,146	

Table 8. Comparison of fisher harvest by county, 2002-2013.

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aitkin	122	124	96	97	156	67	75	50	35	55	52	47
Anoka	0	1	0	0	0	0	2	0	0	1	2	1
Becker	96	88	92	49	87	57	36	44	30	32	45	38
Beltrami	117	74	71	47	54	40	15	22	10	25	21	17
Benton	0	1	0	1	1	0	3	2	0	5	5	2
Carlton	48	42	40	35	49	13	19	15	12	12	14	8
Cass	225	205	186	149	209	80	77	57	43	41	37	23
Chisago	6	5	6	2	18	7	4	10	6	10	3	4
Clay	0	0	0	0	1	0	3	0	6	10	6	5
Clearwater	45	52	41	35	54	19	37	13	6	8	5	12
Cook	27	28	24	40	35	29	10	11	17	28	11	13
Crow Wing	106	106	113	79	140	81	116	42	48	64	55	51
Douglas	0	3	3	3	6	2	5	2	6	15	24	8
Grant	0	0	0	0	0	0	0	0	1	0	0	0
Hubbard	59	62	32	20	51	20	38	18	13	10	11	10
Isanti	0	0	2	3	5	1	5	9	1	4	6	11
Itasca	354	319	323	320	405	195	195	166	88	142	105	116
Kanabec	19	21	13	15	26	11	26	20	13	21	27	30
Kittson	3	11	2	7	2	5	8	5	7	5	9	11
Koochiching	178	171	179	209	221	105	115	96	51	116	80	51
Lake	72	74	87	85	87	49	54	49	45	56	53	35
Lake of the Woods	115	78	33	63	74	17	42	21	9	33	21	13
Mahnomen	16	14	13	9	27	25	6	3	0	3	0	4
Marshall	18	21	25	18	26	19	26	6	7	13	14	17
Mille Lacs	16	22	14	16	20	15	17	18	18	17	20	17
Morrison	6	3	7	5	23	21	14	10	8	10	24	25
Norman	1	1	11	6	4	9	12	7	4	10	19	21
Otter Tail	12	40	52	60	158	110	152	67	100	138	121	117
Pennington	10	18	42	22	22	16	8	2	4	8	8	11
Pine	44	54	56	42	82	39	74	30	26	22	42	46
Polk	46	65	47	38	72	61	49	31	25	54	58	45
Red Lake	15	16	29	34	32	29	23	23	10	17	16	24
Roseau	106	141	114	110	127	84	89	58	20	79	61	42
St. Louis	734	611	740	688	898	407	283	296	186	350	233	220
Sherburne	0	2	0	0	0	0	0	3	1	6	2	2
Stearns	0	0	1	0	0	0	1	1	0	4	1	4
Todd	5	14	18	23	21	13	33	22	18	15	29	22
Wadena	39	32	31	40	44	27	37	23	23	31	25	23
Washington	0	0	0	0	0	1	0	0	0	1	1	0
Wilkin	0	0	0	0	0	0	0	0	0	1	0	0
Unknown	0	2	9	18	14	8	3	7	6	1	27	0
Total	2,660	2,521	2,552	2,388	3,251	1,682	1,712	1,259	903	1,473	1,293	1,146

Table 9. Fisher harvest by date and sex, 2013 season.

	Sex				% of Known	Cumulative
Date	Male	Female	Unknown	Total	Total	%
Nov. 30	5	4		9	0.79	0.79
Dec. 1	149	152		301	26.27	27.05
Dec. 2	196	175	4	375	32.72	59.77
Dec. 3	128	124	1	253	22.08	81.85
Dec. 4	58	61	1	120	10.47	92.32
Dec. 5	31	27		58	5.06	97.38
Unknown	13	17		30	2.62	100%
Total	580	560	6	1,146	100%	

Table 10. Distribution of fisher harvest* among trappers, 1993-2013.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993	239 (34)	460 (66)	----	----	----	699	1.7
1994	321 (31)	725 (69)	----	----	----	1046	1.7
1995	232 (40)	355 (60)	----	----	----	587	1.6
1996	321 (31)	726 (69)	----	----	----	1047	1.7
1997	351 (23)	1205 (77)	----	----	----	1556	1.8
1998	443 (28)	1141 (72)	----	----	----	1584	1.7
1999	397 (37)	664 (63)	----	----	----	1061	1.6
2000	301(38)	251 (31)	129 (16)	121 (15)	----	802	2.1
2001	294 (33)	271 (31)	146 (17)	168 (19)	----	879	2.2
2002	336 (35)	234 (25)	138 (15)	117 (12)	123 (13)	948	1.8
2003	403 (39)	249 (24)	150 (15)	107 (11)	115 (11)	1024	1.7
2004	390 (37)	260 (25)	184 (17)	95 (9)	132 (12)	1061	1.7
2005	407 (40)	251 (24)	150 (15)	102 (10)	118 (11)	1028	1.7
2006	510 (37)	328 (24)	208 (15)	150 (11)	171 (13)	1367	1.7
2007	416 (50)	193 (23)	104 (12)	68 (8)	57 (7)	838	1.7
2008	382 (48)	182 (23)	91 (11)	65 (8)	79 (10)	799	1.6
2009	372 (55)	156 (23)	69 (10)	42 (6)	38 (6)	677	1.6
2010	330 (54)	279 (46)	----	----	----	609	1.5
2011	553 (55)	451 (45)	----	----	----	1004	1.4
2012	453 (52)	415 (48)	----	----	----	868	1.5
2013	501 (61)	316 (39)	----	----	----	817	1.4

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

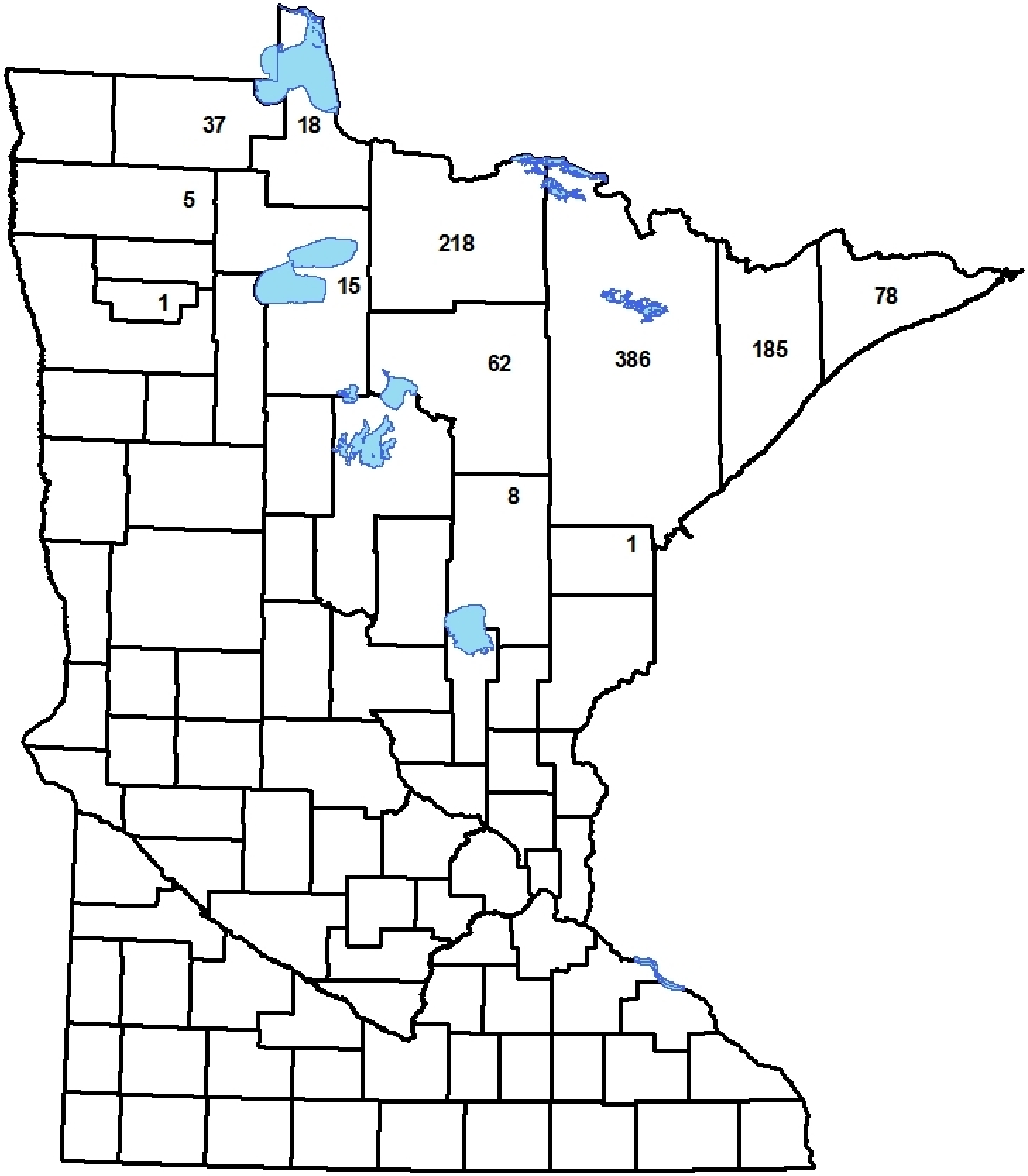

Figure 5. Marten harvest by county, 2013.

Table 11. Marten harvest by county and sex, 2013 season.

County	Sex			Total	Harvest/ 100 Mile^2
	Male	Female	Unknown		
Aitkin	4	4		8	0.40
Beltrami	8	7		15	0.49
Carlton	0	1		1	0.11
Cass	0	0		0	0.00
Clearwater	0	0		0	0.00
Cook	59	19		78	4.86
Crow Wing	0	0		0	0.00
Itasca	43	19		62	2.12
Kanabec	0	0		0	0.00
Kittson	0	0		0	0.00
Koochiching	129	89		218	6.91
Lake	111	74		185	8.09
Lake of the Woods	17	1		18	1.01
Mahnomen	0	0		0	0.00
Marshall	3	2		5	0.28
Pennington	0	0		0	0.00
Pine	0	0		0	0.00
Red Lake	1	0		1	0.23
Roseau	25	12		37	2.20
St. Louis	233	153		386	5.73
Unknown	0	0		0	
Total	633	381	0	1,014	

Table 12. Comparison of marten harvest by county in Minnesota, 2002-2013.

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aitkin	5	6	6	6	13	4	12	5	4	13	10	8
Beltrami	30	38	65	17	19	8	6	10	2	11	20	15
Carlton	4	11	1	10	6	1	4	8	5	6	3	1
Cass	3	2	3	1	4	0	1	2	1	2	0	0
Clearwater	0	1	1	0	0	0	0	0	0	0	0	0
Cook	228	411	318	369	446	269	151	244	191	205	148	78
Crow Wing	0	0	0	0	0	0	0	1	0	1	0	0
Itasca	147	141	136	98	155	74	72	91	73	118	46	62
Kanabec	0	0	0	0	2	0	0	0	0	0	0	0
Kittson	0	0	0	0	0	0	0	0	1	0	4	0
Koochiching	525	534	549	418	592	348	300	354	336	516	276	218
Lake	492	541	551	536	892	520	438	496	491	577	290	185
Lake of the Woods	104	71	122	54	46	31	17	17	13	49	32	18
Mahnomen	0	0	2	0	0	0	0	0	0	0	0	0
Marshall	1	1	5	3	0	1	0	4	0	3	3	5
Pennington	0	0	0	0	0	1	0	0	0	0	0	0
Pine	0	1	2	1	1	1	0	0	1	0	0	0
Red Lake	0	0	0	0	0	0	0	0	0	0	1	1
Roseau	116	104	127	51	31	69	46	32	13	98	77	37
St. Louis	1,184	1,352	1,346	1,065	1,579	885	769	803	709	926	562	386
Unknown	0	0	7	24	2	9	7	6	2	0	0	0
Total	2,839	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842	2,525	1,472	1,014

Table 13. Marten harvest by date and sex, 2013 season.

Date	Sex			Total	% of Known	Cumulative
	Male	Female	Unknown		Total	%
Nov. 24	4	1		5	0.49	0.49
Nov. 25	190	106		296	29.19	29.68
Nov. 26	165	118		283	27.91	57.59
Nov. 27	125	65		190	18.74	76.33
Nov. 28	75	47		122	12.03	88.36
Nov. 29	62	41		103	10.16	98.52
Unknown	12	3		15	1.48	100%
Total	633	381	0	1,014	100%	

Table 14. Distribution of marten harvest* among trappers, 1993-2013.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
1993	76 (10)	681 (90)	----	----	----	757	1.9
1994	165 (20)	681 (80)	----	----	----	846	1.8
1995	78 (10)	711 (90)	----	----	----	789	1.9
1996	157 (18)	734 (82)	----	----	----	891	1.8
1997	161 (13)	1050 (87)	----	----	----	1211	1.9
1998	187 (15)	1056 (85)	----	----	----	1243	1.8
1999	164 (17)	318 (34)	213 (23)	246 (26)	----	941	2.6
2000	188 (28)	190 (28)	123 (18)	173 (26)	----	674	2.4
2001	147 (23)	175 (27)	138 (21)	187 (29)	----	647	2.6
2002	149 (21)	138 (19)	147 (21)	123 (17)	160 (22)	717	1.9
2003	126 (15)	135 (16)	159 (19)	170 (20)	265 (31)	855	1.8
2004	165 (17)	153 (16)	171 (18)	164 (18)	282 (30)	935	1.8
2005	191 (22)	158 (18)	139 (16)	156 (18)	215 (25)	859	1.8
2006	206 (18)	201 (17)	226 (19)	203 (17)	335 (29)	1171	1.8
2007	176 (23)	160 (21)	147 (19)	141 (18)	142 (19)	766	2.0
2008	153 (24)	139 (22)	108 (17)	110 (17)	122 (19)	632	1.9
2009	121 (19)	105 (16)	106 (17)	134 (21)	173 (27)	639	1.9
2010	95 (17)	77 (14)	120 (22)	92 (17)	170 (31)	554	1.8
2011	154 (19)	131 (16)	179 (22)	166 (20)	181 (22)	811	2.0
2012	198 (33)	134 (22)	131 (22)	73 (12)	64 (11)	600	1.9
2013	341 (51)	332 (49)	----	----	----	673	1.5

* 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, 2013. (Combined limit = 2)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		190	331			
	1	350	151				
	2	315					
	3						
	4						
	5				Total takers of at least 1 fisher or marten		1337

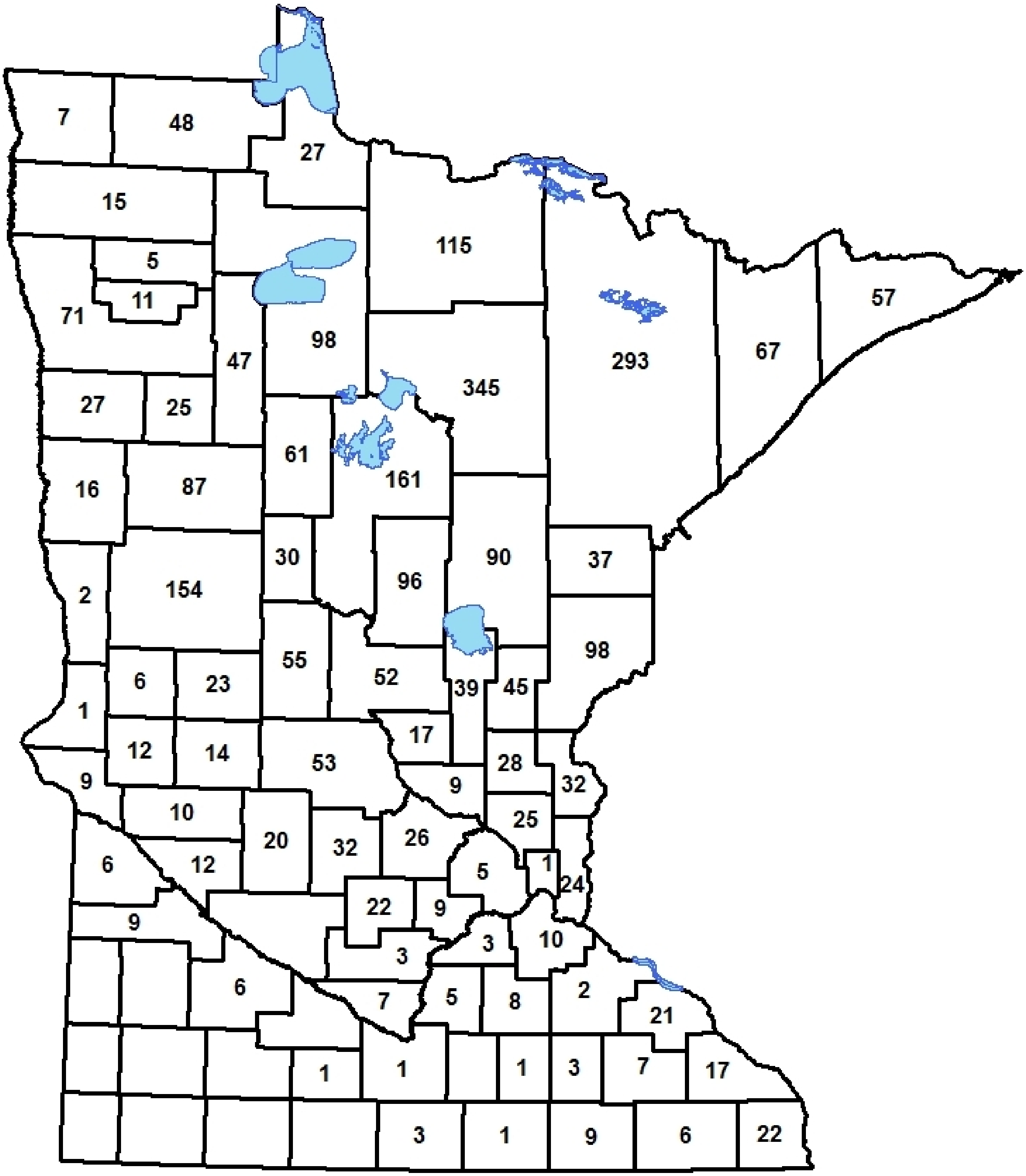

Figure 6. Otter harvest by county, 2013-14.

Table 16. Otter harvest by county and sex, 2013-14 season.

County	Sex: Male	Sex: Female	Sex: Unknown	Total	Harvest/ 100 Mile[2]
Aitkin	58	32		90	4.51
Anoka	14	11		25	5.61
Becker	53	34		87	6.02
Beltrami	53	44	1	98	3.21
Benton	11	6		17	4.12
Big Stone	5	4		9	1.70
Blue Earth	1	0		1	0.13
Carlton	20	17		37	4.23
Carver	7	2		9	2.40
Cass	99	60	2	161	6.67
Chippewa	8	4		12	2.04
Chisago	19	13		32	7.24
Clay	6	10		16	1.52
Clearwater	27	20		47	4.56
Cook	37	20		57	3.55
Crow Wing	57	39		96	8.30
Dakota	5	5		10	1.71
Dodge	2	1		3	0.68
Douglas	11	11	1	23	3.19
Faribault	1	2		3	0.42
Fillmore	4	2		6	0.70
Freeborn	0	1		1	0.14
Goodhue	0	2		2	0.26
Grant	2	4		6	1.04
Hennepin	3	2		5	0.82
Houston	9	13		22	3.87
Hubbard	24	37		61	6.10
Isanti	8	20		28	6.21
Itasca	148	197		345	11.79
Kanabec	13	32		45	8.44
Kandiyohi	8	11	1	20	2.32
Kittson	2	5		7	0.63
Koochiching	49	66		115	3.65
Lac Qui Parle	4	2		6	0.77
Lake	33	34		67	2.93
Lake of the Woods	9	16	2	27	1.52
Le Sueur	1	4		5	1.06
Lincoln	0	0		0	0.00
McLeod	11	11		22	4.35
Mahnomen	11	14		25	4.28
Marshall	7	7	1	15	0.83
Martin	0	0		0	0.00
Meeker	14	18		32	4.97
Mille Lacs	17	22		39	5.73
Morrison	21	31		52	4.51
Mower	2	7		9	1.27
Nicollet	3	4		7	1.50
Norman	14	13		27	3.08
Olmsted	4	3		7	1.07
Otter Tail	70	82	2	154	6.92
Pennington	2	3		5	0.81
Pine	47	50	1	98	6.84
Polk	34	37		71	3.55
Pope	8	6		14	1.95
Ramsey	0	1		1	0.59
Red Lake	4	7		11	2.54

Table 16 (continued). Otter harvest by county and sex, 2013-14 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Redwood	1	5		6	0.68
Renville	0	0		0	0.00
Rice	1	7		8	1.55
Rock	0	0		0	0.00
Roseau	25	23		48	2.86
St. Louis	119	173	1	293	4.35
Scott	1	2		3	0.82
Sherburne	3	6		9	2.00
Sibley	0	3		3	0.50
Stearns	25	28		53	3.81
Steele	1	0		1	0.23
Stevens	5	7		12	2.08
Swift	3	7		10	1.33
Todd	24	30	1	55	5.62
Traverse	0	1		1	0.17
Wabasha	8	13		21	3.82
Wadena	14	16		30	5.52
Washington	6	18		24	5.67
Watonwan	1	0		1	0.23
Wilkin	2	0		2	0.27
Winona	8	9		17	2.65
Wright	11	15		26	3.64
Yellow Medicine	3	6		9	1.18
Unknown	1	1		2	
Total	1,342	1,469	13	2,824	

Table 17. Comparison of otter harvest by county, 2002-2013.

County	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Aitkin	78	87	113	132	124	53	65	54	59	107	111	90
Anoka	17	13	32	22	16	26	18	26	8	13	31	25
Becker	104	105	178	107	117	54	55	39	53	95	127	87
Beltrami	127	173	216	170	154	105	80	74	77	112	120	98
Benton	6	7	19	14	16	9	11	3	13	13	21	17
Big Stone	0	0	0	0	0	0	2	1	0	3	3	9
Blue Earth	0	0	0	0	0	0	0	0	0	2	3	1
Carlton	40	38	53	36	39	36	29	30	35	29	38	37
Carver	0	0	0	0	0	2	5	6	5	15	8	9
Cass	189	198	255	231	236	124	160	90	135	140	183	161
Chippewa	0	0	0	0	0	0	0	0	5	7	8	12
Chisago	18	22	20	28	33	16	15	18	23	19	24	32
Clay	7	7	15	18	35	8	14	7	23	42	23	16
Clearwater	61	52	62	48	41	39	35	19	38	41	46	47
Cook	31	41	56	46	39	13	12	16	19	36	55	57
Crow Wing	108	119	141	102	111	63	99	76	66	107	117	96
Dakota	0	0	0	0	0	0	5	7	1	0	11	10
Dodge	0	0	0	0	0	0	0	0	3	1	1	3
Douglas	0	12	27	16	30	18	28	11	14	34	37	23
Faribault	0	0	0	0	0	0	0	0	0	1	12	3
Fillmore	0	0	0	0	0	6	1	1	5	5	10	6
Freeborn	0	0	0	0	0	0	0	0	5	10	10	1
Goodhue	0	0	0	0	0	3	3	7	11	7	18	2
Grant	0	0	0	0	0	3	3	6	1	8	12	6
Hennepin	0	0	0	0	0	1	3	6	2	3	4	5
Houston	0	0	0	0	0	9	15	11	11	10	26	22
Hubbard	64	70	91	80	72	59	72	41	52	42	67	61
Isanti	33	27	35	38	30	30	17	18	14	9	18	28
Itasca	310	382	483	362	334	205	201	191	247	281	346	345
Kanabec	40	38	57	79	62	44	29	23	17	22	52	45
Kandiyohi	0	0	0	0	0	2	6	6	8	8	10	20
Kittson	2	3	3	3	5	11	2	3	8	2	9	7
Koochiching	96	164	167	131	118	70	95	61	81	62	127	115
Lac Qui Parle	0	0	0	0	0	0	0	0	2	6	15	6
Lake	57	81	88	65	60	35	34	45	28	36	66	67
Lake of the Woods	21	42	31	34	24	30	17	8	15	27	27	27
Le Sueur	0	0	0	0	0	0	0	0	3	0	9	5
Lincoln	0	0	0	0	0	0	0	0	0	0	4	0
McLeod	0	0	0	0	0	6	6	8	12	18	19	22
Mahnomen	7	23	24	29	26	24	7	7	9	20	15	25
Marshall	35	34	29	18	7	6	2	0	13	13	15	15

Table 17 (continued). Comparison of otter harvest by county, 2002-2013.

County	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Martin	0	0	0	0	0	0	0	0	0	0	1	0
Meeker	0	0	0	0	0	13	13	16	12	28	19	32
Mille Lacs	22	33	48	51	21	33	26	28	19	15	30	39
Morrison	36	46	64	77	60	45	43	31	29	29	52	52
Mower	0	0	0	0	0	0	0	0	8	20	14	9
Nicollet	0	0	0	0	0	0	0	0	2	1	5	7
Norman	4	1	16	17	11	9	17	11	12	21	45	27
Olmsted	0	0	0	0	0	0	2	3	2	3	0	7
Otter Tail	32	45	113	85	81	50	82	32	65	109	173	154
Pennington	12	16	18	33	15	9	0	1	4	2	12	5
Pine	61	78	99	51	111	50	74	37	38	44	66	98
Polk	63	72	104	45	47	32	25	19	36	49	83	71
Pope	0	0	0	0	0	11	12	12	11	20	22	14
Ramsey	0	0	0	0	0	0	0	0	0	0	3	1
Red Lake	27	35	58	26	30	19	8	20	22	19	26	11
Redwood	0	0	0	0	0	0	0	0	0	2	4	6
Renville	0	0	0	0	0	0	0	0	0	1	6	0
Rice	0	0	0	0	0	0	0	0	1	9	4	8
Rock	0	0	0	0	0	0	0	0	0	0	2	0
Roseau	27	72	69	60	53	32	53	23	32	33	64	48
St. Louis	316	483	508	428	344	290	251	233	253	239	363	293
Scott	0	0	0	0	0	3	3	1	4	2	4	3
Sherburne	11	24	25	15	29	26	10	17	7	19	12	9
Sibley	0	0	0	0	0	0	0	0	6	6	6	3
Stearns	17	13	22	21	33	9	38	24	13	41	53	53
Steele	0	0	0	0	0	0	0	0	1	0	3	1
Stevens	0	0	0	0	0	1	3	1	6	1	3	12
Swift	0	0	0	0	0	9	4	5	2	11	10	10
Todd	30	49	53	63	81	35	37	32	41	63	55	55
Traverse	0	0	0	0	0	1	0	2	0	1	4	1
Wabasha	0	0	0	0	0	15	7	18	7	8	20	21
Wadena	23	35	34	38	32	15	19	15	16	20	43	30
Washington	12	10	8	11	16	18	19	11	16	18	12	24
Watonwan	0	0	0	0	0	0	0	0	0	0	0	1
Wilkin	0	0	0	0	0	2	0	0	0	0	3	2
Winona	0	0	0	0	0	11	19	13	15	20	21	17
Wright	1	2	3	2	5	7	9	8	11	17	23	26
Yellow Medicine	0	0	0	0	0	0	0	0	0	0	7	9
Unknown	0	14	13	14	22	6	18	12	2	17	40	2
Totals	2,145	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814	2,294	3,171	2,824

Table 18. Otter harvest by sex and week, 2013-14 season.

Date	Sex			Total	% of	Cumulative
	Male	Female	Unknown	Harvest	Total	%
Oct.26 - Nov.1	177	126	1	304	10.76	10.76
Nov.2 - Nov.8	397	306	5	708	25.07	35.84
Nov.9 - Nov.15	313	185		498	17.63	53.47
Nov.16 - Nov.22	198	173		371	13.14	66.61
Nov.23 - Nov.29	159	122	1	282	9.99	76.59
Nov.30 - Dec.6	165	113	5	283	10.02	86.61
Dec.7 - Dec.13	52	56	1	109	3.86	90.47
Dec.14 - Dec.20	68	32		100	3.54	94.02
Dec.21 - Dec.27	59	35		94	3.33	97.34
Dec.28 - Jan.5*	33	31		64	2.27	99.61
Unknown	8	3		11	0.39	100%
Total	1,629	1,182	13	2,824	100%	

* 9-day interval.

Table 19. Distribution of otter harvest* among trappers, 1993-2013.

Number (%) of Takers	Number Taken				Total Takers	Ave. Take
	1	2	3	4		
1993-94	193 (33)	115 (19)	100 (17)	184 (31)	592	2.5
1994-95	250 (27)	185 (20)	143 (15)	349 (38)	927	2.6
1995-96	183 (31)	134 (23)	88 (15)	180 (31)	585	2.5
1996-97	257 (29)	205 (23)	140 (16)	283 (32)	885	2.5
1997-98	304 (33)	235 (26)	117 (13)	255 (28)	911	2.4
1998-99	263 (32)	183 (23)	139 (17)	226 (28)	811	2.4
1999-00	222 (33)	124 (19)	99 (15)	217 (33)	662	2.5
2000-01	206 (32)	122 (19)	108 (17)	201 (32)	637	2.5
2001-02	147 (23)	175 (27)	138 (21)	187 (29)	647	2.6
2002-03	253 (33)	147 (19)	122 (16)	241 (32)	763	2.5
2003-04	269 (27)	201 (20)	152 (16)	361 (37)	983	2.6
2004-05	302 (25)	235 (19)	182 (15)	498 (41)	1217	2.7
2005-06	291 (27)	213 (20)	186 (17)	386 (36)	1076	2.6
2006-07	372 (34)	216 (19)	194 (17)	328 (30)	1110	2.4
2007-08	308 (39)	153 (19)	119 (15)	207 (26)	787	2.3
2008-09	293 (37)	157 (20)	121 (15)	216 (27)	787	2.3
2009-10	237 (38)	131 (21)	93 (15)	171 (27)	632	2.3
2010-11	263 (34)	166 (22)	130 (17)	206 (27)	765	2.4
2011-12	438 (42)	227 (22)	149 (14)	236 (22)	1050	2.2
2012-13	468 (35)	330 (24)	175 (13)	376 (28)	1349	2.3
2013-14	561 (43)	291 (22)	196 (15)	271 (21)	1319	2.1

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