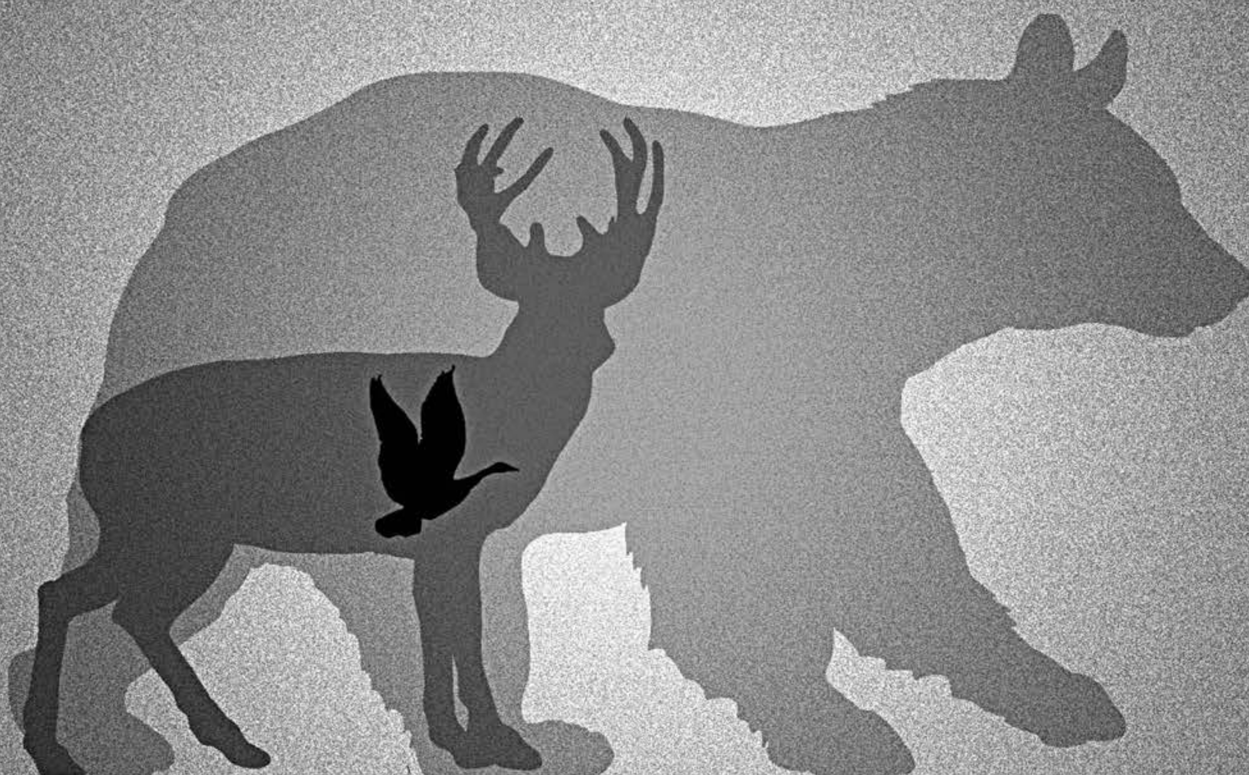

Status of Wildlife Populations

Fall 2015

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

MNDNR

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STATUS OF WILDLIFE POPULATIONS, FALL 2015

(Including 2005-2015 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 2015

(Including 2005-2015 Hunting and Trapping Harvest Statistics)

This is the 39th 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. The white-tailed deer aerial population survey was not flown in 2015 due to poor snow conditions. A wolf population survey was conducted in winter 2014-15 and is included in this report. 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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2015 MINNESOTA AUGUST ROADSIDE SURVEY

Nicole M. Davros, Farmland Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Mild winter conditions and relatively favorable spring and summer weather led to increases in the 2015 population indices for ring-necked pheasants, gray partridge, eastern cottontails, and mourning doves; however, all indices remain below the long-term averages. The white-tailed jackrabbit index was similar to 2014 and remains at a historic low. The population index for white-tailed deer was similar to 2014 and remains well above the long-term average. The index for total sandhill cranes increased but the index for juvenile cranes was similar to 2014.

Conservation Reserve Program (CRP) enrollment declined by 153,492 acres statewide since 2014. Increases in enrollment of other farm programs and acquisition of public lands continued to only partially offset CRP losses, yielding a net loss of 127,646 acres of protected wildlife habitat statewide last year. Within the pheasant range, there was a net loss of 4,353 acres of set-aside habitat. The winter of 2014-15 was milder than normal across all regions. Spring and early summer temperatures and precipitation amounts were normal to near-normal with the exception of May, which was slightly colder than normal and had variable rainfall amounts across the farmland zone. Overall, conditions for overwinter survival were above average and nesting season conditions were favorable for nesting birds.

The 2015 range-wide pheasant index (40.7 birds/100 mi) increased 33% from 2014 but was 39% below the 10-year average and 59% below the long-term average. Minnesota's pheasant population has declined since the mid-2000s in association with the loss of CRP acres, and indices over the past 5 years are comparable to the indices calculated in the mid-1980s. The hen index (6.1 hens/100 mi) increased 32% from 2014 but was 40% below the 10-year average. The cock index (4.9 cocks/100 mi) increased 8% from 2014 but also remained 40% below the 10-year average. The hen:cock ratio (1.27) was greater than the 2014 ratio (0.99) and closer to the average ratio (1.42) for the CRP years. The pheasant brood index (6.3 broods/100 mi) increased 35% from last year but remained 38% below the 10-year average and 51% below the long-term average. Average brood size in 2015 (4.7 chicks/brood) was similar to 2014 and the 10-year average but 14% below the long-term average (5.5 chicks/brood). The median hatch date for pheasants was 9 June 2015, which is 3 days earlier than the 10-year average. The best opportunity for harvesting roosters should be in the Southwest, West Central, and East Central regions.

The gray partridge index (2.3 birds/100 miles) increased 150% from 2014 but remains well below the 10-year and long-term averages (-44% and -83%, respectively). Partridge counts were highest in the Southeast and South Central regions. The eastern cottontail rabbit index (7.1 rabbits/100 mi) was 36% greater than last year, 34% above the 10-year average, and 20% above the long-term average. The cottontail indices were highest in the Southeast, South Central, Southwest, and East Central regions. The white-tailed jackrabbit index (0.1 rabbits/100 mi) did not change from last year and is 95% below the long-term average. The jackrabbit population peaked in the 1950s but declined to low levels in the 1980s with changes in agricultural land use and has not recovered. The white-tailed deer index (21.2 deer/100 mi) was similar to 2014, 33% above the 10-year average, and 98% above the long-term average. The mourning dove index (184.2 doves/100 mi) was 14% greater than 2014 but 13% and 27% below the 10-year and long-term averages, respectively. Mourning dove counts were highest in the Southwest, West Central, and South Central regions. Rangewide, the total

sandhill crane index (14.7 total cranes/100 mi) increased 64% from 2014 and the juvenile index (1.2 juvenile cranes/100 mi) was similar to 2014.

INTRODUCTION

This report summarizes the 2015 Minnesota August Roadside Survey (ARS). The ARS is conducted annually during the first two weeks of August by Minnesota Department of Natural Resources (MNDNR) wildlife and enforcement personnel throughout Minnesota's farmland regions (Figure 1). The 2015 ARS consisted of 170 25-mile routes (1-4 routes/county); 151 routes were located in the ring-necked pheasant range.

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

HABITAT CONDITIONS

Undisturbed grassland habitat acres in Minnesota's farmland landscape continued to decline considerably last year. Conservation Reserve Program (CRP) enrollment declined by 153,492 acres statewide. Losses of CRP were more extensive in northwestern Minnesota's prairie chicken range (-130,540 acres) compared to the pheasant range (-23,116 acres). Acres enrolled in the Conservation Reserve Enhancement Program (CREP) held nearly steady whereas acres enrolled in Reinvest in Minnesota (RIM), Wetlands Reserve Program (WRP), and RIM-WRP increased slightly last year. Combined with acquisitions of state-owned Wildlife Management Areas (WMA) and federally-owned Waterfowl Production Areas (WPA), these gains only partially offset CRP losses, yielding a net loss of 127,646 acres statewide last year. The net loss of protected habitat in Minnesota's pheasant range was 4,353 acres. Similar to 2014, remaining protected habitat accounts for 5.9% of the landscape within the pheasant range (range: 3.1-9.6; Table 1).

Protecting grassland and wetland habitat remains one of the most critical environmental challenges facing Minnesota. Farm programs, especially CRP, make up the largest portion of protected grasslands in the pheasant range (Figure 2). Expiring CRP contracts continue to be a concern for future wildlife populations, with major losses yet to come (>495,000 acres in Minnesota scheduled to expire by fall 2018). Funding from the Legacy Amendment has helped accelerate acquisition of WMAs and WPAs throughout Minnesota's farmland zone, but not at a pace that can keep up with the loss of CRP acres. Minnesota's Prairie Conservation Plan has provided a blueprint for moving forward with conservation strategies and is being carried out through local technical teams (LTTs) 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 2015. The 2012 Minnesota Legislature established a Walk-in Access (WIA) program to provide public access to wildlife habitat on private land for hunting. The WIA program compensates landowners for providing hunter access through an agreement with MNDNR Wildlife. In August 2015, the U.S. Department of Agriculture (USDA) awarded a 3-year, $1.67 million grant which will help continue funding of the WIA program. For the 2015-2016 hunting season, 22,800 acres of private land across 200 sites in the West Central, Central, Southwest, and South Central regions are enrolled in the WIA program. Walk-in Access sites are open for public hunting from September 1 – May 31 where boundary signs are present. Hunters must purchase 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.

WEATHER SUMMARY

Minnesota's winter 2014-2015 was generally mild with warmer and drier than normal conditions across much of the farmland zone. November storms brought deeper snow (>6 inches) to some areas of the pheasant range, including West Central, Central, and East Central Minnesota (Minnesota Climatology Working Group [MCWG], Weekly snow depth maps), and temperatures were 8.0° F colder than normal across all regions in the farmland zone (MCWG Climate Summary). However, temperatures were 5.5° F and 3.5° F warmer than normal in December and January, respectively, and snow cover never exceeded 4 inches except in the Northwest during these months. February was 9.7° F colder than normal, on average. No region in the farmland zone had continuous deep snow cover for more than 2 weeks at a time during winter 2014-2015 except for the Northwest region which had deeper snow cover in some areas during January and February. Storms brought several inches of snow during the first and third weeks of March, but warmer than normal temperatures (average = 2.6° F above normal) melted the snow quickly.

Spring temperatures and precipitation were variable from April through June. April was slightly warmer and drier than normal (1.7° F above normal; 0.65 inches below normal). May was slightly colder than normal (-0.8° F below normal) with highly variable precipitation patterns across the farmland zone. The East Central, Southwest, South Central, and Southeast regions were only slightly wetter than normal (range: 1.05-1.23 inches above normal), whereas the Northwest, West Central, and Central regions received more precipitation (2.66, 3.30, and 2.27 inches above normal, respectively). On average across all farmland regions, June and July had near-normal temperatures and precipitation amounts.

Overall, the conditions for over-winter survival of wildlife were above average throughout the farmland zone in 2014-2015. Although conditions for nesting birds were cooler and wetter in May, June and July conditions were very beneficial for re-nesting and brood-rearing.

SURVEY CONDITIONS

The survey period was extended (30 July – 20 August) to allow routes to be completed, and observers completed 170 of 172 routes in 2015. One route in McLeod County and one route in Mower County were not completed within the survey's timeframe. Weather conditions during the survey ranged from excellent (calm winds, heavy dew, clear sky) to medium (light breeze and dew, overcast skies). Medium-to-heavy dew conditions were present at the start of 98% of the survey routes, which was better than 2014 (94%) and the 10-year average (93%). Clear skies (<30% cloud cover) were present at the start of 82% of routes and wind speeds <7 mph were recorded for 100% of the routes. Overall, survey conditions were excellent in 2015.

RING-NECKED PHEASANT

In 2015, the average number of pheasants observed (40.7 birds/100 mi) increased 33% from 2014 but remained 39% below the 10-year average (Table 2, Figure 3A), 59% below the long-term average, and 85% below the benchmark years of 1955-64. The pheasant population has declined since the mid-2000s in conjunction with the loss of CRP acres (Figure 2), and pheasant indices over the past 5 years are comparable to the indices calculated in the mid-1980s before the CRP era began (Figure 3A). Total pheasants observed per 100 mi ranged from 26.0 birds in the Southeast region to 76.4 birds in the Southwest region (Table 3). The pheasant roadside index showed substantial increases in the Southeast (138%) and East Central (126%) regions (Table 3). The Southwest (23%), West Central (31%), and Central (44%) regions also showed increased roadside indices, whereas the South Central Region (-2%) remained similar to 2014. The best opportunity for harvesting pheasants appears to be in the Southwest, West Central, and East Central regions.

The range-wide hen index (6.1 hens/100 mi) increased 32% from 2014 but was 40% below the 10-year average (Table 2). The hen index varied from 3.8 hens/100 mi in the Southeast to 11.4 hens/100 mi in the Southwest. The 2015 hen index was similar to 2014 in the West Central (1%) and Central (8%) regions and increased in the South Central (13%), Southwest (69%), East Central (152%), and Southeast (259%) regions. The range-wide cock index (4.9 cocks/100 mi) increased 8% from 2014 but remained 40% below the 10-year average (Table 2). The cock index increased in the South Central (12%), West Central (23%), and Central

(39%) regions but decreased 16-29% in the other three regions of the pheasant range. The 2015 hen:cock ratio was 1.27, which was greater than 2014 (0.99) and closer to the average (1.42 ± 0.35) for the CRP years (1987-2014).

Across their range, the average number of pheasant broods observed (6.3 broods/100 mi) increased 35% from last year but remained 38% below the 10-year average and 51% below the long-term average (Table 2). Regional brood indices ranged from 3.9 broods/100 mi in the Central region to 13.1 broods/100 mi in the Southwest region. The brood index was similar to 2014 for the South Central and Central regions and increased in all other regions (range: 23-201%). The average brood size index in 2015 (4.7 ± 0.2 chicks/brood) was similar to 2014 and the 10-year average but 14% below the long-term average (5.5 ± 0.1 chicks/brood). The median hatch date for pheasants across their range was approximately 9 June 2015 (n = 240 broods), 3 days earlier than the 10-year average (Table 2). The distribution of estimated hatch dates was unimodal and normally distributed, which suggests that weather conditions in May and June were not disruptive to nesting overall. However, it is notable that the median hatch date for the West Central and South Central regions was delayed (15 June and 19 June, respectively).

The increase in pheasant counts can be attributed to the relatively mild winter and good nesting season conditions experienced throughout their range. Winter conditions for pheasants are considered severe when the temperature is ≤0° F and snow cover exceeds 6 inches. Lack of simultaneous extreme cold and deep snow conditions improved overwinter survival of hens. Additionally, the lack of deep snow cover made food resources (e.g., weed seeds, waste grain) more readily available, which would have allowed hens to enter the nesting season in above-average body condition. Although heavier rains in some regions in May might have forced hens to re-nest, the drier conditions in June and July were beneficial to brood-rearing and likely improved chick survival rates.

GRAY PARTRIDGE

The range-wide gray partridge index (2.3 birds/100 miles) increased 150% from 2014 but remains well below the 10-year and long-term averages (-44% and -83%, respectively; Table 2, Figure 3B). The partridge index ranged from 0.0 birds/100 mi in the Central and East Central regions to 6.5 birds/100 mi in the Southeast region (Table 3). Observations of gray partridge broods (n = 9 broods statewide) were too few for analysis by age class.

Conversion of diversified agricultural practices (e.g., hayfields, 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 years. Consequently, gray partridge are more adversely affected by heavy precipitation during the breeding season than are pheasants. The Southeast and South Central regions will offer the best opportunity for harvesting gray partridge in 2015.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (7.1 rabbits/100 mi) increased 36% from 2014 and was 34% above the 10-year average and 20% above the long-term average (Table 2, Figure 4A). The cottontail rabbit index ranged from 1.3 rabbits/100 mi in the Northwest to 13.4 rabbits in the Southeast (Table 3). The best opportunity for harvesting cottontail rabbits should be in the Southeast, South Central, Southwest, and East Central regions.

The number of white-tailed jackrabbits observed (0.1 rabbits/100 mi) remains at a historic low (i.e., 95% below the long-term average of 1.7 rabbits/100 mi; Table 2). 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).

WHITE-TAILED DEER

The index for white-tailed deer (21.2 deer/100 mi) was similar to 2014, 33% above the 10-year average, and 98% above the long-term average (Table 2, Figure 5A). Roadside indices for deer ranged from 6.1 deer/100 mi in the South Central region to 58.7 deer/100 mi in the Northwest (Table 3).

MOURNING DOVE

The mourning dove index (184.2 doves/100 mi) was 14% greater than 2014 but 13% below the 10-year average and 27% below the long-term average (Table 2, Figure 5B). The index ranged from 75.1 doves/100 mi in the East Central region to 263.8 doves/100 mi in the Southwest region (Table 3). The best opportunities for harvesting doves should be in the Southwest, West Central, and South Central regions.

SANDHILL CRANE

The 2015 range-wide index of sandhill cranes averaged 14.7 total cranes/100 mi, representing a 64% increase in total cranes compared to 2014 (Table 2). Indices ranged from 0.0 total cranes/100 miles in the Southwest region to 65.7 total cranes/100 mi in the Northwest region (Table 3). Overall, regional indices for the total number of cranes increased in the West Central (300%), Central (70%), and Northwest (120%) regions, decreased in the East Central (-8%) and South Central (-46%) regions, and remained similar in the Southeast region.

The range-wide index of juveniles was 1.2 juvenile cranes/100 mi, which was similar to 2014 (Table 2). Juvenile cranes were observed in the West Central, Central, East Central, and Northwest regions.

OTHER SPECIES

Notable incidental sightings included: belted kingfisher (Jackson and Nobles Counties), black-billed magpie (Polk and Red Lake Counties), common raven (Polk and Red Lake Counties), greater prairie-chicken (Clay and Wilkin Counties), meadowlark sp. (Redwood and Renville Counties), northern shrike (Dakota County), osprey (Wright County), pectoral sandpiper (Nobles County), purple martin (Nobles County), red-headed woodpecker (Nobles County), sharp-tailed grouse (Lac qui Parle and Red Lake Counties), trumpeter swan (Brown County), and upland sandpiper (Nobles, Redwood, and Traverse Counties). Wild turkey adults and poults were noted in 18 counties.

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I thank the many cooperators for their efforts in completing routes in 2015 as this survey would not be possible without their help. Tonya Klinkner, Katie Steffl, and Joni Johnson provided logistical assistance including preparation of packets for mailing, data entry, and data proofing. Tabor Hoek of the Minnesota Boards 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. Greg Hoch and Kurt Haroldson reviewed an earlier draft of this report. This project was funded in part by the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act).

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Table 1. Abundance (total acres) and density (acres/mi2) of undisturbed grassland habitat within Minnesota's pheasant range, 2015[a].

	Cropland Retirement									**Density**
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi2
WC[b]	260,174	37,688	21,641	13,783	19,992	192,000	109,553	654,832	9.6	61.7
SW	89,330	24,763	18,391	2,225	848	21,916	60,509	217,982	5.8	36.9
C	119,102	14,326	31,530	6,328	3,067	89,432	49,614	313,398	5.2	33.2
SC	81,615	27,656	12,741	10,039	8,978	9,288	34,065	184,382	4.6	29.2
SE	56,441	2,706	7,269	692	985	36,731	53,159	157,983	4.3	27.3
EC	3,430	0	1,132	0	4	4,994	91,117	100,677	3.1	20.1
Total	610,092	107,139	92,704	33,066	33,874	354,361	398,017	1,629,253	5.9	37.8

a. Unpublished data, Tabor Hoek, BWSR, 1 August 2015.

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, 1955-2015.

Species / Subgroup	Change from 2014[a] *n*	2014	2015	%	95% CI	Change from 10-year average[b] *n*	2005-14	%	95% CI	Change from long-term average[c] *n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	148	30.6	40.7	33	±26	145	65.1	-39	±13	146	96.2	-59	±10
Cocks	148	4.5	4.9	8	±24	145	7.7	-40	±12	146	10.9	-57	±11
Hens	148	4.6	6.1	32	±30	145	10.0	-40	±14	146	13.9	-57	±11
Broods	148	4.7	6.3	35	±30	145	10.1	-38	±14	146	12.7	-51	±11
Chicks per brood	240	4.6	4.7	2			4.7	0			5.5	-14	
Broods per 100 hens	148	101.7	103.0	1			100.8	2			101.3	2	
Median hatch date	240	16 June	9 June				12 June						
Gray partridge	167	0.9	2.3	150	±198	164	4.1	-44	±38	146	15.0	-83	±19
Eastern cottontail	167	5.2	7.1	36	±27	164	5.4	34	±22	146	6.6	20	±20
White-tailed jackrabbit	167	0.1	0.1	0	±119	164	0.2	-56	±52	146	1.7	-95	±14
White-tailed deer	167	21.1	21.2	0	±19	164	16.0	33	±23	165	10.6	98	±32
Mourning dove	167	161.1	184.2	14	±18	164	203.4	-13	±11	146	268.6	-27	±12
Sandhill crane													
Total cranes	167	9.0	14.7	64	±75								
Juveniles	167	1.3	1.2	-6	±47								

[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 = 1955-2014, except for deer = 1974-2014. 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, 1955-2015.

Region	**Change from 2014**[a]					**Change from 10-year average**[b]				**Change from long-term average**[c]			
Species	*n*	2014	2015	%	95% CI	*n*	2005-14	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	19	0.0	0.8			19	0.5	55	±150	19	3.3	-74	±77
Eastern cottontail	19	0.4	1.3	198	±286	19	0.5	149	±234	19	0.8	58	±148
White-tailed jackrabbit	19	0.2	0.2	0	±302	19	0.4	-41	±126	19	0.6	-67	±75
White-tailed deer	19	45.9	58.7	28	±57	19	42.8	37	±61	19	31.1	89	±73
Mourning dove	19	78.3	85.3	9	±46	19	86.8	-2	±38	19	119.4	-29	±25
Sandhill crane	19	29.9	65.7	120	±195								
West Central[e]													
Ring-necked pheasant	39	35.5	46.3	31	±60	35	72.9	-38	±30	37	97.9	-56	±23
Gray partridge	39	0.3	0.2	-33	±246	35	0.9	-73	±73	37	9.5	-98	±22
Eastern cottontail	39	3.1	2.6	-17	±54	35	2.8	-1	±45	37	3.9	-34	±32
White-tailed jackrabbit	39	0.2	0.1	-50	±229	35	0.3	-55	±107	37	2.2	-95	±21
White-tailed deer	39	24.8	17.4	-30	±31	35	15.2	18	±26	37	9.9	74	±40
Mourning dove	39	184.2	281.4	53	±40	35	239.8	10	±22	37	367.9	-22	±19
Sandhill crane	39	0.9	3.7	300	±371								
Central													
Ring-necked pheasant	27	18.5	26.7	44	±60	27	53.5	-50	±28	26	69.7	-60	±17
Gray partridge	27	0.3	0.0	-100	±206	27	1.0	-100	±90	26	9.2	-100	±49
Eastern cottontail	27	1.3	4.6	244	±186	27	5.2	-12	±48	26	6.5	-29	±33
White-tailed jackrabbit	27	0.0	0.0			27	0.0			26	1.1	-100	±24
White-tailed deer	27	14.7	20.4	40	±53	27	10.7	91	±64	26	6.0	223	±119
Mourning dove	27	88.3	123.1	40	±69	27	164.0	-25	±32	26	222.9	-44	±23
Sandhill crane	27	12.0	20.3	70	±95								
East Central													
Ring-necked pheasant	12	20.4	46.2	126	±128	13	55.4	-23	±46	13	85.8	-50	±30
Gray partridge	12	0.0	0.0			13	0.0			13	0.1	-100	±147
Eastern cottontail	12	7.0	8.9	28	±116	13	10.3	-15	±52	13	8.7	2	±46
White-tailed jackrabbit	12	0.0	0.0			13	0.0			13	0.2	-100	±64
White-tailed deer	12	22.2	23.6	6	±59	13	16.2	38	±66	13	9.6	133	±105
Mourning dove	12	78.4	75.1	-4	±50	13	100.3	-25	±30	13	117.2	-36	±38
Sandhill crane	12	43.2	39.6	-8	±50								

Table 3. Continued.

Region / Species	Change from 2014 *n*	2014	2015	%	95% CI	Change from 10-year average *n*	2005-14	%	95% CI	Change from long-term average *n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	62.1	76.4	23	±45	19	125.3	-39	±23	19	114.5	-33	±23
Gray partridge	19	0.8	1.9	125	±304	19	14.7	-87	±32	19	39.8	-95	±19
Eastern cottontail	19	7.6	10.7	42	±72	19	6.3	70	±66	19	8.0	35	±58
White-tailed jackrabbit	19	0.4	0.4	0.0	±153	19	0.7	-43	±106	19	3.7	-89	±24
White-tailed deer	19	23.4	18.5	-21	±41	19	16.6	11	±51	19	9.6	93	±79
Mourning dove	19	335.6	263.8	-21	±37	19	313.1	-16	±31	19	310.4	-15	±32
Sandhill crane	19	0.0	0.0										
South Central													
Ring-necked pheasant	32	31.6	31.0	-2	±48	32	64.2	-52	±23	32	126.0	-75	±13
Gray partridge	32	3.6	6.1	69	±233	32	7.3	-16	±88	32	18.3	-67	±46
Eastern cottontail	32	8.1	11.6	43	±53	32	7.8	48	±46	32	7.6	53	±48
White-tailed jackrabbit	32	0.0	0.0			32	0.1	-100	±69	32	1.7	-100	±25
White-tailed deer	32	5.5	6.1	11	±66	32	5.5	11	±47	32	3.8	62	±66
Mourning dove	32	225.8	199.9	-12	±28	32	272.5	-27	±23	32	257.4	-22	±38
Sandhill crane	32	1.6	0.9	-46	±97								
Southeast													
Ring-necked pheasant	19	10.9	26.0	138	±169	19	15.4	69	±113	19	68.0	-62	±39
Gray partridge	19	0.0	6.5			19	5.1	29	±112	19	13.6	-52	±47
Eastern cottontail	19	11.6	13.4	16	±56	19	7.1	88	±65	19	7.5	78	±69
White-tailed jackrabbit	19	0.0	0.0			19	0.1	-100	±153	19	0.6	-100	±46
White-tailed deer	19	21.0	19.1	-9	±52	19	15.4	24	±73	19	10.9	76	±102
Mourning dove	19	68.5	133.1	94	±81	19	153.0	-13	±32	19	218.7	-39	±22
Sandhill crane	19	0.0	0.4										

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

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

[c] LTA = 1955-2014, except for Northwest region (1982-2014) and white-tailed deer (1974-2014). Estimates based on routes (*n*) surveyed ≥40 years (1955-2014), 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.

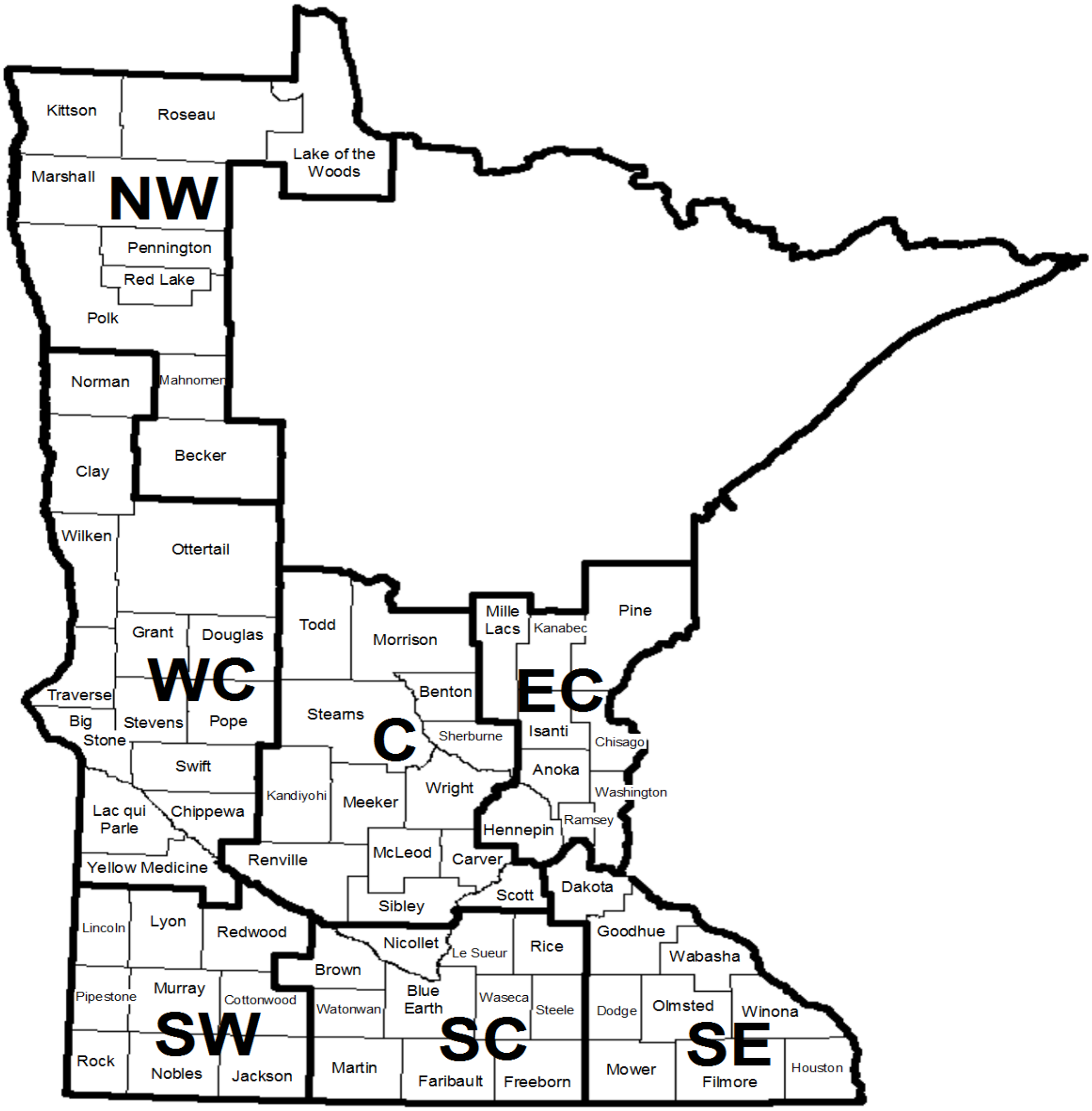


Figure 1. Survey regions for Minnesota's August roadside survey, 2015.

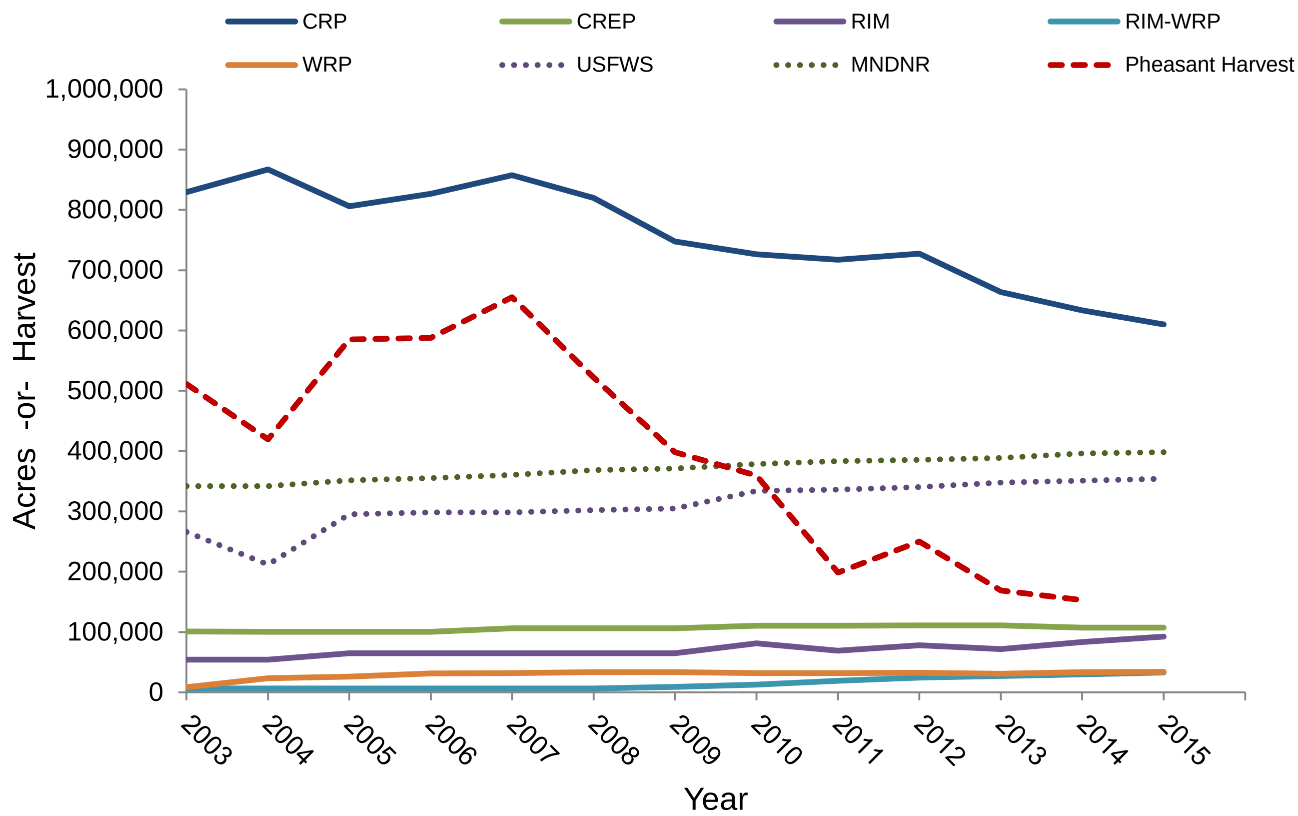
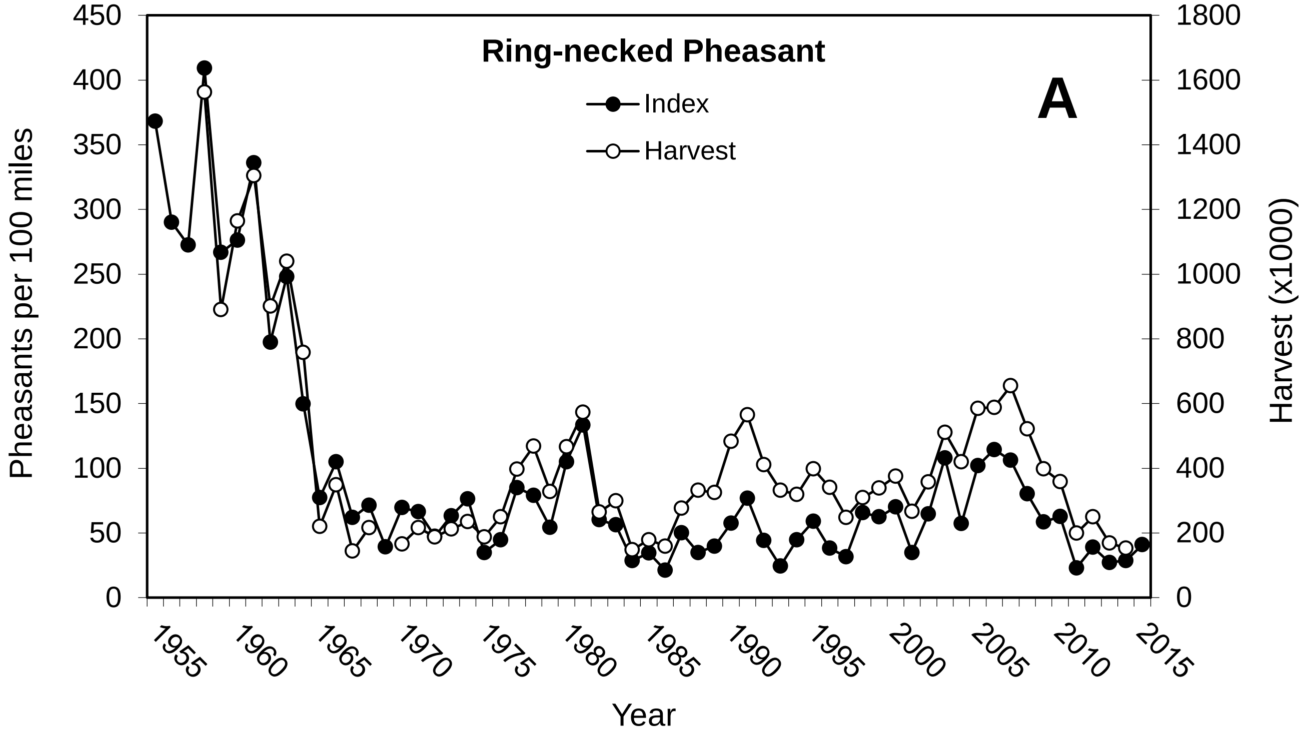


Figure 2. Acres enrolled in private and public land habitat conservation programs vs. ring-necked pheasant harvest trends in Minnesota, 2003-2015. Acres are calculated for the pheasant range only.



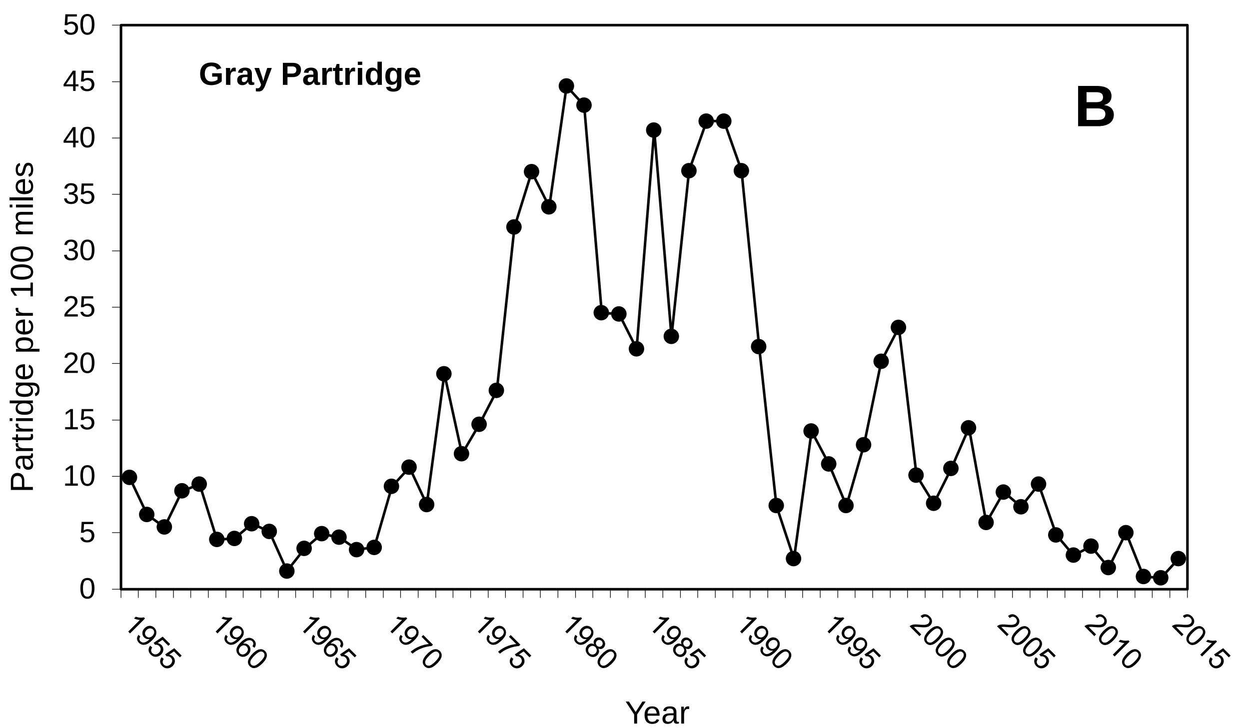


Figure 3. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 1955-2015. Does not include the Northwest region. Based on all survey routes completed.

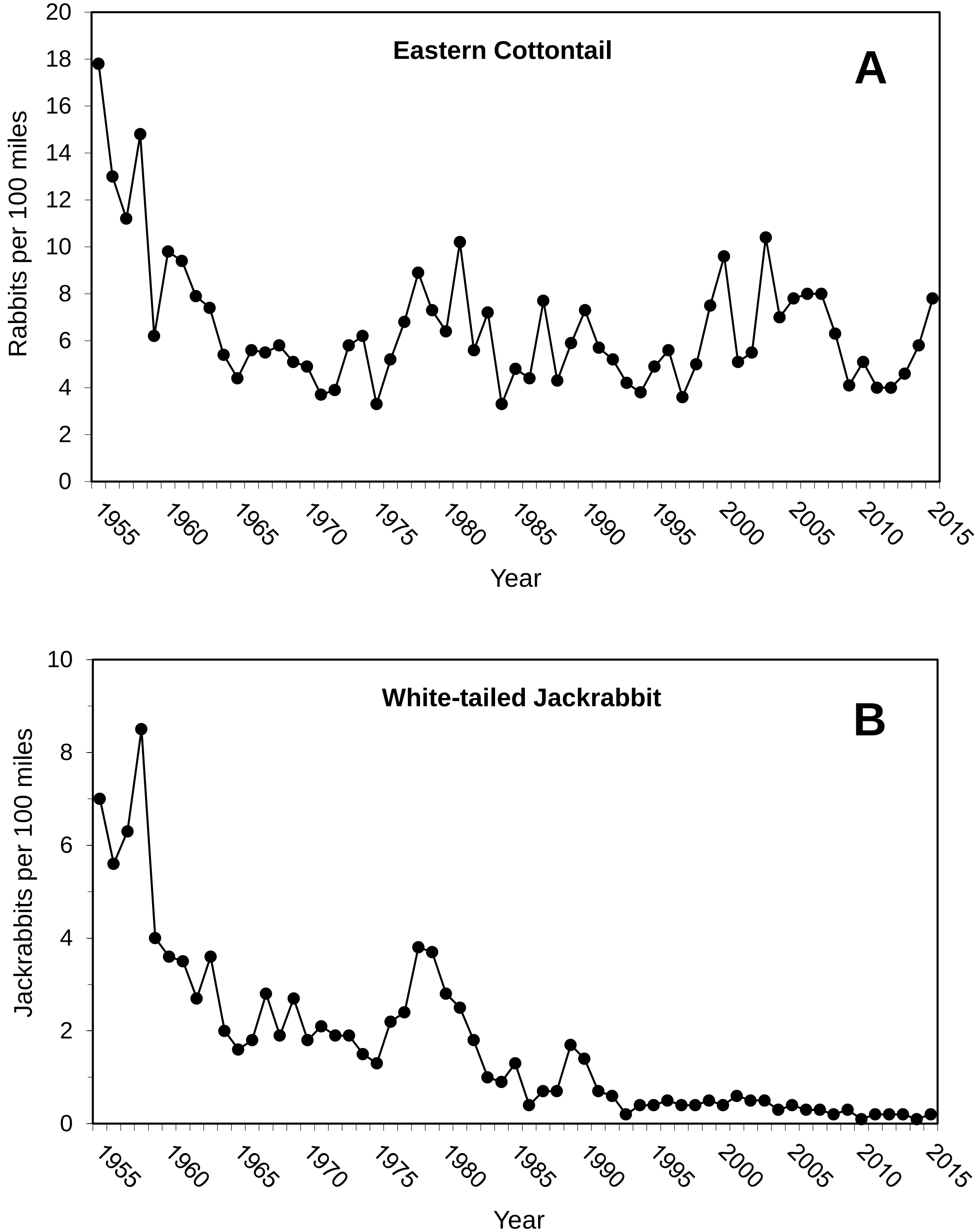


Figure 4. Range-wide index of eastern cottontail (A) and white-tailed jackrabbits (B) seen per 100 miles driven in Minnesota, 1955-2015. Does not include the Northwest region. Based on all survey routes completed.

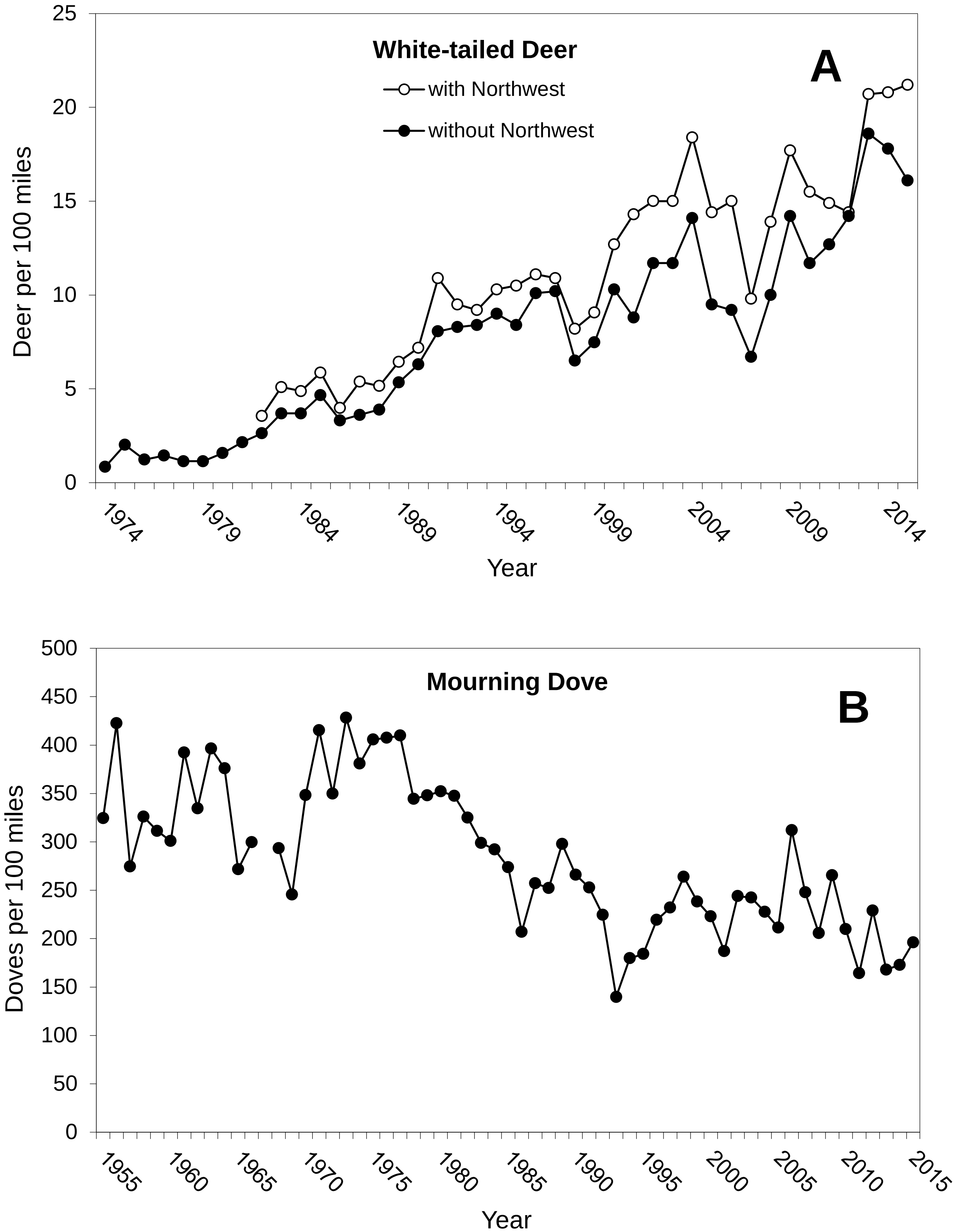


Figure 5. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2015. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA - 2015

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INTRODUCTION

Hunting is the primary method used to manage white-tailed deer (*Odocoileus virginianus*) populations in Minnesota. Minnesota Department of Natural Resources (MNDNR) sets hunting regulations annually to adjust deer harvest to meet management goals. MNDNR wildlife researchers conduct simulation modeling of deer populations within deer permit areas (DPAs) to understand historical deer herd dynamics, predict population sizes, and to explore the impacts of various hunting regulations on populations. To aid in decision-making, the output from population modeling is considered along with deer harvest metrics, hunter success rates, surveys of hunter and landowner satisfaction with deer populations, and deer population goals set through a public process.

We utilized a stochastic population model to simulate annual variations in deer densities within individual DPAs. We defined ranges of values for fecundity and survival by sex- and age-classes of deer based on values from the primary literature and data from studies within Minnesota. This report summarizes the structure and parameters of the simulation model, and provides a description of recent trends in deer populations.

METHODS

Model Structure

We started each multi-year simulation in spring of the initial year before reproduction occurred (Figure 1). We specified an initial population density (see more about selection of initial population densities in Modeling Procedures section), and the model converted the initial population density into a total population size by multiplying the density by the total land area of the DPA. Based on harvest data from previous years (McInenly 2014), we estimated the proportion of adult deer by age- and sex-class in the initial population (adult females mean = 0.40 [SD = 0.02], adult males mean = 0.25 [SD = 0.02]).

Within each annual cycle, we applied age-specific fecundity rates to females to estimate reproduction. All age- and sex-classes were subjected to spring/summer mortality, and the result was the pre-hunt fall population. Deer harvested were subtracted from the pre-hunt population. Winter mortality rates were estimated by age-class relative to the severity of winter, and were applied to the post-hunt population. The remaining population represented the starting population size for the next stage of the simulation. We assumed that the effects of immigration and emigration on a population within a DPA were equal. In the following, we provide more detailed information about the selection of model parameters.

Reproduction

We used fecundity rates, which were within a range of values reported for Minnesota and Wisconsin (MNDNR unpublished data, Fuller 1990, McCaffery et al. 1998, DelGiudice et al. 2007, Dunbar 2007, Grund 2011, Wisconsin Department of Natural Resources 2014). Fecundity rates were partitioned by 2 age-classes of breeding females (i.e., yearlings <1.0 years old when bred and adults $\geq$1.0 years old when bred) and were allowed to vary by 3 eco-geographic zones (northeast, farmland-forest transition areas, southeast) that reflected relative differences in habitat quality. Fecundity rates were estimated to be lowest in the northeast (yearlings, mean = 0.06 [SD = 0.01]; adults, mean = 1.55 [SD = 0.03]), moderate in the farmland-forest transition zone (yearlings, mean = 0.10 [SD = 0.01]; adults, mean = 1.75 [SD = 0.03]), and greatest in the southeast (yearlings, mean = 0.15 [SD = 0.01]; adults, mean = 1.85 [SD = 0.03]). The sex ratio of fawns at birth in most deer populations is approximately 50:50, but may vary annually (Ditchkoff 2011). We allowed the proportion of male fawns at birth to vary between 0.48-0.52.

Spring/Summer Survival

Survival rates of deer during winter are dependent on the severity of winter conditions (Fuller 1990, DelGiudice et al. 2002). Likewise, the condition of breeding females following winter may directly influence survival of their newborn fawns (Verme 1977, Nixon et al. 1991, Carstensen et al. 2009). MNDNR calculates a winter severity index (WSI) in each DPA annually based on snow depth and minimum daily temperatures. WSI was calculated weekly by staff from Minnesota Information Technology Services at MNDNR. From 1 November through 31 May, 1 point was added to the WSI for each day with snow depths $\geq$ 15 in (38.1 cm). One point was also added to the WSI for each day when temperatures were $\leq 0^0$ F (-17.8^0 C). Therefore, the WSI accumulated 0, 1, or 2 points each day in a DPA. Winters were considered mild when the WSI was <100 and severe winters had a WSI $\geq$180.

We used estimates of spring/summer survival of fawns, which spanned values reported in the primary literature for deer in Minnesota and populations in similar habitats (Huegel et al. 1985, Nelson and Mech 1986a, Nelson and Woolf 1987, Kunkel and Mech 1994, Van Deelen et al. 1997, Brinkman et al. 2004, Vreeland et al. 2004, Rohm et al. 2007, Hiller et al. 2008, Carstensen et al. 2009). Fawn survival rates were adjusted to approximate the effects of winter severity on the condition of adult females during the previous winter. Mean spring/summer survival values for fawns were 0.80 (SD = 0.03), 0.65 (SD = 0.03), and 0.45 (SD = 0.03) following mild (WSI <100), moderate (WSI $\geq$100 and <180), and severe winters (WSI $\geq$180), respectively.

Spring/summer survival rates reported in the primary literature for adult deer $\geq$1 year old were relatively high and similar for both sexes (DeYoung 2011). We used default values for summer survival of adult deer from the population model previously used in Minnesota (Grund and Woolf 2004, Grund 2014) and allowed the values to vary stochastically (female = 0.97 [SD = 0.01, male = 0.98 [SD = 0.01]). These estimates overlapped values reported in the literature for Minnesota and populations in similar habitats (Nelson and Mech 1986a, Fuller 1990, Van Deelen et al. 1997, Whitlaw et al. 1998, Brinkman et al. 2004, Grund and Woolf 2004, Grund 2011, Grovenburg et al. 2011).

Fall Harvest and Survival

In most DPAs in Minnesota, hunter harvest represents the greatest source of mortality for deer populations in the fall (Fuller 1990, DelGiudice et al. 2006, Grovenburg et al. 2011).

We obtained harvest data from the MNDNR Electronic Licensing System. Hunters were required to register deer within 48 hours after harvest, indicate in which DPA the deer was harvested, and classify the deer as adult male, adult female, fawn male, or fawn female. We pooled harvest data for the archery, firearms, and muzzleloader seasons within DPAs.

We recognized that some deer were killed but not registered because hunters did not complete the registration process (Rupp et al. 2000), wounding loss occurred (i.e., deer was not recovered by the hunter and thus was not reported; Nixon et al. 2001), and deer were harvested illegally (Dusek et al. 1992). We first applied a mean multiplier of 1.05 (SD = 0.002) to the numerical harvest to account for non-registered deer. We then applied a mean multiplier of 1.05 (SD = 0.002) for wounding loss and 1.05 (SD = 0.002) for illegal harvest. The mean multiplier for combined harvest reporting errors was 1.13 (SD = 0.003).

Winter Survival

Winter severity, particularly snow depth, increases risk of deer mortality via starvation and predation and fawns are more susceptible than adults (Nelson and Mech 1986b, DelGiudice et al. 2002). We estimated winter survival rates relative to winter severity based on studies conducted in Minnesota (Nelson and Mech 1986a, DelGiudice et al. 2002, Brinkman 2004, Grund and Woolf 2004, DelGiudice 2006, Grovenburg et al. 2011, Grund 2011). These studies reported survival rates similar to those observed in other deer populations in northern latitudes (Van Deelen et al. 1997, Whitlaw et al. 1998, DePerno et al. 2000, Dumont et al. 2000).

For adult deer, we set mean winter survival at 0.95 during mild winters. For moderate to severe winters, the model used a linear equation to calculate survival as a function of winter severity (mean winter survival = $1 - [0.011 + 0.0015 \text{ WSI}]$). For fawns, we set the mean winter survival rate at 0.85 during mild winters. For fawn survival in moderate winters, the linear equation to calculate adult survival was used, however, an additional mortality rate of 0.05 was subtracted to simulate the parallel but lower survival of fawns versus adults (mean winter survival = $(1 - [0.011 + 0.0015 \text{ WSI}]) - 0.05$). For severe winters, the equation was adjusted to simulate increased mortality reported for fawns in field studies (mean winter survival = $1 - [0.0054 \text{ WSI} - 0.33]$). For extremely severe winters (WSI >240), we set fawn survival at 0.033. We then allowed winter survival (for both fawns and adults) in any given model iteration to vary stochastically about the predicted mean using SD ≈ 0.02.

Modeling Procedures

To model each DPA, we tested several initial population densities including: 1) population estimates from field surveys when available for the starting year of the simulation (Haroldson 2014), 2) previous estimates from modeling (Grund 2014), or 3) a crude population estimate reconstructed from the reported harvest of adult males in the most recent deer season and given assumptions about the harvest rate of adult males, the proportion of adult males in the pre-hunt population, and the proportion of adults in the pre-hunt population.

To determine the most appropriate initial population density, we examined the modeled population trends relative to: 1) population estimates from field surveys when available within the years modeled, 2) the trend in reported deer harvest, and 3) the relationship between estimated population densities and adult male harvest. To further refine the initial population density, we incrementally increased and decreased the density and re-examined the modeled trend relative to the aforementioned indices. In some cases, we also adjusted spring/summer survival of adult females ≤0.10 in conjunction with varying initial population densities.

We ran each model simulation for 6 years (2010-2015) with the final population estimate occurring pre-fawning for the spring following the most recent deer hunting season (i.e., spring 2015). All simulations were performed with the R programming language (ver. 3.1.2, R Core Team 2014). We used 1,000 Monte Carlo simulations (simulated draws from the stochastic distributions) until the most reasonable set of starting parameters was determined, and then used 5,000 simulations for the final run.

It is not logistically or financially feasible to conduct field studies on deer populations across all DPAs with regularity to estimate model input parameters. Population modeling requires researchers to make assumptions about these data based on prior studies (Hansen 2011). Since model input data rely on broad generalizations about herd demographics and survival rates, models simulating deer populations in small geographic areas would not be realistic. Grund and Woolf (2004) demonstrated that modeling small deer herds increased variability in model estimates, thus decreasing the ability to consider model outputs in making management decisions. Therefore, we did not model populations in DPAs that were small in area or where harvest data were limited.

RESULTS

Deer Population Trends and Management Recommendations

Deer population goal-setting was conducted during 2015 in 40 deer permit areas through a public process. Of the 40 deer permit areas with new goals, 26 will be managed for deer densities higher than those established by the previous goals; 8 will be managed at similar densities to former goals; and 6 will be managed for densities below former goals. Management designations throughout the state for the 2014 deer season were conservative to intentionally reduce harvest of antlerless deer to offset deer mortality due to the harsh winter of 2013-14. The statewide deer harvest of approximately 139,442 deer was the lowest observed since the mid-1980s with antlerless harvest 34% below the average for the previous 5 years. With more antlerless deer left on the landscape and mild winter conditions throughout much of the state, deer populations in most DPAs likely increased above 2014 levels following reproduction in 2015.

Although the parameters included in the model were derived from studies of deer in Minnesota or from studies in similar habitats and environmental conditions, uncertainty is inherent in modeling the dynamics of free-ranging deer populations. Our modeling allowed input parameters to vary stochastically to simulate uncertainty, and model outputs also included measures of uncertainty reflecting variation among model simulations. However, for ease of interpretation, we present mean pre-fawn deer densities in this document.

We conducted simulation modeling in 112 of 128 DPAs (Table 1, Figure 2). Recommendations from MNDNR research for the 2015 deer season were similar to 2014 to provide continuity in management designations wherever possible. Changes in management strategies were recommended to: 1) bring stabilization to deer populations that had reached appropriate levels by spring of 2015, or 2) to increase or decrease populations toward goals where necessary.

Farmland Zone

For the 2015 deer season, most DPAs throughout the farmland region were recommended for Lottery designations with a low to moderate number of either-sex permits. Most deer populations have been stable for several years, and these DPAs generally have consistent hunter numbers with less hunting pressure than the farmland-forest transition zone and forest region. Antlerless harvest in the farmland is closely tied to the number of either-sex permits and a similar number of permits across years will maintain deer densities.

Farmland-Forest Transition Zone

Deer populations along the transition zone are highly productive. Most 2015 season recommendations for the DPAs in the transition zone were for the Hunter Choice designation or Lottery with permit levels allowing ≥20% of hunters to receive an either-sex permit. Several areas were recommended for Managed where deer abundance is higher and agricultural depredation is a concern. Deer populations in DPAs 346 and 349 in extreme southeast Minnesota have been above goal levels for several years and agricultural complaints are common. These DPAs should be managed with an Intensive designation and an early season antlerless hunt to maximize the harvest of antlerless deer and to reduce deer densities in a reasonable timeframe.

Forest Zone

Deer herds in the forest zone were most impacted by the severe winter of 2013-14. In some DPAs, winter mortality of fawns would have exceeded 90% with substantial losses of adult deer. Several years of conservative management will allow deer numbers to rebound if winters continue to be mild. Recommendations for the majority of forest DPAs were for a low number of Lottery permits or Bucks-only designations during the 2015 deer season. DPAs in the moose range have relatively low population goals to minimize the effects of deer abundance on moose. Also, with Bucks-only designations during 2014 in these areas, populations likely began to rebound. Given these factors, DPAs in the northeastern-most portion of the arrowhead were recommended for less conservative designations to maintain current deer densities.

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Table 1. Mean pre-fawn deer densities (deer/mi^2) derived from 5,000 population model simulations in Minnesota deer permit areas, 2010-2015.

		Pre-fawn deer density[a]					
Deer Permit Area	Land area (mi^2)	2010	2011	2012	2013	2014	2015
101	496	-	-	-	-	-	-
103	1820	4	4	4	4	3	3
105	740	13	12	13	13	10	10
108	1651	6	6	7	7	5	5
110	529	19	16	18	16	12	12
111	1438	3	3	3	3	2	3
114	116	-	-	-	-	-	-
117	927	-	-	-	-	-	-
118	1220	5	4	5	5	3	4
119	770	8	7	8	8	5	6
122	603	6	5	5	6	4	4
126	942	4	4	4	5	3	3
127	564	-	-	-	-	-	-
152	61	-	-	-	-	-	-
155	593	18	18	19	19	16	19
156	825	16	16	15	14	9	9
157	673	21	20	20	19	19	19
159	571	18	16	16	17	12	14
169	1124	13	12	13	12	8	9
171	701	12	12	13	13	10	11
172	687	21	21	22	23	18	21
173	584	10	10	10	10	7	8
176	1113	13	12	13	14	9	10
177	480	23	19	20	20	13	14
178	1280	16	13	12	12	7	8
179	862	20	18	18	17	11	10
180	977	10	9	8	8	5	5
181	708	18	15	13	14	8	9
182	267	-	-	-	-	-	-
183	663	14	15	16	18	12	13
184	1229	22	21	22	21	16	18
197	955	13	12	12	12	9	10
199	148	-	-	-	-	-	-
201	161	-	-	-	-	-	-
203	83	-	-	-	-	-	-
208	414	6	6	6	6	6	7
209	640	8	8	8	7	5	6

[a] "-" indicates deer permit area was not modeled.

Deer Permit Area	Land area (mi^2)	Pre-fawn deer density[a]					
		2010	2011	2012	2013	2014	2015
210	615	14	12	11	10	7	7
213	1057	15	14	15	16	18	21
214	554	23	24	26	28	26	27
215	701	15	16	17	19	18	18
218	884	9	10	10	11	11	13
219	391	12	13	13	15	15	17
221	642	14	14	15	16	14	14
222	413	17	17	17	17	14	15
223	376	12	13	14	16	16	17
224	47	-	-	-	-	-	-
225	618	17	16	17	18	14	14
227	472	17	17	17	18	15	16
229	284	7	8	8	10	10	12
230	452	4	4	4	4	4	4
232	377	6	5	5	6	5	6
233	385	5	5	5	5	5	5
234	636	2	3	3	3	3	3
235	34	-	-	-	-	-	-
236	370	17	16	17	17	16	17
237	728	2	2	3	2	2	3
238	95	-	-	-	-	-	-
239	919	13	12	12	12	11	13
240	643	20	19	20	21	20	20
241	996	28	28	28	30	24	25
242	214	24	23	22	20	15	14
246	840	16	16	17	17	15	17
247	228	20	20	21	22	19	20
248	214	20	20	20	20	17	16
249	502	18	16	17	18	16	16
250	713	4	4	4	5	6	7
251	55	-	-	-	-	-	-
252	715	4	4	4	5	6	7
253	974	3	3	4	4	4	5
254	929	4	4	5	5	5	5
255	774	4	4	4	5	5	5
256	654	6	6	6	6	6	6
257	412	8	7	8	8	7	8
258	343	21	20	22	22	19	22
259	490	25	24	24	23	18	21
260	1249	2	2	2	3	2	3

[a] “-“ indicates deer permit area was not modeled.

		Pre-fawn deer density[a]					
Deer Permit Area	Land area (mi^2)	2010	2011	2012	2013	2014	2015
261	795	2	2	3	3	4	4
262	677	2	2	2	3	3	3
263	512	8	7	8	9	8	9
264	669	10	10	11	13	12	14
265	494	8	8	8	9	9	10
266	617	5	4	4	5	5	6
267	472	4	4	4	4	3	4
268	228	11	10	11	12	11	13
269	650	3	3	3	3	3	4
270	748	2	2	2	2	2	3
271	632	3	3	3	3	4	5
272	531	3	3	3	4	4	6
273	571	6	6	6	7	8	10
274	354	5	5	5	6	8	9
275	764	4	3	3	4	4	5
276	542	8	8	8	9	9	11
277	812	12	12	13	16	18	22
278	402	6	6	6	7	8	11
279	344	4	4	4	5	6	7
280	675	2	2	2	3	3	4
281	575	6	6	6	7	8	9
282	778	2	2	2	2	3	4
283	613	4	4	4	5	6	7
284	838	3	3	3	4	4	5
285	549	5	5	5	6	6	6
286	446	5	5	5	5	5	5
287	46	-	-	-	-	-	-
288	625	6	6	6	6	6	6
289	815	2	2	2	3	3	3
290	662	6	5	5	6	6	7
291	800	6	6	7	7	8	9
292	479	8	8	9	11	12	15
293	511	8	8	8	8	7	7
294	686	3	3	4	4	4	5
295	839	4	4	4	5	5	6
296	667	4	4	4	5	6	7
297	438	3	3	3	3	3	3
298	618	10	9	10	10	9	12
299	386	5	5	5	6	6	6
338	454	5	6	6	6	6	6

[a] “-“ indicates deer permit area was not modeled.

Deer Permit Area	Land area (mi^2)	Pre-fawn deer density[a]					
		2010	2011	2012	2013	2014	2015
339	394	6	6	6	7	7	7
341	612	13	13	12	12	11	12
342	349	16	16	15	14	12	11
343	663	12	12	12	12	12	11
344	190	-	-	-	-	-	-
345	323	11	11	12	12	12	12
346	318	26	28	28	28	26	22
347	434	8	9	10	10	9	9
348	332	16	16	16	15	14	14
349	490	22	24	23	23	22	20
601	1625	-	-	-	-	-	-

[a] "-" indicates deer permit area was not modeled.

Figure **1.** Model structure for simulations of white-tailed deer populations in Minnesota, 2015.

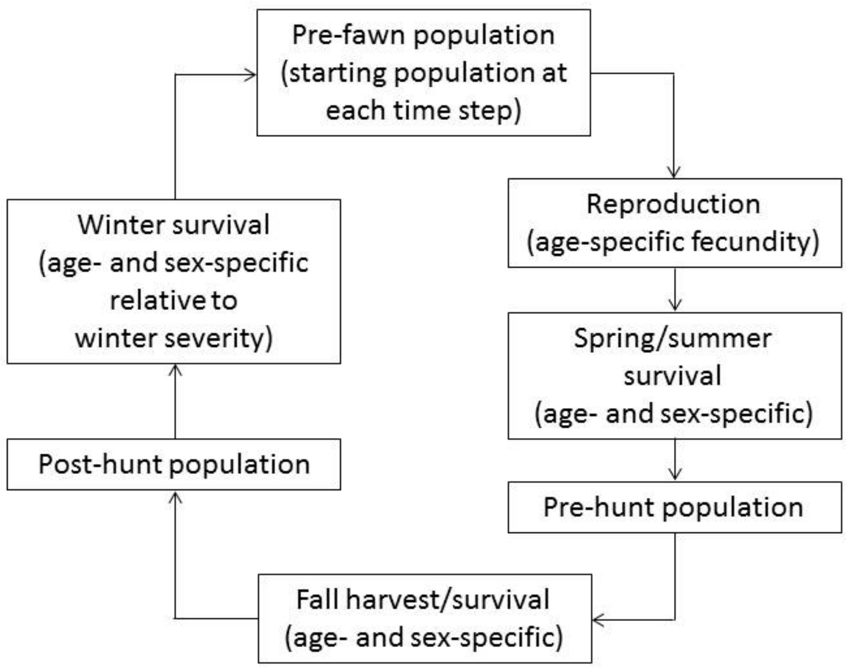
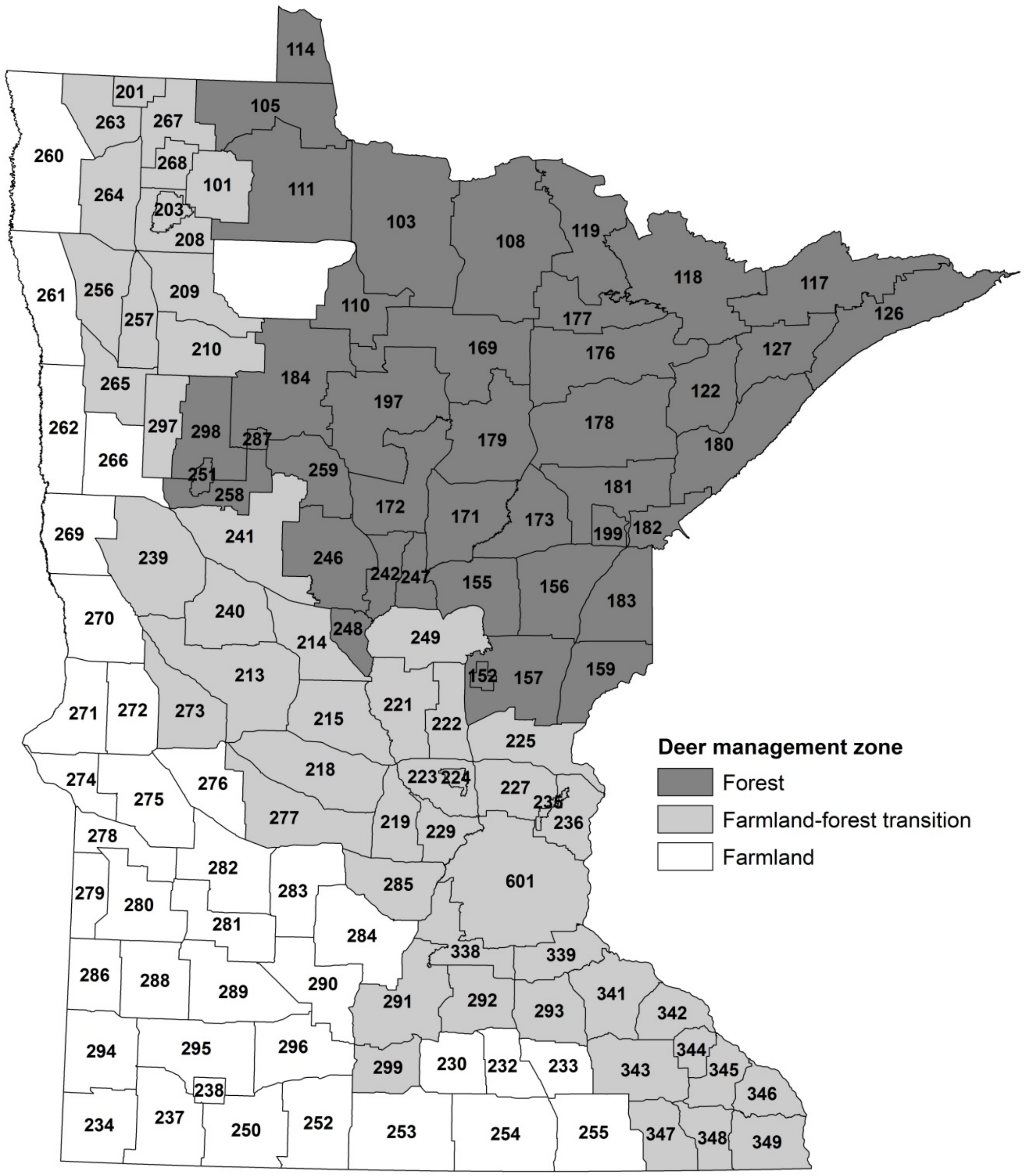


Figure 2. Deer permit areas (DPAs) in Minnesota and deer management zones used to describe deer population and harvest trends, 2015. DPAs were assigned to forest, farmland-forest transition, or farmland zones based on historical land cover and current woody cover. Generally, forested DPAs were composed of ≥60% woody cover, farmland-forest transition DPAs were composed of 6%-50% woody cover, and farmland DPAs were composed of ≤5% woody cover.



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, 2014

John Erb, Forest Wildlife 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 39th 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 (FO), transition (TR), and farmland (FA); Figure 1).

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 280 routes were completed this year. There were 2,605 operable scent stations examined on the 280 routes. Route density varied from 1 route per 532 km^2 in the Forest Zone to 1 route per 1,194 km^2 in the Farmland Zone (Figure 1).

Statewide, route visitation rates (% of routes with detection), in order of increasing magnitude, were 10% (wolves), 14% (domestic dogs and bobcats), 22% (coyotes), 29% (red foxes), 31% (domestic cats), and 33% (raccoons and skunks). Regionally, route visitation rates were as follows: red fox – FA 26%, TR 28%, FO 31%; coyote – FO 9%, FA 33%, TR 42%; skunk – FO 25%, TR 39%, FA 46%; raccoon – FO

19%, TR 45%, FA 60%; domestic cat – FO 15%, TR 48%, FA 54%; domestic dog – FO 5%, FA 21%, TR 27%; wolf - FA 0%, TR 3%, FO 17%; and bobcat - FA 0%, TR 15%, FO 18%.

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 changes this year were increases in the Farmland Zone domestic cat index (Figure 2) and Transition Zone skunk and bobcat indices (Figure 3). There was also a 'marginally significant' decline in the Forest Zone red fox index (Figure 4).

In the Farmland Zone (Figure 2), red fox indices remain well below the long-term average, whereas raccoon indices remain above average. Although the Farmland coyote index also remains above the long-term average, it has declined the past 2 years. The significant increase in the domestic cat index to a record level this year follows last year's significant decline.

In the Transition Zone (Figure 3), red fox indices had increased several years ago to near the long-term average. However, indices from the past 3 years have now declined and are once again well below the long-term average. The Transition Zone coyote index was unchanged from last year and remains at peak levels. Indices for most other species are near their long-term average.

In the Forest Zone (Figure 4), there was a marginally significant decline in the red fox index to its lowest level since the late 1980's. Coyote indices have remained below their long-term average, with indices from the past 3 years being the lowest recorded since the survey began. Raccoon and skunk indices remain near their long-term average.

After a recent (2009-11) rapid rise, the Forest Zone wolf index has subsequently declined to near the long-term average (Figure 5). The point estimate for the Transition Zone wolf index also dropped to near its 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 peak levels. The Transition Zone bobcat index had recently declined from peak levels to near the long-term average, and then exhibited a significant increase back to near-record levels this fall (Figure 5).

ACKNOWLEDGEMENTS

I wish to thank all of the cooperators who participated in the 2014 survey: DNR Division of Wildlife staff; Superior National Forest Aurora District; Agassiz, Rydell, Sherberne and Tamarac National Wildlife Refuges; 1854 Treaty Authority, White Earth, Red Lake, and Leech Lake Tribal Natural Resource Departments; Lori Schmidt and Vermillion Community College; Peter Jacobson and Faribault High School; Steven Hogg and the Three Rivers Park District; and Richard Nelles and Tom Stuber. This project was funded in part by the Wildlife Restoration (Pittman-Robertson) Program.

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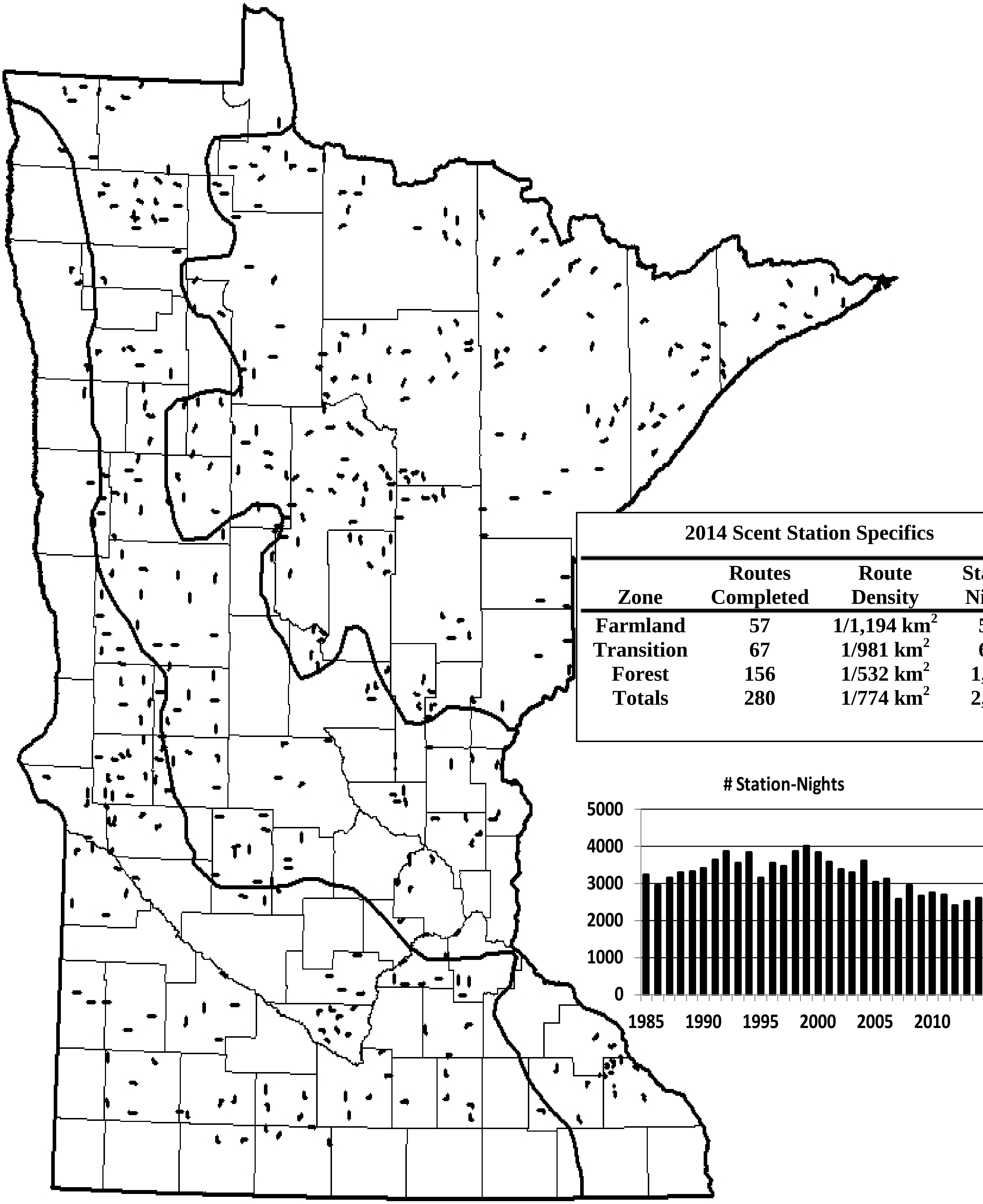

2014 Scent Station Specifics

Zone	Routes Completed	Route Density	Station Nights
Farmland	**57**	**1/1,194 km^2**	**522**
Transition	**67**	**1/981 km^2**	**624**
Forest	**156**	**1/532 km^2**	**1,459**
Totals	**280**	**1/774 km^2**	**2,605**

Figure 1. Locations of existing scent station routes (not all completed every year). Insets show 2014 route specifics and the number of station-nights per year since 1983.

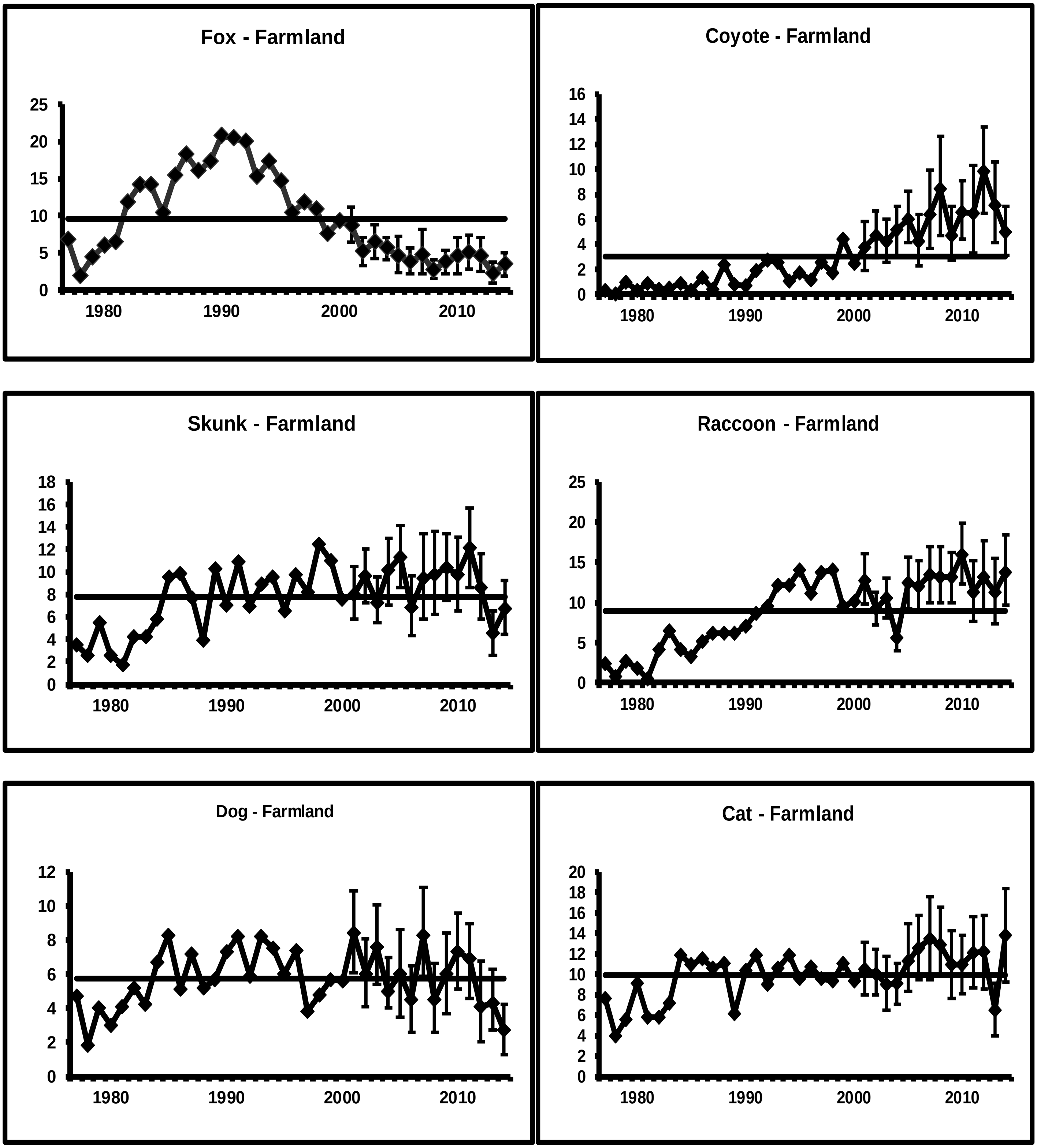

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2014. Horizontal line represents long-term mean.

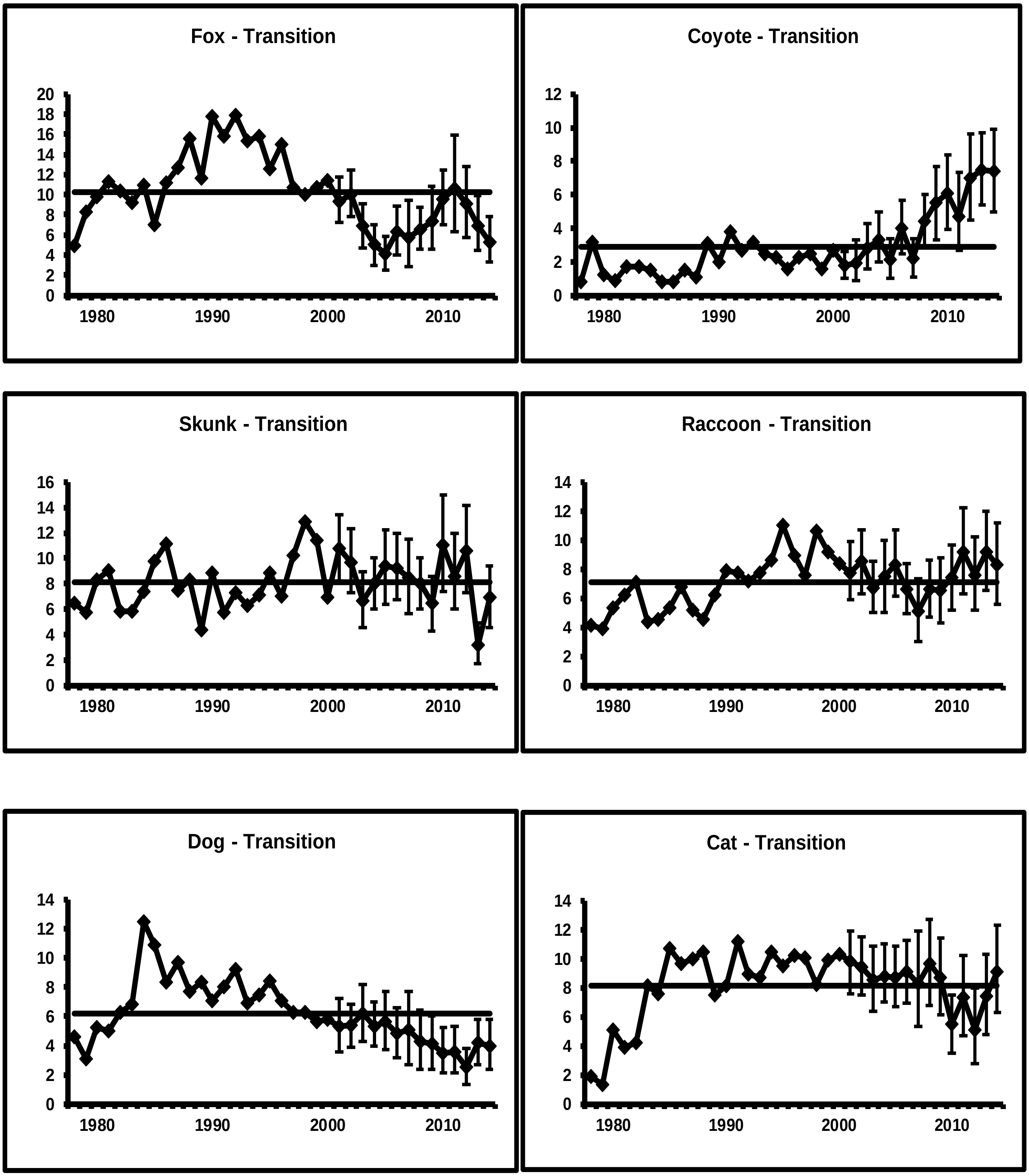

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2014. Horizontal line represents long-term mean.

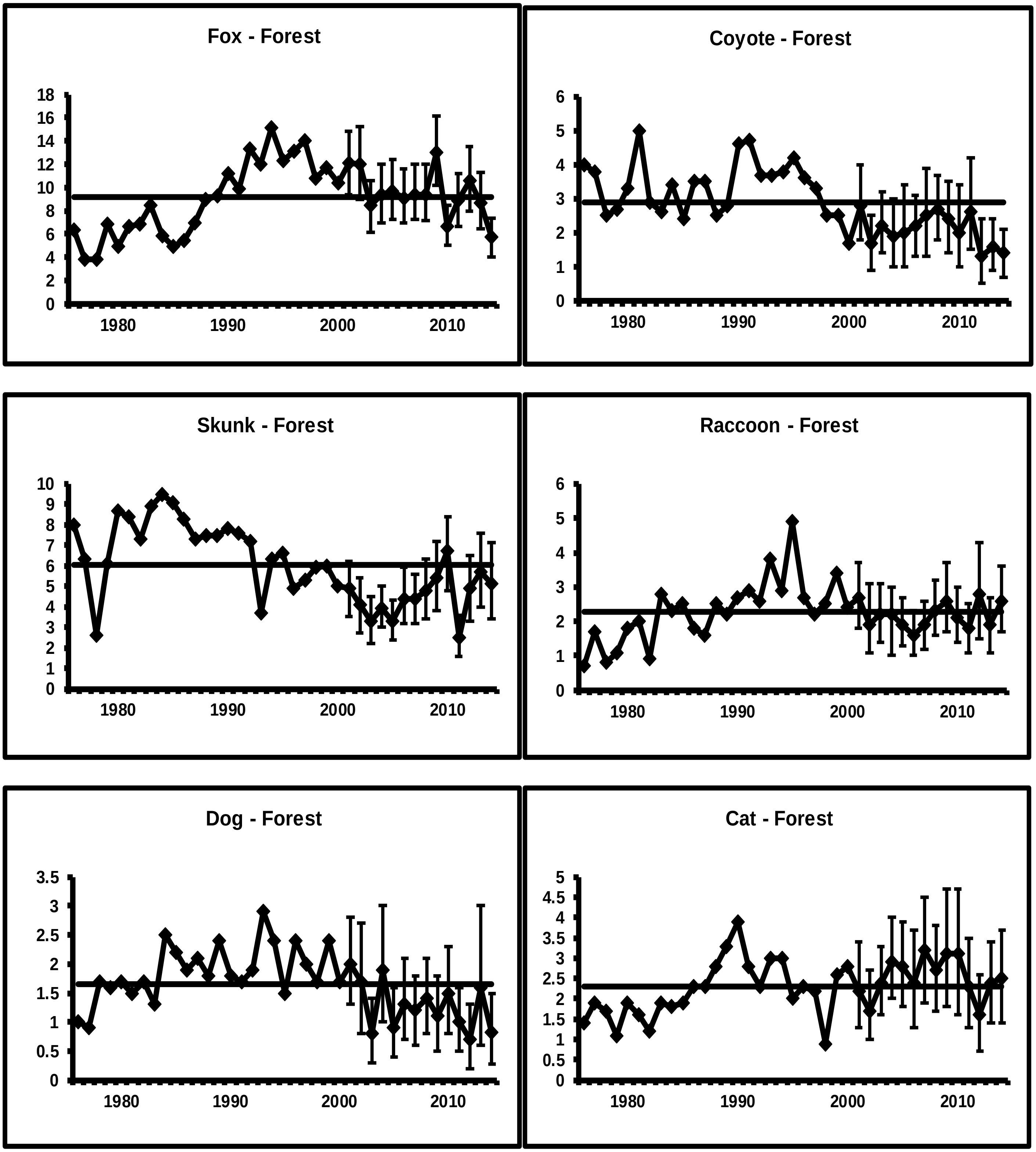

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2014. Horizontal line represents long-term mean.

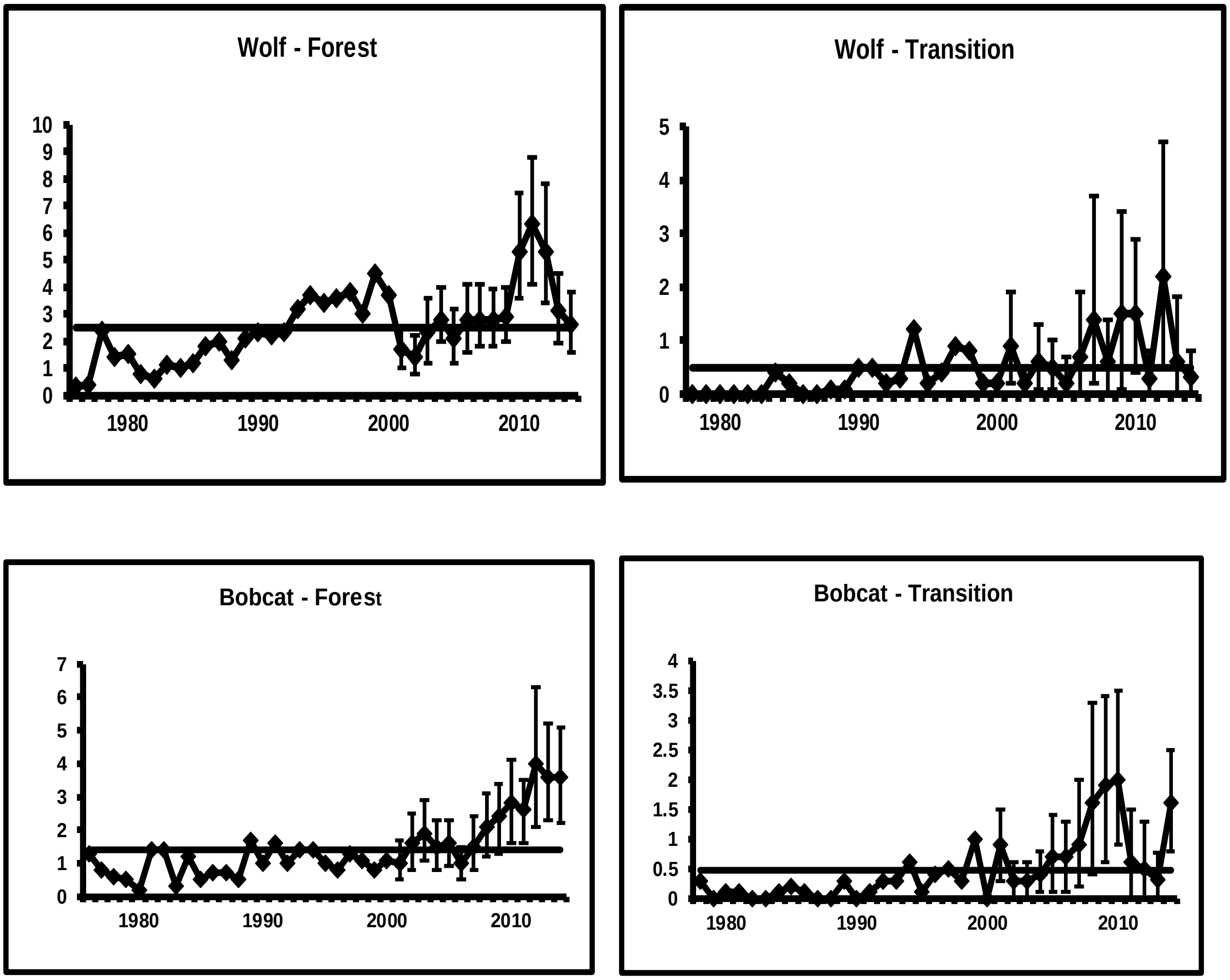

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2014. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2014

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, 56 track survey routes are operational 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; 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 are by definition 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 50^{th} and 950^{th} values constitute the lower and upper bounds of the confidence interval.

RESULTS

In spite of infrequent snowfall this winter, 49 of the 56 routes were completed, the most since the survey began (Figure 2). Survey routes took an average of 2.2 hours to complete. Total snow depths averaged 5.7" along completed routes, slightly below the long-term average (Figure 3). Mean overnight low temperature the night preceding the surveys was 4°F, also slightly below the long-term average (Figure 3). Survey routes were completed between November 20^{th} and February 25^{th}, with a mean survey date of January 5^{th} (Figure 3).

Considering presence or degree of confidence interval overlap, bobcat, coyote, and marten indices exhibited significant increases, with the bobcat index the highest yet recorded (Figure 4). Indices for fisher, red fox and weasel exhibited marginally significant increases, though all remain below their long-term averages (Figure 4).

Fishers were detected on ~ 5% of the route segments and along 53% of the routes (Figure 4). Numerous sources of information indicate that over the past decade fishers have expanded 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. Marten were detected on ~ 8% of the route segments, and 49% of the survey routes (Figure 4).

Wolf indices were near their long-term average, essentially unchanged from last winter. Wolves were detected on ~ 8% of the route segments and 82% of the survey routes (Figure 4). The average number of wolves detected per route was 2.7.

Although weasels (*Mustela erminea* and *Mustela frenata*) exhibited a marginally significant increase this winter, their track index continues to be characterized by a downward trend with periodic irruptions (Figure 4). No significant changes were observed in either the spring or winter snowshoe hare indices. Historic data (pre-1994; not presented here) for snowshoe hares clearly exhibited 10-year cycles, but in recent times only faint hints of a cycle are apparent during the first couple years of each decade. Since the winter track survey began in 1994, hare indices have steadily increased, with some leveling off in the past 4 years (Figure 4).

DISCUSSION

Reliable interpretation of changes in these track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000, 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. Surveys this winter were completed during snow and temperature conditions near but slightly below the long-term average from previous surveys. Nevertheless, other factors can influence animal movement and hence detection rates. Acknowledging these caveats, indices for most species exhibited significant or marginally significant increases this winter, following across-the-board declines observed last winter when surveys were conducted during particularly cold and deep-snow conditions.

ACKNOWLEDGEMENTS

I wish to thank all those who participated in this year's survey, including Minnesota DNR field staff, Tamarac National Wildlife Refuge, Superior National Forest (Cook and Grand Marais offices), tribal staff from the Leech Lake, Fond-du-Lac, Grand Portage and Red Lake Bands of Ojibwe, and the 1854 Treaty Authority.

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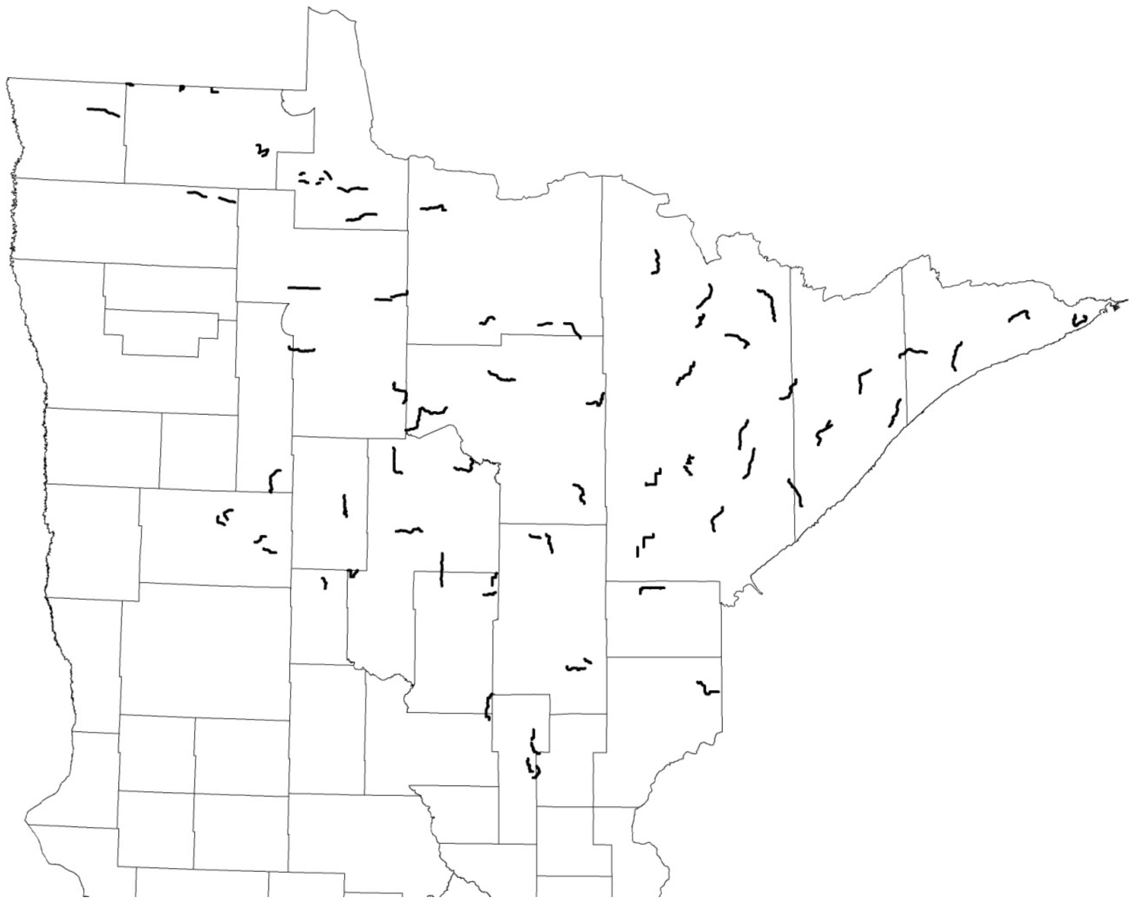


Figure 1. Locations of established furbearer winter track survey routes in northern Minnesota.

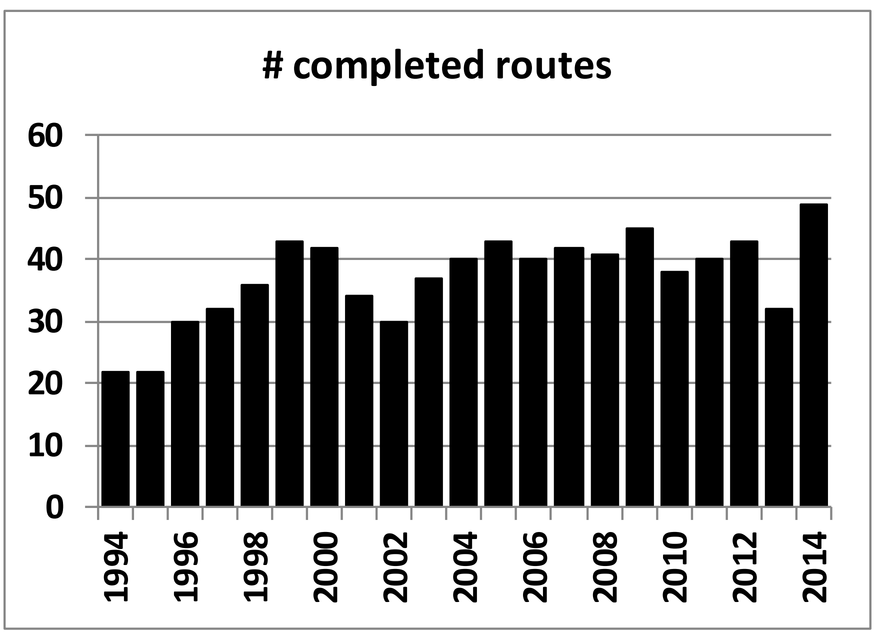
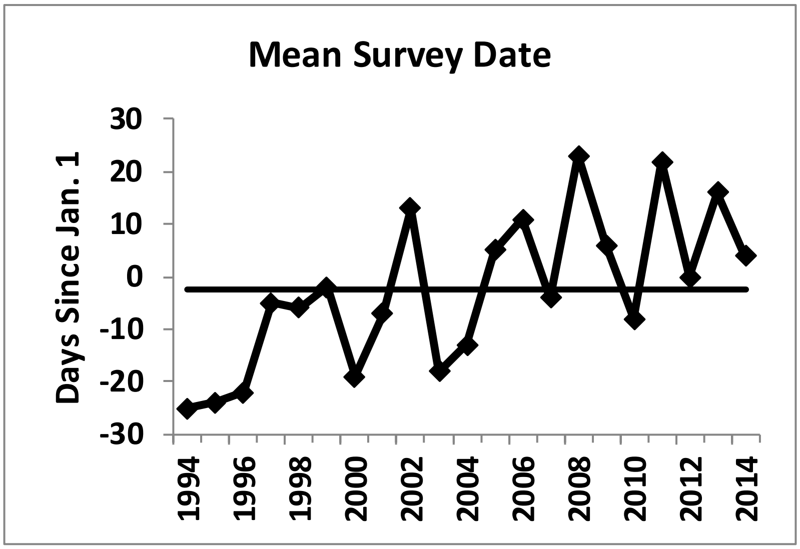
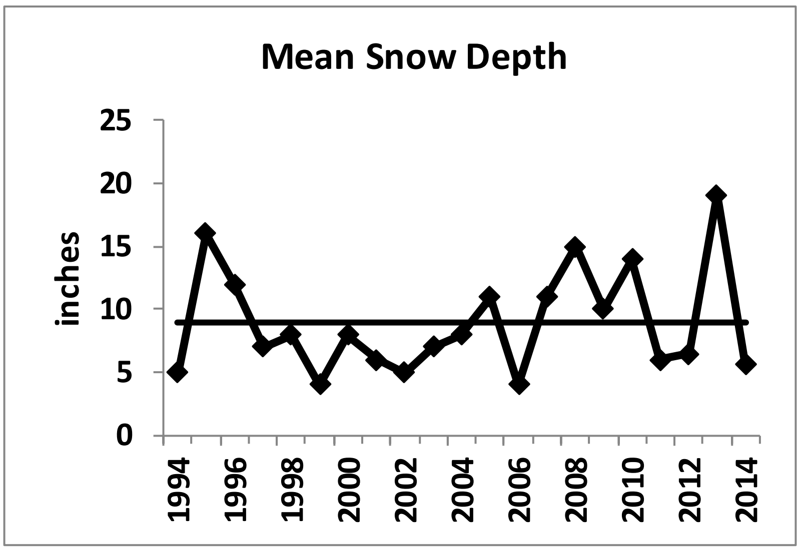


Figure 2. Number of snow track routes surveyed in Minnesota, 1994-2014.





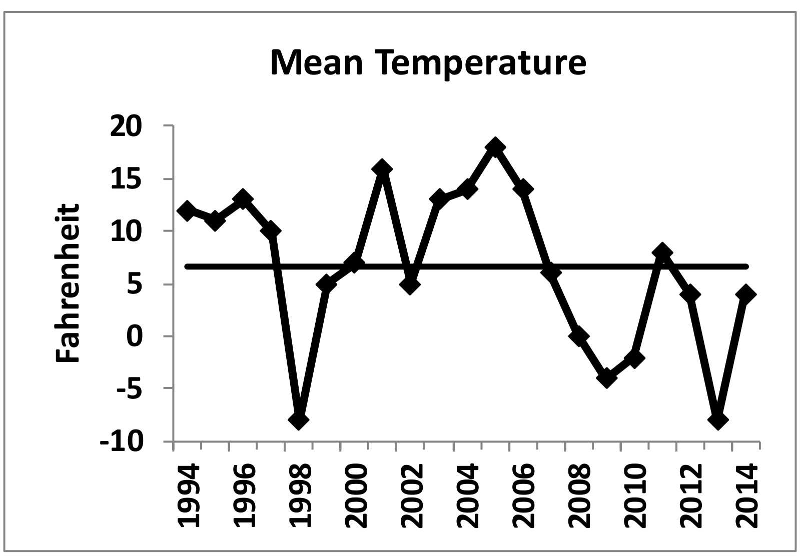


Figure 3. Average survey date, snow depth, and temperature for snow track routes completed in Minnesota, 1994-2014. Horizontal line represents long-term mean.

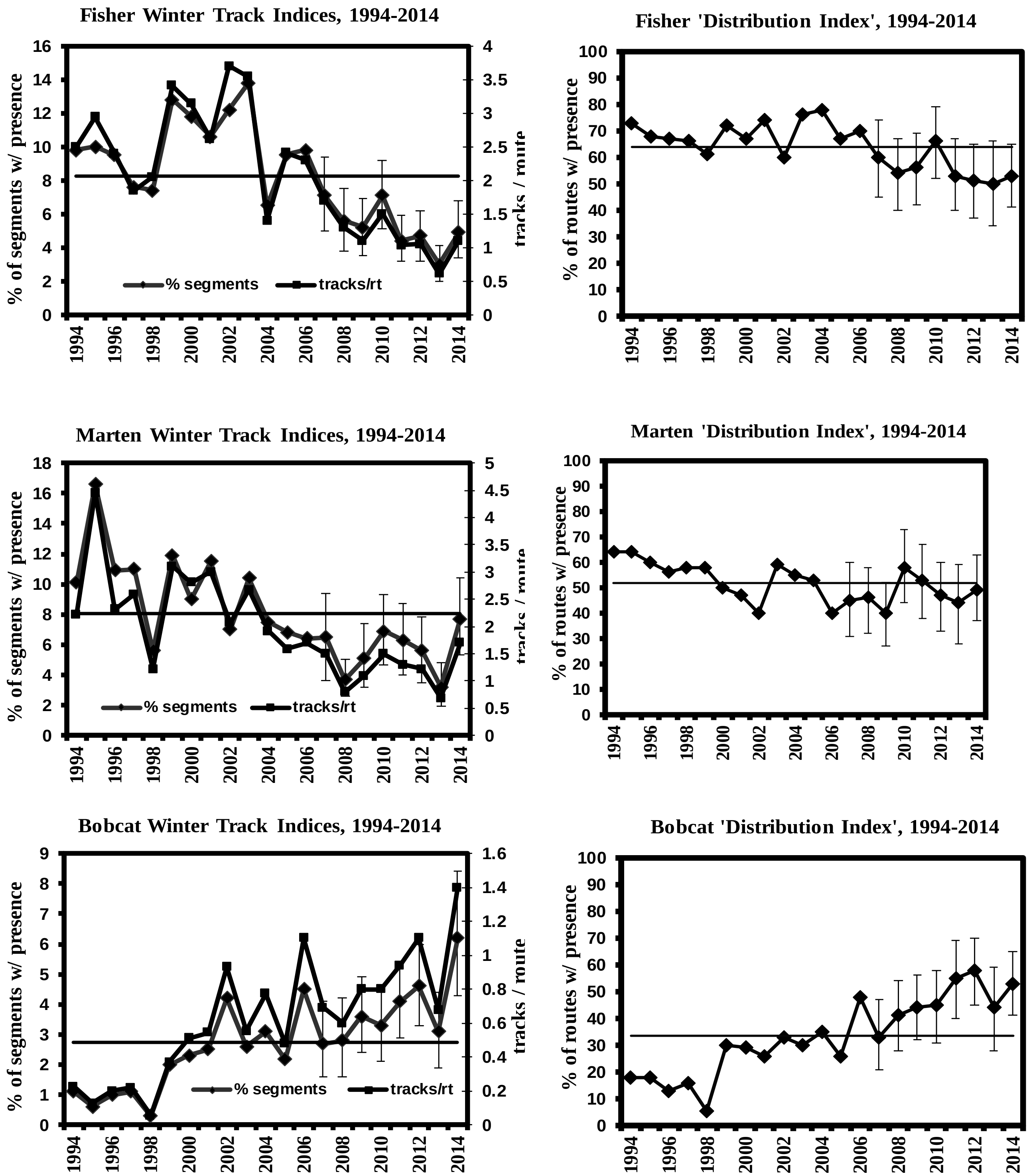


Figure 4. Winter track indices for selected species in Minnesota, 1994-2014. Confidence intervals are presented only for % segments and % routes with track presence; horizontal lines represent their long-term averages.

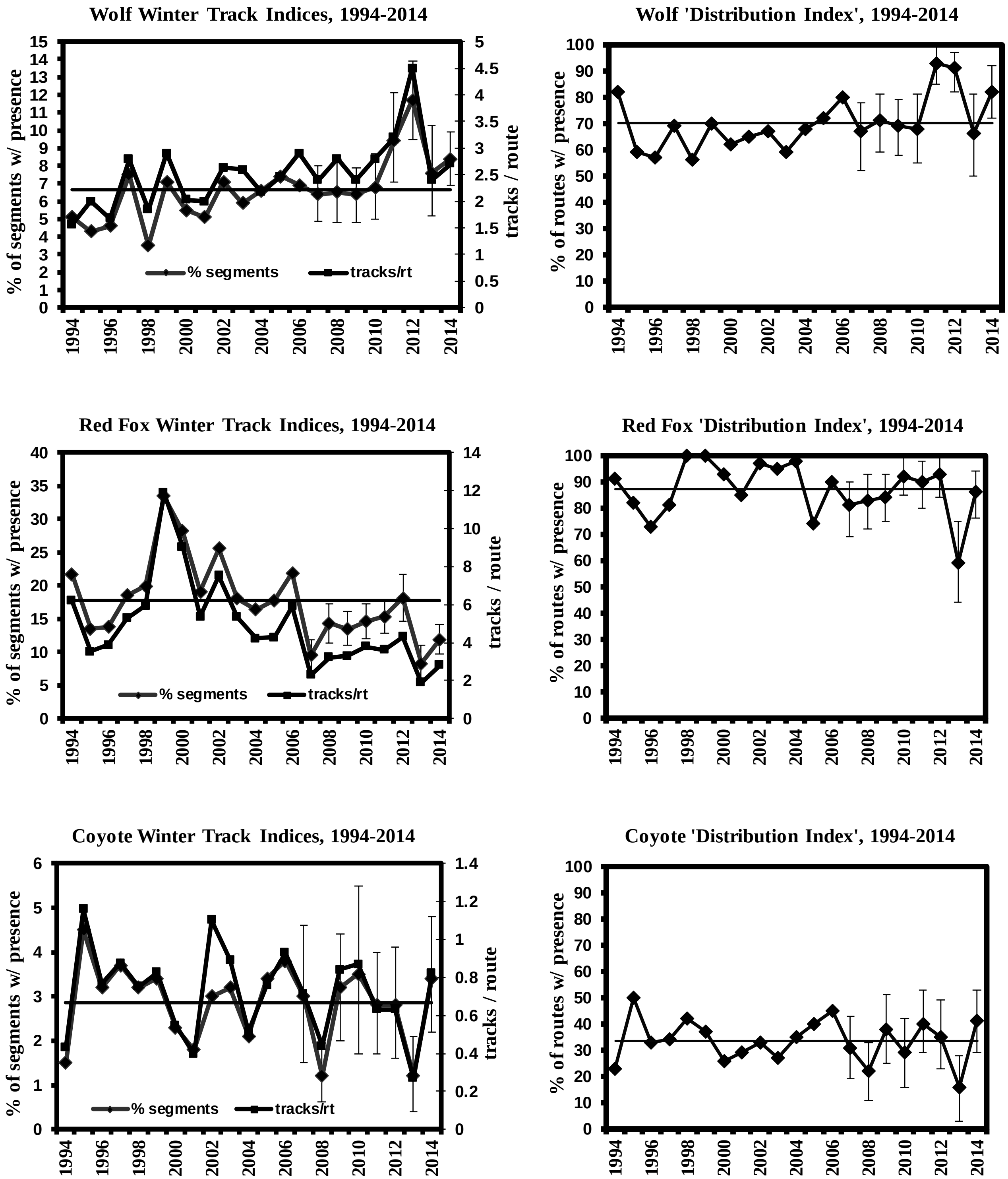


Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2014.

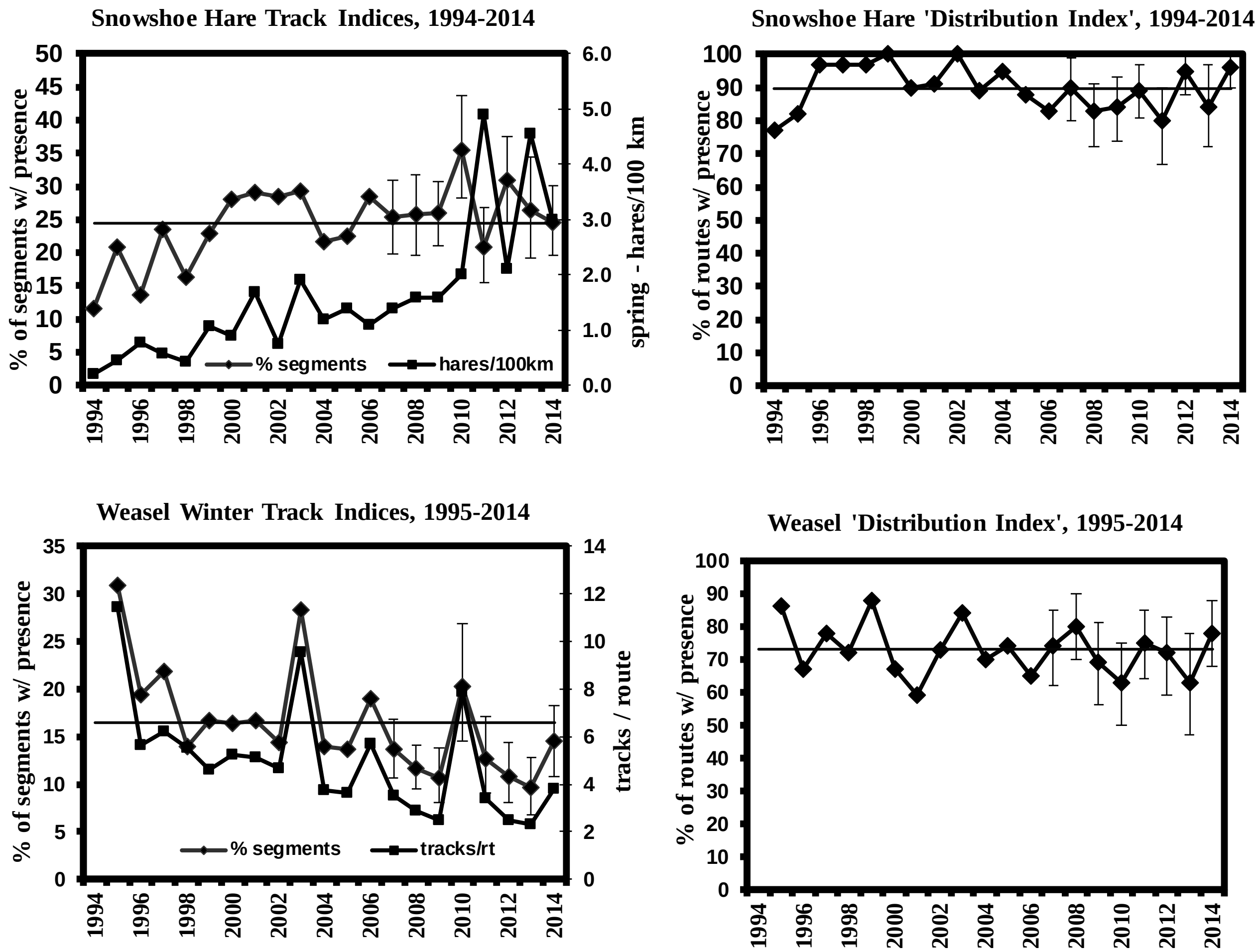


Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2014.

FOREST WILDLIFE POPULATIONS

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2015 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 2015, ruffed grouse surveys were conducted between 14 April and 16 May, with one route run later. Mean ruffed grouse drums per stop (dps) were 1.1 statewide (95% confidence interval = 1.0–1.3) and did not change (-1%) from the previous year.

Sharp-tailed grouse surveys were conducted between 13 March and 8 May 2015, with 2,019 birds observed at 206 leks. The mean numbers of sharp-tailed grouse/lek were 5.3 (4.3-6.4) in the East Central (EC) survey region, 10.8 (9.9–11.9) in the Northwest (NW) region, and 9.8 (8.9–10.7) statewide. Comparisons between leks observed in consecutive years (2014 and 2015) were unchanged statewide ($t = 0.7$, $P = 0.4$) and 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 126 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 12 cooperating organizations surveyed routes between 14 April and 28 May 2015. Most routes (96%) were surveyed between 14 April and 9 May, with the median date (April 29) earlier than last year (May 10) and more similar to recent years (April 23 and 25 in 2010 and 2012, and May 1 and 3 in 2009 and 2011, respectively). Excellent (63%), Good (31%), and Fair (6%) survey conditions were reported for 117 routes reporting conditions.

Statewide counts of ruffed grouse drums averaged 1.1 dps (95% confidence interval = 1.0–1.3 dps) during 2015 (Figure 3). Drum counts were 1.3 (1.1–1.5) dps in the Northeast (n = 103 routes), 1.0 (0.4–1.7) dps in the Northwest (n = 8), 0.7 (0.4–1.0) dps in the Central Hardwoods (n = 15), and 0.4 (0.2–0.6) dps in the Southeast (n = 8) regions (Figure 4a-d).

Statewide drum counts were similar to last year (-1% change). Although counts increased statewide last year, the spring of 2014 was very cold and wet and likely had a negative impact on production last spring. We also had comparatively little snow last year for snow roosting, which may have influenced overwinter survival.

Sharp-tailed Grouse

A total of 2,019 male sharp-tailed grouse and grouse of unknown sex was counted at 206 leks (Table 1) during 13 March - 8 May 2015. More leks (14%) were observed in 2015 than during 2014, in part due to the filling of several DNR Wildlife staff vacancies and increased survey effort in the EC region this year. Leks with $\geq$2 grouse were observed an average of 1.9 times.

The statewide index value of 9.8 (8.9–10.7) was centrally located among values observed since 1980 (Figure 5). In the EC survey region, 208 grouse were counted on 39 leks, and 1,811 grouse were counted on 167 leks in the NW region. The index value (i.e., grouse/lek) was similar statewide and in both regions compared to 2014, and confidence intervals overlapped those from the last few years (Table 1). Counts at leks observed during both 2014 and 2015 were also similar ($t = 0.7$, $P = 0.4$) statewide and by region ($P > 0.05$; Table 2).

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. However, both grouse population indices did not change this year.

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, Leech Lake, Red Lake, and White Earth Reservations; 1854 Treaty Authority; Agassiz and Tamarac National Wildlife Refuges (U.S. Fish & Wildlife Service); Vermilion Community College; Cass County Land Department; and 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, Crookston, 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. Clarinda Wilson and Sophia Crosby also assisted with sharp-tailed grouse surveys this year. 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
2015	9.8	8.9–10.7	206	10.8	9.9–11.9	167	5.3	4.4–6.4	39

[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
2014 - 2015	-0.2	-1.0– 0.9	141	-0.3	-1.9– 1.3	102	-0.1	-1.1– 1.1	39

[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.

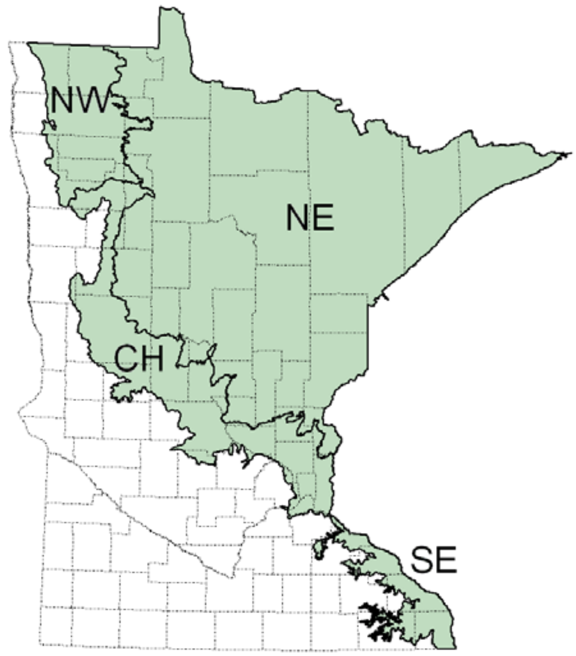


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

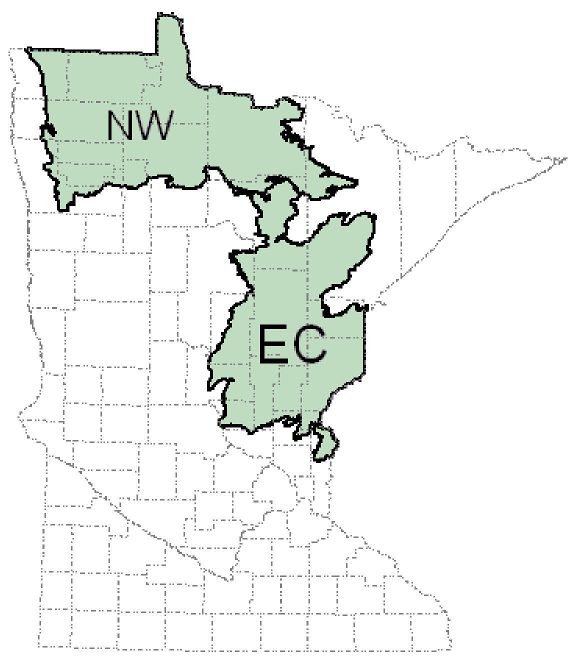


Figure 2. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

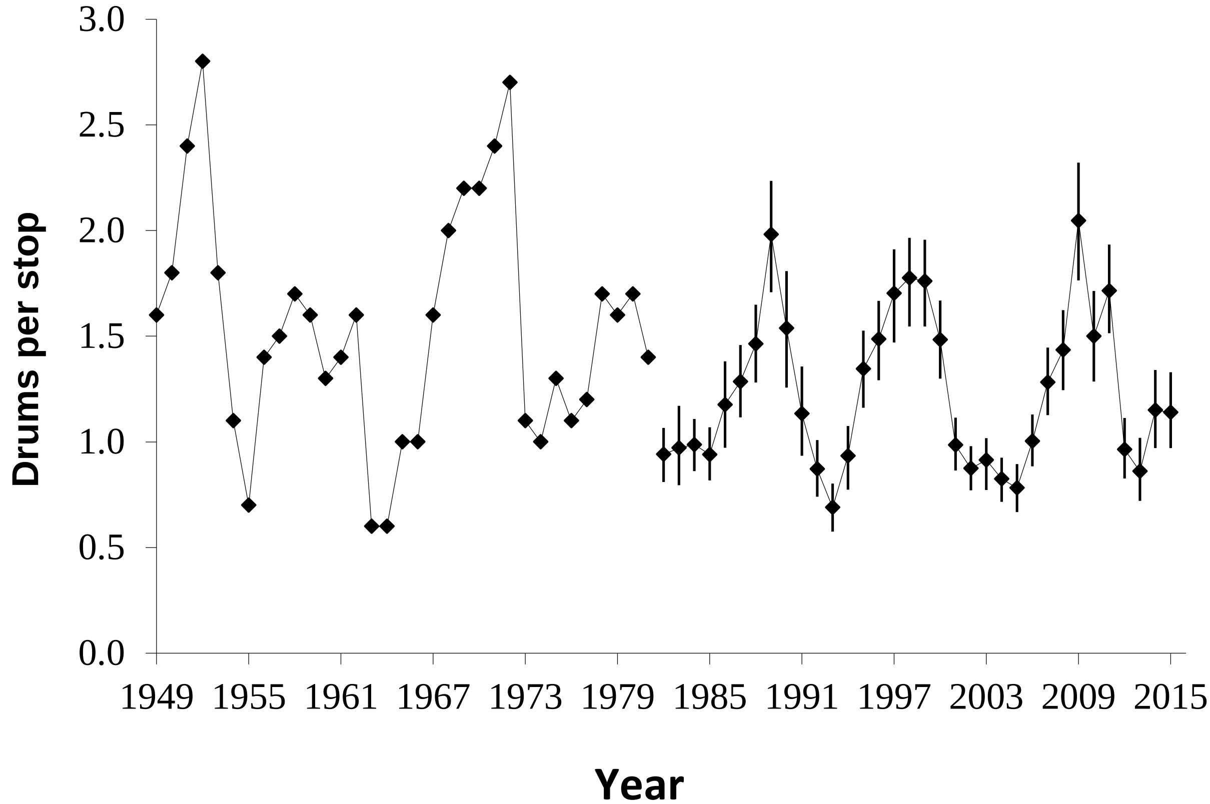
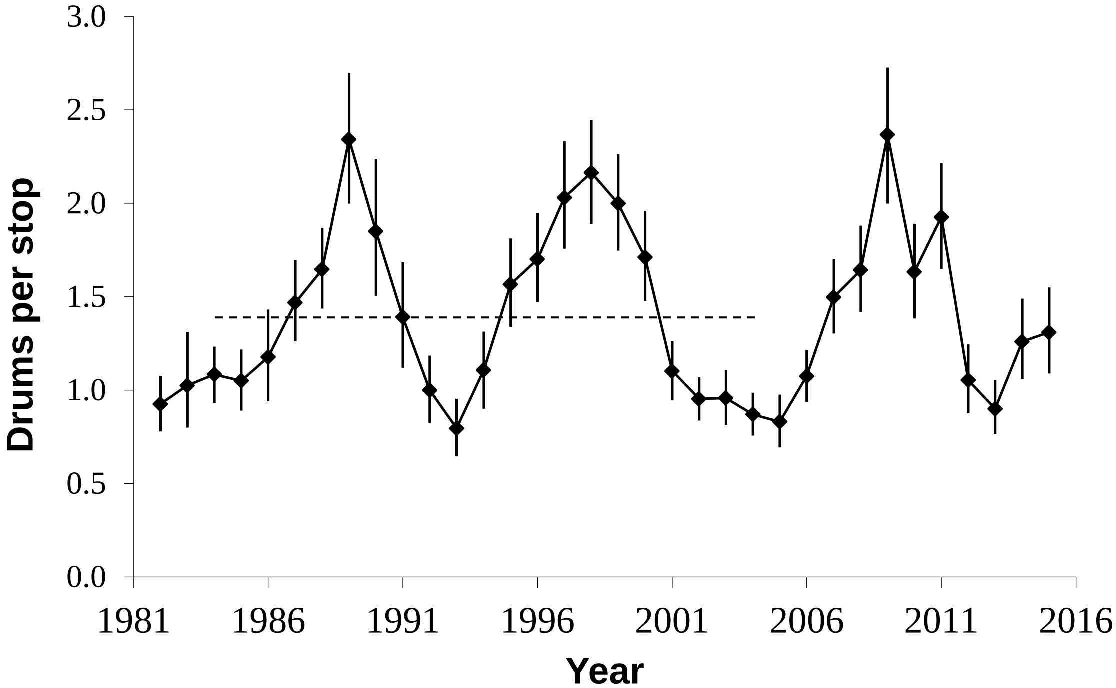
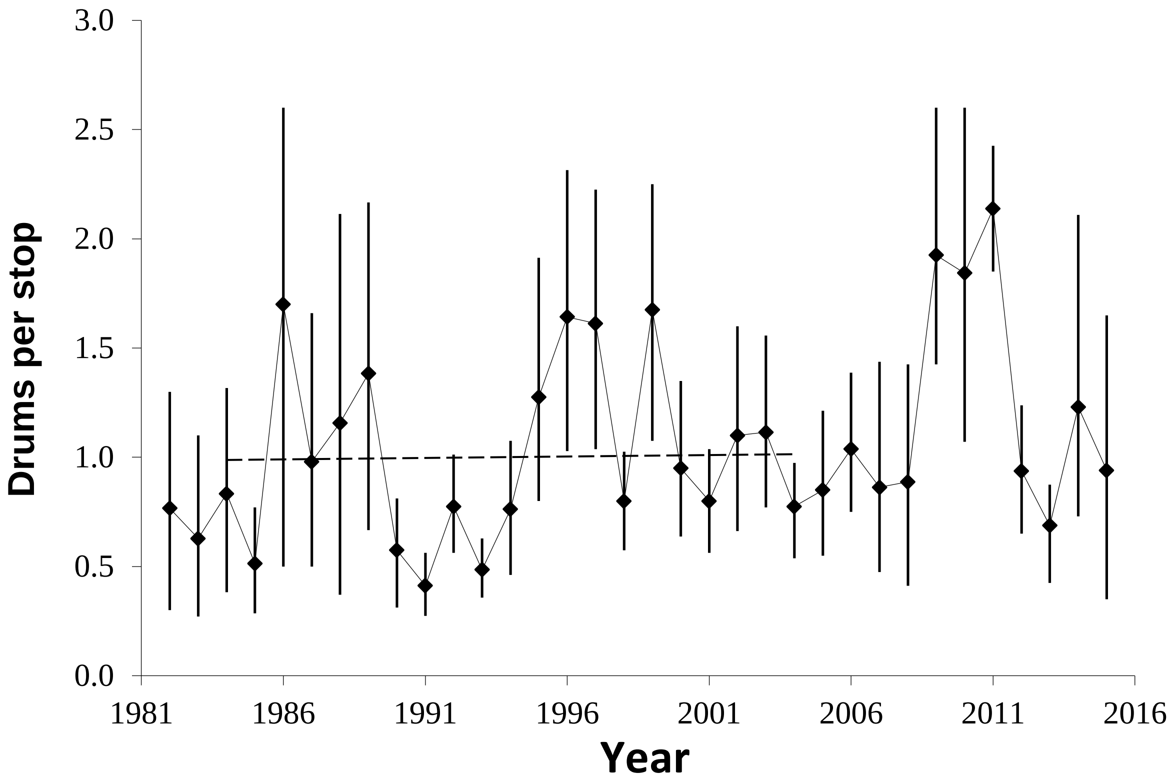


Figure 3. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not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

a.


3.0
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1986
1991
1996
2001
2006
2011
2016
Year

b.


3.0
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1986
1991
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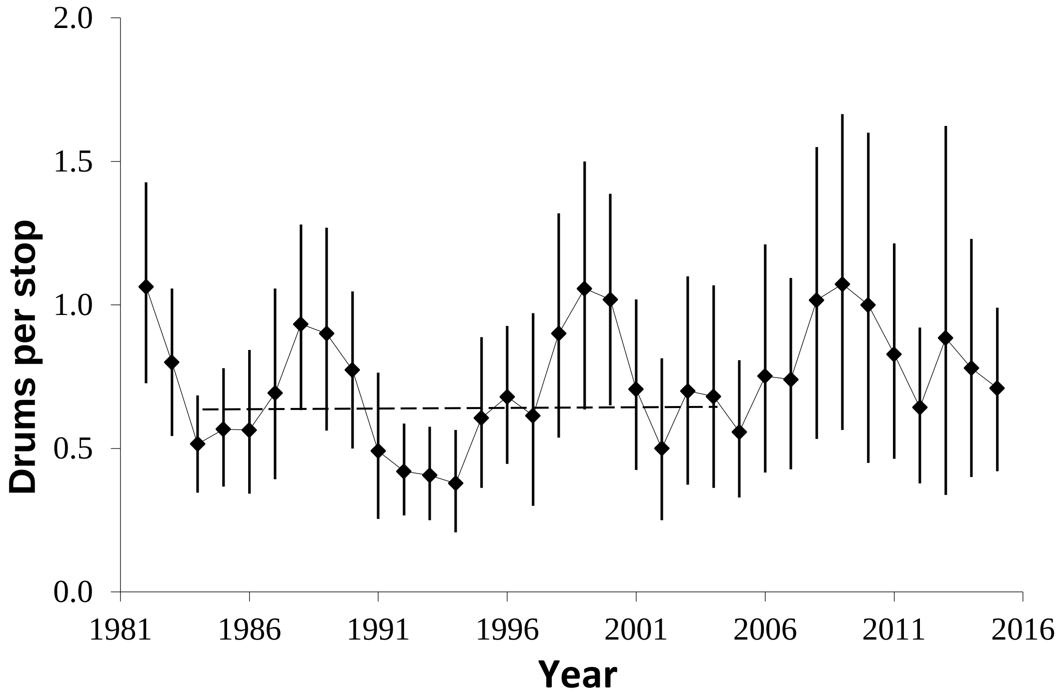
2006
2011
2016
Year

c



d.

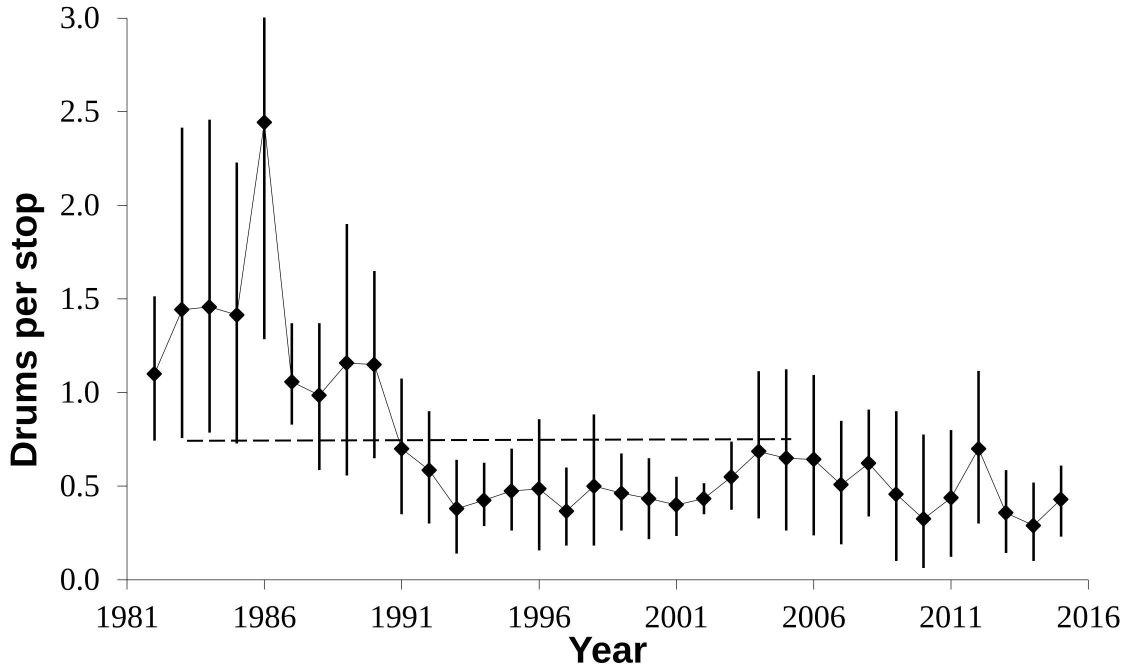


Figure 4a,b,c,d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2004 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In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

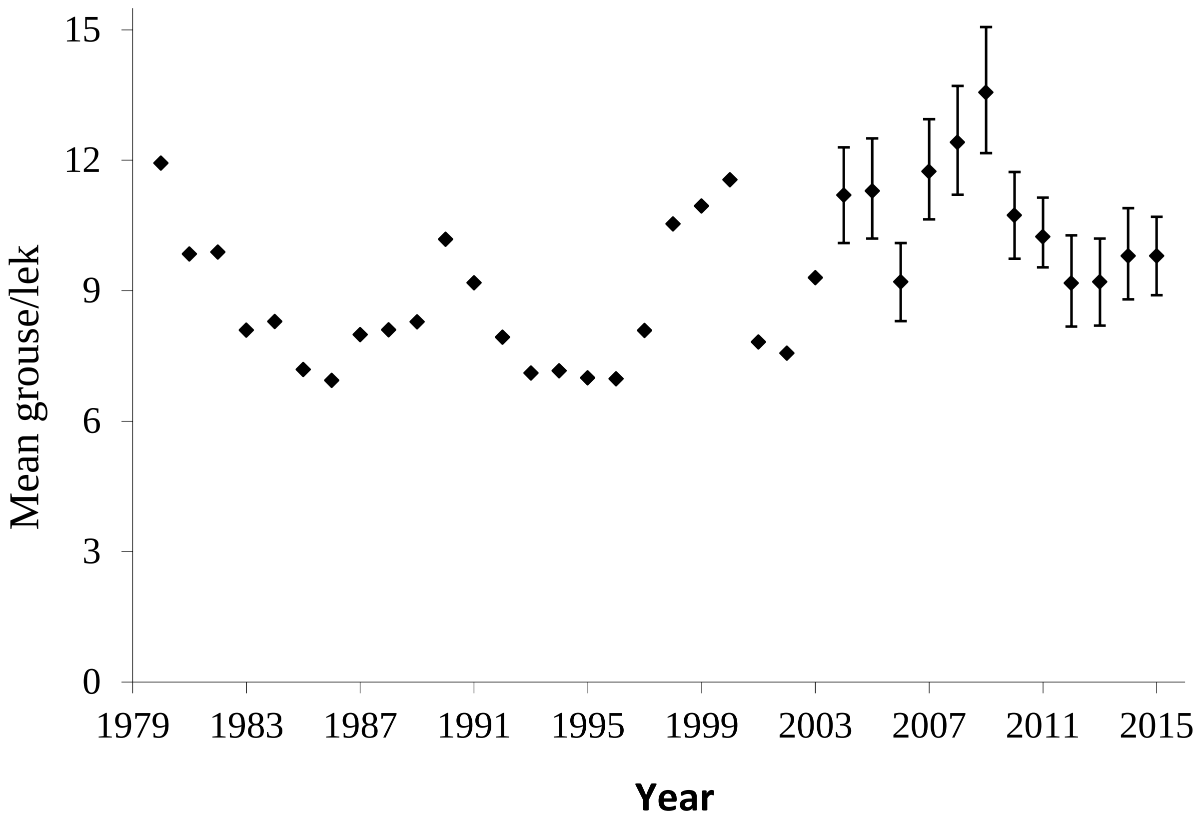


Figure 5. **Sharp-tailed grouse** counted in spring lek surveys statewide during 1980–2015. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year.

2015 MINNESOTA PRAIRIE-CHICKEN SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

Greater prairie-chickens (*Tympanuchus cupido pinnatus*) were surveyed in all 17 survey blocks during the spring of 2015. Observers located 137 booming grounds and counted 1,383 male prairie-chickens and 51 birds of unknown sex. Estimated densities of 0.10 (0.07–0.12) 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 all 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 leks 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. Leks 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 18 March and 21 May 2015. Observers located 137 booming grounds and observed 1,383 male prairie-chickens and 51 birds of unknown sex within and outside survey blocks (Table 1). These counts represent a minimum number of prairie-chickens in Minnesota during 2015, 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 2015. Lek and bird counts are not comparable among permit areas or years.

Permit Area	Area (km^2)	Leks	Males	Unk[a]
803A	1,411	16	147	0
804A	435	0	0	0
805A	267	20	214	0
806A	747	9	70	0
807A	440	16	142	0
808A	417	21	277	0
809A	744	13	159	0
810A	505	8	110	0
811A	706	11	86	19
812A	914	5	33	6
813A	925	5	58	17
PA subtotal	7,511	124	1,296	42
Outside PAs[b]	NA[c]	13	87	9
Grand total	NA[c]	137	1,383	51

[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, 724 males and birds of unknown sex were counted on 68 booming grounds during 2015 (Table 2). Each lek was observed an average of 2.1 times (median = 2), with 41% of booming grounds observed just once. Densities of prairie-chickens in the 10 core survey blocks were 0.12 (0.08–0.15) booming grounds/km^2 and 10.9 (9.1–12.7) males/booming ground (Table 2, Figure 2). In the 7 peripheral survey blocks, densities were 0.07 (0.06–0.08) booming grounds/km^2 and 7.8 (5.9–9.6) males/booming ground.

The density of 0.10 (0.07–0.12) booming grounds/km^2 in all survey blocks during 2015 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 2015 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.

			2015		Change from 2014[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	9	87	3	38
	Polk 2	42.0	5	84	-1	-13
	Norman 1	42.0	1	12	0	-1
	Norman 2	42.2	4	53	2	20
	Norman 3	41.0	6	58	-3	9
	Clay 1	46.0	8	77	2	4
	Clay 2	41.0	2	52	0	9
	Clay 3	42.0	5	57	0	6
	Clay 4	39.0	3	22	0	-5
	Wilkin 1	40.0	5	67	1	20
	Core subtotal	415.0	48	569	4	87
Periphery	Mahnomen	41.7	4	29	1	-8
	Becker 1	41.4	2	22	-8	-36
	Becker 2	41.7	3	26	-1	-7
	Wilkin 2	41.7	3	18	1	-2
	Wilkin 3	42.0	3	27	0	2
	Otter Tail 1	41.0	2	14	0	0
	Otter Tail 2	40.7	3	19	NA[d]	NA[d]
	Periphery subtotal	290.6	20[e]	155[e]	-7[e]	-51[e]
Grand total		705.5	68[e]	724[e]	-3[e]	36[e]

[a] The 2014 count was subtracted from the 2015 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 2014.
[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, Tyler Larson, Bob O'Connor, and Tony Nelson; cooperators with the US Fish and Wildlife Service included Maria Fosado, Shawn Papon, Chad Raitz, Larry Hanson; and numerous additional volunteers participated including Steve Bommersbach, Dan Svedarsky, Doug Wells, Terry Wolfe, Jill Fejszes, Kris Spaeth, Tom Kucera, and Doug Hedtke. This year, Clarinda Wilson and Sophia Crosby also assisted with surveys. 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.

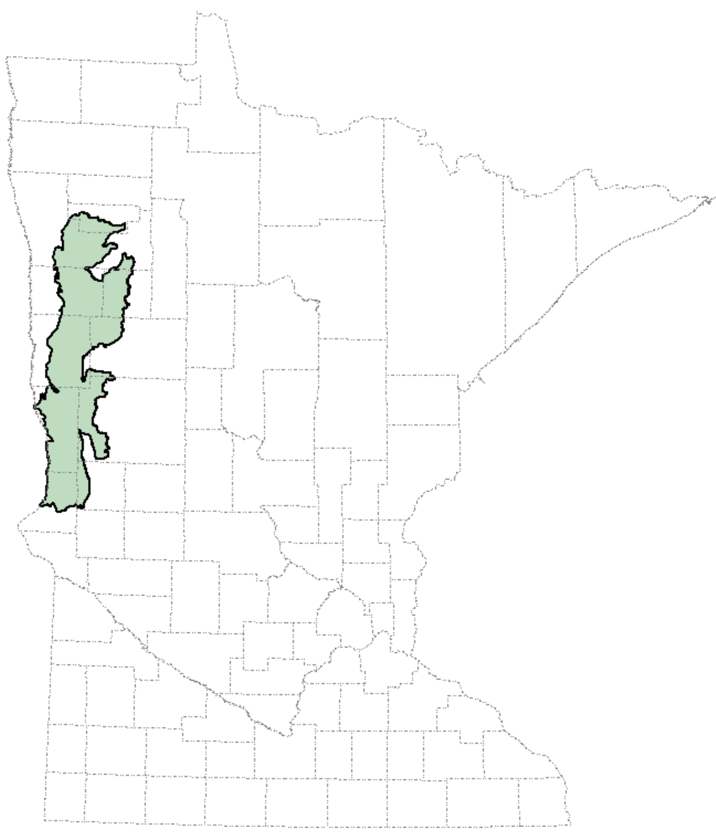


Figure 1. Primary greater prairie-chicken range in Minnesota (shaded area) relative to county boundaries. The range boundary was based on Ecological Classification System Land Type Associations and excludes some areas known to be occupied by prairie-chickens.

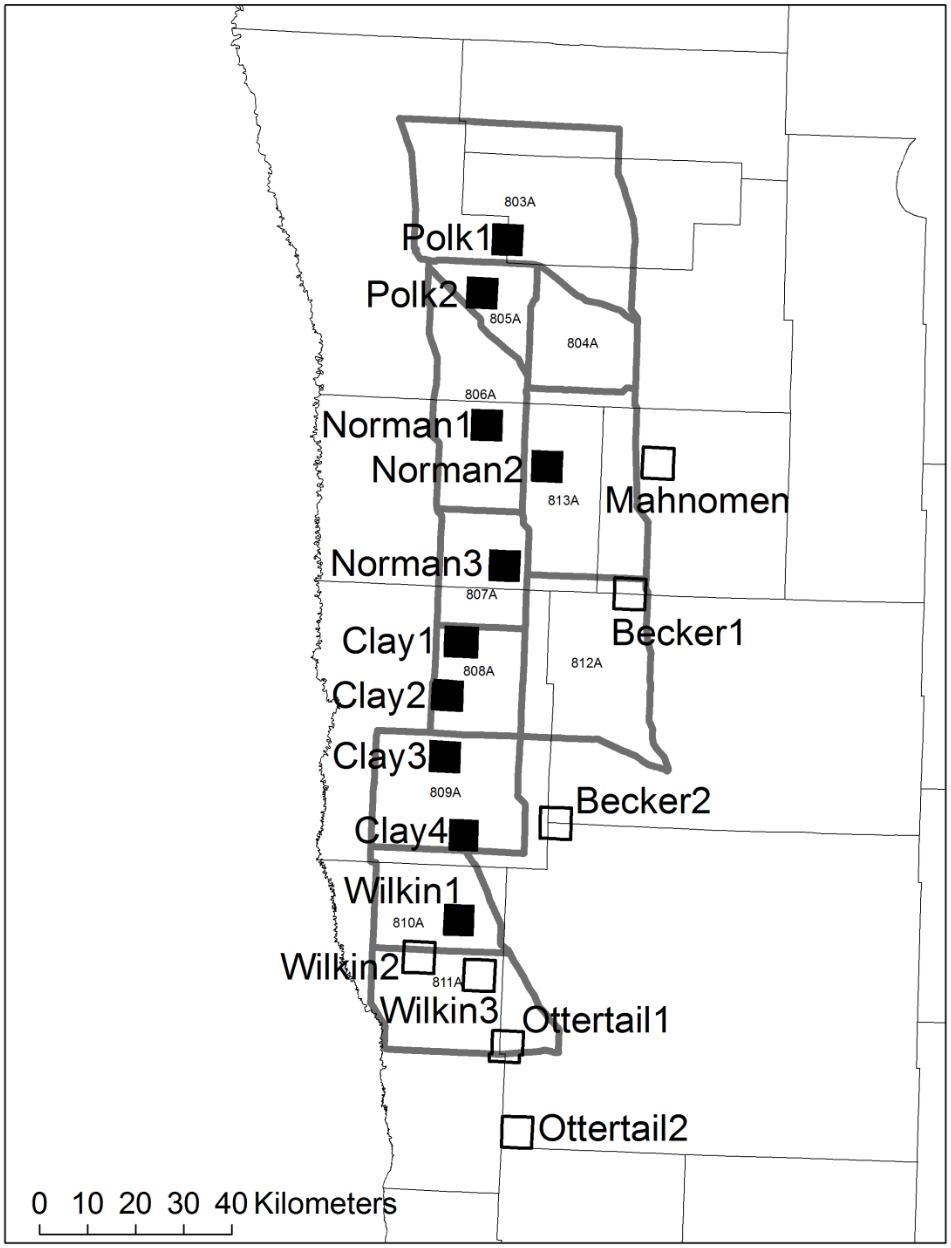


Figure 2. Prairie-chicken lek survey blocks (41 km^2, labeled squares) and hunting permit areas (thick grey lines) in western Minnesota. Survey blocks were either in the core (black) or periphery (white) of the range with a threshold of 1.0 male/km^2 in 2010, and were named after their respective counties (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.

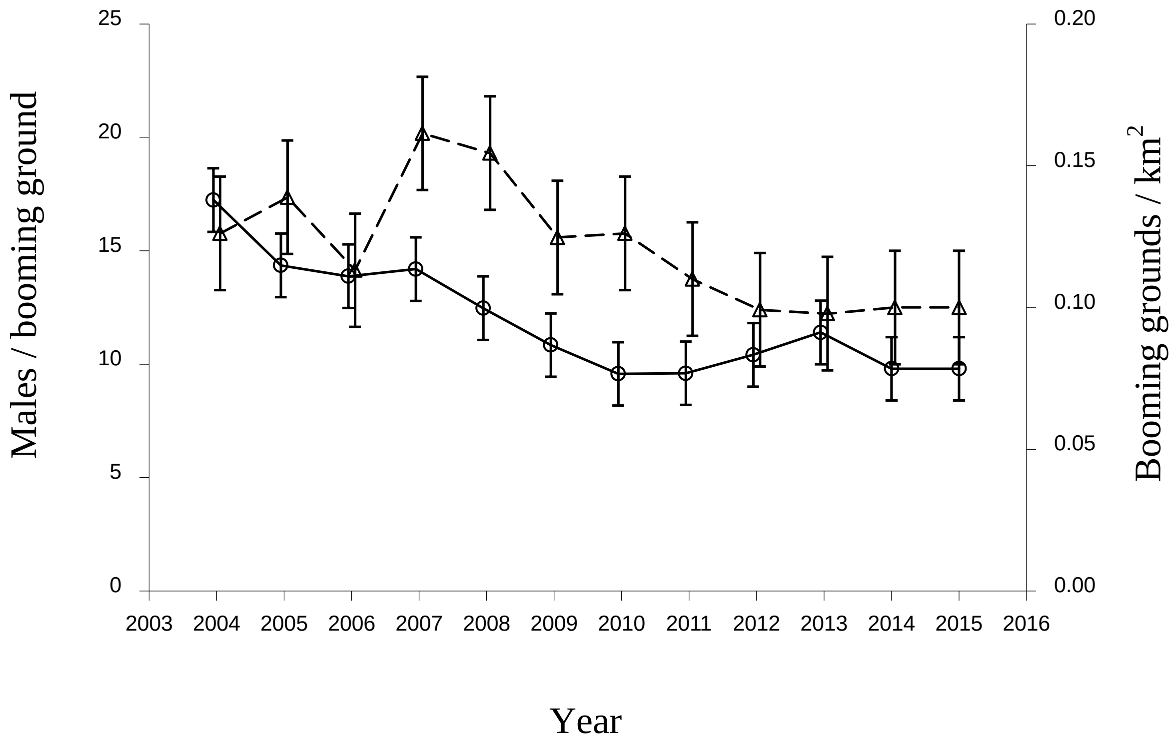


Figure 3. Mean prairie-chicken males/booming ground (circles connected by solid line) and booming grounds/km^2 (triangles connected by dashed line) in survey blocks in Minnesota with 95% confidence intervals.

2015 AERIAL MOOSE SURVEY

Glenn D. DelGiudice, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year, we conduct an aerial survey in northeastern Minnesota to monitor moose (*Alces americanus*) numbers and fluctuations in the overall status of the state'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 assess the population's long-term trend and composition, set the harvest quota for the subsequent hunting season when applicable, improve our understanding of moose ecology, and otherwise contribute to sound future management strategies.

METHODS

The survey area is approximately 5,985 mi^2 (Lenarz 1998, Giudice et al. 2012). We estimated moose numbers, age and sex ratios by flying transects within a stratified random sample of the 436 total survey plots (Figure 1). All survey plots are reviewed and re-stratified as low, medium, or high moose 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. The most recent re-stratification was conducted in 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 4^{th} stratum represented by a series of 9 plots which have undergone disturbance by wildfire, 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.

All survey plots of the 436-plot grid (designed in 2005) are rectangular (5 x 2.67 mi.) and oriented east to west with 8 transects spaced about 0.3 miles apart. Minnesota Department of Natural Resources (MNDNR) Enforcement pilots flew the 2 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 each 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). This model was developed between 2004 and 2007 using moose that were radiocollared as part of a study of survival and its impact on dynamics of the population (Lenarz et al. 2009, 2010). 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'-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).

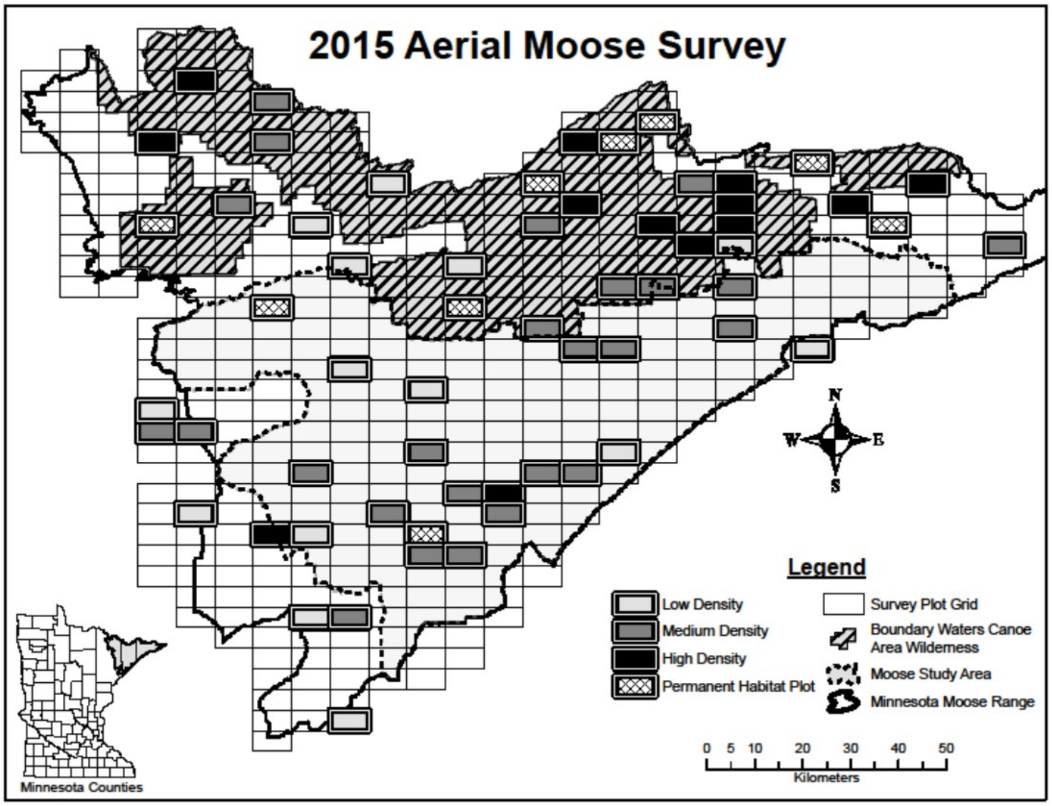


Figure 1. Moose survey area and 52 sample plots flown in the 2015 aerial moose survey. The study area for ongoing MNDNR moose research also is shown.

RESULTS AND DISCUSSION

The survey was conducted from 13 to 29 January 2015. It consisted of 8 actual survey days, and as in 2014, included 52 survey plots. This year, based on optimal allocation analyses, we surveyed 11 low, 22 medium, and 10 high density plots, and the 9 permanent plots (Giudice 2015). Generally, 8" of snow cover is our minimum threshold depth for conducting the survey. Snow depths were marginal on 6% of the survey plots, but 8-16" and greater than 16" on 92% and 2% of the plots, respectively. Overall, survey conditions were good for 86% and fair for 14% of the plots when surveyed. Average survey intensity was 47 minutes/plot (13.4 mi^2) and ranged from 30 to 65 minutes/plot (Giudice 2015).

This year a total of 392 moose were observed on 34 (65%) of the 52 plots surveyed (694 mi^2), not markedly dissimilar from last year (419 moose on 41 plots), and included 162 bulls, 169 cows, 56 calves, and 5 unclassified moose. This apparent occupancy of plots is lower than the 10-year average of 82%. An average of 11.5 moose were observed per "occupied" plot (range = 1-46 moose) compared to a 10-year average of 12.2 moose. Estimates of the calf:cow and bull:cow ratios were 0.29 and 0.99, respectively. This calf:cow ratio is one of the lowest since 2005 (Table 1).

After adjusting for sampling and sightability, we estimated the population in northeastern Minnesota at 3,450 (2,610–4,770, 90% confidence interval) moose (Table 1, Fig. 2). As can be noted from the 90% confidence limits associated with the population point estimates (Table 1,Figure 2), statistical uncertainty inherent in aerial wildlife surveys can be quite large, even when surveying large, dark, relatively conspicuous animals such as moose against a white background during winter. This is attributable 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) interaction of these factors. Short-term, year-to-year statistical comparisons of population estimates are not supported by these surveys, rather they are best suited to establishing long-term trends. Past aerial survey and research results have indicated that the trend of the population in northeastern Minnesota has been declining since 2006 (Lenarz et al. 2010, DelGiudice 2013). This downward trend persists (r^2= 0.821, P = 0.001, Figure 2), and the 2015 population estimate of 3,450 indicates a 61% decline since 2006; however, the population estimate is not statistically different from last year.

Table 1. Estimated moose numbers, 90% confidence intervals, and calf:cow ratios, percent calves in the population, percent cows with twins, and bull:cow ratios estimated from aerial surveys in northeastern Minnesota, 2005-2015.

Survey	**Estimate**	**90% Confidence Interval**	**Calf: Cow**	**% Calves**	**% Cows w/ twins**	**Bull: Cow**
2005	8,160	6,090 – 11,410	0.52	19	9	1.04
2006	8,840	6,790 – 11,910	0.34	13	5	1.09
2007	6,860	5,320 – 9,100	0.29	13	3	0.89
2008	7,890	6,080 – 10,600	0.36	17	2	0.77
2009	7,840	6,270 – 10,040	0.32	14	2	0.94
2010	5,700	4,540 – 7,350	0.28	13	3	0.83
2011	4,900	3,870 – 6,380	0.24	13	1	0.64
2012	4,230	3,250 – 5,710	0.36	15	6	1.08
2013	2,760	2,160 – 3,650	0.33	13	3	1.23
2014	4,350	3,220 – 6,210	0.44	15	3	1.24
2015	3,450	2,610 – 4,770	0.29	13	3	0.99

Based on the survey's recorded calf:cow ratio (0.29), estimated calf recruitment in spring of 2015 could be one of the lowest in several years (Table 1, Fig. 3). The calf:cow ratio in mid- January 2015 was 0.29, down markedly compared to last year's survey (0.44) and 17% below the 10- year average of 0.35. Calves were 14% of the total 392 moose actually observed and represented 13% of the estimated population (Table 1, Fig. 3). The sighting of twins with cows, 3% of the 169 cow moose observed, has not been uncommon since 2005 (Table 1). Survey results indicate calf survival to late January 2015 was low. Findings from an ongoing study of GPS-collared moose calves indicate that calf survival was low in 2013-14 and likely in 2014-15 (Severud et al. 2014). Annual recruitment of calves can have a significant influence on the population performance of moose, but it is not actually determined until the next spring's calving season when winter survey-observed calves become yearlings. At this point, little is known about survival 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 greatest long-term impact on annual changes in the moose population (Lenarz et al. 2010). For the past year annual mortality of adult moose has been lower (11% vs. 20%; Carstensen et al., unpublished data).

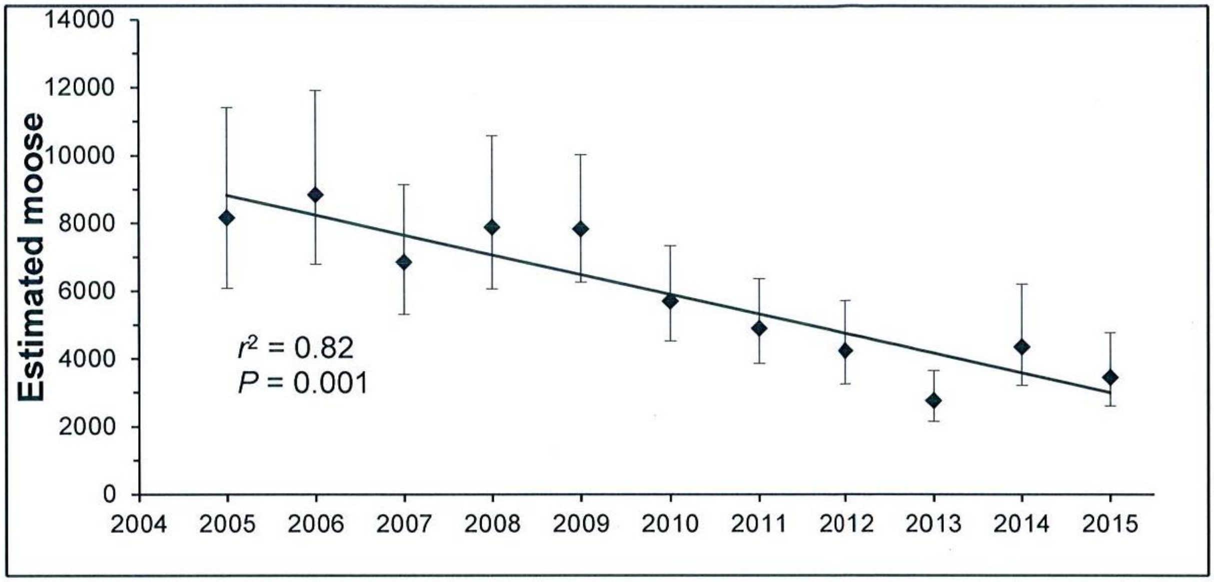


Figure 2. Point estimates, 90% confidence intervals, and trend line of estimated moose numbers in northeastern Minnesota, 2005-2015. (Note: The 2005 survey was the first to be flown with helicopters and to include a sightability model and a uniform grid of east-west oriented rectangular 13.4-mi^2 plots).

The estimated bull:cow ratio (Table 1; Figure 4) exhibits an apparent decrease compared to 2013 and 2014, but is similar to the mean of 2005-2015 (0.98). There is a great deal of annual variability associated with the bull:cow ratios, consequently, they exhibited no clear upward or downward long-term trend (2005-2015).

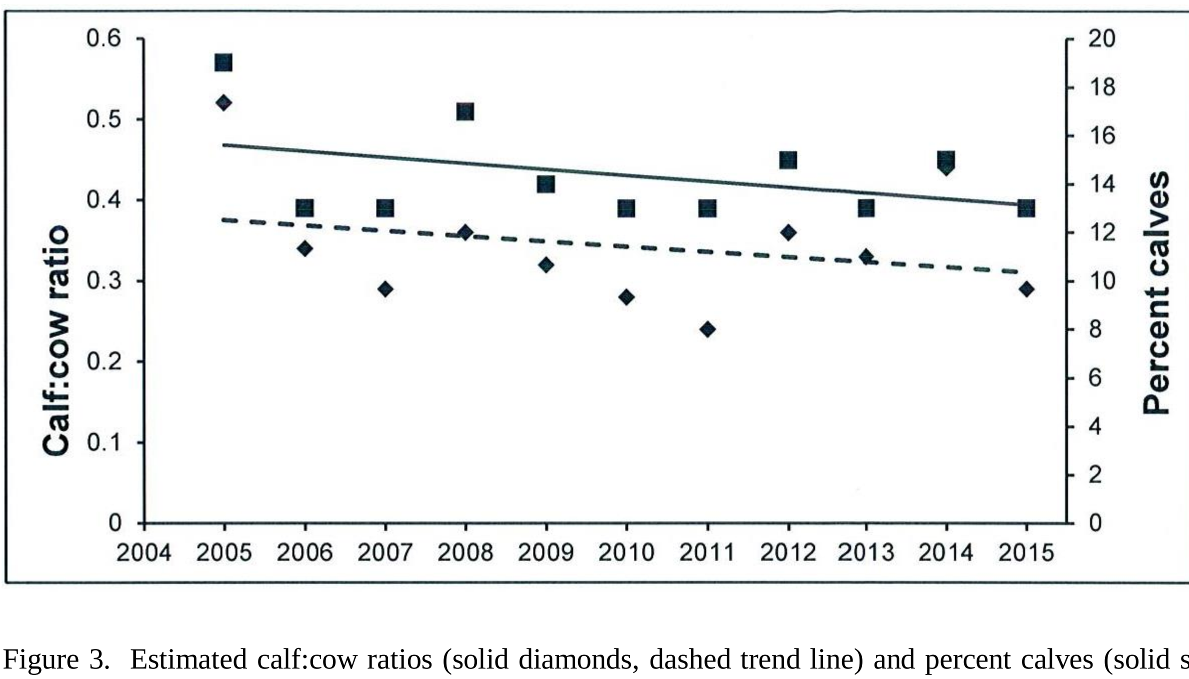


Figure 3. Estimated calf:cow ratios (solid diamonds, dashed trend line) and percent calves (solid squares, solid trend line) of the population from aerial moose surveys in northeastern Minnesota, 2005-2015.

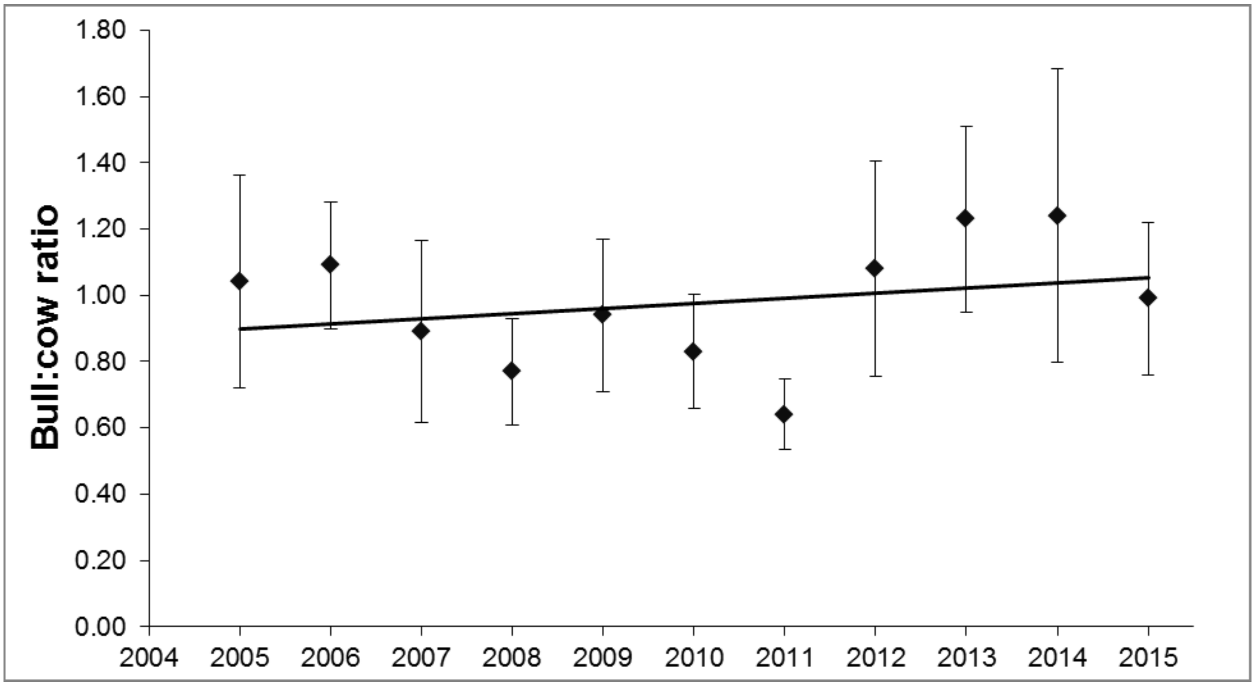


Figure 4. Estimated bull:cow ratios, 90% confidence intervals, and trend line from aerial moose surveys in northeastern Minnesota, 2005-2015.

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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, Nancy Hansen, Jessica VanDuyn, Bailey Petersen, and Chris Balzer flew as observers. The consistent annual efforts of these teams contribute to the rigor of this survey and the comparability of long-term results and are gratefully appreciated. Thank you to John Giudice who continues to provide critical statistical consultation and analyses, and 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. We gratefully acknowledge Bob Wright, Brian Haroldson, and Chris Pouliot for creating the program DNRSurvey. Bob also modifies the software as needed and each year provides refresher training for survey observers using DNRSurvey. The efforts of all of these people contribute to survey improvements. This project was funded in part by the Wildlife Restoration (Pittman-Robertson) Program.

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Drawing by Gilbert Proulx

REGISTERED FURBEARER POPULATION MODELING 2015 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, 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 were originally based largely on carcass data collected in the early 1980s. However, reproductive data for fishers and martens has been collected over the past 8 years from a telemetry study, and for bobcats, additional carcass data was collected in 1992 and from 2003-present. Initial and subsequent survival inputs were based on a review of published estimates in the literature, updated for fishers and martens based on recent Minnesota research, and are periodically adjusted based on presumed relationships 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.

Harvest data is obtained through mandatory furbearer registration. A detailed summary of 2014 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. The data will also be used for deriving independent estimates of abundance using statistical population reconstruction (e.g., Skalski et al. 2012). 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 2014 registered DNR trapping and hunting harvest increased 33% to 1,384 (Table 1). Total modeled harvest, which includes reported tribal take, was 1,453. Age and reproductive data from bobcats harvested in 2014 is not complete at this time. Past data is presented in Figures 1 – 5 and Table 1.

Based on projections from the population model, 25% of the fall 2014 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 6% decline in the bobcat population (Figure 3), with an estimated 2015 spring population size of ~ 4,000 (Figure 6). Both track indices remain near the upper end of their previously recorded range (Figure 6).

Fisher. Over the past 7 years, the fisher harvest season has become progressively more conservative, with the past 3 seasons each lasting only 6 days and a per trapper combined limit of 2 fisher/marten. Fisher harvest this year under the DNR framework decreased ~ 18% to 943 (Table 2). Modeled harvest, which includes reported tribal take, was 1,045.

After a 15-year lapse, fisher carcass collections were resumed in 2010 to collect current information on harvest age distribution. A total of 881 carcasses were collected in 2014 (Table 2). Juveniles accounted for 56% of the total harvest, the highest since aging resumed in 2010, but below the average (64%) from 1977-1994. The juvenile:adult female ratio was 3.7, identical to the previous 4-year average, but well below the 1977-1994 average of 6.6 (Table 2). Average age of harvested males and females was 1.4 and 1.9, respectively, with the harvest being comprised of few fishers over the age of 1.5 (Figures 7 and 8).

Based on model projections, 14% of the fall fisher population was harvested during the 2014 season. After years of estimated decline based on track surveys and modeling, fisher trends have stabilized or slightly increased the past 2 years (Figure 9). Along the southern and western periphery of fisher range, an area not represented in track surveys, 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 this caveat, modeling projects a 1.6% increase in the fisher population with an estimated 2015 spring population size of ~ 6,100 fishers (Figure 9).

Marten. As with fishers, the marten harvest season has become progressively more conservative in recent years, with the past 2 seasons lasting 6 days and a per trapper combined limit of 2 fisher/marten. Harvest this year under the DNR framework was 1,059, slightly above last year and the second lowest since 1991 (Table 3). Modeled harvest, which includes reported tribal take, was 1,124.

Juveniles accounted for 58% of the total harvest with a juvenile:adult female ratio of 5.8 (Table 3, Figure 10). Both numbers are above their 2002-13 averages (3.8; 43%) when modeling projects the population to have been in decline, though the juvenile:adult female ratio remains below that estimated from the 1987 – 2001 period (9.1) when the population is projected to have increased. Average age of harvested males and females was 1.9 and 1.8, respectively (Figures 11 and 12).

Based on projections from the marten population model, 12% of the fall 2014 population was harvested. This represents the lowest estimated harvest rate since 1991 (Table 3). Although the estimated population remains well below the peaks in the mid to late 1990's, modeling indicates that the population has stabilized in recent years (Figure 13), with an estimated 3% increase in the population from last year. The 2015 spring population is projected at ~ 7,750 martens (Figure 13).

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 2014 under the DNR framework decreased 24% to 2,154 (Table 4). Modeled statewide otter harvest, which includes tribal take, was 2,235 (Table 4).

An estimated 16% of the fall 2014 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. Since 2002, otter population estimates have fluctuated as a result of cycles in fur prices that have altered harvest above and below this threshold. The population remains near the high end of levels estimated over the past 35 years (Figure 14) with the 2015 spring population estimated to be ~ 12,100, a 2.4% increase from last year.

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This project was funded in part by the Wildlife Restoration Program.

Table 1. Bobcat harvest data, 1985 to 2014.

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]
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	1128	20	634	35	18	47	1.4	59	50	48	52	$89
2014	1384	1453	25	1296				Not yet available				58	

[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.

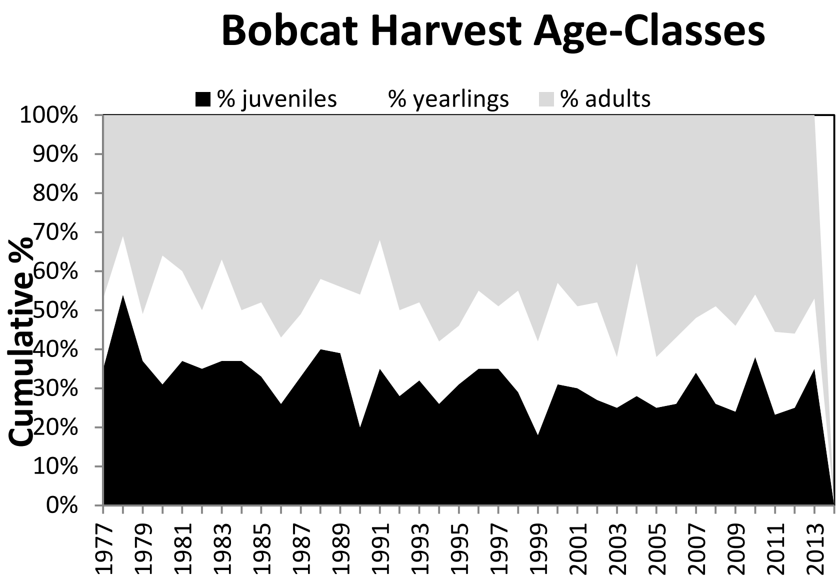

Figure 1. Age-class distribution of bobcats harvested in Minnesota 1977 - 2013.

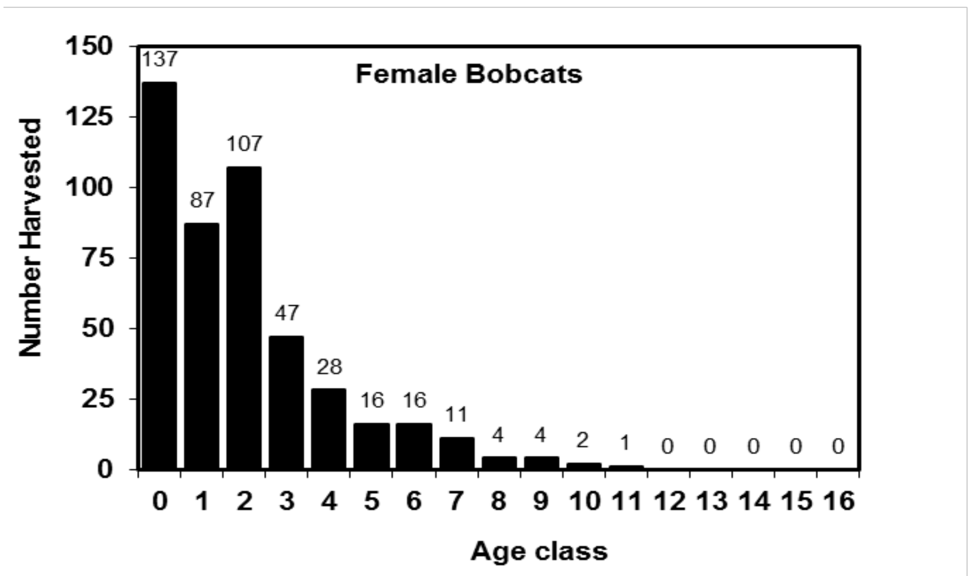

Figure 2. Age structure of female bobcats in the 2013 harvest.

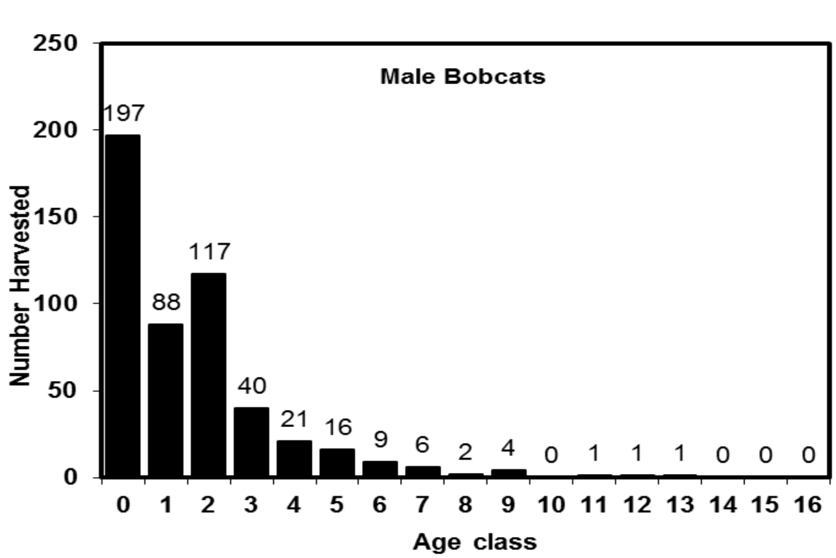

Figure 3. Age structure of male bobcats in the 2013 harvest.

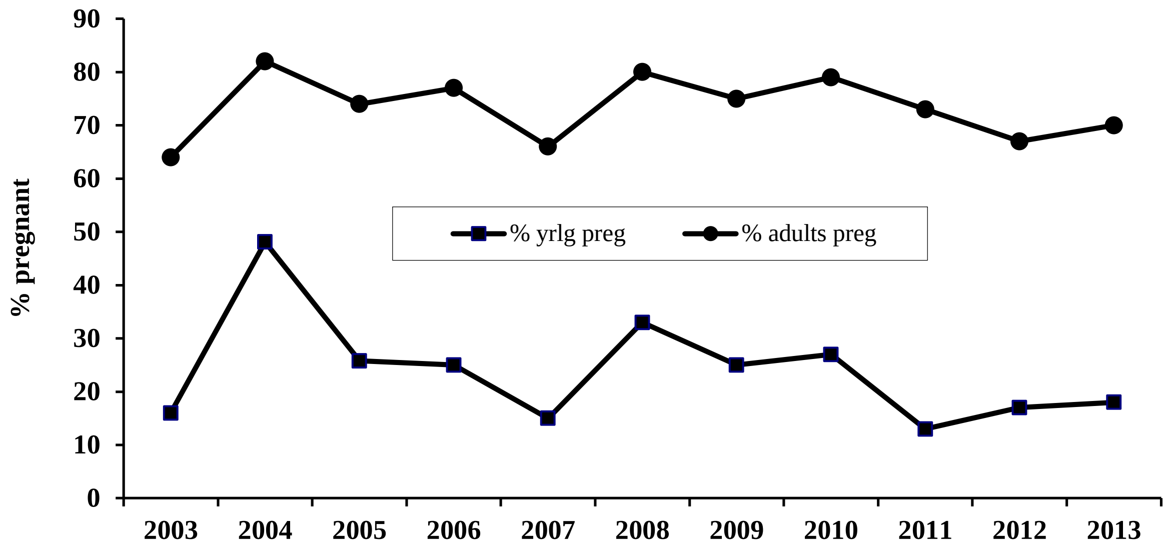

Figure 4. Pregnancy rates for yearling and adult bobcats in Minnesota, 2003-2013.

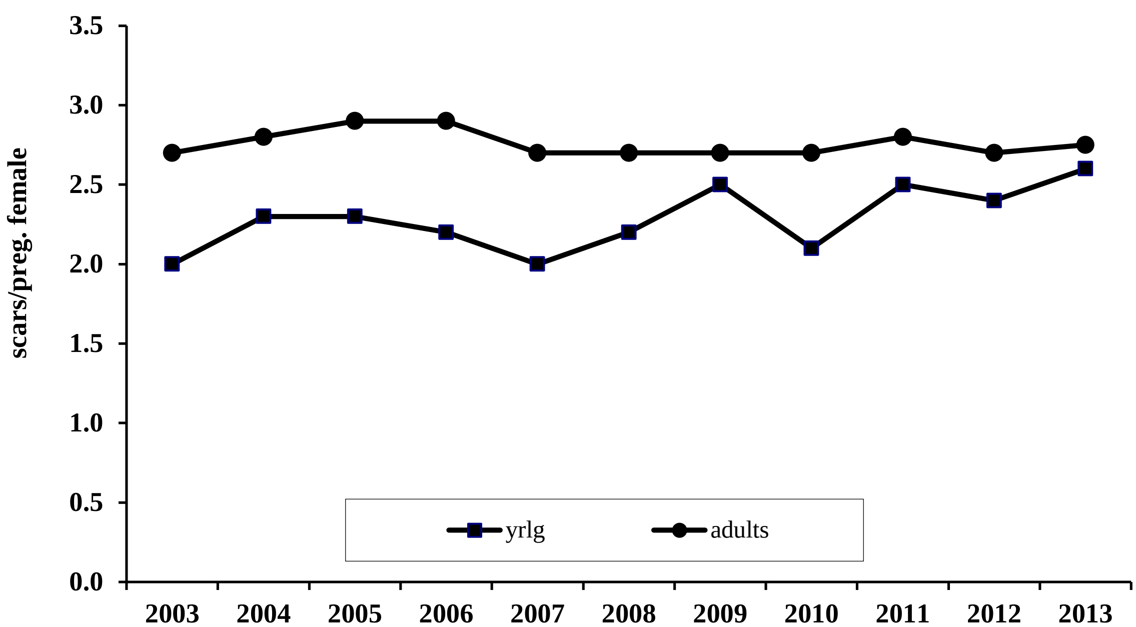

Figure 5. Litter size for parous yearling and adult bobcats in Minnesota, 2003-2013.

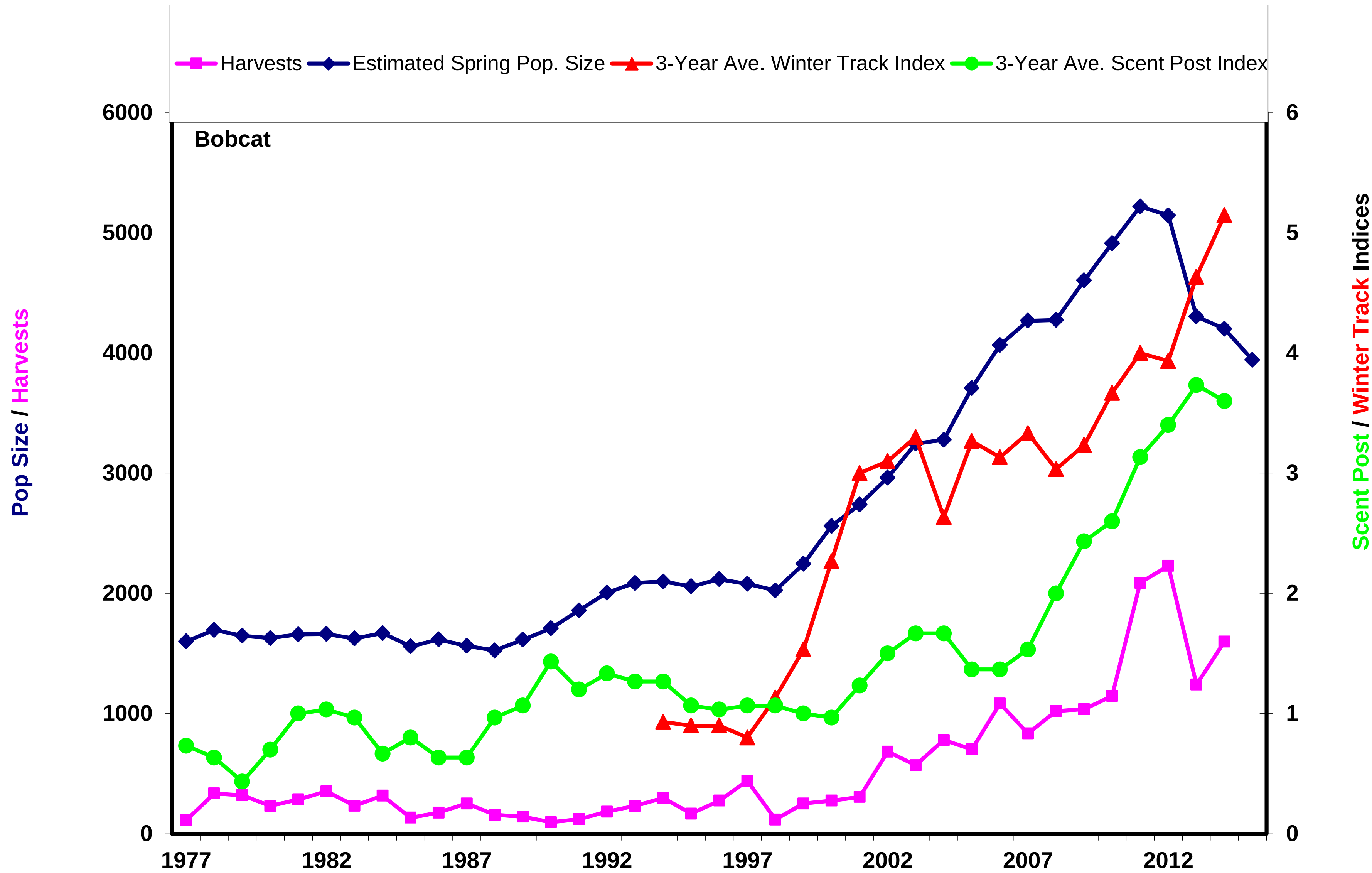

Figure 6. Bobcat populations, harvests, and survey indices, 1977-2015. Harvests include an estimate of non-reported take.

Table 2. Fisher harvest data, 1985 to 2014.

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]
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
2014	943	1045	14	881	56	21	23	3.7	57	57	36	52		

[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 7. Age structure of female fishers in the 2014 harvest.

Figure 8. Age structure of male fishers in the 2014 harvest.

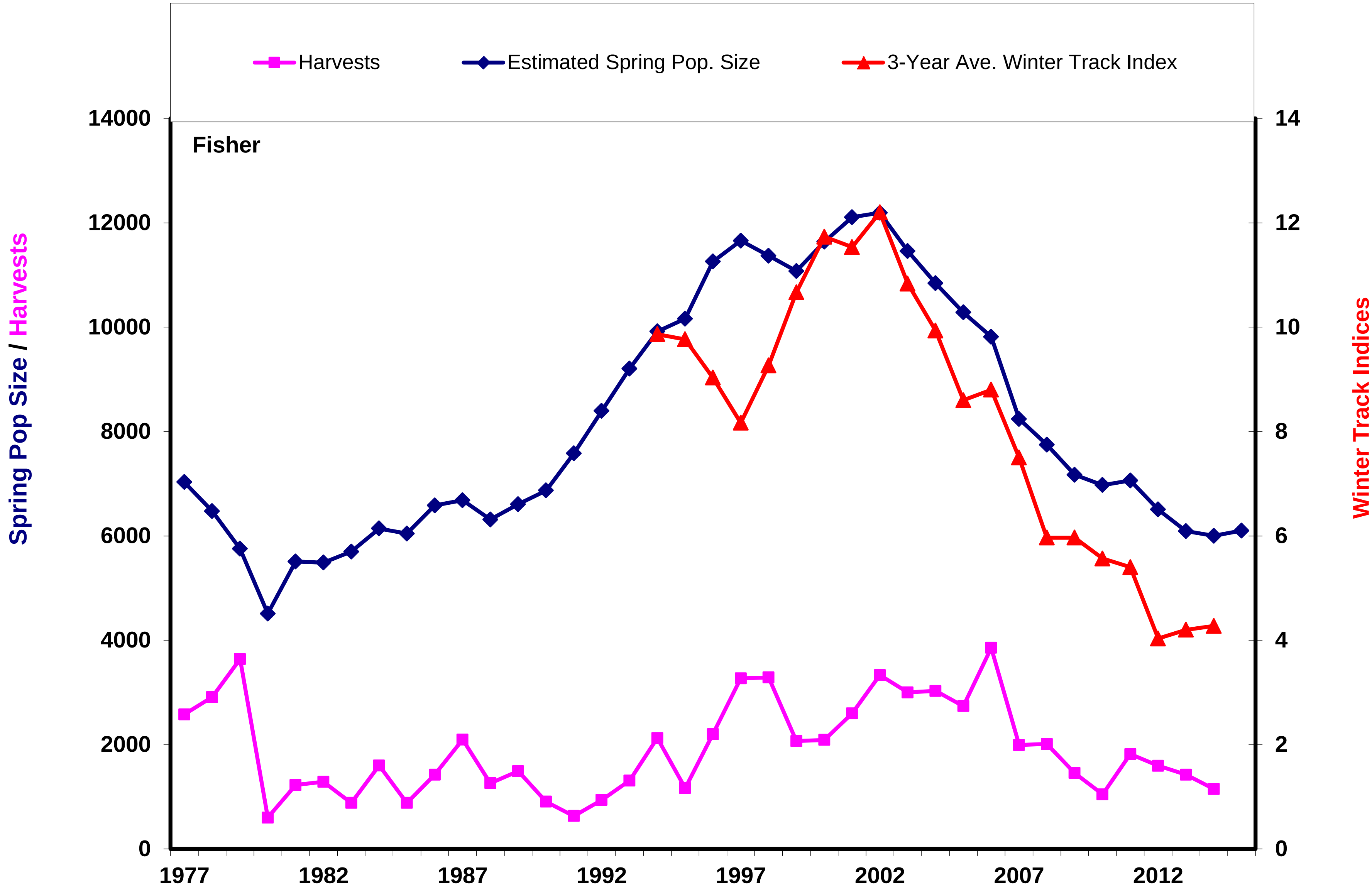

Figure 9. Fisher populations, harvests, and survey indices, 1977-2015. Harvests include an estimate of non-reported take.

Table 3. Marten harvest data, 1985 to 2014.

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
2014	1059	1124	12	991	58	14	28	5.8	65	67	64	65		

[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

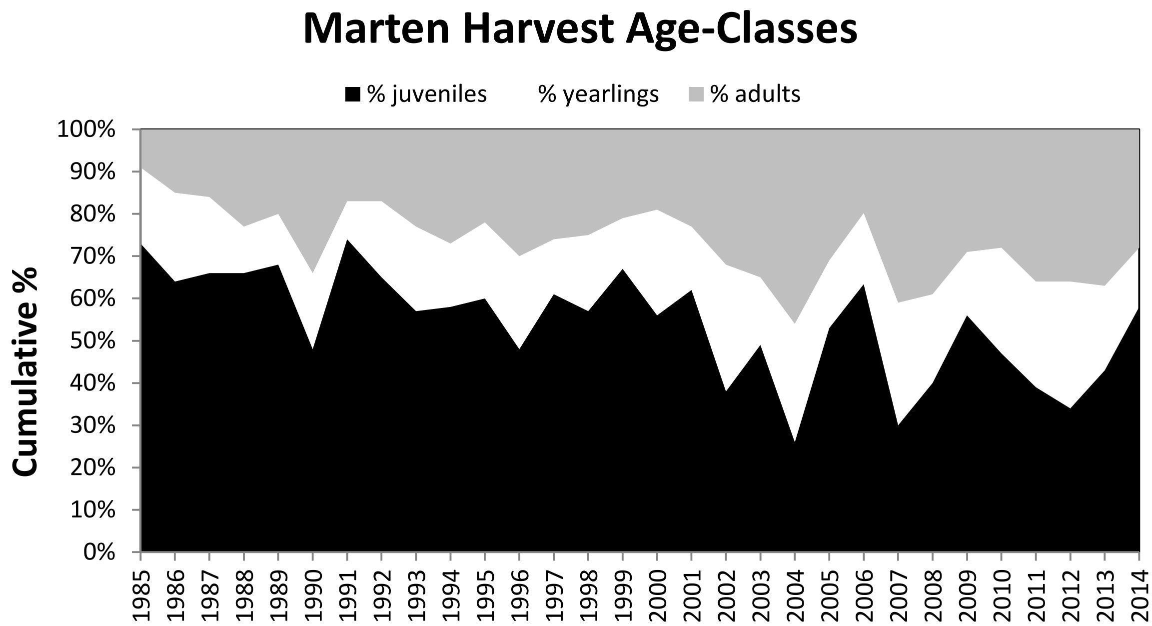

Figure 10. Age-class distribution of martens harvested in Minnesota, 1985 - 2014.

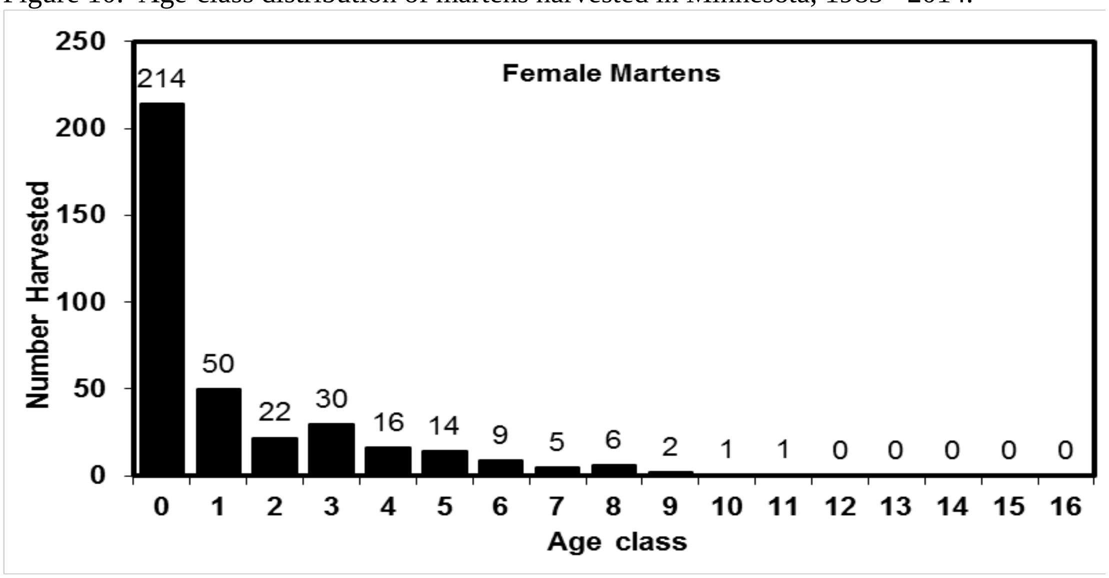

Figure 11. Age structure of female martens in the 2014 harvest.

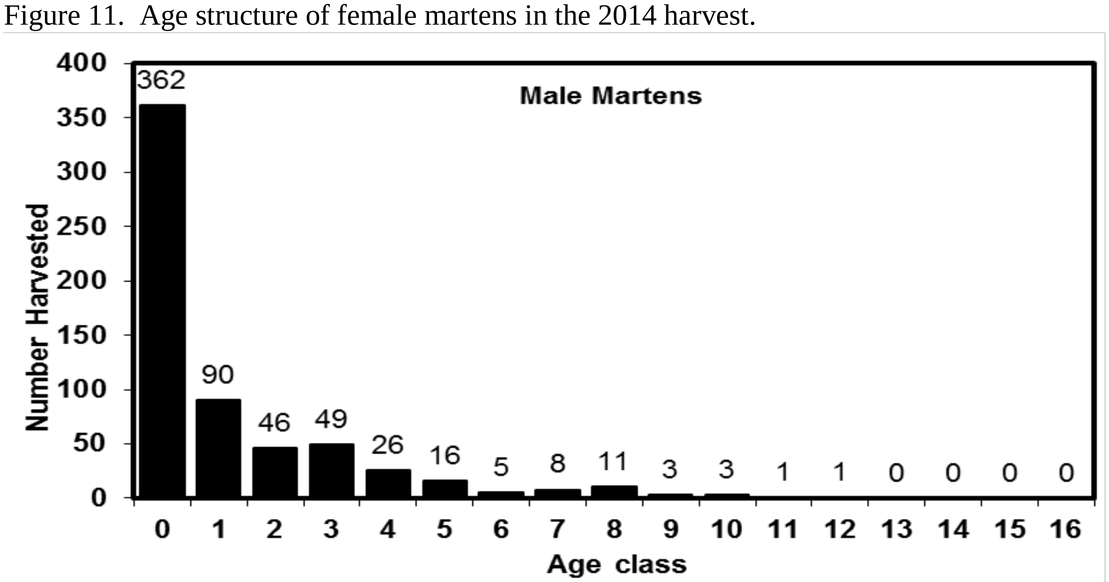

Figure 12. Age structure of male martens in the 2014 harvest.

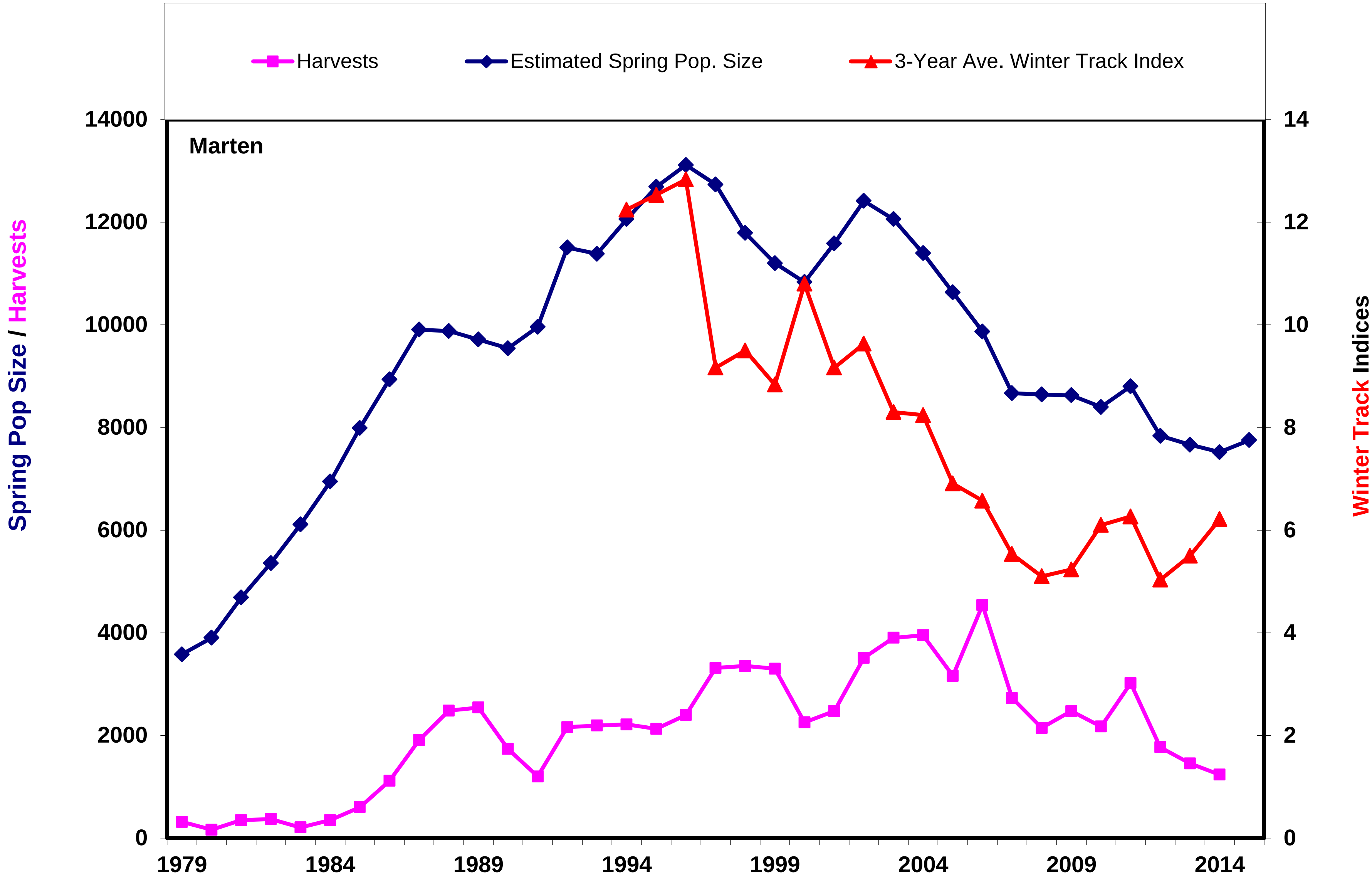

Figure 13. American marten populations, harvests, and survey indices, 1979-2015. Harvests include an estimate of non-reported take.

Table 4. Otter harvest data[1], 1985 to 2014. 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]
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
2014	2154	2235	16	-	-	-	-	-	-	-	-	59		

[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.

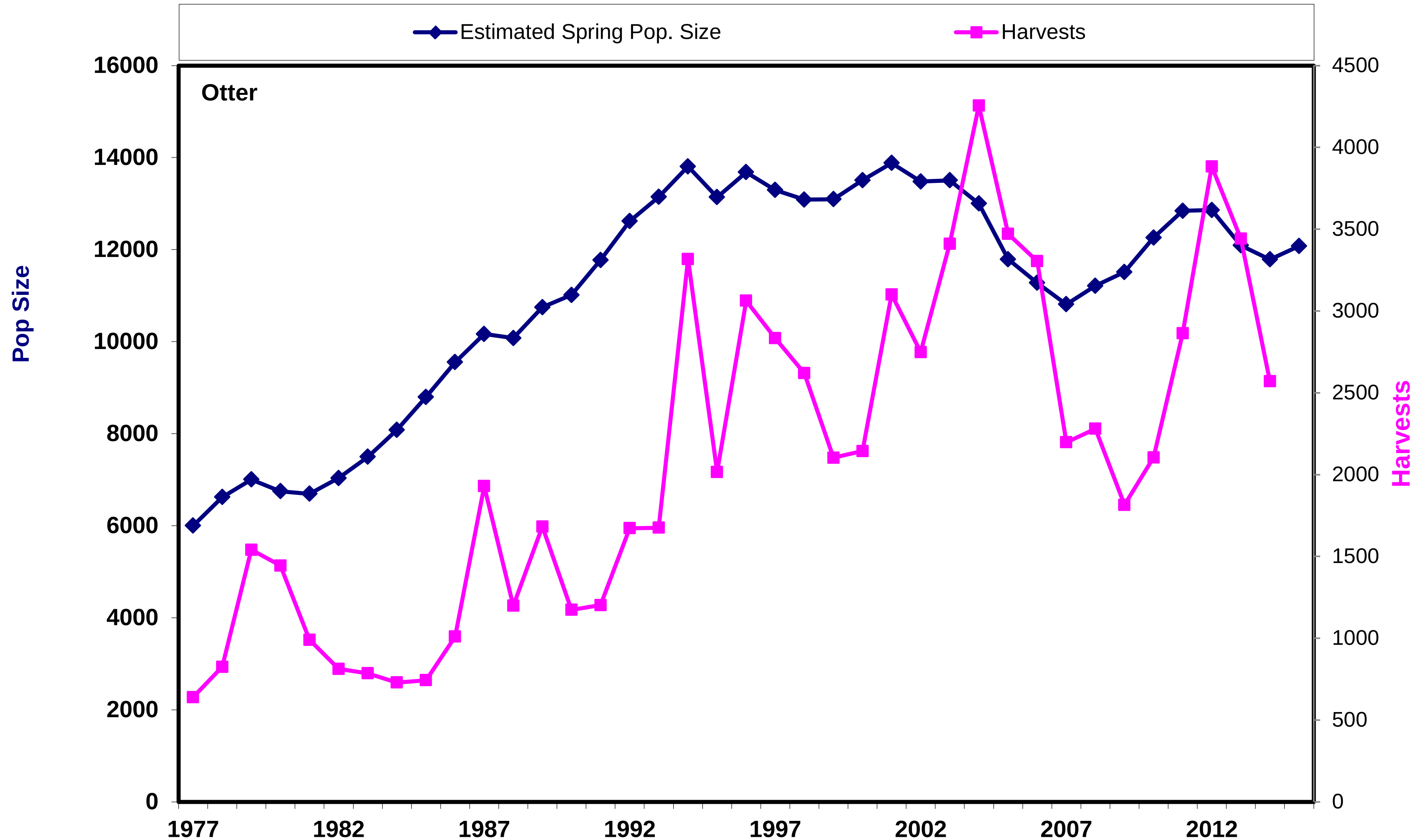

Figure 14. Otter populations and harvests, 1977-2015. Harvests include an estimate of non-reported take.

MNDNR

MINNESOTA WOLF POPULATION UPDATE 2015

John Erb, Carolin Humpal, and Barry Sampson, Minnesota Department of Natural Resources

INTRODUCTION

Since the late 1970's, Minnesota has monitored its statewide wolf population using an approach that combines attributes of territory mapping with an *ad hoc* approach to determine the total area of the state occupied by wolf packs. The methods employed have changed only slightly during this time. Initially, surveys were conducted at approximately 10-year intervals (1978, 1988, 1997), then at approximately 5-year intervals thereafter (2003, 2007, 2012). Results indicated a geographically and numerically expanding population through the 1997-98 survey, with little geographic expansion from 1998 to 2007 (Erb and DonCarlos 2009). These results were generally consistent with separate wolf population trend indicators (annual scent station survey, winter track survey, and number of verified depredations) in Minnesota.

In 2012, wolves in the Western Great Lakes Distinct Population Segment were removed as a listed species under the federal Endangered Species Act. The de-listing coincided with the normally scheduled (every 5th year) wolf survey as well as survey timeline specifications in the Minnesota Wolf Management Plan (i.e., first and fifth year after delisting; Minnesota Department of Natural Resources 2001). The 2012-13 survey (Erb and Sampson 2013) concluded that overall wolf range had expanded along its south and west edge, but with minimal change in the total amount of land occupied by wolf packs.

After federal de-listing in 2012, wolf harvest seasons were established and population surveys have been conducted annually to better inform annual management decisions. In the first two winters post-harvest, wolf population point estimates have varied from approximately 2,200 to 2,400 (Erb and Sampson 2013, Erb et al. 2014). In December 2014, following the third consecutive wolf harvest season, wolves in Minnesota were returned to the list of federally threatened species as a result of a court ruling. This update summarizes the results of the 2014-15 winter survey.

METHODS

The methodology used to estimate wolf population size in Minnesota utilizes three primary pieces of information: 1) an estimate of the number of square kilometers of land occupied by wolf packs; 2) an estimate of average wolf pack territory size; and 3) an estimate of average mid-winter pack size. It is likely that occupied range changes on a comparatively slow timescale compared to fluctuations in average territory and pack size. As such, since the 2012-13 survey we have assumed that occupied range has remained unchanged (i.e., 70,579 km^2; Erb and Sampson 2013) and tentatively plan to re-evaluate occupied range at 5-year intervals.

To radio-collar wolves, we and various collaborators captured wolves using foothold traps (LPC # 4, LPC #4 EZ Grip, or LPC #7 EZ Grip) approved as part of research conducted under the Association of Fish and Wildlife Agencies Best Management Practices for trapping program. Ten wolves have also been captured with the use of live-restraining neck snares, and a few by helicopter dart-gun. Wolves were typically immobilized using a mixture of either Ketamine:Xylazine or Telazol:Xylazine. After various project-specific wolf samples and measurements were obtained, an antibiotic and the antagonist Yohimbine were typically administered to all animals prior to release. Various models of radio-collars were deployed depending on study area and collar availability. Most GPS radio-collars were programmed to take from 3-6 locations per day, while wolves fitted with VHF-only radio-collars were relocated at approximately 7 to 10 day intervals throughout the year, or in some cases primarily from early winter through spring.

To estimate average territory size, we delineated territories of radio-collared packs using minimum convex polygons (MCP) for consistency with previous surveys. Prior to delineating wolf pack territories, we removed 'outlier' radiolocations using the following guidelines, though subjective deviations were made in some cases as deemed biologically appropriate: 1) for wolves with approximately weekly VHF radiolocations only, locations > 5 km from other locations were excluded as extraterritorial forays (Fuller 1989); 2) for GPS collared wolves with temporally fine-scale movement information, we removed obvious movement paths if the animal did not travel to that area on multiple occasions and if use of the path would have resulted in inclusion of obviously unused areas in the MCP.

In past surveys where all or the majority of territories were delineated using VHF radiolocations, raw territory sizes were increased 37% to account for the average amount of interstitial space between delineated wolf pack territories, as estimated from several Minnesota studies (Fuller et al. 1992:50) where the number of radiolocations per pack typically averaged 30-60. Interstitial spaces are a combination of small voids created by landscape geometry and wolf behavior, but are much more likely to be an artifact of territory underestimation when there are comparatively sparse radiolocations. Hence, for packs with < 100 radiolocations (n=12; mean number of radiolocations = 29), we multiplied each estimated territory size by 1.37 as in the past. For packs with > 100 radiolocations (n = 36; mean number of radiolocations = 1,017), territories were assumed fully delineated and not re-scaled.

To estimate average mid-winter pack size, radio-marked wolves were repeatedly located via aircraft during winter to obtain visual counts of pack size. In some cases where visual observations were insufficient (n = 5 packs), we relied on estimates of pack size based on tracks observed in the snow within the pack territory. If snow-track counts produced uncertain estimates (e.g., 4 to 5 wolves), we used the lower estimate. Overall, counts are assumed to represent minimum known mid-winter pack size.

The estimated number of packs within occupied wolf range is computed by dividing the area of occupied range by average scaled territory size. The estimated number of packs is then multiplied by average mid-winter pack size to produce an estimate of pack-associated wolves, which is then divided by 0.85 to account for an estimated 15% lone wolves in the population (Fuller et al. 1992:46, Fuller et al. 2003:170). Specifically,

N = ((km^2 of occupied range/mean scaled territory size)*mean pack size)/0.85.

Using the accelerated bias-corrected method (Manly 1997), the population size confidence interval (90%) was generated from 9,999 bootstrapped re-samples of the pack and territory size data and does not incorporate uncertainty in estimates of occupied range or percent lone wolves.

RESULTS AND DISCUSSION

Pack and Territory Size

We obtained territory and winter pack size data from 40 radio-marked wolf packs (Figure 1). Eight additional wolf packs had adequate radiolocation data to delineate territories, but we were unable to obtain mid-winter pack counts. Using scaled territory sizes for all packs combined, radio-collared pack territories represented approximately 13% of occupied wolf range.

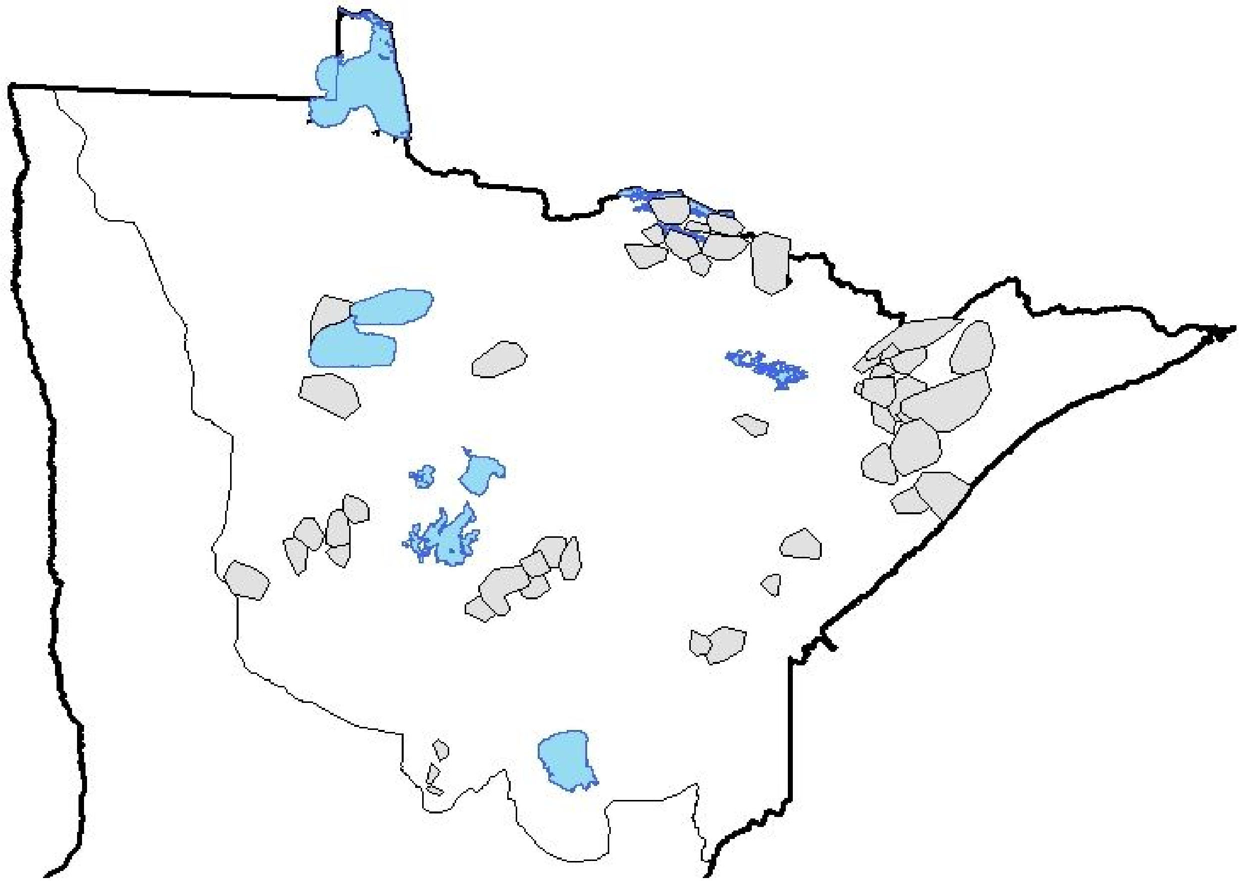

Figure 1. Location of radio-marked wolf packs during the 2014/15 survey.

A land cover comparison using the 2011 National Land Cover Database suggests that land cover within territories of radio-marked packs used in the survey was representative of land cover throughout the entirety of occupied wolf range in Minnesota (Table 1; Chi-square $p = 0.34$). Using spring 2014 deer density data (MNDNR, unpublished data) for deer hunting permit areas, weighted by number of wolf packs in a permit area, we estimate an average of approximately 7.9 deer/mi^2 (pre-fawn) in territories of radio-marked packs at the beginning of the biological year in which the survey was conducted. In comparison, 2014 spring deer density for the entirety of occupied wolf range (weighted by permit area) in Minnesota was approximately 7.3 deer/mi^2 in spring 2014. Collectively, we believe that 'conditions' within marked pack territories closely approximated conditions within overall wolf range.

Table 1. Comparison of land cover[a] in territories of radio-collared wolf packs with land cover in all of occupied wolf range in Minnesota.

	Overall Occupied Wolf range	Radio-collared Wolf Territories
Land Cover Category	% Area	% Area
Woody Wetlands	32.6	27.8
Deciduous Forest	23.6	26.9
Emergent Herbaceous Wetlands	9.9	4.1
Mixed Forest	7.2	9.9
Evergreen Forest	6.9	12.6
Open Water	5.4	8.5
Shrub/Scrub	4.5	5.2
Pasture/Hay	3.4	1.5
Cultivated Crops	2.9	0.3
Developed, Open Space	1.8	1.5
Grassland/Herbaceous	1.4	1.2
Developed, Low Intensity	0.2	0.1
Barren Land (Rock/Sand/Clay)	0.1	0.1
Developed, Medium Intensity	<0.1	<0.1
Developed, High Intensity	<0.1	<0.1

[a] Land cover data derived from the 2011 National Land Cover Database

After applying the territory scaling factors, the average estimated territory size for radio-marked packs during the 2014-15 survey was 188.77 km^2 (range = 27 – 717 km^2). Average territory size was similar to that observed in the 1997-98 survey (Figure 2), which, like this survey, followed 2 sequential severe winters and a notable decline in the deer population. Prey density is often a key determinant of longer-term variation in pack territory sizes (Fuller et al. 2003).

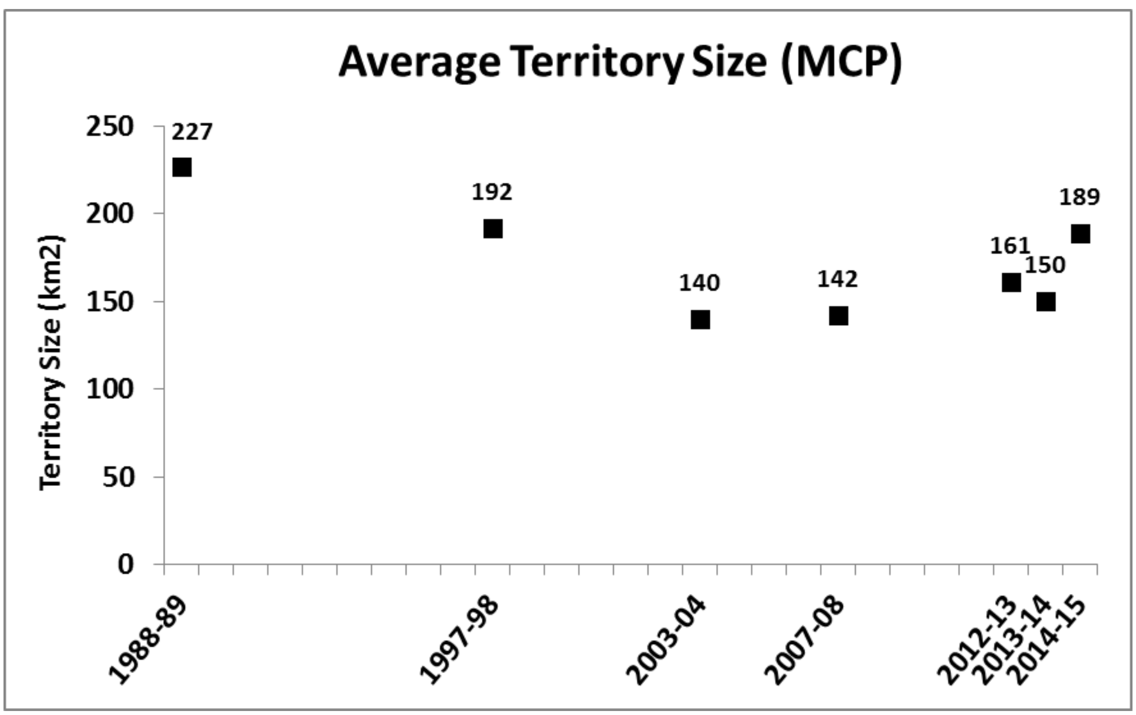

Figure 2. Average scaled territory size for radio-marked wolf packs in Minnesota from 1989 to 2015.

Average pack size had slowly declined from 1988 to 2012, then stabilized the last 2 years. However, average pack size in winter 2014-15 increased 16% to approximately 5.1 (range = 2 – 13, Figure 3).

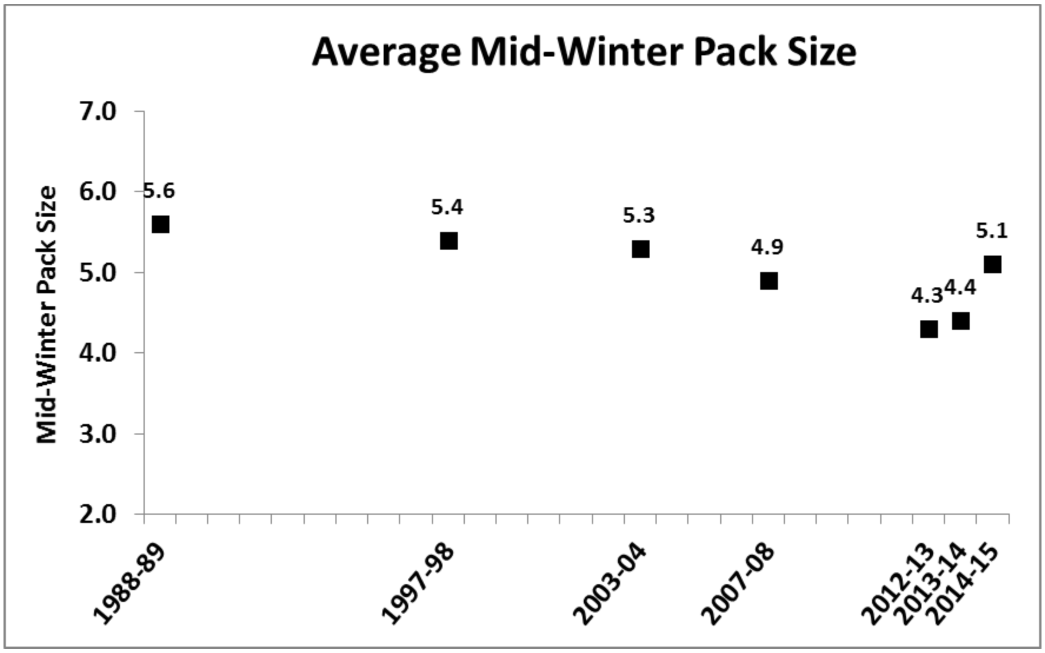

Figure 3. Average mid-winter pack size for radio-marked wolf packs in Minnesota from 1989 to 2015.

Wolf Numbers

Given an average territory size of approximately 189 km^2 and assuming occupied range unchanged since 2013 (70,579 km^2; Erb and Sampson 2013), we estimate a total of 374 wolf packs in Minnesota. Although also influenced by the estimated amount of occupied range, trends in the estimated number of packs (Figure 4) are generally the inverse of trends in estimated territory size (Figure 2).

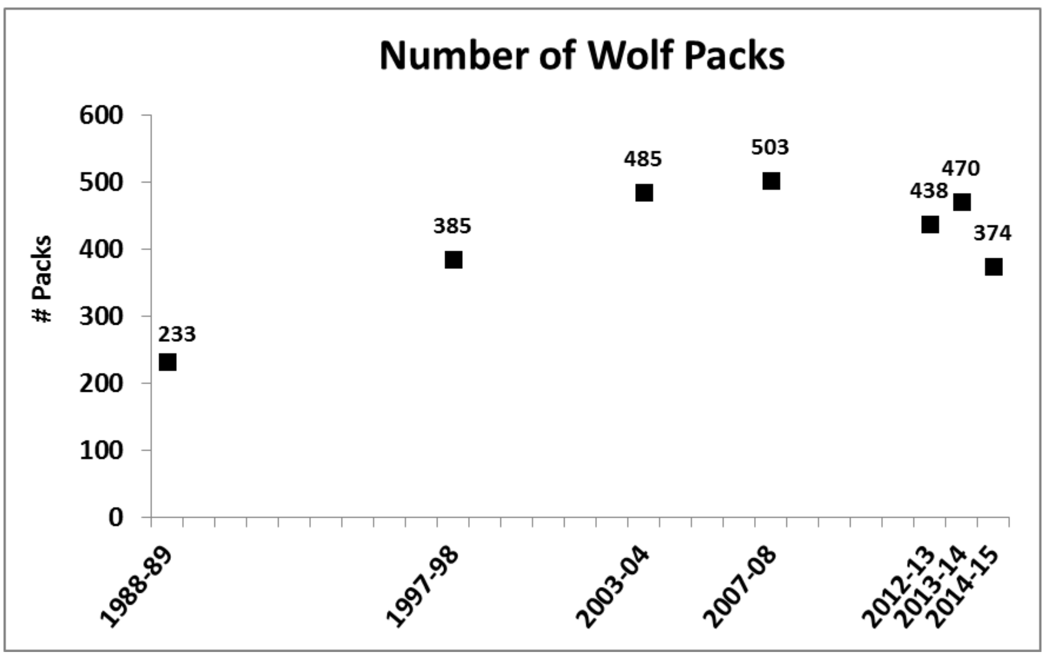

Figure 4. Estimated number of wolf packs in Minnesota at periodic intervals from 1989 to 2015.

After accounting for the assumed 15% lone wolves in the population, we estimate the 2014-15 mid-winter wolf population at 2,221 wolves, or 3.2 wolves per 100 km^2 of occupied range. The 90% confidence interval was approximately +/- 500 wolves, specifically 1,789 to 2,719. Given the substantial overlap with the 2012 and 2013 confidence intervals, we conclude there has been no statistically significant change in the size of the statewide mid-winter wolf population over the past 3 years.

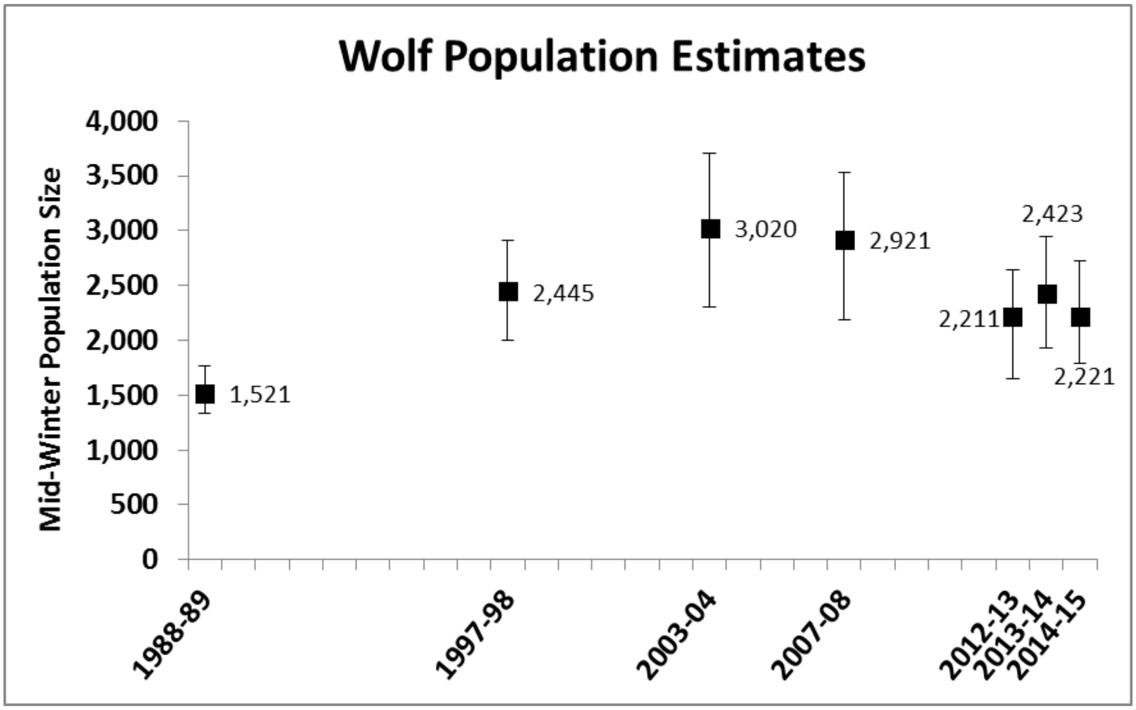

Figure 5. Wolf population estimates from periodic standardized surveys in Minnesota from 1989 to 2015.

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WILDLIFE RESTORATION

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WETLAND WILDLIFE POPULATIONS

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2015 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 2015 aerial survey portion was flown from May 4 to May 30. The survey was the longest on record due to poor weather in mid-May. Spring ice-out dates were ~2 weeks earlier than average across the state. Temperatures were above normal and precipitation was below normal in March and April. Temperatures in May were near normal but precipitation was well above normal across the state. Spring wetland conditions were poor in early May at the start of the survey but improved some by the end of May when the survey was completed. Overall, wetland numbers (Types II-V) decreased 36% compared to 2014 and were below both the 10-year (-22%) and long-term (-13%) averages. The number of temporary wetlands (Type 1) was 64% below the long-term average.

The 2015 estimated mallard breeding population was 206,000, which was 20% lower than last year's estimate of 257,000 mallards, but statistically unchanged (P=0.45). Mallard numbers were 17% below the 10-year average and 10% below the long-term average of 228,000 breeding mallards. The estimated blue-winged teal population was 169,000, which was 66% higher than last year's estimate of 102,000 blue-winged teal, but statistically unchanged (P=0.28). Blue-winged teal numbers were 14% above the 10-year average and 21% below the long-term average of 212,000 blue-winged teal. The combined population index of other ducks, excluding scaup, was 149,000 ducks, which was 29% higher than last year's estimate and 17% below the 10-year average and 16% below the long-term average of 177,000 other ducks.

The estimate of total duck abundance (524,000), which excludes scaup, was 10% higher than last year's estimate of 474,000 ducks and was 9% below the 10-year average and 15% below the long-term average of 618,000 ducks. The estimated number of Canada geese was 162,000 and 62% higher than last year and 2% above the 10-year average.

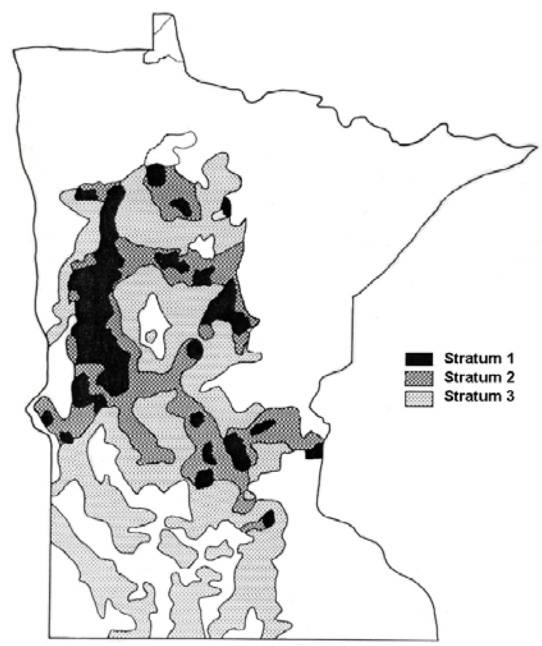

Figure 1. Location of waterfowl breeding population survey strata in Minnesota.

METHODS

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

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

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

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

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

All aerial transects in Strata I-III (Table 1) were flown using an American Champion Scout. Past surveys have been flown with a Cessna 185 but the Scout performed well for the survey. 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 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 2014 and 2015 were compared using two-tailed Z-tests.

SURVEY CHRONOLOGY

The 2015 aerial survey began on 4 May in southern Minnesota and concluded in northern Minnesota on 30 May. Transects were flown on 9 days, May 4-5, May 9, May 19-20, May 22, May 27-28, and May 30 and completed in 63 flight hours. Flights began near 7 AM and were completed by 12:30 PM each day. The median date for survey completion was May 20, which was similar to last year but one of the latest on record.

WEATHER AND HABITAT CONDITIONS

For the majority of Minnesota lakes, ice out was 1-2 weeks earlier than the historical median dates. Temperatures in March averaged 2°F above normal and precipitation was 0.9 inches below normal statewide. Temperatures in April averaged 1.6°F above normal and precipitation was 0.6 inches below normal statewide. Temperatures in May averaged 0.9°F below normal statewide and precipitation was 1.8 inches above normal statewide (http://climate.umn.edu). Additional temperature and precipitation data are provided in Appendix A.

Wetland conditions in early spring 2015 were extremely dry but improved some by late May. In early May 2015, 40% of the state was classified as severe drought, 54% was moderate drought, 1% was abnormally dry, and 4% of the state was under no drought designation. By early June 2015, 0% of the state was classified as severe drought, 12% was moderate drought, 39% was abnormally dry, and 49% of the state was under no drought designation. In early May 2015, statewide topsoil moisture indices were rated as 6% very short, 39% short, 55% adequate and 0% surplus moisture. By early June 2015, statewide topsoil moisture indices were rated as 0% very short, 1% short, 87% adequate and 13% surplus moisture (http://droughtmonitor.unl.edu).

Planting dates for row crops were extremely early in 2015. By May 3, about 83% of the corn acres had been planted statewide compared to 7% in 2014 and 34% for the previous 5-year average. By June 1, 12% of alfalfa hay had been cut compared to 5% in 2014 and a 5-year average of 23% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, (http://www.nass.usda.gov/mn/).

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

Wetland numbers (Type II-V) decreased 36% from 2014 and were 22% below the 10-year average and 13% below the long-term average (Table 2; Figure 2). The number of temporary (Type 1) sheet water wetlands was 64% below the long-term average. In general, wetland conditions improved some during the survey with significant rain events in mid-May across the survey area.

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 2015 breeding population estimate of mallards was 206,230 (SE = 37,498), which was 20% lower than the 2014 estimate of 257,000 mallards, but statistically unchanged (Z = 0.76, P = 0.45) (Table 7, Figure 3). Mallard numbers were 17% below the 10-year average and 10% below the long-term average of 228,000 mallards. In 2015, the mallard population was comprised of 68% lone or flocked males, 19% pairs, and 13% flocked mallards. The 5-year average is 71% lone or flocked males, 21% pairs, and 8% flocked mallards.

The estimated blue-winged teal population was 168,615 (SE = 56,787), which was 66% higher than the 2014 estimate of 101,640 blue-winged teal, but statistically unchanged (Z = 1.09, P = 0.28). Blue-winged teal numbers were 14% above the 10-year average and 21% below the long-term average (Table 7, Figure 4). The blue-winged teal population was comprised of 10% lone males, 43% pairs, and 47% flocks. The long-term average is 18% lone males, 54% pairs, and 29% flocks.

The combined population estimate of other ducks (excluding scaup) was 149,330 which was 29% above last year's estimate of 115,750 other ducks and 17% below the 10-year average and 16% 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 (35,000) were 46% above the 10-year average and 43% below the long-term average.

The total duck population index, excluding scaup, was 524,000 ducks and was 10% above last year's index of 474,000 ducks and 9% below the 10-year average and 15% below the long-term average (Table 8, Figure 6).

The population index for total ducks was 559,000 ducks, which was 7% below the 10-year average and 18% below the long-term average.

Visibility Correction Factors (VCFs) were lower for mallards in 2015 than 2014 but higher for blue-winged teal, other ducks, and Canada geese in 2015 compared to 2014 (Table 7, Table 8). The mallard VCF (2.17) was 6% below last year's estimate and 20% below the 10-year average. The blue-winged teal VCF (5.04) was 58% above last year's estimate and 32% above the 10-year average. The VCF for other ducks (3.22) was 44% above last year's estimate and 3% above the 10-year average. The VCF for Canada geese (1.75) was 11% above last year's estimate and 17% below the 10-year average.

The population estimate of Canada geese (adjusted for visibility) was 162,000, which was 2% above the 10-year average (Table 8, Figure 7). There were considerably more geese observed in flocks (>10 geese) this year compared to previous years. The goose population was comprised of 60% lone or paired Canada geese and 40% flocked geese. In 2013, the goose population was comprised of 77% lone or paired Canada geese and 23% flocked geese. These flocked Canada geese could be non-breeding Minnesota resident geese, early molt migrant Canada geese from states south of Minnesota, or even late migrant Canada geese moving to Canada. A total of 23 Canada goose broods were observed, compared to 13 in 2014, 5 in 2013 and 70 in 2012.

The estimated coot population, uncorrected for visibility, was 10,000 compared to 19,000 in 2014.

The estimated number of swans (likely trumpeters) was 12,575 swans compared to last year's estimate of 7,700 (Table 6). Lone swans are not doubled and the estimate is expanded for area but not visibility, although visibility of swans is extremely high. Trumpeter swans continue to expand their range and dramatically increase in number.

SUMMARY

Ice out was about 2 weeks earlier than average across the state in 2015. Temperatures in March and April were above normal and precipitation was below normal. Temperatures in May were near average but precipitation was well above average. Wetland conditions were below average across the survey area. Overall, wetland numbers were 36% lower than last year and 13% below the long-term average. Mallard abundance in 2015 was 206,000 mallards, which was 20% lower than last year and 17% below the 10-year average and 10% below the long-term average of 228,000 breeding mallards. Blue-winged teal abundance (169,000) was 66% higher than 2014 but 21% below the long-term average of 212,000 blue-winged teal. The combined population index of other ducks (149,000) was 29% higher than 2014 and 16% below the long-term average of 178,000 other ducks. Total duck abundance (524,000), excluding scaup, was 10% higher than 2014 and was 15% below the long-term average. Canada goose numbers adjusted for visibility bias increased 62% from 2014.

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Data Supplied By:

Minnesota Department of Natural Resources (MNDNR); U.S. Fish and Wildlife Service (USFWS)

Air Crew:

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Ground Crew Leaders: Sean Kelly, Deputy Chief, Migratory Birds, USFWS, Region III, Twin Cities; Wayne Brininger, USFWS, Tamarac National Wildlife Refuge; Dan Hertel and Fred Oslund, USFWS, HAPET, Fergus Falls; Tom Cooper, Andy Forbes and Jim Kelley, USFWS, Region III, Twin Cities; Bruce Davis, Minnesota DNR; Gina Kemper and Greg Dehmer, USFWS, Sherburne National Wildlife Refuge

Ground Crew Assistants: Rich Olsen, Minnesota DNR; Lowell Deede, USFWS, Tamarac National Wildlife Refuge; Tyler Zimmerman and Jordan Swart, USFWS, HAPET, Fergus Falls; Paul Richert and Steve Lewis, USFWS, Region III, Twin Cities; K. Svendsgaard, J. Rorah, K. Rittenhouse, E. Broich, Kris Spaeth, and John Riens, USFWS, Sherburne National Wildlife Refuge

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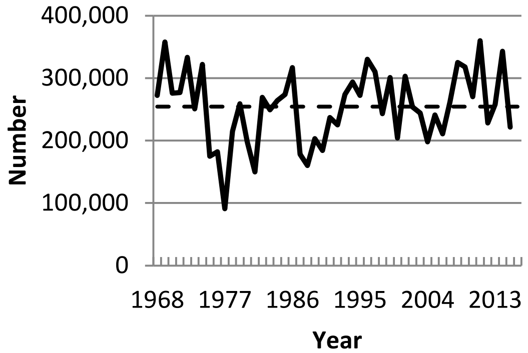

Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2015.

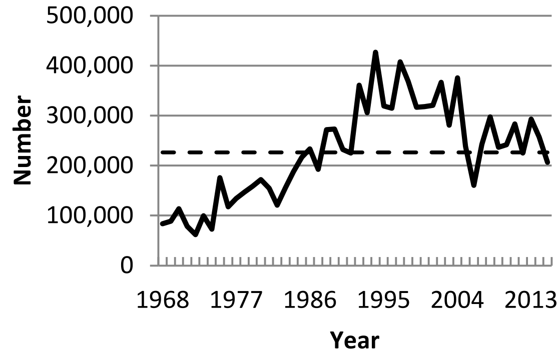

Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2015.

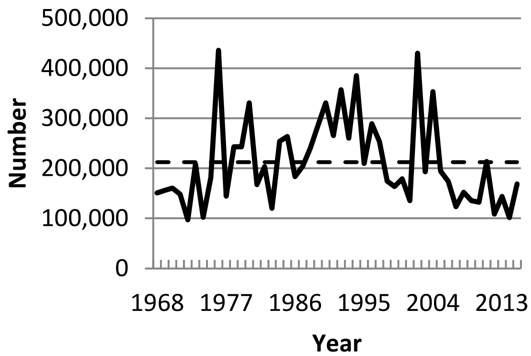

Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2015.

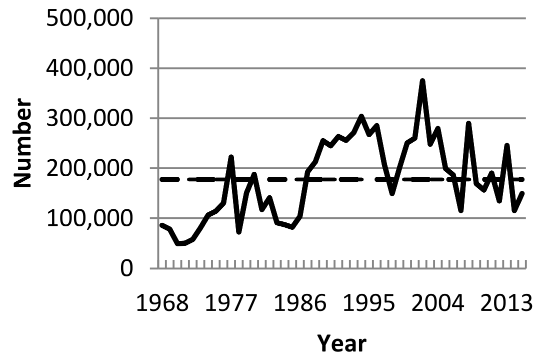

Figure 5. Other duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2015

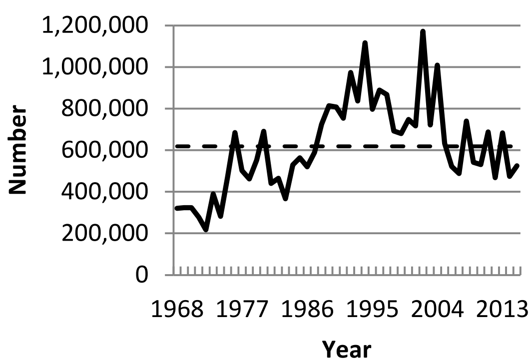

Figure 6. Total duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2015

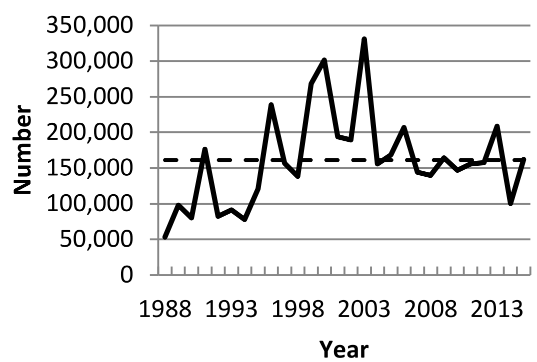

Figure 7. Canada goose population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1988-2015.

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Table 1. Survey design for Minnesota, May 2015.[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), 1968-2015.

Year	Number of Ponds[1]		Year	Type 1 wetlands	Number of Ponds[1]
1968	272,000		1991	82,862	237,000
1969	358,000		1992	10,019	225,000
1970	276,000		1993	199,870	274,000
1971	277,000		1994	123,958	294,000
1972	333,000		1995	140,432	272,000
1973	251,000		1996	147,859	330,000
1974	322,000		1997	30,751	310,000
1975	175,000		1998	20,560	243,000
1976	182,000		1999	152,747	301,000
1977	91,000		2000	5,090	204,000
1978	215,000		2001	66,444	303,000
1979	259,000		2002	30,602	254,000
1980	198,000		2003	34,005	244,000
1981	150,000		2004	9,494	198,000
1982	269,000		2005	30,764	241,000
1983	249,000		2006	56,798	211,000
1984	264,000		2007	32,415	262,000
1985	274,000		2008	69,734	325,000
1986	317,000		2009	39,078	318,000
1987	178,000		2010	26,880	270,000
1988	160,000		2011	89,218	360,000
1989	203,000		2012	30,910	228,000
1990	184,000		2013	9,813	258,000
			2014	54,300	343,000
			2015	22,056	220,000
		Averages:	10-year	44,000	282,000
			Long-term	61,000	254,000
		% change from:	2014	-59%	-36%
			10-year	-50%	-22%
			Long-term	-64%	-13%

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

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1997-2015.

	Year																		
Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dabblers:																			
Mallard	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	19,633
Black Duck	0	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	333	167	222
Gadwall	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	1,083
American Wigeon	0	56	56	56	111	0	56	555	167	0	56	111	56	56	111	222	222	167	111
Green-winged Teal	56	333	0	278	56	278	222	444	56	56	167	278	167	56	56	56	0	0	56
Blue-winged Teal	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	4,360
Northern Shoveler	1,500	500	555	1,055	305	1,277	278	1,166	333	167	56	1,000	666	1,027	111	56	333	722	111
Northern Pintail	111	111	167	167	389	56	111	56	0	56	0	56	56	0	111	0	111	167	222
Wood Duck	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	2,222
Dabbler Subtotal	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	28,020
Divers:																			
Redhead	778	944	500	583	1,444	750	333	805	666	666	916	1,389	472	944	805	750	861	1,333	583
Canvasback	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	1,027
Scaup	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	5,526
Ring-necked Duck	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	3,110
Goldeneye	0	111	56	56	333	111	0	222	222	56	222	278	278	222	56	56	333	444	278
Bufflehead	0	56	111	56	111	222	111	389	167	222	56	1,611	833	389	278	56	611	56	278
Ruddy Duck	528	11,052	972	0	83	1,305	417	305	1,222	305	0	1,027	861	28	56	0	305	111	694
Hooded Merganser	555	389	722	500	722	555	333	278	333	555	111	666	944	555	500	555	333	666	1,000
Large Merganser	56	0	0	0	111	0	972	0	111	0	278	333	333	333	111	56	222	139	167
Diver Subtotal	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	12,663
Total Ducks	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	40,683
Other:																			
Coot	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	1,972
Canada Goose	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	23,077
Swan	0	56	139	0	0	111	1,000	305	417	861	389	694	500	694	1,611	1,277	2,944	1,944	2,472

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1997-2015.

	Year																		
Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dabblers:																			
Mallard	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	24,078
Black Duck	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	0	0	0	117
Gadwall	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	818
American Wigeon	351	818	0	468	0	0	0	2,513	117	0	0	351	0	351	0	117	234	0	234
Green-winged Teal	234	351	117	117	117	468	234	234	0	117	0	0	234	117	0	0	117	351	584
Blue-winged Teal	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	5,026
Northern Shoveler	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	877
Northern Pintail	234	468	117	117	117	0	117	0	0	0	234	0	0	0	234	0	0	117	0
Wood Duck	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	1,753
Dabbler subtotal	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	33,487
Divers:																			
Redhead	1,987	935	1,636	2,805	2,455	234	584	1,110	292	175	935	935	584	760	1,578	468	468	526	468
Canvasback	701	117	117	935	0	468	1,052	234	0	0	1,169	468	234	117	584	117	935	1,286	1,169
Scaup	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	4,909
Ring-necked Duck	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	4,325
Goldeneye	818	234	935	584	468	234	234	351	117	117	0	351	584	468	468	584	935	1,519	935
Bufflehead	117	0	0	0	0	1,169	117	468	351	117	117	1,403	818	643	1,403	468	0	818	0
Ruddy Duck	117	0	468	0	0	1,870	2,688	0	351	58	0	0	175	409	58	234	117	0	351
Hooded Merganser	468	117	701	935	1,403	701	701	234	234	351	234	584	701	117	2,221	1,636	701	234	1,169
Large Merganser	0	0	0	117	117	0	0	234	351	0	0	351	0	0	234	0	234	117	234
Diver subtotal	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	13,560
Total Ducks	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	47,047
Other:																			
Coot	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	0
Canada Goose	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	24,312
Swan	175	117	117	58	117	292	994	701	1,461	994	468	1,519	2,922	2,279	7,188	3,507	6,604	3,740	5,318

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1997-2015.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dabblers:																			
Mallard	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	51,154
Black Duck	0	0	0	0	0	0	0	174	0	0	174	174	0	0	0	174	174	0	0
Gadwall	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	2,088
American Wigeon	348	696	0	522	174	1,218	174	1,566	1,044	174	348	348	174	348	1,044	174	348	174	1,566
Green-winged Teal	348	174	0	1,218	1,392	522	174	0	174	522	0	0	0	0	174	348	696	0	348
Blue-winged Teal	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	24,098
Northern Shoveler	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	1,914
Northern Pintail	522	870	870	696	522	0	174	348	174	174	348	174	0	174	0	174	174	0	174
Wood Duck	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	8,265
Dabbler subtotal	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	89,607
Divers:																			
Redhead	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	1,305
Canvasback	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	696
Scaup	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	435
Ring-necked Duck	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	3,480
Goldeneye	522	696	696	1,044	1,566	3,132	1,305	696	1,044	1,044	870	348	522	174	870	0	348	174	1,218
Bufflehead	174	348	0	0	0	1,218	783	2,088	0	174	696	1,218	870	174	2,871	174	3,915	4,698	522
Ruddy Duck	348	0	174	0	696	18,878	87	2,262	870	696	261	87	348	0	3,828	522	522	174	0
Hooded Merganser	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	522
Large Merganser	0	0	0	0	0	522	0	0	261	957	348	348	348	348	174	174	0	0	0
Diver subtotal	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	8,178
Total Ducks	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	97,785
Other:																			
Coot	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	7,917
Canada Goose	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	43,498
Swan	87	0	348	348	174	0	348	348	522	2,001	1,218	609	1,914	2,175	1,827	1,827	2,088	2,001	4,785

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1997-2015.

	Year																		
Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dabblers:																			
Mallard	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	94,866
Black Duck	0	0	0	0	117	0	0	174	56	0	174	174	0	0	0	174	507	167	339
Gadwall	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	3,989
American Wigeon	699	1,570	56	1,045	285	1,218	230	4,634	1,327	174	404	810	230	754	1,155	513	804	341	1,911
Green-winged Teal	638	858	117	1,613	1,564	1,267	630	678	230	694	167	278	400	172	230	404	813	351	988
Blue-winged Teal	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	33,484
Northern Shoveler	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	2,902
Northern Pintail	867	1,449	1,153	979	1,028	56	402	404	174	230	582	230	56	174	345	174	285	284	396
Wood Duck	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	12,240
Dabbler subtotal	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	151,115
Divers:																			
Redhead	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	2,356
Canvasback	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	2,892
Scaup	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	10,870
Ring-necked Duck	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	10,915
Goldeneye	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	2,431
Bufflehead	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	800
Ruddy Duck	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	1,045
Hooded Merganser	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	2,691
Large Merganser	56	0	0	117	228	522	972	234	723	957	626	1,032	681	681	519	230	456	256	400
Diver subtotal	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	34,400
Total Ducks	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	185,515
Other:																			
Coot	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	9,888
Canada Goose	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	90,887
Swan	262	172	604	406	291	403	2,341	1,355	2,400	3,855	2,074	2,823	5,336	5,148	10,626	6,611	11,500	7,700	12,575

Table 7. Mallard, blue-winged teal, and other duck (excluding scaup) populations in Minnesota, 1968-2015.

	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

Table 7. Cont.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
1993	123,771	2.47	305,838	31,103	64,670	4.02	260,070	36,307	82,612	3.28	271,263
1994	138,482	3.08	426,455	66,240	70,324	5.48	385,256	82,580	85,671	3.55	303,847
1995	142,557	2.24	319,433	48,124	47,737	4.40	210,043	40,531	66,096	4.05	267,668
1996	153,473	2.05	314,816	53,461	57,196	5.05	288,913	64,064	107,950	2.64	285,328
1997	160,629	2.54	407,413	65,771	45,496	5.57	253,408	67,526	76,095	2.72	207,316
1998	188,972	1.95	368,450	61,513	47,788	3.66	174,848	33,855	91,478	1.64	149,786
1999	169,213	1.87	316,394	51,651	36,106	4.53	163,499	36,124	80,459	2.49	200,570
2000	157,853	2.02	318,134	36,857	60,288	2.97	179,055	32,189	120,158	2.09	250,590
2001	146,034	2.20	320,560	39,541	37,706	3.60	135,742	19,631	91,152	2.85	260,051
2002	145,191	2.53	366,625	46,264	91,982	4.67	429,934	87,312	92,778	4.04	374,978
2003	115,974	2.42	280,517	34,556	46,759	4.13	193,269	36,176	46,796	5.30	248,019
2004	158,416	2.37	375,313	57,591	94,152	3.75	353,209	56,539	95,105	2.94	279,802
2005	82,472	2.89	238,500	28,595	48,394	4.01	194,125	37,358	46,797	4.26	199,355
2006	72,843	2.21	160,715	24,230	38,328	4.53	173,674	60,353	42,333	4.41	186,719
2007	76,979	3.15	242,481	30,020	29,407	4.20	123,588	20,055	30,963	3.73	115,390
2008	103,411	2.88	297,565	27,787	40,777	3.74	152,359	24,157	99,575	2.91	289,629
2009	78,368	3.02	236,436	36,539	37,286	3.63	135,262	32,155	62,725	2.70	169,568
2010	80,922	2.99	241,884	33,940	32,742	4.04	132,261	27,430	55,076	2.84	156,599
2011	102,245	2.77	283,329	49,845	61,772	3.46	213,584	88,720	79,743	2.39	190,586
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
2015	94,866	2.17	206,229	37,498	33,484	5.04	168,615	56,787	46,295	3.23	149,330
Averages:											
10-year	91,630	2.72	247,611	38,984	39,766	3.83	147,903	39,292	59,786	3.13	180,434
Long-term	102,696	2.23	228,204	37,701	57,527	3.87	212,356	42,065	60,901	3.12	177,529

Table 7. Cont.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI	SE	Unad. PI	VCF	PI
% change from 2014	-15%	-6%	-20%	-32%	5%	58%	66%	136%	-10%	44%	29%
10-year average	4%	-20%	-17%	-4%	-16%	32%	14%	45%	-23%	3%	-17%
Long-term average	-8%	-3%	-10%	-1%	-42%	30%	-21%	35%	-24%	3%	-16%

Table 8. Scaup, total ducks (excluding scaup), total ducks, and Canada goose populations in Minnesota, 1968-2015.

	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

Table 8. Cont.

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
1991	40,727	2.81	114,480	313,595	753,710	354,322	868,191	42,231	4.18	176,465
1992	66,071	2.33	153,939	347,012	973,323	413,083	1,127,262	33,965	2.43	82,486
1993	11,801	3.28	38,750	271,053	837,172	282,854	875,921	43,858	2.08	91,369
1994	57,670	3.55	204,536	294,477	1,115,558	352,147	1,320,095	48,595	1.68	77,878
1995	28,421	4.05	115,096	256,390	797,144	284,811	912,241	58,065	2.08	120,775
1996	65,585	2.64	173,351	318,619	889,057	384,204	1,062,408	60,870	3.92	238,708
1997	31,138	2.72	84,834	282,220	868,137	313,358	952,971	60,449	2.59	156,817
1998	28,416	1.64	46,528	328,238	693,084	356,654	739,612	79,147	1.75	138,507
1999	14,041	2.49	35,002	285,778	680,463	299,819	715,465	80,012	3.35	268,168
2000	32,376	2.09	67,520	338,299	747,779	370,675	815,299	105,932	2.84	301,298
2001	15,743	2.85	44,914	274,892	716,353	290,653	761,267	89,418	2.17	193,887
2002	13,016	4.04	52,606	327,951	1,171,537	340,967	1,224,143	78,200	2.42	189,353
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

Table 8. Cont.

	Scaup			Total Ducks (exc. scaup)		Total ducks		Canada geese		
Year	Unad. PI	VCF	PI	Unad. PI	PI	Unad. PI	PI	Unad. PI	VCF	PI
2014	6,517	2.24	14,614	195,006	474,387	201,523	489,001	63,857	1.57	100,255
2015	10,870	3.23	35,062	174,645	524,174	185,515	559,236	90,887	1.77	160,427
Averages:										
10-year	7,739	3.13	24,051	191,217	576,654	198,922	600,705	76,715	2.10	159,312
Long-term	20,798	3.12	61,305	221,099	618,240	241,890	679,545	47,449	2.31	160,994
% change from 2014	67%	44%	140%	-10%	10%	-8%	14%	42%	13%	60%
10-year average	40%	3%	46%	-9%	-9%	-7%	-7%	18%	-16%	1%
Long-term average	-48%	3%	-43%	-21%	-15%	-23%	-18%	92%	-24%	0%

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 3 May - 31 May 2015 (Source: Minnesota Climatological Working Group, http://climate.umn.edu/cawap/nwssum/nwssum.asp).

		Temperature (F) for week ending:										Total weekly precipitation (inches)				
		3-May		10-May		17-May		24-May		31-May						
Region	City	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	Avg[1]	Depart[2]	3-May	10-May	17-May	24-May	31-May
NW	Crookston	56.2	7.0	52.7	0.7	48.1	-6.4	49.4	-7.5	58.5	-0.8	0.15	0.12	1.80	0.38	0.31
	Itasca	52.0	5.8	51.1	2.0	44.9	-6.6	m	m	m	m	0.24	0.60	3.15	m	m
NC	Grand Rapids	54.8	6.1	49.9	-1.5	47.5	-6.2	51.2	-4.7	56.8	-1.2	0.05	1.33	2.67	0.14	1.90
	Park Rapids	56.4	8.1	51.3	0.3	51.1	-2.2	52.7	-2.6	58.6	1.3	0.21	1.32	3.62	0.21	1.94
WC	Montevideo	54.7	3.0	55.2	0.6	53.2	-3.9	52.4	-7.0	61.3	-0.4	0.11	0.97	4.81	0.72	1.28
	Morris	56.6	5.6	55.3	1.5	51.1	-5.1	51.9	-6.7	60.8	-0.1	0.14	0.31	5.24	1.03	1.04
C	Willmar	m	m	m	m	m	m	m	m	m	m	0.24	0.57	2.43	0.55	0.53
	St. Cloud	54.7	3.4	54.9	1.1	53.2	-2.8	51.2	-6.8	59.1	-0.9	0.06	1.67	3.45	0.52	0.33
EC	Aitkin	51.1	2.8	51.4	0.8	50.0	-2.9	51.1	-3.8	m	m	0.10	0.79	1.81	0.63	m
	Msp Airport	59.3	5.2	60.4	4.0	56.4	-2.2	55.1	-5.6	62.8	0.1	0.06	1.11	0.57	0.52	1.29
SW	Marshall	59.5	7.0	58.2	2.9	55.5	-2.3	55.1	-5.0	62.3	-0.1	0.00	0.60	1.83	0.09	0.80
	Worthington	54.6	3.2	56.1	1.9	53.5	-3.3	52.0	-7.2	60.1	-1.4	0.07	0.95	1.38	0.47	2.34
SC	Waseca	55.4	2.6	60.1	4.6	55.3	-2.8	53.5	-7.0	62.7	-0.1	0.10	0.49	1.18	0.87	2.11
	New Ulm	53.8	m	57.6	m	54.3	m	51.9	m	61.2	m	0.31	1.00	2.20	0.38	1.59
Statewide		54.5	4.0	55.5	2.3	51.5	-4.0	52.2	-5.6	59.9	0.0	0.09	0.89	1.97	0.52	0.79

[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, 2015 by Joshua Dooley, 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/birds/surveys-and-data/reports-and-publications.php).

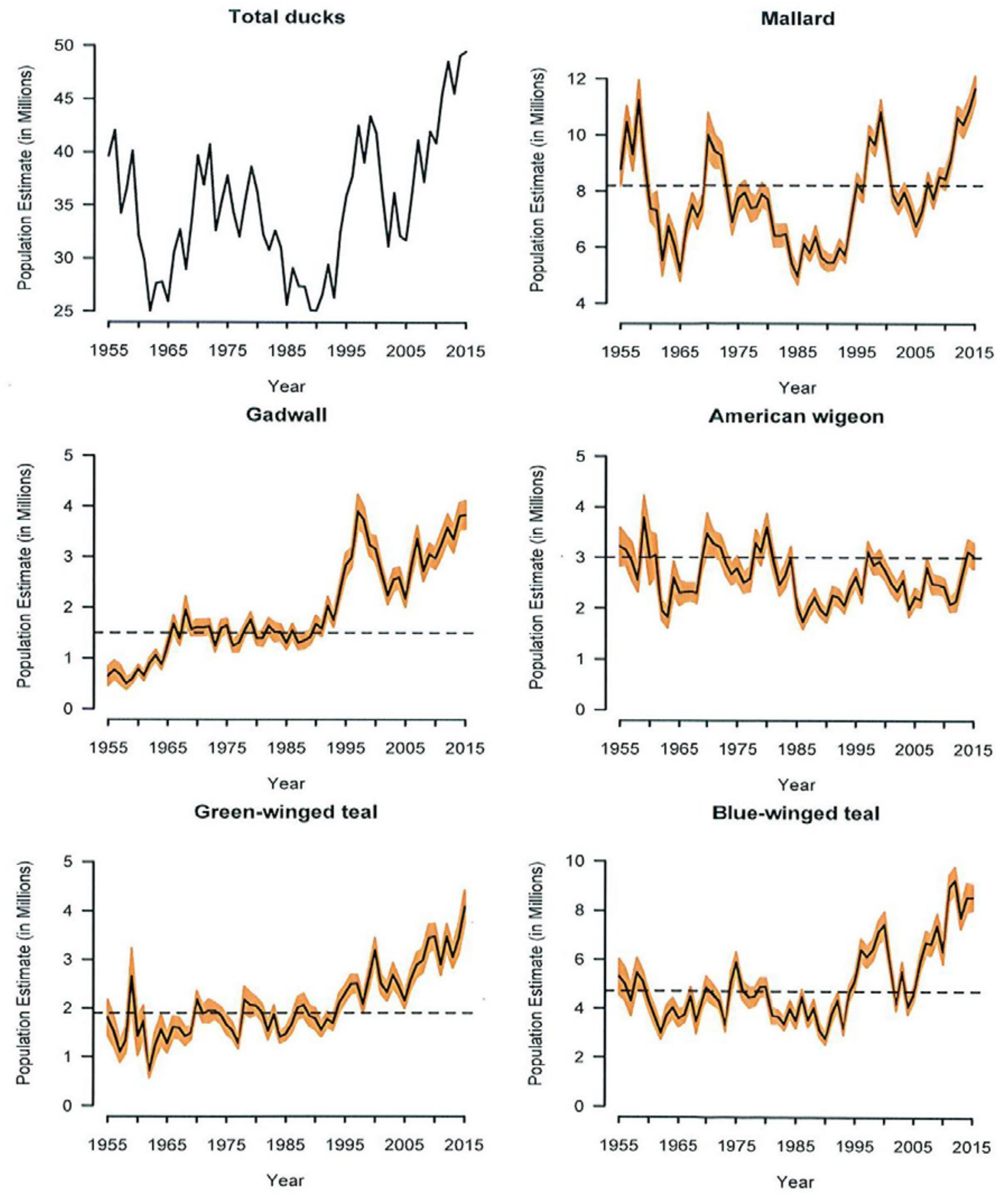

Figure 1 Estimates of North American breeding populations, 90% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S (from: U.S. Fish and Wildlife Service 2015).

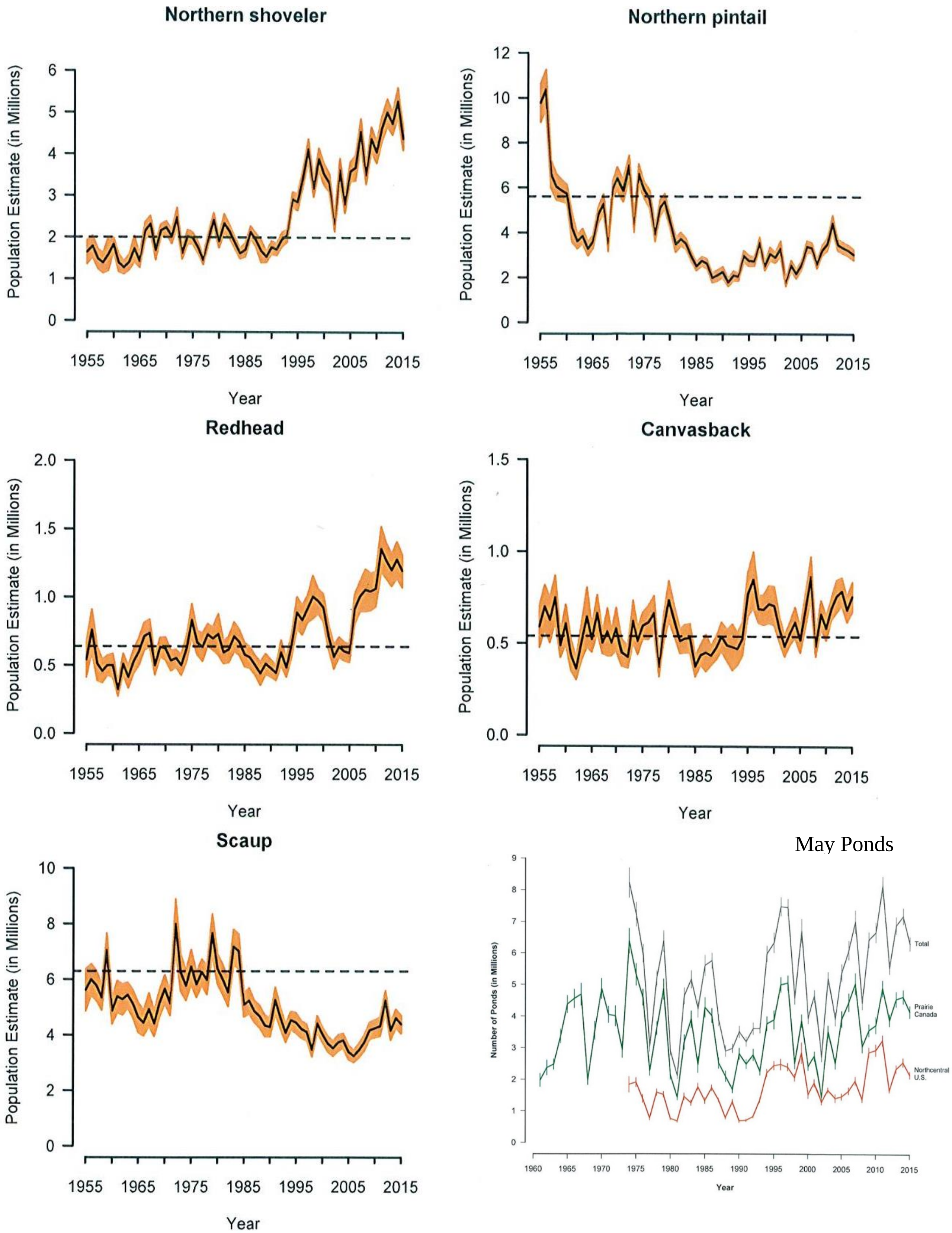

Figure 1 (continued).

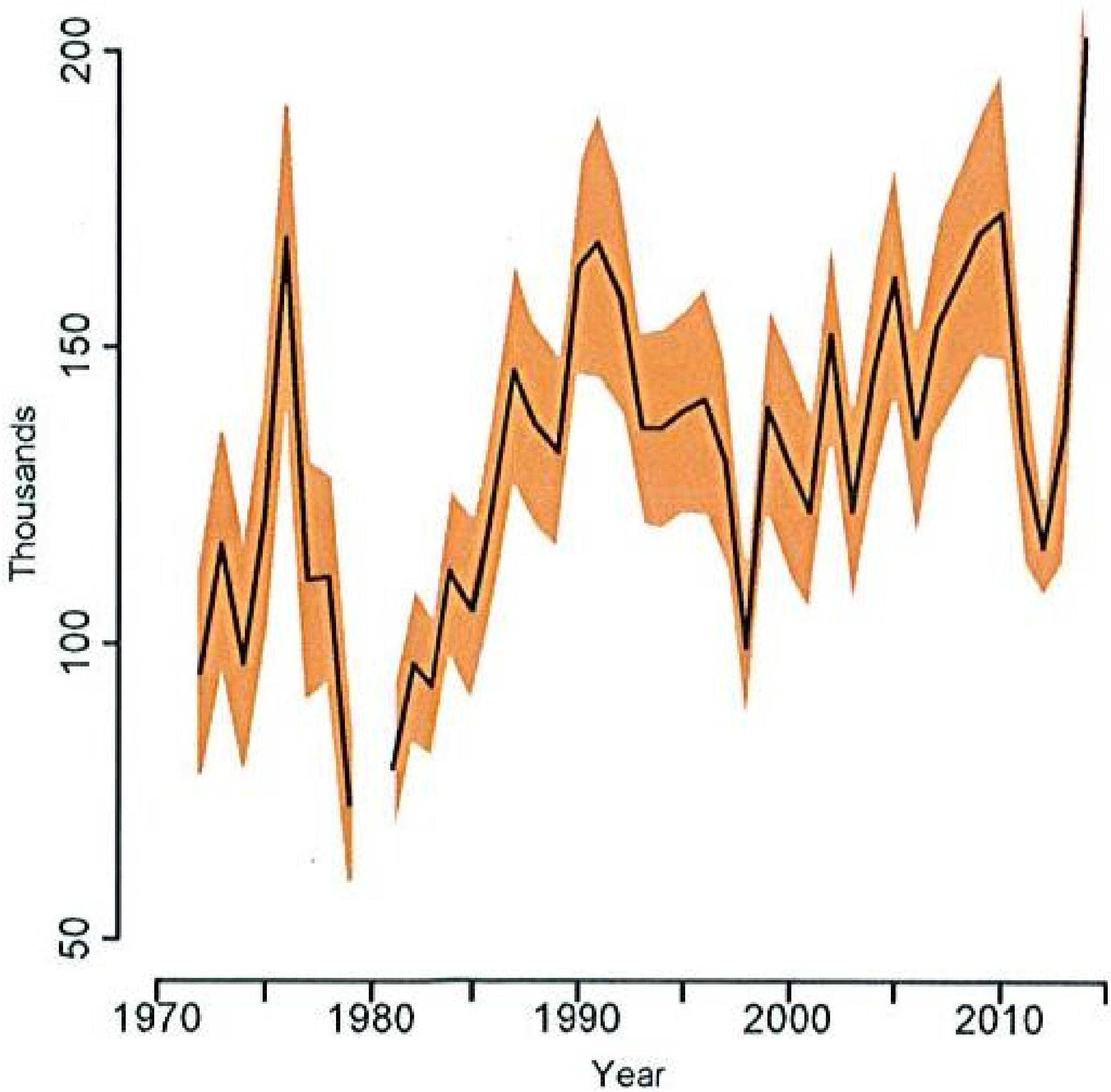

Figure 2. Estimated numbers (and 95% confidence intervals) of Eastern Prairie Population (indicated pairs) Canada geese. (from: U.S. Fish and Wildlife Service 2015).

2015 MINNESOTA SPRING CANADA GOOSE SURVEY

Rebecca Peak, Wetland Wildlife Populations and Research Group

INTRODUCTION

This report presents results from the fifteenth year of a spring helicopter survey of resident Canada geese (*Branta canadensis*) in Minnesota. Minnesota Department of Natural Resources (MNDNR) personnel developed the survey per a request from the Mississippi Flyway Council to produce a statewide population estimate having 95% confidence intervals (ci) that are within ± 25% of the estimate for this bird species.

METHODS

MNDNR Wetland Group staff initiated surveys for resident Canada geese in 2001 (Maxson 2002). Using the boundaries of the Prairie Parkland, Eastern Broadleaf Forest, Tallgrass Aspen Parklands, and Laurentian Mixed Forest provinces, they divided the state into 3 ecoregions (Aaseng et al. 2005). They combined the Eastern Broadleaf Forest and Tallgrass Aspen Parklands provinces to create the Transition ecoregion, renamed the Prairie Parkland province the Prairie ecoregion, and the Laurentian Mixed Forest province the Forest ecoregion (Figure 1). Maxson (2002) excluded the 7-county Metro area from the Transition ecoregion and Lake County, Cook County, and Boundary Waters Canoe Area from the Forest ecoregion. Using Public Land Survey quarter section boundaries and ArcView, Maxson (2002) assigned quarter sections of the remaining counties to the appropriate ecoregion, which yielded 304,929 quarter section plots (hereafter plots).

From 2002–2007, they used a double sampling design. First, Maxson (2002) randomly selected 900 plots within each ecoregion, which yielded a sampling frame of 2,700 total plots (Table 1). Maxson (2002) used National Wetland Inventory Circular 39 data and DNR 1:24000 lakes GIS layers to stratify plots by habitat quality using the following classification variables: 1) total acres of type 3, 4, and 5 wetlands; 2) total acres of type 3 wetlands; total acres of 1:24000 lakes and; 4) total acres of riverine habitat. This sampling design yielded 9 strata (Table 1) defined by the expected number of pairs of resident Canada geese: 1) no 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. They did not survey plots in the “0 pairs” strata and the Forest ecoregion ≥3 pairs habitat-quality stratum did not contain any plots (Table 1). They implemented the second part of the double sampling design by randomly selecting 30 plots from the remaining 5 strata to survey each season, for a sample size of 150 plots.

Rave (2008) eliminated the double sampling design and randomly selected 30 plots per strata from the entire sampling frame excluding the “0” pairs strata (n = 128,031 plots; Table 1). He also excluded Lake of the Woods and the Northwest Angle from the Forest ecoregion. They used the same stratification criteria and field protocols to survey resident Canada geese for all years. Thus, results should be comparable among years.

Rave (2011) further modified the sampling frame to include a binary stratification variable, which permitted a domain analysis of total geese in a proposed intensive harvest goose hunting zone (Figure 1). Using proportional allocation per strata, they randomly selected 30 plots in the proposed hunting zone and 130 plots from outside the zone for a total of 160 plots (Figure 1). The Intensive Harvest Zone that was used from 2012-2015 to delineate boundaries for an August Canada goose conservation action and an increase in daily bag limit (10 geese daily) during the September Canada goose season was larger than the proposed zone used here (see Minnesota Waterfowl Hunting Regulations Booklet, 2013, 2014, 2015). However, we continue to use the proposed zone to monitor changes in goose numbers in a portion of the intensive harvest area.

Ideally, we fly the survey plots during mid-incubation. Pilot Tom Pfingsten and I conducted the survey on 8 days between 20–29 April 2015, which are the average start and end dates for the past fourteen years. We recorded Canada geese seen within plot boundaries as singles, pairs, or groups. We also recorded whether singles and pairs were observed with a nest. To calculate total number of resident Canada geese, we doubled the number of singles and pairs.

RESULTS AND DISCUSSION

The analysis yielded a population estimate (± 95% CI) of 249,988 (± 61,291) resident Canada geese for the sampling frame. The 2015 resident Canada goose population estimate was comparable to estimates calculated for 2013 and 2014 (Table 2). Relative error (95% CI half-width) was 24.5% of the estimate. The large annual confidence intervals do not indicate differences between any years, but a general pattern indicates an increase in population size from 2001 to 2006 and then again from 2007 to 2012, with population declines in 2007 and 2013 (Figure 2). The population has been generally stable at a lower level the last 3 years. Canada goose population estimates were similar to 2014 in all 3 Ecoregions (Table 2).

The 2015 population estimate (± 95% CI) in the proposed Intensive Harvest Zone (Fig. 1) was 79,945 (±22,032). This was similar to the estimates (± 95% CI) from 2011-2014 for this zone: 151,669 (+105,319), 127,220 (+64,628), 79,701 (+24,619), and 93,600 (±54,300), respectively. An estimated 32% of these geese were associated with the Intensive Goose Hunting zone in 2015, compared to 43, 31, 32, and 38% from 2011-2014.

We added 17,500 geese for the Twin Cities metro area (Cooper 2004), which yielded a statewide population estimate of 267,488 resident Canada geese (Table 2). The 2015 statewide population estimate represents the fifteenth consecutive year that this estimate has been above the state Canada goose population goal of 250,000 resident Canada geese.

Of the total number of Canada geese we detected, 38.5% were singles, 56.4% pairs, and 5.1% groups (Table 3). We combined singles and pairs associated with nests to develop an index to nesting effort and used it to calculate a productivity estimate of 41.6% (Table 3). The proportion of productive Canada geese for 2015 was comparable to the estimates for 2013 and 2014 (Table 3). Weather conditions throughout May and June were important factors affecting Canada goose productivity.

Mean ambient temperature in Minnesota during April 2015 was 54.2° F, which was 3.4° F above the century average (National Oceanic and Atmospheric Administration 2015). Median lake ice-out date for 2015 was 12 April (17 March–30 April, n = 100), which was 6 days earlier than median lake ice-out date previously recorded across the state (median = 18 April, 29 March–12 May, n = 100) (Minnesota Department of Natural Resources 2015). Our goal was to survey plots during mid-incubation. The above average temperature and early lake ice out suggests many pairs should have been in the incubation stage of the nesting cycle when we conducted the survey.

ACKNOWLEDGMENTS

Chris Scharenbroich assisted in randomly selecting plots and provided GPS coordinates of plots to the pilot. Tom Pfingsten piloted the helicopter and served as the second observer. Dave Rave provided guidance on conducting surveys and historical context for the surveys. John Giudice provided statistical support. John Giudice, Jeff Lawrence, and Dave Rave reviewed an earlier version of this report. This project was funded in part by the Wildlife Restoration (Pittman-Robertson) Program.

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Table 1. Sampling frames used to conduct spring Canada goose surveys in Minnesota from 2001–2007 (*n* = 2,700 plots) and 2008–2015 (*n* = 304,929 plots). Ecoregion is the combination of provinces across the state. Strata are determined by type and acres (ac) of wetlands and rivers per quarter section plot.

Ecoregion	Strata	National Wetland Inventory Data	*N* plots in sample frame by period	
			2001–2007[a]	2008–2015[b,c]
Prairie	0 pairs	Type 3, 4, and 5 wetlands <0.5 ac and rivers <10.0 ac all water	476	61,597
	1–2 pairs	Type 4 and 5 wetlands >0.5 ac but type 3 <15.0 ac or type 3, 4, and 5 <0.5 ac and rivers >10.0 ac all water	344	30,751
	≥3 pairs	Type 3 >15.0 ac but plot not all water	80	9,533
Transition	0 pairs	Type 3, 4, and 5 wetlands <1.0 ac and rivers <8.0 ac or plot all water	377	39,484
	1–2 pairs	Type 3, 4, and 5 wetlands 1.0–25.0 ac or >25.0 ac, but type 3 <15.0 ac or type 3, 4, and 5 <1.0 ac and rivers >8.0 ac	428	29,048
	≥3 pairs	Type 3, 4, and 5 wetlands >25.0 ac, but type 3 >15.0 ac and plot not all water	95	8,015
Forest	0 pairs	Type 3, 4, and 5 wetlands <2.0 ac and rivers <2.0 ac or plot all water	510	75,835
	1–2 pairs	Type 3, 4, and 5 wetlands >2.0 ac but plot not all water or type 3, 4, and 5 <2.0 ac and rivers >2.0 ac	390	50,666
	≥3 pairs	None	0	0
Total			2,700	304,929

[a]-From 2001-2007, double-sampling was used to estimate stratum weights and the survey plots were randomly drawn from a sample of 900 plots in each Ecoregion.

[b]-The entire sampling frame was re-stratified in 2008 and Lake of the Woods and the NW Angle were removed from the sampling frame. The sampling frame was adjusted slightly in 2009 because of some processing errors in 2008. The population estimates for 2008–2015 are based on the updated sampling frame.

[c]- From 2011-15, a portion of the potential survey plots were in the original proposed intensive harvest goose hunting zone (Fig. 1). These included 9,674 of the 1-2 pair plots and 3,400 of the >3 pair plots in the Prairie Ecoregion and 5,777 of the 1-2 pair plots and 1,479 of the > 3 pair plots in the Transition Ecoregion.

Table 2. Population estimates of resident Canada Geese for prairie, transition, and forest ecoregions, ecoregions combined ± 95% confidence interval (CI), the seven-county Twin cities metro area, and the state of Minnesota, 2001–2015 (n = 150 plots 2001–2007 and n = 160 plots 2008–2015).

	N geese by ecoregion						
Year	Prairie	Transition	Forest	Combined	95% CI	Metro	Statewide
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
2015	97,847	114,986	37,156	249,988	61,291	17,500	267,488

Table 3. Percent of singles, pairs, groups, and an index to nesting effort (i.e. productive Canada geese) on the Minnesota spring Canada goose survey, 2001–2015.

Year	Singles[a]	Pairs[a]	Groups	Productive Canada geese[b]	Survey period
2001	27.0	63.9	9.1	36.4	4/14 to 5/02/2001
2002	30.7	52.0	17.2	41.5	4/26 to 5/11/2002
2003	27.9	58.2	13.9	29.3	4/22 to 5/01/2003
2004	26.5	57.5	16.0	35.5	4/22 to 5/04/2004
2005	33.0	50.2	16.8	40.7	4/20 to 5/03/2005
2006	43.5	45.9	10.6	50.3	4/24 to 5/05/2006
2007	31.0	51.5	17.5	36.2	4/23 to 4/28/2007
2008	38.4	55.4	6.2	42.6	4/23 to 5/05/2008
2009	41.8	50.7	7.5	45.2	4/21 to 5/01/2009
2010	42.5	48.2	9.3	46.6	4/15 to 4/20/2010
2011	50.3	47.2	2.6	55.7	4/21 to 4/29/2011
2012	30.0	49.6	20.4	35.1	4/16 to 4/23/2012
2013	27.0	68.0	5.0	30.0	5/06 to 5/14/2013
2014	39.3	55.1	5.6	44.0	4/21 to 5/04/2014
2015	38.5	56.4	5.1	41.6	4/20 to 4/29/2015

[a] Singles and pairs were doubled before calculating proportions
[b] Productive Canada geese = singles + pairs with nests

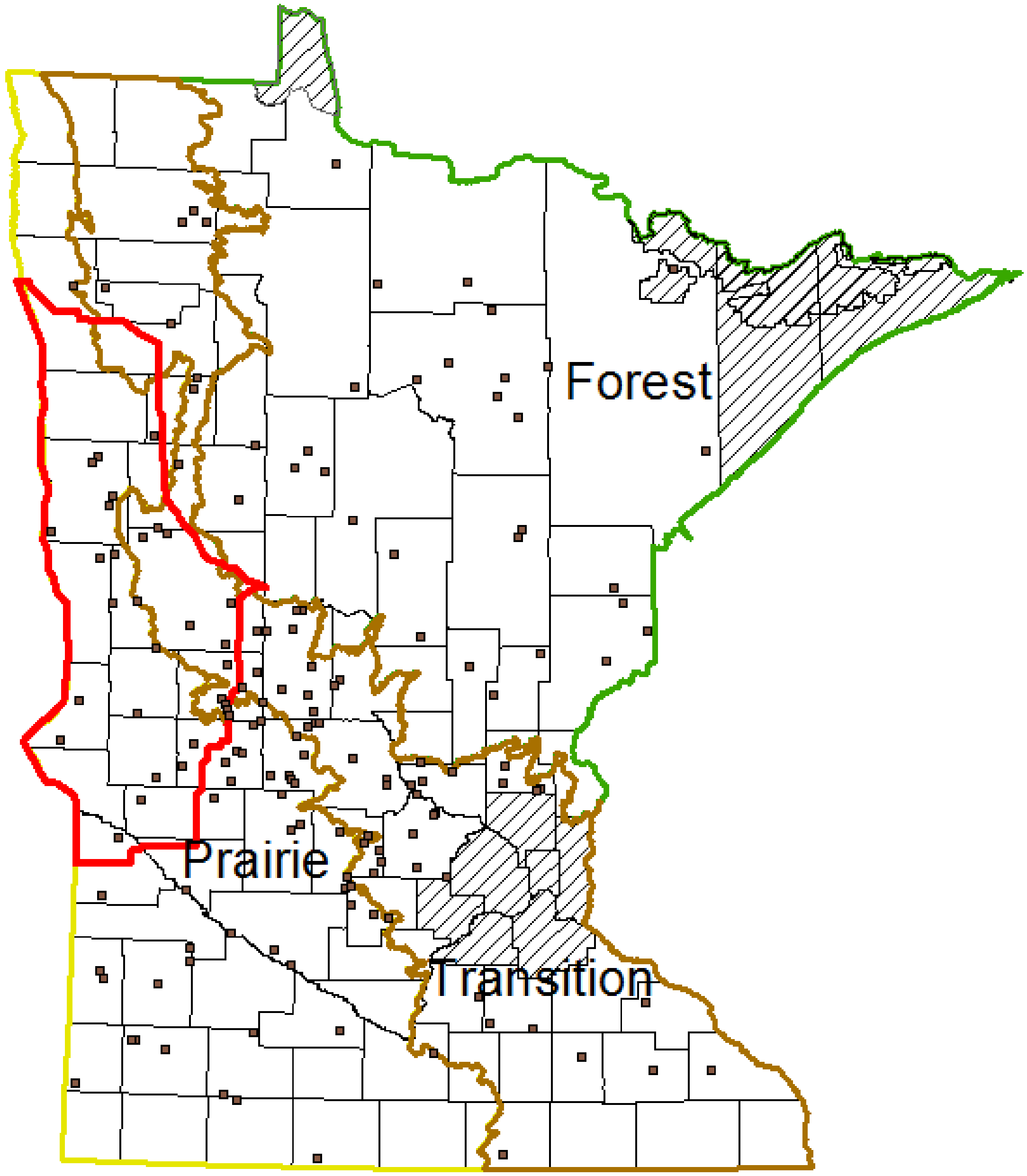

Figure 1. Location of 160 quarter section plots surveyed during the 2015 spring Canada goose survey. Plots are distributed among the Prairie, Transition, and Forest ecoregions. Cross-hatched areas were not included in the survey. The polygon delineated in red designates the location of the proposed Intensive Canada goose hunting zone in 2011.

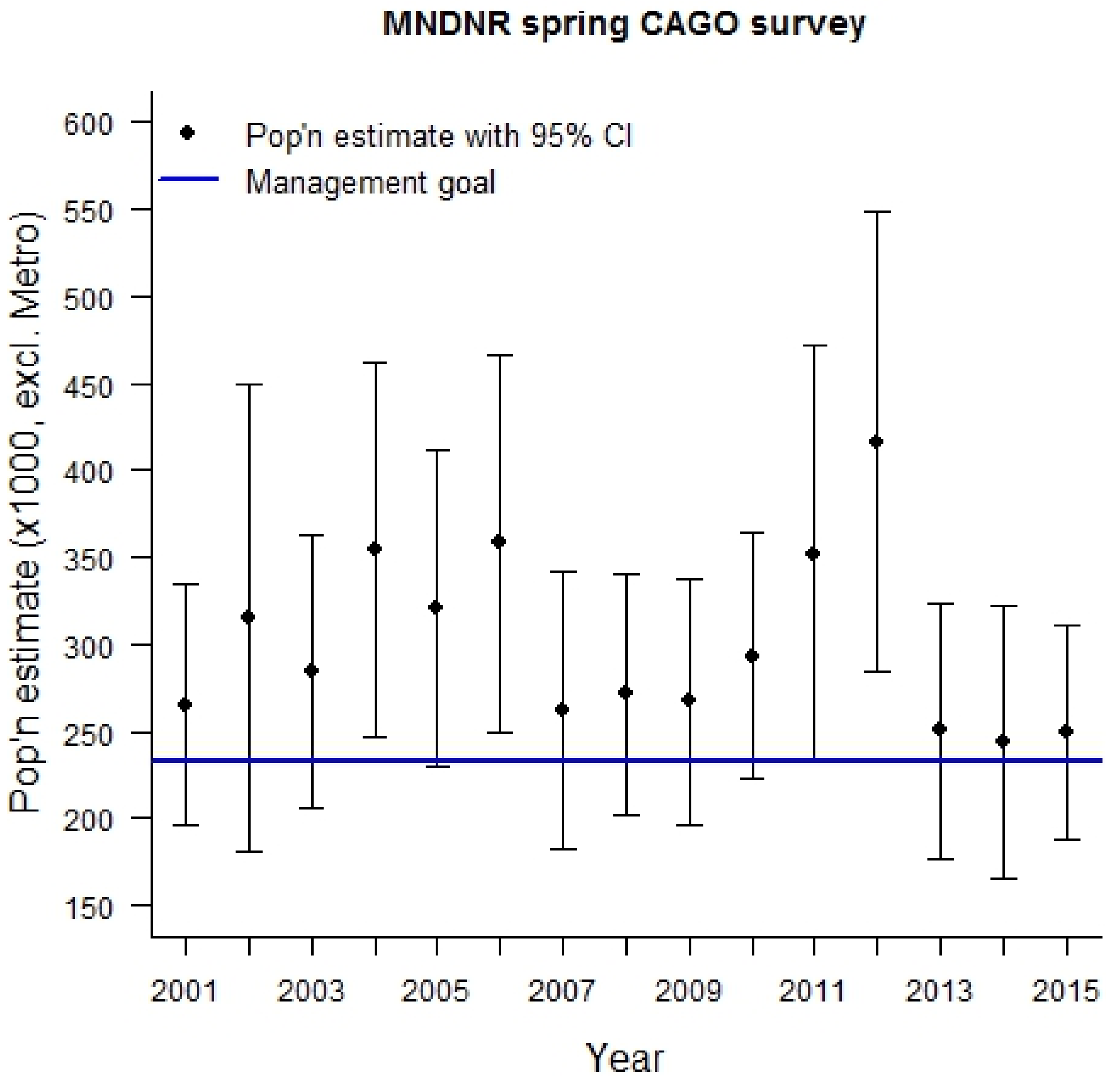

Figure 2. Resident Canada goose population estimates (± 95% CI) in Minnesota (excluding Metro), 2001–2015. The management goal is 250,000 Canada geese (250,000 – 17,500 Metro geese = 232,500).

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Seamans, M.E. 2015. Mourning dove population status, 2015. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 22 pp. The entire report is available on the Division of Migratory Bird Management web site

(http://www.fws.gov/birds/surveys-and-data/reports-and-publications/population-status.php).

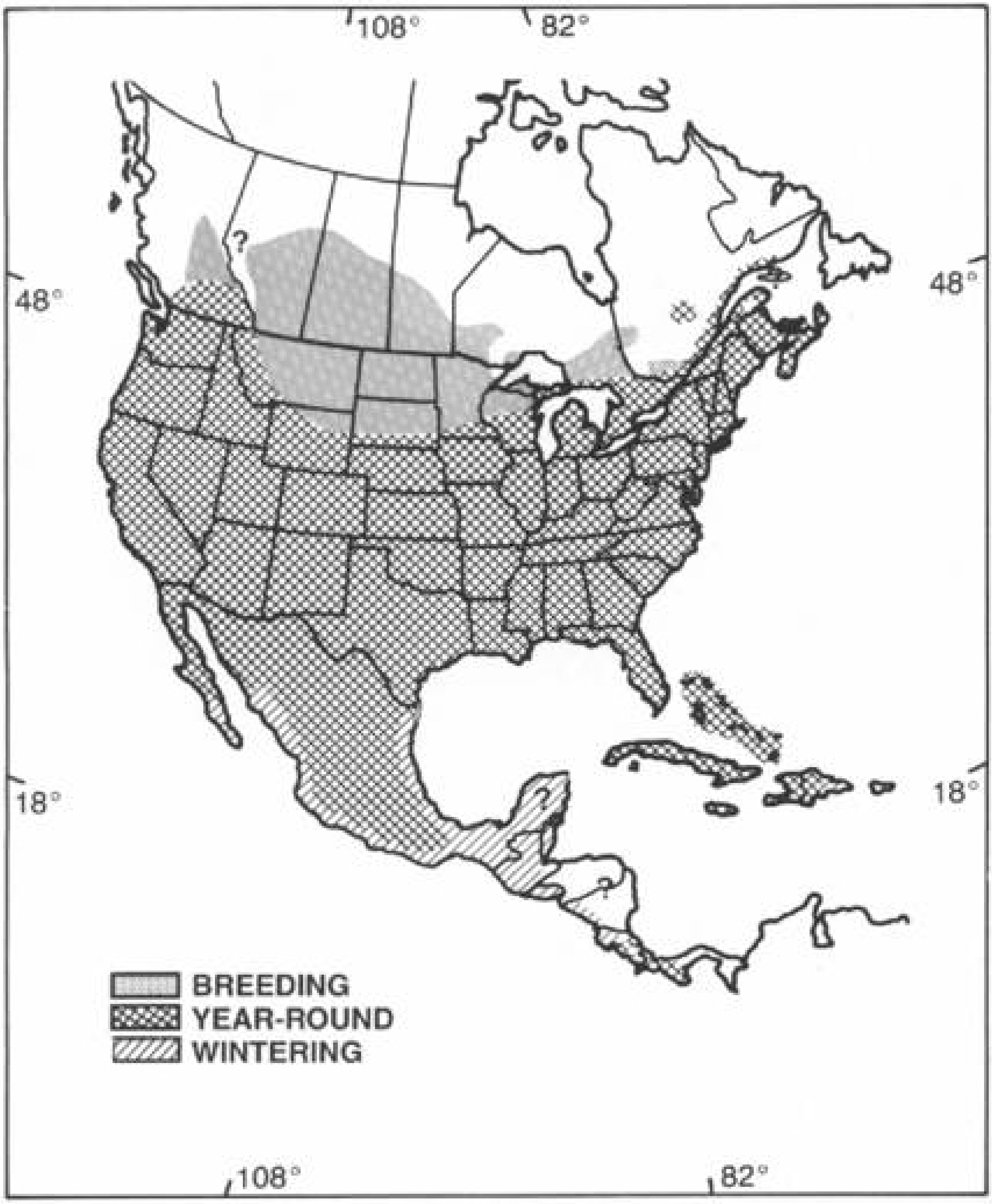

Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). (From: Seamans, M.E. 2015. Mourning dove population status, 2015. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 22 pp.)

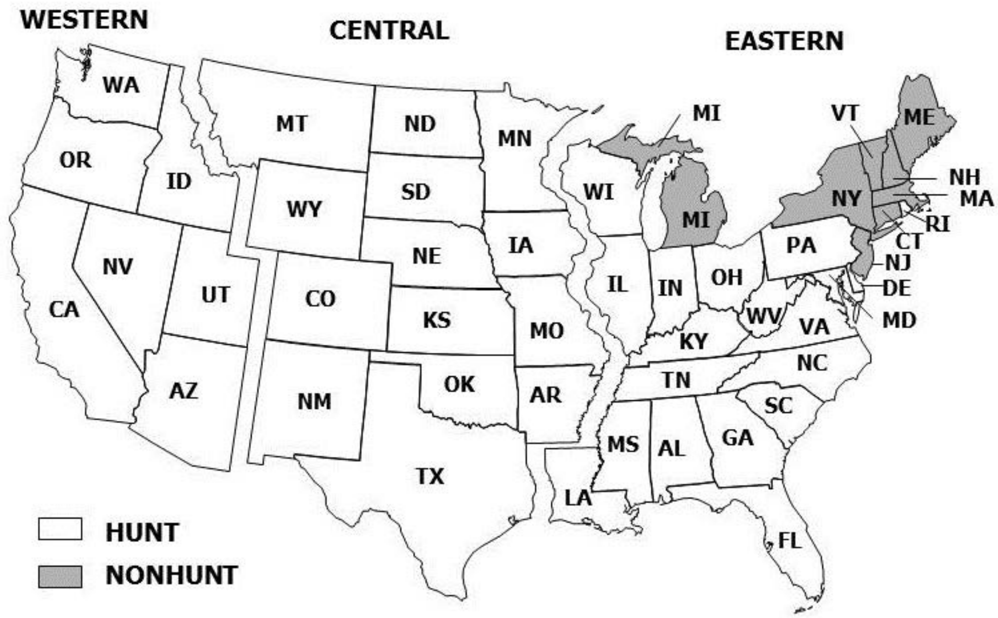

Figure 2. Mourning dove management units with 2014 hunting and non-hunting states. (From: Seamans, M.E. 2015. Mourning dove population status, 2015. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 22 pp.)

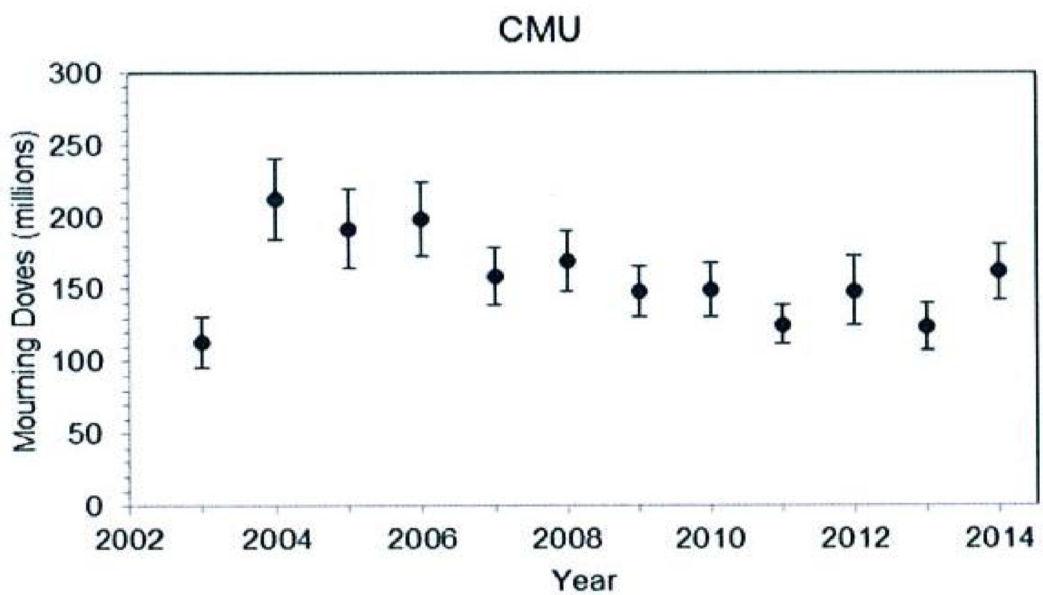

Figure 3. Estimates and 95% confidence intervals of mourning dove absolute abundance in the Central Management Unit (CMU), 2003-14. Estimates based on band recovery and harvest data. (From: Seamans, M.E. 2015. Mourning dove population status, 2015. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 22 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 2012, 2013 and 2014 seasons [a]. (From: Seamans, M.E. 2015. Mourning dove population status, 2015. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 22 pp.)

Management unit / State	Active Hunters			Hunter Days Afield			Total Harvest		
	2012	2013	2014	2012	2013	2014	2012	2013	2014
CENTRAL	338,700 †	353,000 †	427,100 †	1,108,700 ±11	1,185,300±10	1,333,600 ± 9	6,361,600 ±14	6,236,000 ±11	7,654,700 ±10
AR	21,400 ±22	8,900 ±42	19,900 ±21	57,600 ±26	30,100 ±57	47,900 ±28	494,200 ±30	155,900 ±46	347,900 ±29
CO	17,000 ±18	15,600 ±15	14,400 ±14	43,800 ±26	36,900 ±19	27,800 ±16	204,300 ±26	176,900 ±25	173,100 ±19
IA	†[b]	12,900 ±9	9,200 ±9	†[b]	49,400 ±14	27,100 ±12	†[b]	214, 300 ±16	130,000 ±13
KS	12,200 ±39	31,900 ±12	26,200 ±10	49,100 ±52	93,000 ±16	70,700 ±14	244,800 ±62	504,400 ±18	485,300 ±18
MN	6,800 ±52	7,700 ±53	6,900 ±51	21,600 ±48	17,000 ±39	20,200 ±59	65,400 ±75	53,500 ±30	54,800 ±29
MO	23,800 ±29	36,400 ±11	24,100 ±12	51,400 ±50	104,500 ±18	62,200 ±15	296,600 ±81	587,600 ±28	374,000 ±17
MT	200 ±87	1,700 ±46	1,400 ±42	500 ±120	2,900 ±41	2,900 ±41	2,600 ±161	12,000 ± 41	8,500 ±37
NE	13,200 ±17	13,500 ±16	9,700 ±12	39,000 ±17	39,300 ±19	26,700 ±13	223,400 ±20	239,800 ±24	172,900 ±15
NM	9,000 ±11	6,500 ±9	7,600 ±10	38,000 ±17	23,700 ±13	24,100 ±15	160,100 ±17	123,000 ±15	115,200 ±15
ND	4,900 ±30	6,300 ±28	3,900 ±25	17,400 ±36	16,400 ±29	11,900 ±30	78,900 ±37	88,200 ±37	47,600 ±23
OK	15,700 ±14	23,300 ±13	19,100 ±13	49,200 ±19	69,400 ±24	56,900 ±24	349,700 ±26	421,200 ±25	417,900 ±21
SD	4,500 ±22	6,200 ±22	6,400 ±21	14,700 ±28	17,500 ±26	17,500 ±24	65,500 ±28	118,300 ±31	106,800 ±25
TX	207,200 ±13	178,900 ±13	276,800 ±10	720,200 ±16	677,900 ±16	934,300 ±13	4,150,800 ±20	3,506,700 ±18	5,199,400 ±14
WY	2,700 ±32	3,100 ±19	1,500 ±26	6,300 ±38	7,200 ±19	3,400 ±23	25,300 ±40	34,200 ±19	21,100 ±25

[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, 2015. 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).

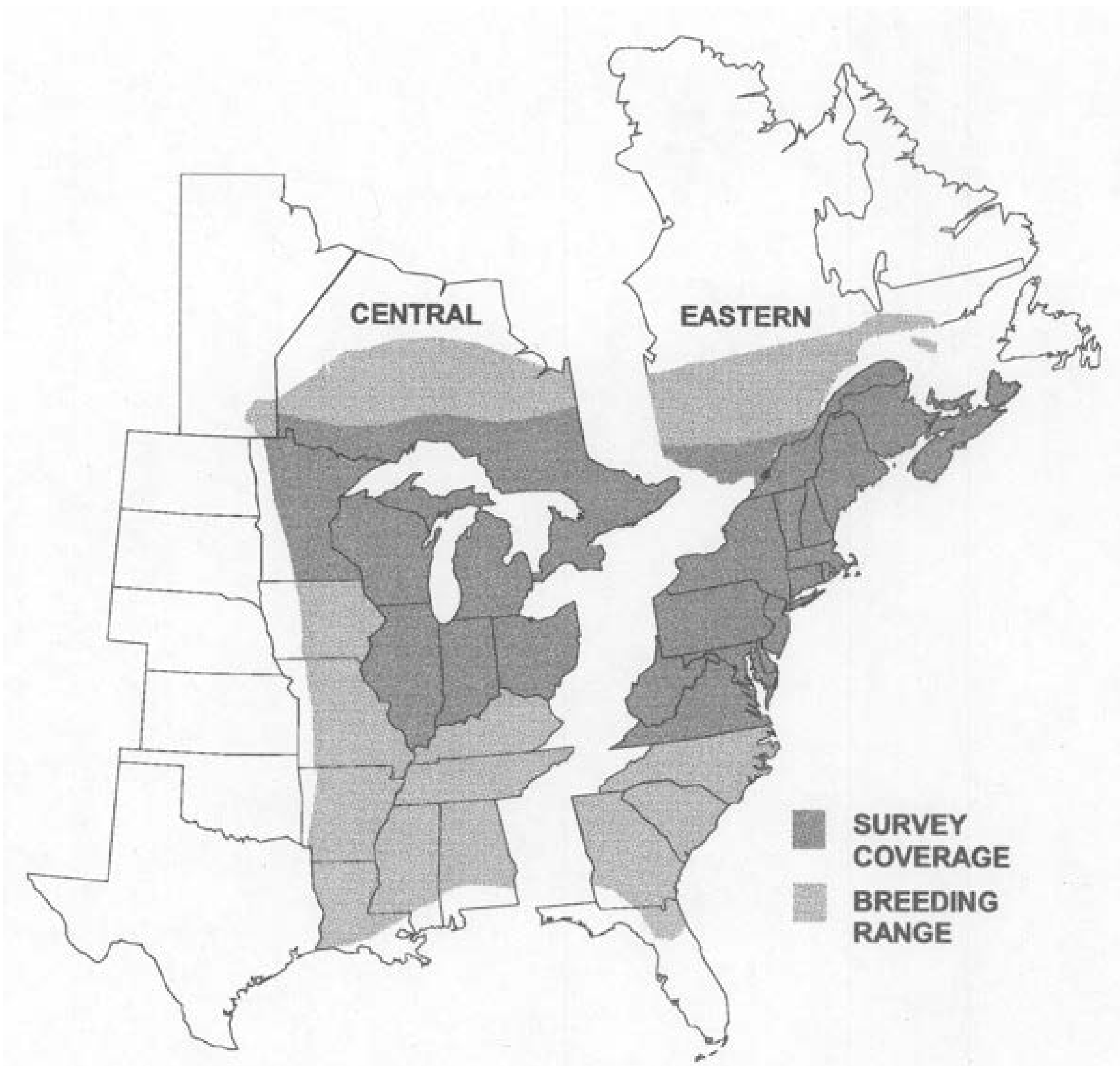

Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 1. Short term (2014 – 15), 10 –year (2005-2015), and long-term (1968-2015) 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. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit/State	Number of Routes[b]	n[c]	2014-15			2005-15			1968-15		
			% Change	95% CI[d] lower	upper	% Change	95% CI[d] lower	upper	% Change	95% CI[d] lower	upper
CENTRAL	440	735	6.32	-1.29	14.66	- 0.72	-1.54	0.11	- 0.71	-0.95	-0.47
IL	13	46	79.98	-44.49	577.55	3.16	- 7.62	16.21	0.27	-2.45	3.43
IN	18	61	- 6.78	-47.11	56.86	- 4.74	-10.26	0.09	- 4.19	-5.47	-3.00
MB[e]	23	30	14.79	-12.71	55.89	0.33	- 3.00	3.77	0.11	-1.51	1.94
MI	109	153	-0.86	-12.91	12.89	- 0.25	- 1.65	1.17	- 0.69	-1.07	-0.31
MN	75	121	28.12	8.39	51.50	0.53	- 1.17	2.31	0.40	-0.20	1.03
OH	41	73	8.98	-15.76	45.27	- 0.80	- 3.62	2.25	- 1.25	-2.00	-0.47
ON	80	160	-3.98	-17.55	11.63	- 2.25	- 4.02	-0.50	- 0.95	-1.42	-0.46
WI	81	121	16.65	-2.21	39.02	- 0.21	- 2.07	1.68	- 0.34	-0.85	0.19

[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 2015 for which data were received by 5 June, 2015.

[c] Number of routes with at least one year of non-zero data between 1968 and 2015.

[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.

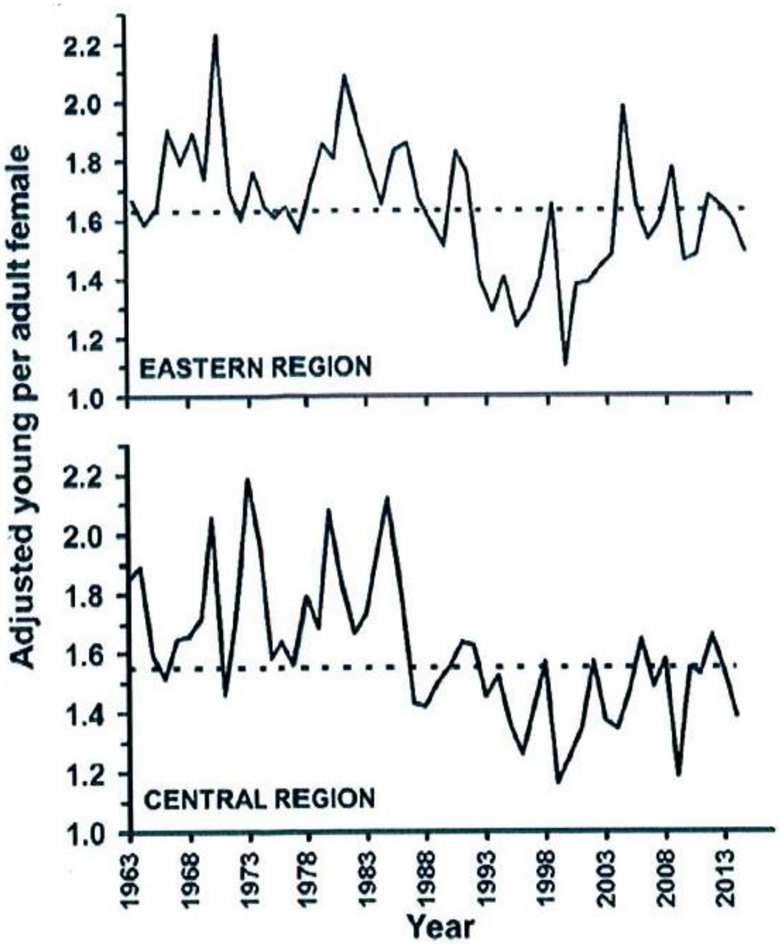

Figure 2. Weighted annual indices of American woodcock recruitment, 1963-2014. Dashed line is the 1963-2013 average. (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

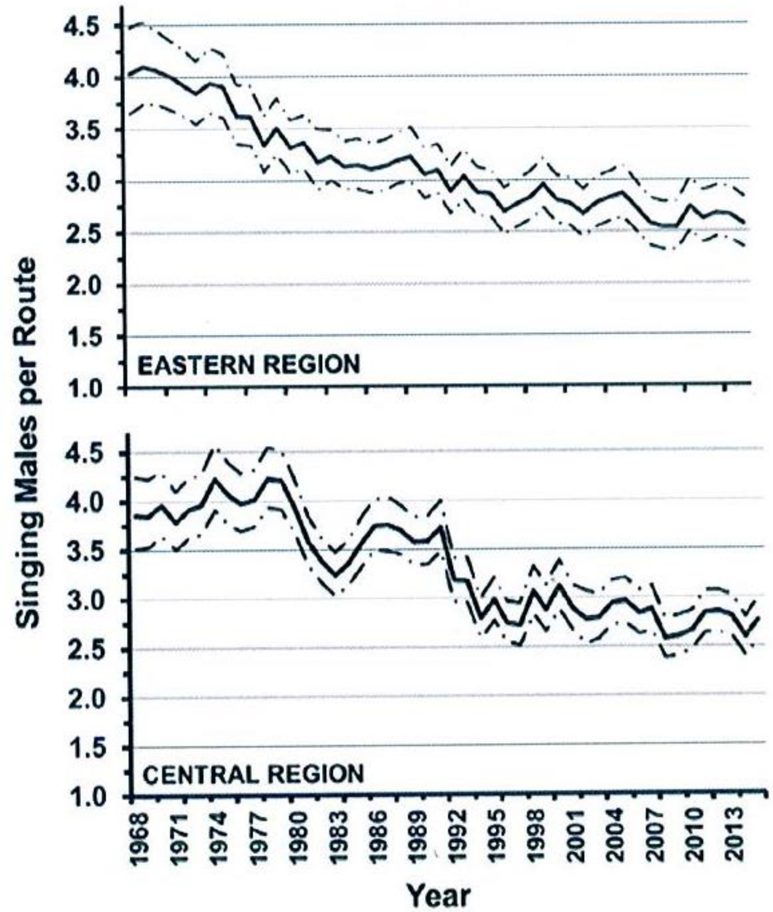

Figure 3. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2015. The dashed lines represent the 95th percentile credible interval. (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Table 2. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2011-12, 2012-13, 2013-14 and 2014-15 Harvest Information Program surveys. (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

Management Unit / State	Active woodcock hunters ([a])				Days afield ([a, c])				Harvest ([a, c])			
	2011-12	2012-13	2013-14	2014-15	2011-12	2012-13	2013-14	2014-15	2011-12	2012-13	2013-14	2014-15
Central Region	n.a. [b]	n.a. [b]	n.a. [b]	n.a. [b]	350,500 ± 16	276,900 ± 16	306,100 ± 20	227,600 ±13.6	231,700 ± 20	193,100 ± 23	180,600 ± 20	141,500 ± 23
IL	2,900 ± 108	900 ± 175	1,600 ± 128	800 ± 169	8,800 ± 131	3,500 ± 172	3,400 ± 119	2,600 ± 162	3,700 ± 195	1,900 ± 160	1,000 ± 142	300 ± 132
IN	1,100 ± 79	400 ± 119	700 ± 77	300 ± 99.7	4,100 ± 86	1,500 ± 122	1,600 ± 58	900 ± 88.1	1,800 ± 102	600 ± 84	1,400 ± 84	700 ± 43
MI	28,400 ± 15	25,700 ± 17	30,000 ± 19	19,400 ± 21.1	144,000 ± 18	121,400 ± 22	123,700 ± 24	87,500 ± 19.1	106,900 ± 28	74,100 ± 28	79,300 ± 28	53,500 ± 29
MN	17,000 ± 29	11,200 ± 36	10,900 ± 37	13,500 ±33.5	76,900 ± 46	40,400 ± 34	74,700 ± 62	47,500 ± 31.8	44,200 ± 42	31,000 ± 59	18,600 ± 57	23,900 ± 45
OH	3,100 ± 98	600 ± 115	3,000 ± 63	1,600 ± 85.4	10,200 ± 96	2,600 ± 83	8,600 ± 64	4,500 ± 94.2	2,300 ± 74	1,500 ± 80	8,600 ± 85	300 ± 90
WI	15,200 ±25	13,700 ± 28	14,500 ± 27	16,200 ± 25	69,000 ± 30	58,000 ± 33	60,000 ± 31	66,400 ± 26.9	42,600 ± 31	40,400 ± 37	38,400 ± 24	49,300 ± 45

[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.

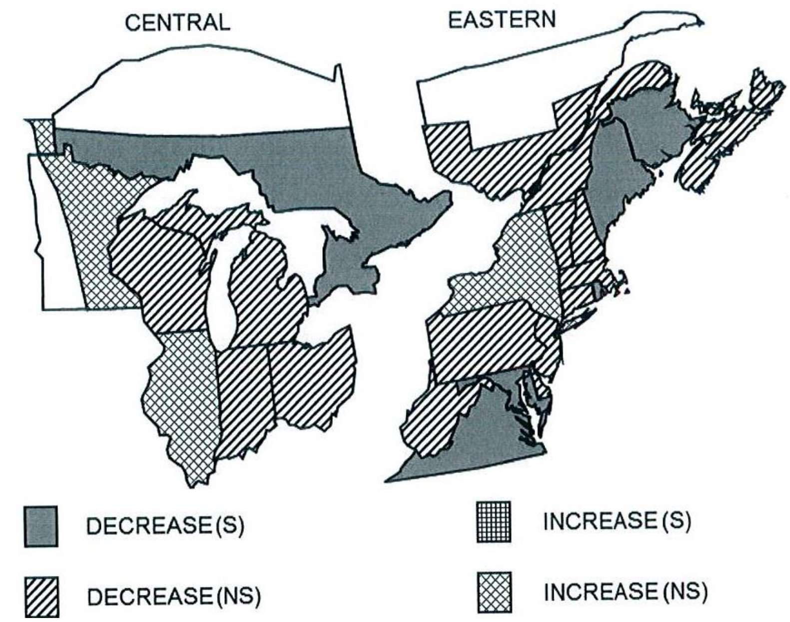

Figure 4. Ten-year trends in number of American woodcock heard on the Singing-ground Survey; 2005-15, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

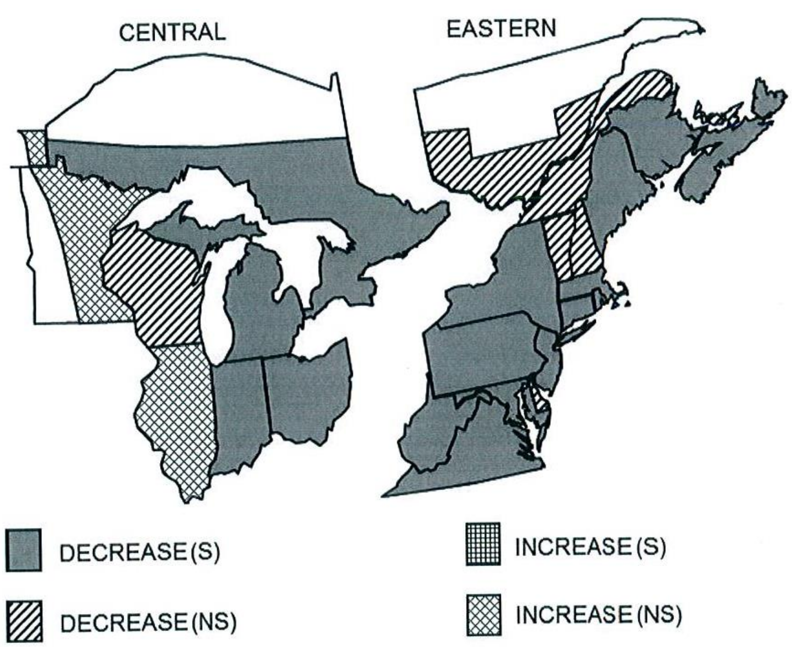

Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-2015, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Cooper, T.R. and R.D. Rau. 2015. American woodcock population status, 2015. U.S. Fish and Wildlife Service, Laurel, MD. 16 pp.).

2015 NORTHWEST MINNESOTA SANDHILL CRANE BREEDING GROUND SURVEY

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Robert G. Wright, Minnesota Information Technology Services

SUMMARY

We conducted an annual sandhill crane (SACR, *Grus canadensis*) breeding population survey in northwest Minnesota during 2012-2015. After the first year of the survey, we excluded the portion of the Red River Prairie Ecological Classification System (ECS) Subsection from the survey area due to low crane numbers in the agricultural landscape. We used 4 km^2 plots as the primary sampling unit. In 2015, we used a split-panel design and surveyed 129 plots: 69 plots that we surveyed in 2012 were revisited and a spatially balanced sample of 60 new plots selected 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. 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, and 4,845 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 4 years (2012-2015). Habitat conditions were different with dry conditions in 2012 and wet conditions in 2013-2015. Survey conditions were very dry at the beginning of the survey in 2013 and 2015, but major precipitation events resulted in wet conditions for the majority of the survey. We believe that timing of the survey and arrival of nonbreeding cranes on the breeding grounds may have influenced the counts in 2014 and 2015.

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 2012-2015, present population estimates for the 4 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.

Beginning 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 (Lawrence et al. 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 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).

Beginning in 2013, we excluded the Red River Prairie survey area because first year 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

Details of sampling design for previous years are contained in previous reports (Lawrence et al. 2012, 2013, and 2014). We used descriptions of crane nesting habitat in northwest Minnesota (DiMatteo 1991, Provost et al. 1992, Maxson et al. 2008) and National Land Cover Data (NLCD; Fry et al. 2011) to identify potential crane habitat. 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 NLCD (30 m cell resolution) to quantify the amount (m^2) of potential SACR habitat in each 4-km^2 plot. 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).

In 2012, we classified each 4-km2 plot into one of 4 categories:

- Stratum 1 (NLCD-1): > median amount of nesting habitat,
- Stratum 2 (NLCD-2): 0 < m2 of nesting habitat < median,
- Stratum 3 (NLCD-3): nesting habitat = 0 but other SACR habitat > 0, or

- Stratum 4 (NLCD-4): no SACR habitat.

We selected 60 plots from Stratum 1 and 2 combined and 30 plots from Stratum 3. We assumed that SACR density in the NLCD4 stratum was very low (approaching zero) and did not sample Stratum 4. We also surveyed a 100 km^2 plot (25 plots) generally overlaying Espelie Township to better understand distribution of cranes within good nesting habitat.

In 2013 and 2014, we used the GRTS design to select 115 plots from all plots with potential crane habitat with no stratification (i.e. Strata 1, 2, and 3 combined). We also recalculated the 2012 estimates based upon the 2013 sample frame.

In 2015, we modified the sampling design to provide a more powerful measure of change. Specifically, we employed a split-panel sampling design (Warren 1994, Urquhart and Kincaid 1999) that consisted of 69 "revisit" plots and 60 "new" plots (Figure 3). Revisit plots were originally selected and surveyed in 2012, and consisted of 58 stratum 1-2 plots, 6 stratum 3 plots, and 5 randomly-selected plots of the original 25 Espelie Township plots. The "new" plots were drawn from the remaining 2,884 stratum 1, 2, and 3 plots in the reduced sampling frame using a spatially balanced simple random sampling design. We treated the 2 panels as strata, with inclusion probabilities = 1 for plots in the revisit stratum, and used the GRTS design-based estimator (Kincaid and Olsen 2013) to compute sampling statistics and estimates of population size. We also used a mixed-model framework to generate model-assisted estimates of total and breeding SACR abundance during 2012 to 2015. We used plot counts as our response variable and the model contained fixed effects for strata and random effects for year and plot. We fit the model using the lme4 package (Bates et al. 2014) in R (R Core Team 2014). We weighted the predicted mean count for each stratum and year by stratum weights and multiplied by N (sampling frame size) to obtain model-assisted population estimates. We used a bootstrap procedure to obtain confidence intervals for the model-assisted population estimates. More specifically, we bootstrapped 200 sample datasets using with-replacement sampling of plots from each stratum and year, and then refit our mixed model to each bootstrap dataset to generate 200 population estimates for each year and target population (total and breeding SACR). We used the distribution of bootstrapped population estimates to compute percentile confidence intervals (90% CI). Because we only had 2 years (2012 and 2015) where our sample of revisit plots were surveyed, we did not attempt to include a slope parameter for year in our mixed model (i.e., to quantify the population trend). Instead, we treated revisit plots as a paired sample and compared mean change in plot counts and naïve occupancy between 2012 and 2015, which correspond to the first and last years in our time series.

Target population(s)

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.

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] helicopter 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. In 2015, we used DNRSurvey ver. 2.11, an ArcGIS addin developed by Minnesota DNR Wildlife and MN.IT Services GIS staff.

RESULTS

Survey effort

The 2015 survey was conducted on 5 days (5, 6, 12, 20, and 21 May) during a 17-day period. We averaged 26 plots/day (range: 11-38). The survey timing (Figure 4) almost encompassed the range of previous surveys and started 2 days earlier than other years (5 May) but ended only 2 days before our latest survey end date in 2013. The survey team (DNR pilot Brad Maas and observer Jeff Lawrence) spent an average of 9 min surveying each plot (range: 2 – 19 min), about 2 minutes longer that the in 2013 and 2014, and 1 minute shorter than in 2012 (Table 1).

Sampling statistics

We detected SACR on 64 (50%) of the 129 sample plots in 2015 compared to 32% in 2014 and approximately 45% in 2012 and 2013 (Table 2). Cranes were observed on 58% of the 60 randomly-selected plots in 2015. The average count per 'occupied' plot (>=1 SACR observed) was 2.8 birds, which was similar to last year's mean (2.4) but less than the conditional mean plot count in 2012 (4.9) and 2013 (4.4). In 2015 we counted 175 SACR on sample plots, of which 59% were pairs, 27% were singles, and 13% were in groups (Table 3). We observed 5 groups on sample plots, which ranged in size from 3 to 8 birds. We saw relatively more grouped SACR in 2012 (37% of cranes observed) and 2013 (42%) than in 2014-2015 (15% and 13%, respectively; Table 3b). About 22% of observed pairs and singles exhibited some evidence of being breeding birds, which was lower than previous years (Table 3). In 2015 we detected 20 nests, similar to the 20 nests each in 2012-2013 and 17 nests in 2014.

Population estimates and distribution

The estimated total number of cranes in the survey area in 2015 was 4,835 (90% CI: 3,516-6,153), which was similar to the 2013 estimate (5,547; 90% CI: 3,582-7,511) and greater than the 2014 estimate (2,285; 90% CI: 1,716-2,855; Table 4). 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, then the estimated total number of breeding SACR in the survey area in 2015 was 1,069 (90% CI: 674-1,465), which again was similar to the 2013 estimate (950; 90% CI: 691-1,210) and greater than the 2014 estimate (591; 90% CI: 368-813; Table 4). The number of estimate breeding and unknown status (single and paired) cranes was similar in 2012 and 2015 (Figure 5).

A model-assisted analysis of the survey data suggested population estimates from 2014 were likely biased low (Figure 6). In both cases (design-based vs. model-assisted estimates) the estimated mean annual change in IBB and total birds during 2012-2015 was approximately -14% and -17%/yr, respectively. However, in all cases the slope of the trend line was not significantly different from zero (t-tests, P > 0.25). The lack of statistical significance in this case is not unexpected given we only have 4 data points (years).

A more powerful metric of change is a comparison of the 69 plots surveyed in 2012 and 2015 (i.e., revisit plots). The number of single cranes observed on these plots was the same in 2012 and 2015 (n = 24 in each year), but the number of pairs declined from 43 to 22 and the number of birds in groups declined from 73 to 8. On average, we counted -0.41 and -1.55 fewer IBB/plot and total SACR/plot, respectively, in 2015 compared to

2012. These differences were statistically significant in both cases (paired t-tests, df = 68, P <= 0.025). In terms of naive occupancy (probability of observing >=1 SACR | probability of detection=1), 67% of revisit plots did not change state from 2012 to 2015, but 22% changed from occupied to unoccupied and only 12% changed from unoccupied to occupied. Thus, there was a net decrease in naive probability of occupancy from 0.53 (90% CI: 0.39-0.73) in 2012 to 0.39 (90% CI: 0.19-0.51) in 2015.

Habitat associations

The relationships between SACR plot counts (2012-2015) and remote-sensing habitat metrics were very weak (Figure 7). Conversely, the probability of observing >=1 SACR was positively associated with the amount of nesting cover in the plot (Figure 8).

DISCUSSION

Survey effort and design considerations

In 2015, conditions started similar to 2012 (similar start date, drought conditions). In 2012, drought conditions persisted. In 2015, significant rainfall on May 17-18 changes conditions to very wet with flooded basins and standing waters in some fields. This was similar to the change in habitat conditions we observed in 2013. Spring phenology has varied each year, too. We had record early spring phenology in 2012, very late phenology in 2013 and 2014, and closer to average phenology in 2015. We have tried to time the survey for peak crane nest incubation, but these annual changes have made this difficult. Timing of the SACR survey may be critical to getting consistent results.

Population estimate

The number of indicated breeding cranes (IBB) and total cranes have shown a downward trend during the 4-year period we have conducted surveys, but some of this decline may be due to other factors such as survey timing and habitat conditions. The number of breeders and unknown cranes (singles and pairs) was approximately 4,100 in both 2012, the year of the highest population count, and 2015. The model-assisted estimate suggests that the 2014 count was biased low, but additional years of data may be necessary to better understand this annual variation.

The most powerful measure of change in crane numbers was the decline in the number of cranes observed on same plots between 2012 and 2015. Cranes have strong philopatry to their nesting territories (Krapu et al. 2011, Gerber et al. 2014), and we would expect similar numbers of IBB on the same plots if populations were stable. However, other factors influencing recruitment (e.g. flooded nests due to heavy precipitation in 2015) may influence the number of cranes seen on these plots. In addition, we recorded the same numbers of singles on these plots. Most singles are assumed to have a nesting mate nearby that was either undetected on the plot or off plot. The number of pairs on these plots in 2015 (*n*=22) was about ½ the number in 2012 (*n*=43), but we suspect many pairs have not started breeding yet. Cranes in groups have been included in our population estimates, yet the uneven distribution of groups makes them difficult to survey using the plot based design. In addition, plot data and anecdotal evidence suggests that groups were not present in large numbers on the northwest Minnesota breeding grounds when we conducted the survey in 2014 and 2015. The low number of groups observed in 2015 suggests that many nonbreeders had not yet returned to the breeding grounds and this may apply to nonbreeding pairs, too.

We will continue to report the total breeding population including groups, yet the 4 breeding ground surveys conducted to date suggest that return dates for the nonbreeding component of the crane population may be highly variable. Cranes in groups, some cranes in pairs, and likely a few singles would comprise the nonbreeding component of the population. While the number of nonbreeding pairs returning in May maybe variable, we believe the total number of cranes observed as singles and pairs will provide the most reliable measure of the crane population in Northwest Minnesota.

We plan to conduct the survey again in May 2016.

ACKNOWLEDGMENTS

This project was funded by a grant from the U.S. Fish and Wildlife Service Webless Migratory Bird Program (2012-2014) and the Minnesota Department of Natural Resources (2012-2015). Special thanks to DNR pilots Brad Maas, who flew the survey in 2015 and John Heineman, who flew in 2012-2014. They both did an exceptional job flying the helicopter and helping with the survey during all 3 years. Chris Scharenbroich prepared maps for the survey.

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Table 1. Survey effort (minutes) by activity for an aerial survey of sandhill cranes in Minnesota, May 2012-2015.

			Survey Duration						
Year	Design[a]	*n* plots	Start date	End date	Calendar days	Survey days	Total flight hrs	Plots/ day	Minutes/ plot
2012	GRTS-ST3	115	7-May	15-May	9	7	30	16.3	9.8
2013	GRTS-SRS	115	17-May	23-May	7	3	23	38.0	6.7
2014	GRTS-SRS	115	9-May	16-May	8	4	26	28.8	6.7
2015	SP12-GRTS	129	5-May	21-May	17	5	34	25.8	8.7

[a]-GRTS-ST3: generalized random-tessellation stratified with 3 strata; GRST-SRS: generalized random-tessellation stratified, simple random sample, SP12-GRTS: repeat 2012 Aspen Parkland plots, generalized random-tessellatior stratified, simple random sample for remainder of plots

Table 2. Sampling statistics[a] for an aerial survey of sandhill cranes in northwestern Minnesota, May 2012-2015.

								Counts/occupied plot				
Year	Strata	Sampling allocation[b]	n	N	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	115	2,953	0.039	49	0.43	1	46	3	4.4	1.06
2014	1	SRS	115	2,953	0.039	37	0.32	1	10	2	2.4	0.31
2015	2	SP-SRS	129	2,953	0.044	64	0.50	1	14	2	2.8	0.45

[a]n = sample size (4-km^2 plots), N = 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]SRS = simple random sample, SP-SRS=Split plot-simple random sample.

Table 3. Social and breeding classification of sandhill crane observations, 2012-2015.

Social Class[a]	*n* by year				Proportion by year				Proportion of singles of pairs			
	2012	2013	2014	2015	2012	2013	2014	2015	2012	2013	2014	2015
Pairs (x2)	114	92	38	104	0.48	0.43	0.43	0.59				
Breeding birds	50	28	12	24	0.21	0.13	0.14	0.14	0.44	0.30	0.32	0.23
Status unknown	64	64	26	80	0.27	0.3	0.29	0.46	0.56	0.70	0.68	0.77
Singles	37	34	38	48	0.15	0.16	0.43	0.27				
Breeding birds	8	9	11	10	0.03	0.04	0.12	0.06	0.22	0.26	0.29	0.21
Status unknown	29	25	27	38	0.12	0.12	0.3	0.22	0.78	0.74	0.71	0.79
Groups	89	90	13	23	0.37	0.42	0.15	0.13				
Total	240	216	89	175								

[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).

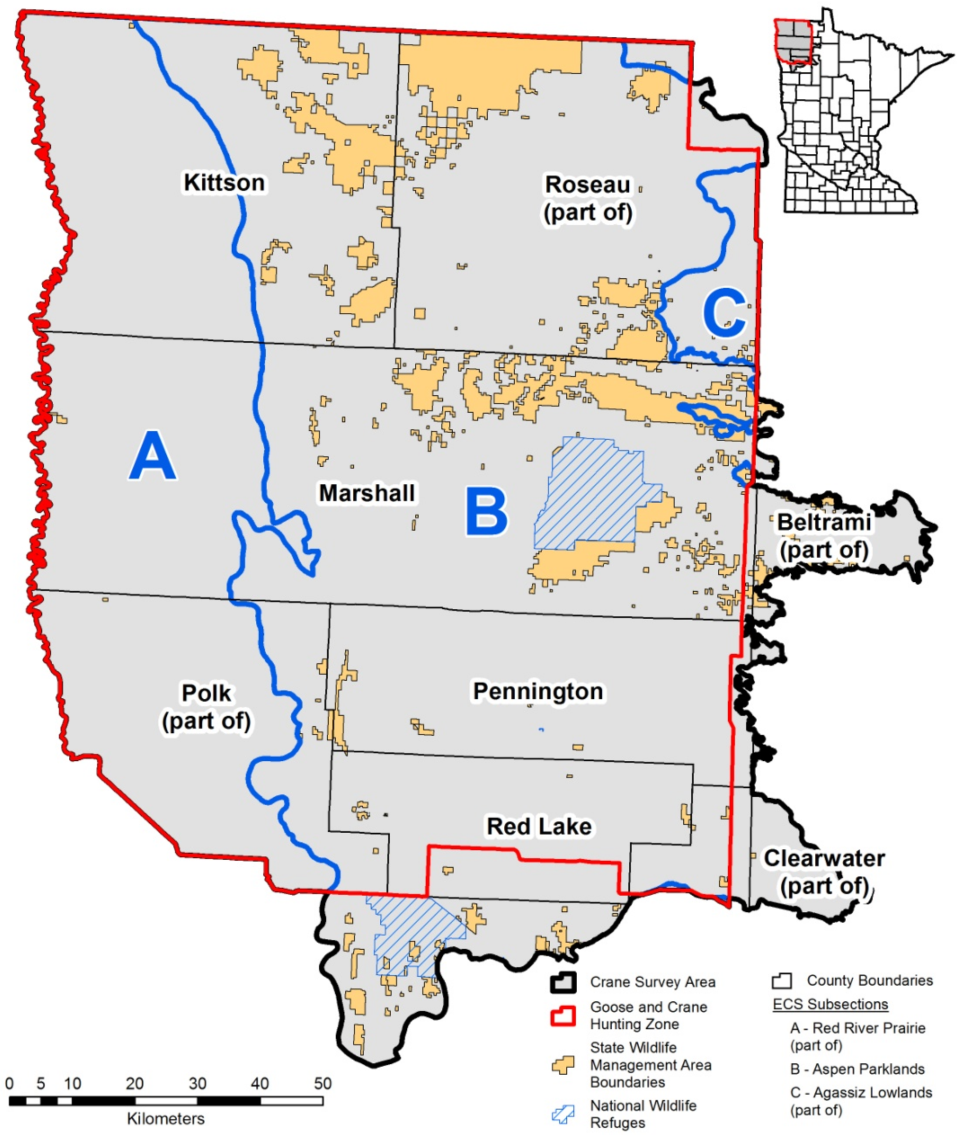
Table 4. Population estimates (N) by indicated breeding status for sandhill cranes in northwestern Minnesota, May 2012-2015.

Year	Survey Area	Status	Plots surveyed	Total plots	n plots with cranes	Minimum cranes/plot	Maximum cranes/plot	Avg. birds/plot	SE birds/plot	$\hat{N}$	SE	LCB (90%)	UCB (90%)	CV %
2012	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
2015	Without Red River Valley	Breeding birds[b]	129	2,953	21	1	3	0.4	0.08	1,069	240	674	1,465	22
		Groups	129	2,953	5	3	8	0.2	0.13	729	398	75	1,383	55
		Status unknown[c]	129	2,953	52	1	9	1.0	0.16	3,036	481	2,245	3,827	16
		Total	129	2,953	64	1	14	1.6	0.27	4,845	801	3,516	6,153	17

[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.


Kittson
Roseau (part of)
C
A
Marshall
B
Beltrami (part of)
Polk (part of)
Pennington
Red Lake
Clearwater (part of)
Crane Survey Area
Goose and Crane Hunting Zone
State Wildlife Management Area Boundaries
National Wildlife Refuges
County Boundaries
ECS Subsections
A - Red River Prairie (part of)
B - Aspen Parklands
C - Agassiz Lowlands (part of)
0 5 10 20 30 40 50
Kilometers

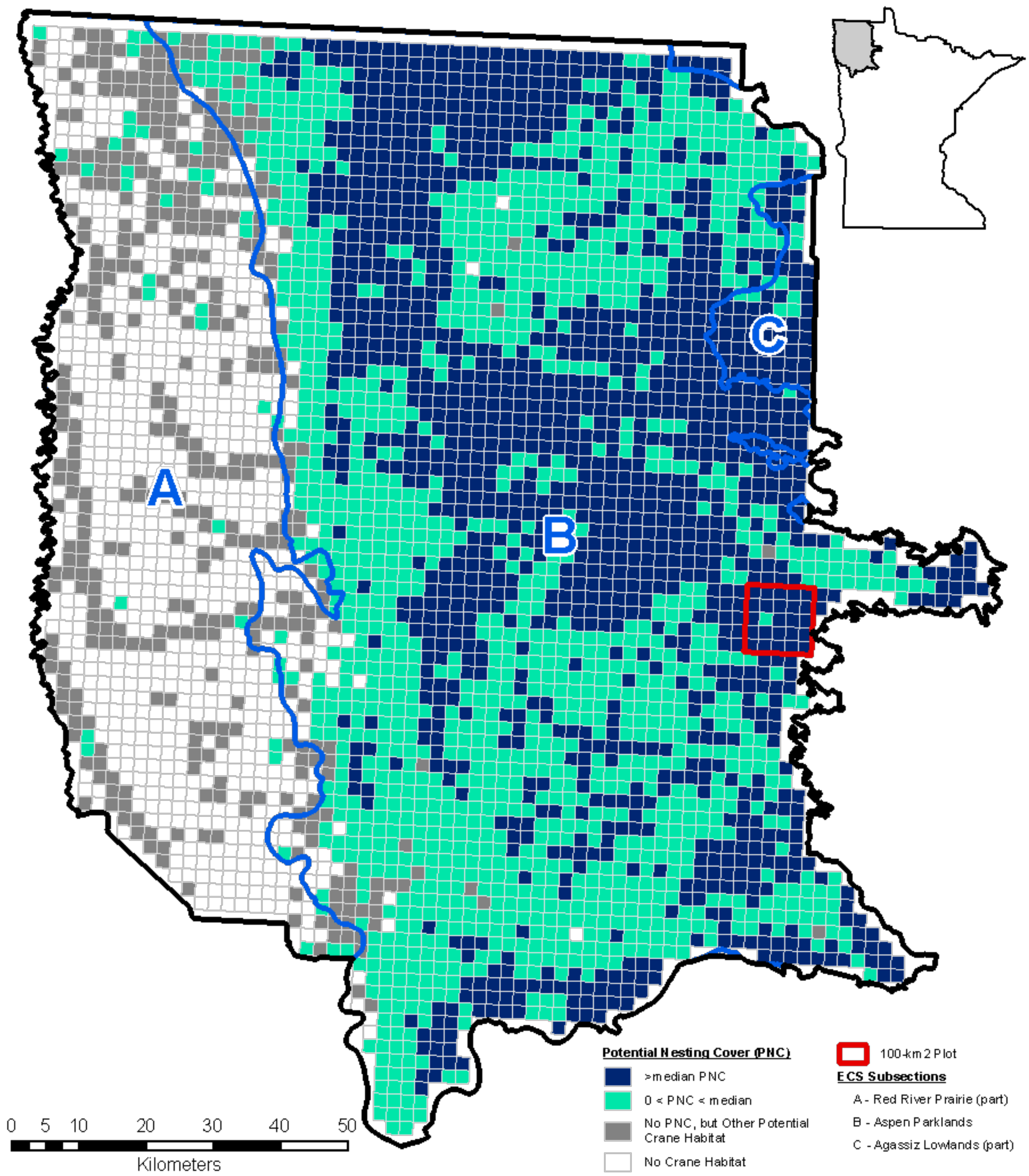


Figure 2. Sampling frame for the spring aerial survey of sandhill cranes, northwestern Minnesota. The primary sampling unit was 4-km^2 plots. Colored squares denote plots by strata as defined by National Land Cover Data: dark blue = NLCD-1 (>median amount of potential crane nesting cover [PNC]), turquoise = 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). After 2012, 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 after 2012.

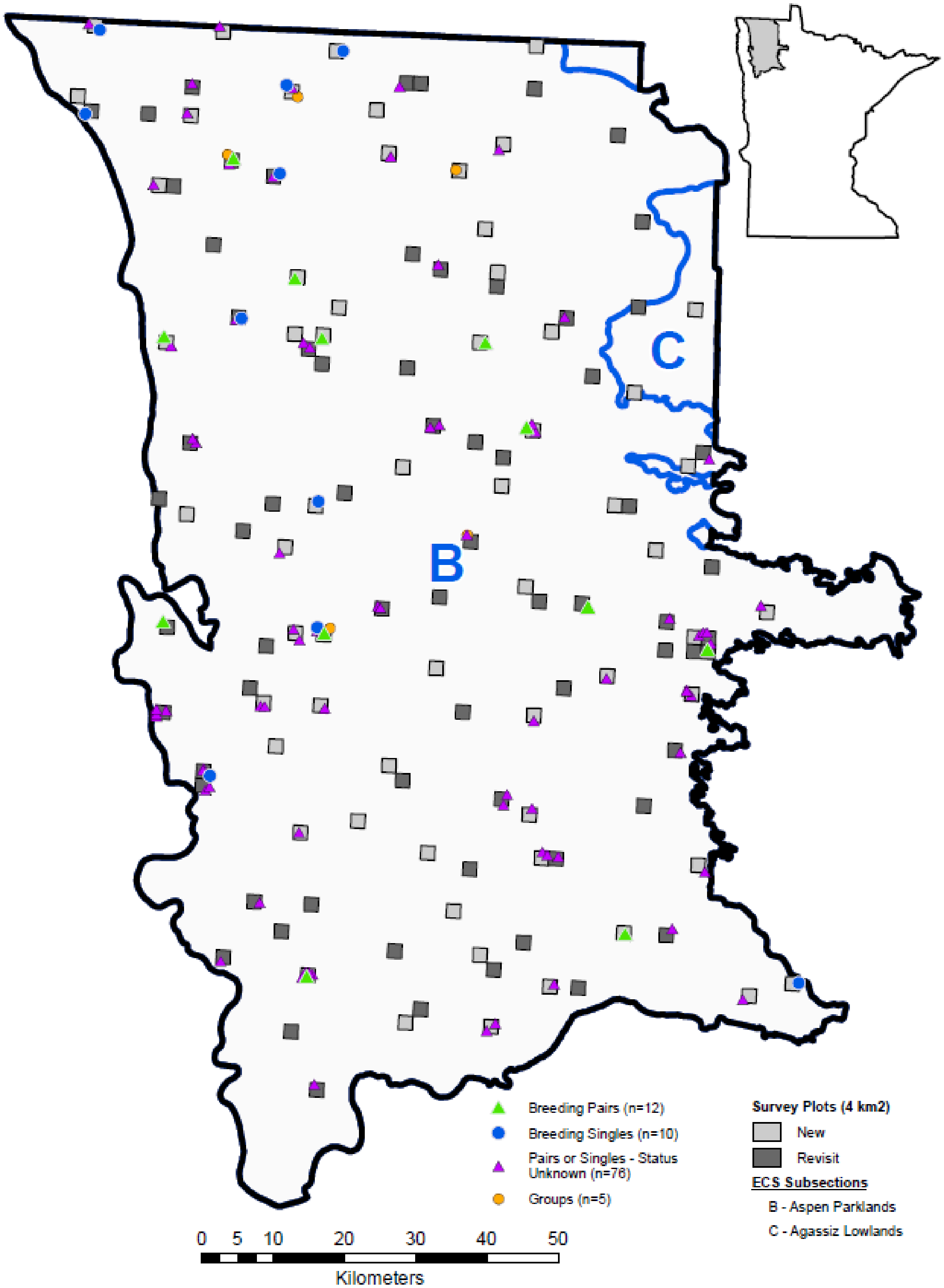


Figure 3. Distribution of sample plots (n = 129) and sandhill crane observations by type in the 2015 MNDNR spring aerial survey, northwestern Minnesota. Each sample plot was 4 km2 and the SACR survey area was 11,812 km2.

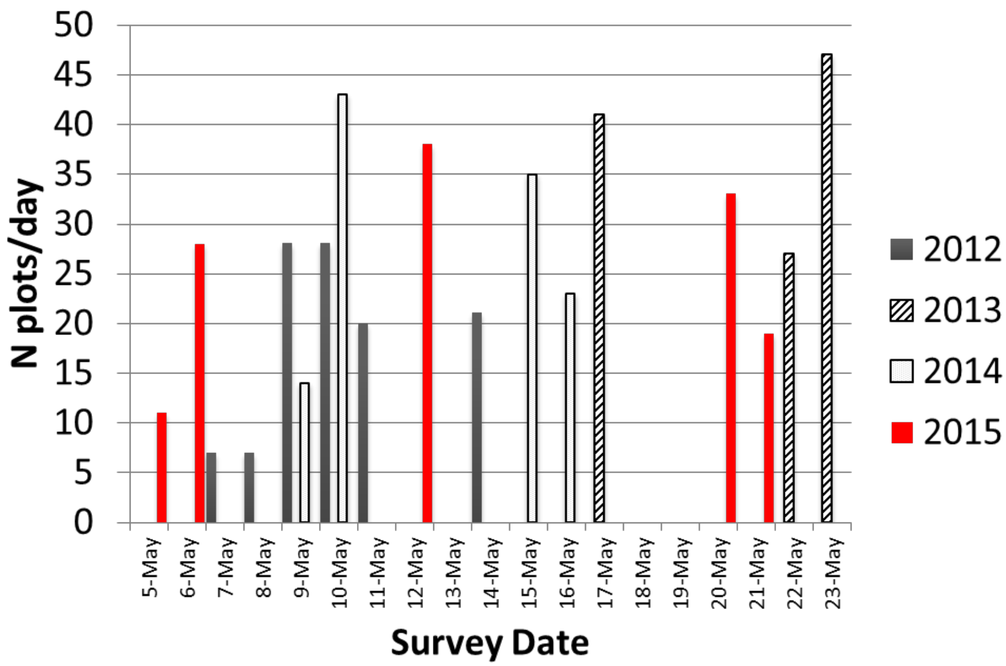


Figure 4. Number of plots surveyed by calendar date during the Northwestern Minnesota Sandhill Crane breeding population survey, 2012-2015. 115 plots were flown each year from 2012 to 2014 and 129 were flown in 2015.

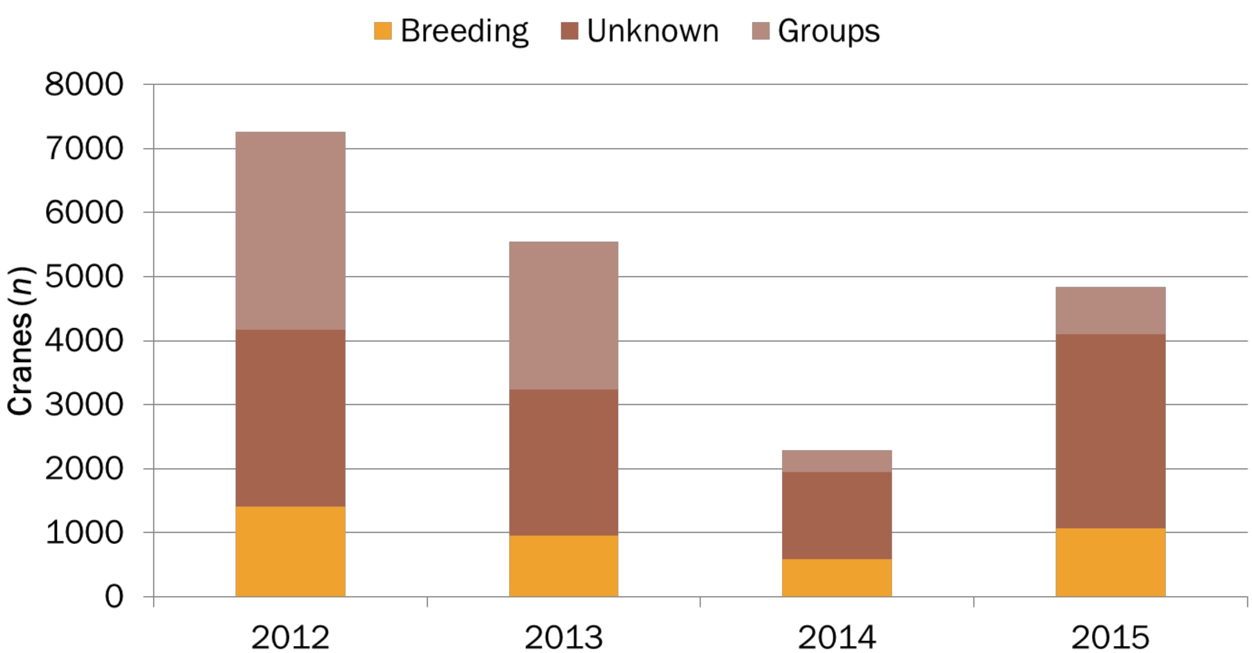


Figure 5. Number of cranes by social grouping in the Aspen Parklands survey area of northwestern Minnesota, 2012-2015.

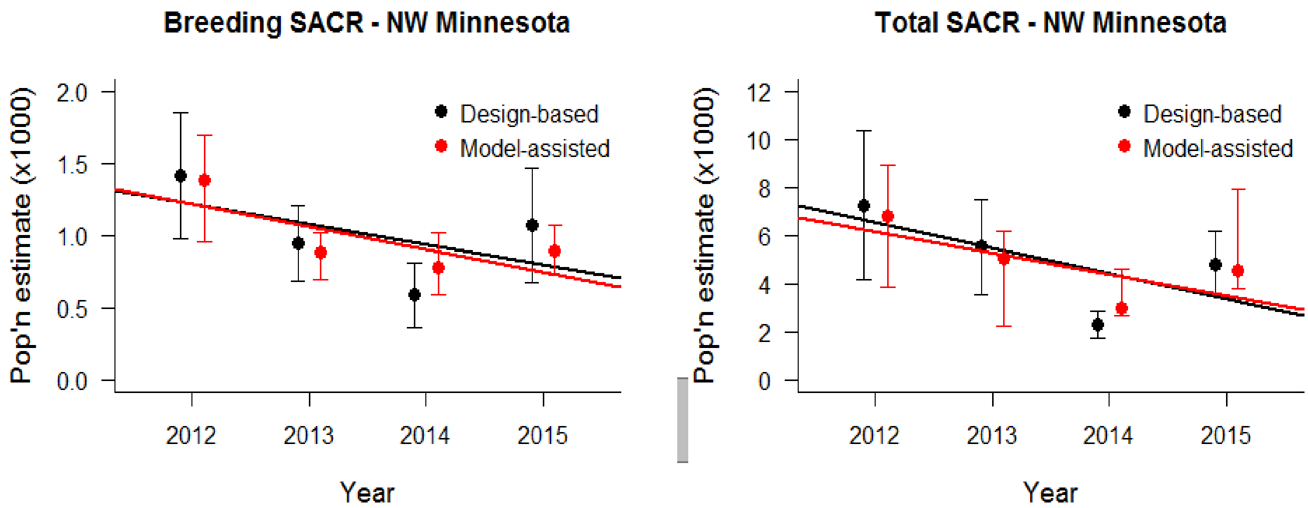


Figure 6. Design-based and model-assisted estimates of breeding sandhill cranes (SACR) and total breeding ground population in the Aspen Parklands survey area of northwestern Minnesota, 2012-2015. See text for explanation of the methods.

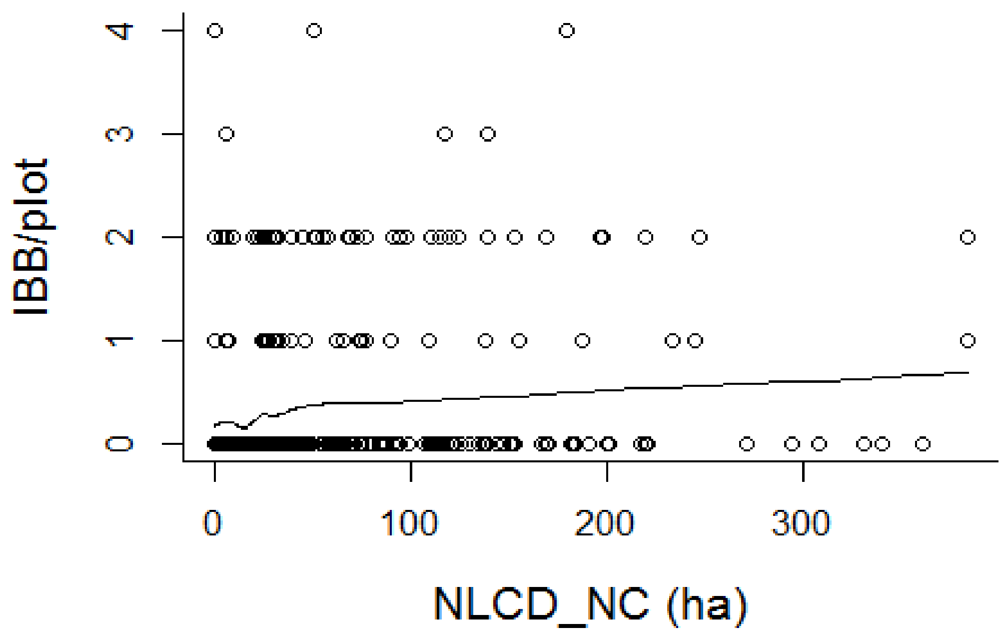


Figure 7. Relationship between Indicated Breeding Birds [IBB]) sandhill crane observations and habitat abundance (as defined by NLCD classification schemes [see text]) based on 448 4-km2 plots surveyed in northwest Minnesota, 2102-2015.

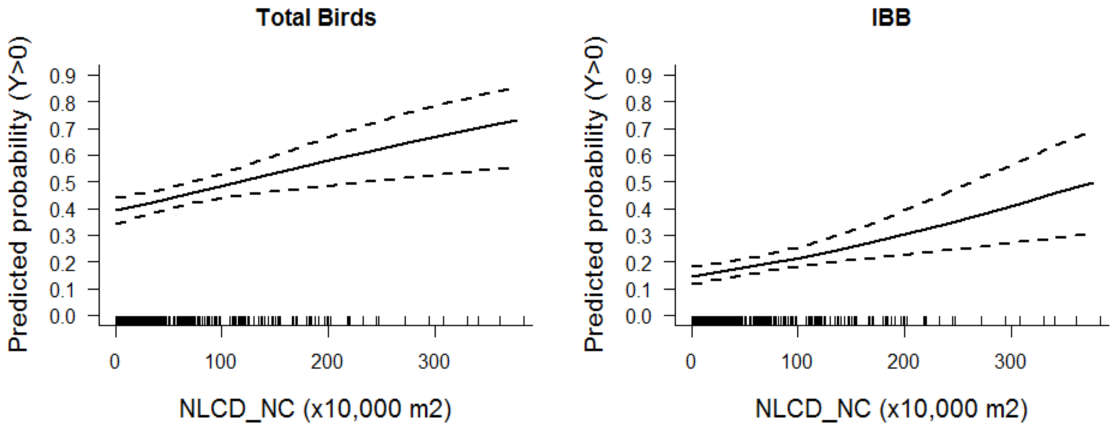


Figure 8. Relationship between sandhill crane occurrence (total SACR and Indicated Breeding Pairs [IBB]) and habitat abundance (as defined by NLCD classification schemes [see text]) based on 448 4-km2 plots surveyed in northwest Minnesota, 2102-2015.

HUNTING HARVEST STATISTICS

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2014 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 mail survey of small game hunters. The small game mail survey was initiated in 1976 as a means to gather small game harvest information, which is used to inform our constituency and guide decisions about hunting regulations and season structure.

METHODS

A postcard survey (Figure 1) was mailed in early March and respondents who returned it within three weeks were eliminated from follow-up mailings. The sampling frame consisted of individuals who purchased a small game hunting license (any type) for the 2014-15 small game hunting season (N= 258,109). A stratified random sample (n= 7,000, 2.7%), allocated proportionally by license type 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= 252,053) and “Nonresident” (N= 6,056) (Figure 2). A free youth license was added to the sampling frame for 2010-13 but that license has since been discontinued. Estimates for those years have been recalculated without the youth license so that harvest estimates and license sales are comparable among years. The percent of respondents who said they hunted or did not hunt is reported in Table 1. License sales and survey response rate are shown in Figure 2.

Recipients were asked if they hunted small game in 2014-15 and if not, they were instructed to return the survey. Respondents who hunted were asked: (1) total number of days they hunted small game, (2) number bagged by species, (3) number of days hunted by species and (4) the county in which they hunted most for each species listed. 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. 3.1.2 (2014-10-31); R Development Core Team [RDCT] 2014).

RESULTS

Of the 7,000 mailed surveys, 110 surveys were undeliverable; 3,451 surveys were returned for an adjusted response rate of 50%. A summary of the top four small game species (ducks- all species, Canada geese, pheasants, and ruffed grouse) harvested in Minnesota are shown in figure 3. License sales were fairly similar to the previous year (Figure 2, Table 5). Estimated number of hunters increased slightly for ruffed grouse but declined for most other species (Table 2). Estimated harvest per active hunter (Table 3) was up for mourning doves (10.4) but relatively stable for most other species. Mean harvest for successful hunters and hunter success rates remain unchanged (Table 4). License sales and estimated hunter harvest are presented in Table 5. Ruffed grouse harvest increased from 288,410 in 2013 to 301,190 in 2014 but was less than the 2010 harvest of 465,580 which is the highest harvest in the last 10 years. Duck harvest declined from 782,810 in 2013 to 699,620 in 2014 but was still higher than harvests from 2008 to 2011. Canada goose (221,620) and Ring-necked pheasant (152,800) harvest estimates are the lowest in the last 10 years. Nonresident hunters (Table 6) showed increased license sales for ducks, geese, and ruffed grouse. Harvest was up for grouse but down for ducks, geese and raccoons (no nonresident hunters reported hunting or harvesting raccoons).

This project was funded in part by the Wildlife Restoration Program.

Figure 1. Sample of Small Game Hunter survey card.

Dear Small Game Hunter:

You have been selected at random from among Minnesota's small game hunting license buyers to assist us in evaluating the 2014-2015 small game hunting season **(March 2014-February 2015)**. We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2014 hunting experience.

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

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

THANK YOU FOR YOUR COOPERATION

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

2014 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2014 - Feb 2015)? ☐ 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			

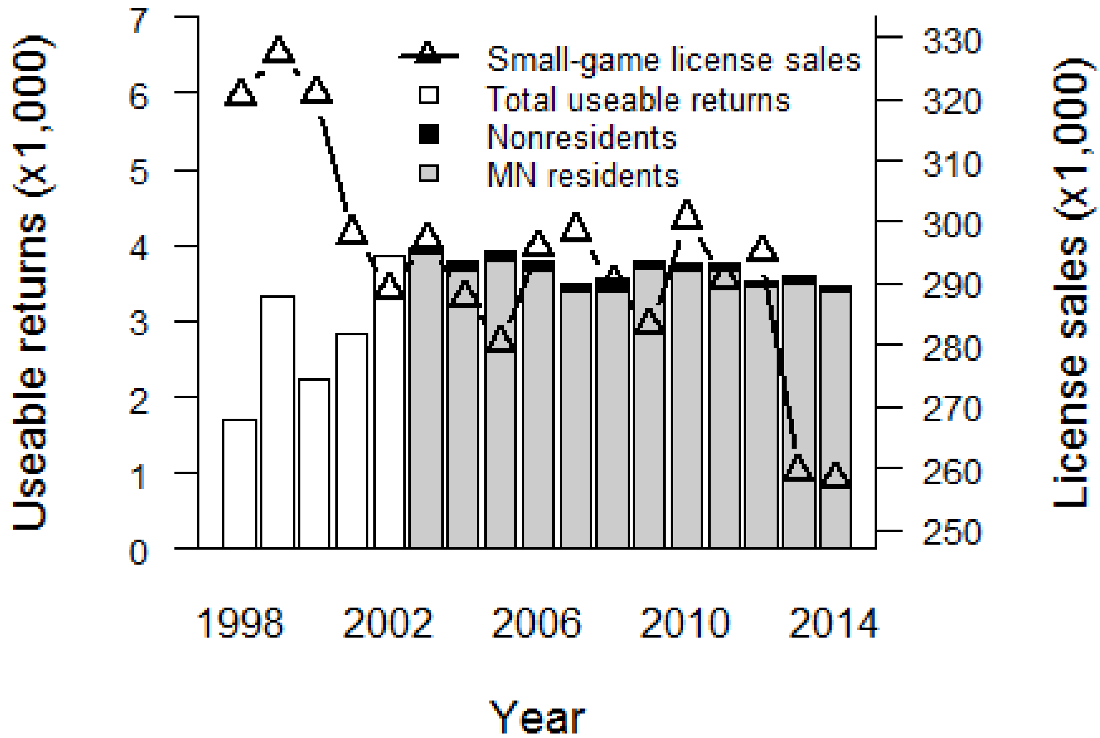

Figure 1. Number of Minnesota small game license sold and usable returned surveys, 1998-2014. Includes resident and non-resident licenses, and excludes duplicate and free licenses.

Figure 2. Summary of top four small game species harvested in Minnesota, 2002-2014.

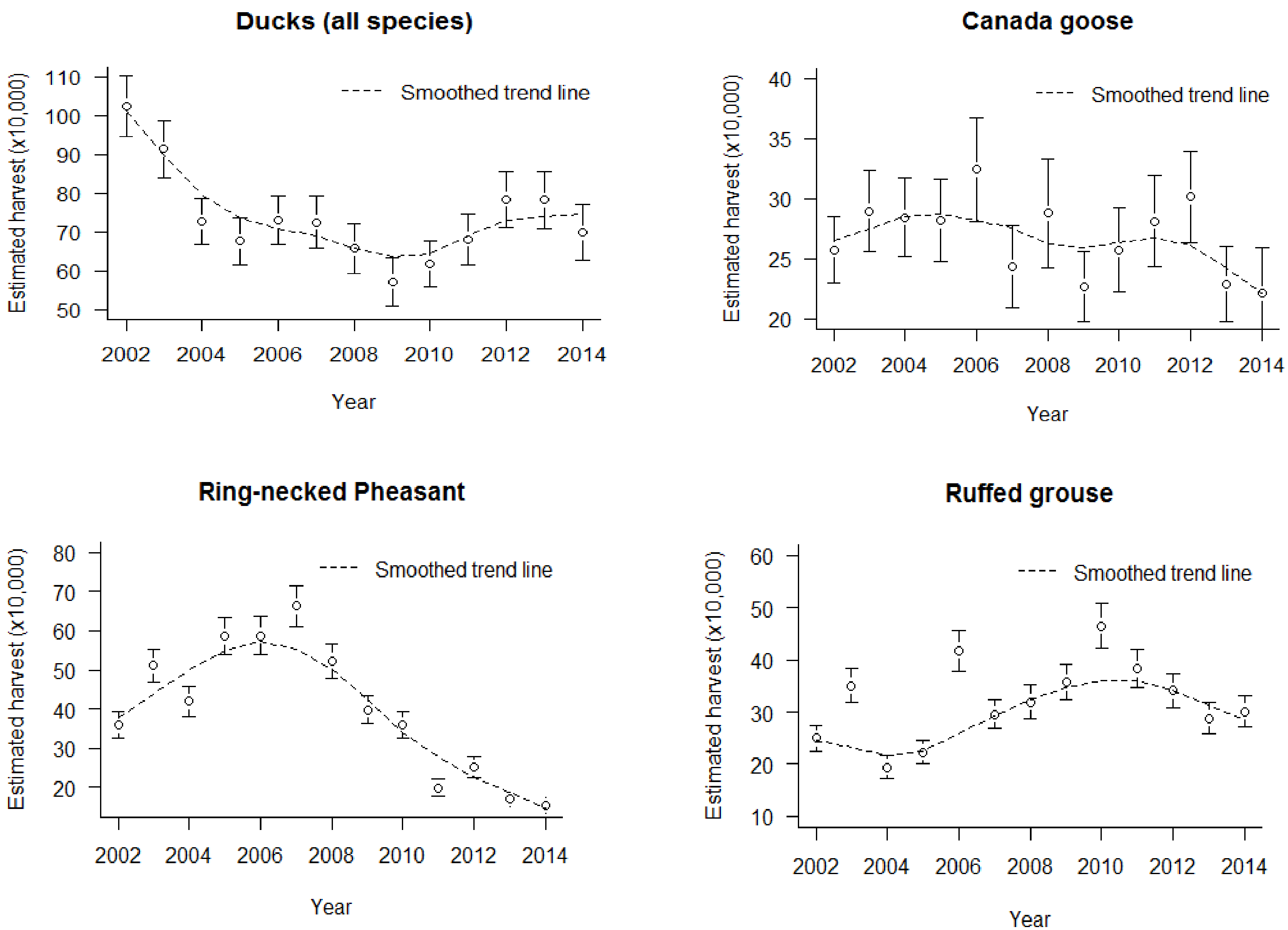

Table 1. Percent of respondents who hunted small game, 2005-06 through 2014-2015 [a].

		Returns from mail survey	Projections from license sales
2005-06	Hunted	3,035 (77%)	216,000
	Did not hunt	900 (23%)	64,156
		3,935 (100.0%)	280,156
2006-07	Hunted	2,994 (79%)	233,759
	Did not hunt	795 (21%)	62,139
		3,789 (100.0%)	295,898
2007-08	Hunted	2,894 (78%)	232,505
	Did not hunt	822 (22%)	65,961
		3,716 (100.0%)	298,467
2008-09	Hunted	2,678 (75%)	218,753
	Did not hunt	873 (25%)	71,311
		3,551 (100.0%)	290,064
2009-10	Hunted	2,850 (75%)	212,126
	Did not hunt	952 (25%)	70,857
		3,802 (100.0%)	282,983
2010-11	Hunted	2,824 (75%)	210,129
	Did not hunt	953 (25%)	70,911
		3,777 (100.0%)	281,040
2011-12	Hunted	2,761 (74%)	214,137
	Did not hunt	987 (26%)	76,549
		3,748 (100.0%)	290,686
2012-13	Hunted	2,669 (76%)	223,808
	Did not hunt	851 (24%)	71,360
		3,520 (100%)	295,168
2013-14	Hunted	2,586 (72%)	186,317
	Did not hunt	1,003 (28%)	72,264
		3,589 (100%)	258,581
2014-15	Hunted	2,476 (72%)	185,186
	Did not hunt	975 (28%)	72,923
		3,451 (100%)	258,109

[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, 2002-03 through 2014-15.

	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	2014-15
Ducks	111,619	101,487	104,634	92,634	87,075	87,468	81,358	77,480	72,770	76,090	80,770	76,950	75,170
Canada goose	78,574	74,855	74,728	69,416	66,224	62,649	59,222	55,520	53,430	57,220	58,900	51,160	48,240
Other geese	5,981	7,373	5,327	4,628	4,529	3,695	4,411	3,280	3,650	2,710	3,830	2,810	2,770
American coot	4,411	3,912	5,099	4,129	4,529	3,454	4,166	4,090	4,610	3,480	3,990	3,820	4,410
Common snipe	2,243	1,429	1,902	1,210	2,187	1,928	1,797	1,340	1,340	1,160	1,160	1,370	820
Rails / gallinules	673	150	228	0	547	482	408	370	220	230	500	140	300
Crow [*]	12,859	12,263	12,404	11,890	10,777	8,514	10,047	10,640	9,380	10,360	11,480	8,570	7,400
American woodcock	11,962	12,789	12,023	11,035	13,510	10,843	12,171	11,760	10,790	9,430	13,310	12,030	9,650
Mourning dove [γ]			15,524	11,107	12,886	13,172	11,599	10,500	10,640	8,970	9,230	10,380	9,950
Ring-necked pheasant	91,284	105,023	104,406	110,852	118,703	118,311	106,763	99,440	89,140	72,840	76,950	62,110	57,590
Ruffed grouse	90,686	93,513	79,141	76,037	91,682	90,600	86,505	87,230	92,490	88,620	91,260	81,130	83,020
Spruce grouse	7,327	8,727	7,305	7,048	9,840	10,602	8,332	9,750	8,860	10,210	7,400	10,810	10,320
Sharp-tailed grouse	6,355	6,921	6,164	4,913	6,560	6,827	6,616	5,510	7,140	6,190	6,570	6,700	5,460
Gray partridge	6,579	7,975	5,327	6,265	6,013	6,667	4,411	4,240	3,720	2,400	3,080	2,450	2,540
Gray squirrel	25,494	29,190	23,438	24,563	25,459	25,863	22,382	22,260	23,740	23,280	24,710	21,690	21,240
Fox squirrel	14,878	19,936	15,372	15,094	15,619	14,779	13,233	13,180	15,630	12,060	14,220	12,030	12,790
Eastern cottontail	15,700	21,441	18,644	20,148	20,070	19,598	17,644	16,300	15,030	12,300	16,390	14,550	13,160
White-tailed jackrabbit	2,467	3,009	3,044	2,065	2,577	2,891	2,451	1,790	2,230	2,320	1,750	1,220	1,350
Snowshoe hare	5,682	5,567	4,338	3,346	5,545	4,257	4,574	3,500	3,800	3,250	4,820	3,750	4,560
Raccoon (Sept - Feb)	5,981	5,868	6,316	4,841	8,747	9,558	7,433	7,300	8,260	8,040	8,570	7,640	6,880
Raccoon[‡] (March -Aug)	3,589	4,589	3,348	2,705									
Red fox (Sept -Feb)	7,476	7,222	5,783	5,980	6,248	5,783	5,800	7,820	7,220	6,030	5,820	5,910	4,560
Red fox[‡] (March -Aug)	2,243	2,182	1,370	1,282									
Gray fox	1,271	1,505	1,674	997	2,030	1,928	1,879	1,790	1,640	1,390	1,580	1,730	1,050
Coyote	12,261	15,122	16,133	18,653	17,024	16,064	19,278	19,280	19,420	17,940	21,050	17,650	17,580
Badger	748	451	533	783	859	482	490	370	600	310	330	500	80

[*]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 active hunter by species, 2003-04 through 2014-15.

	Estimated harvest per hunter											
	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 $^{\beta}$	2012-13 $^{\beta}$	2013-14	2014-15
Ducks	9.0	6.9	7.3	8.4	8.1	8.1	7.4	8.5	9.0	9.7	10.2	9.3
Canada geese	3.9	3.8	4.1	4.9	3.9	4.9	4.1	4.8	4.9	5.1	4.5	4.6
Other geese	1.7	1.5	1.9	1.5	2.1	3.2	1.9	1.1	1.8	2.3	2.5	2.4
American coot	2.8	4.0	3.9	5.6	4.6	5.7	3.6	5.7	3.0	4.2	4.0	3.9
Common snipe	1.8	1.1	4.4	1.9	2.0	1.2	1.1	1.4	1.2	1.2	1.7	0.6
Rails/gallinules	0.5	0.3	0	2.4	5.3	0.4	0.8	0.3	1.7	0.2	0.5	0.2
Crow *	6.7	5.8	7.8	6.4	6.4	5.2	5.3	6.1	7.9	7.9	7.9	7.6
American woodcock	2.4	3.5	2.5	3.2	2.6	2.4	3.0	2.8	2.6	2.3	2.7	2.7
Mourning dove $^{\gamma}$		6.2	7	6.7	7.7	11.4	10.5	9.4	8.2	10.0	7.8	10.4
Ring-necked pheasant	4.9	4.0	5.3	4.9	5.5	4.9	4.0	4.0	2.7	3.3	2.7	2.7
Ruffed grouse	3.8	2.5	2.9	4.5	3.2	3.7	4.1	5.0	4.3	3.7	3.6	3.6
Spruce grouse	2.1	1.3	1.4	2.7	1.7	2.0	2.0	1.7	1.8	1.6	1.2	1.4
Sharp-tailed grouse	1.7	1.7	1.3	1.8	2.0	2.1	1.7	2.4	1.9	1.6	1.1	1.6
Gray partridge	2.8	2.4	2.6	1.9	1.6	2.2	1.9	2.5	1.6	1.7	1.0	1.4
Gray squirrel	6.0	5.7	5.0	5.5	5.2	5.4	4.9	5.9	5.0	5.1	3.9	4.3
Fox squirrel	4.2	4.1	4.1	4.2	3.2	3.9	4.1	3.9	4.0	3.5	2.8	3.2
Eastern cottontail	4.3	4.6	4.5	3.9	4.0	4.5	3.5	3.6	2.8	3.9	2.8	2.9
White-tailed jackrabbit	2.4	2.3	2.7	1.6	3.3	2.6	1.5	3.2	2.2	1.1	1.5	0.8
Snowshoe hare	2.2	1.8	3.1	3.0	1.4	2.5	1.5	1.8	2.6	3.5	1.7	1.7
Raccoon (Sept - Feb)	8.5	9.0	6.0	7.2	4.9	9.7	9.1	9.4	5.5	5.6	6.1	7.7
Raccoon‡ (March -Aug)	4.7	6.1	2.7									
Red fox (Sept -Feb)	1.8	1.1	1.7	1.3	1.1	0.8	1.3	1.2	1.2	1.4	0.9	0.7
Red fox‡ (March -Aug)	0.6	0.6	0.9									
Gray fox	0.4	1.1	0.9	1.8	0.3	1.3	1.0	1.5	0.8	0.2	0.2	0.6
Coyote	1.3	1.1	2.1	1.2	2.1	2.4	2.4	2.3	1.9	2.5	1.3	1.0
Badger	0.7	1.0	1.2	1.3	0.3	1.0	2.0	1.0	0.8	1.0	0.6	1.0

*Crow season added in 1989. ‡ Raccoon and red fox season continuous May 1994 thru March 15, 2006. $^{\gamma}$ Mourning dove season added 2004. $^{\beta}$ 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 (%), 2005-06 through 2014-15.

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 [β]	2012-13 [β]	2013-14	2014-15
Ducks	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)	11.0 (85)
Canada geese	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)	6.6 (69)
Other geese	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)	4.3 (54)
American coot	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)	5.0 (78)
Common snipe	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)	1.4 (45)
Rails / gallinules	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)	1.0 (25)
Crow	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)	8.7 (87)
American woodcock	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)	4.2 (64)
Mourning dove [γ]	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)	12.5 (83)
Ring-necked pheasant	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)	4.3 (61)
Ruffed grouse	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)	5.1 (71)
Spruce grouse	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)	2.5 (56)
Sharp-tailed grouse	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)	3.8 (41)
Gray partridge	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)	4.4 (32)
Gray squirrel	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)	5.5 (78)
Fox squirrel	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)	4.3 (75)
Eastern cottontail	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)	4.1 (73)
White-tailed jackrabbit	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)	1.8 (44)
Snowshoe hare	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)	3.0 (57)
Raccoon (Sept -Feb)	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)	8.5 (90)
Raccoon[‡] (March -Aug)	3.1 (87)									
Red fox (Sept -Feb)	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)	1.7 (41)
Red fox[‡] (March -Aug)	1.6 (56)									
Gray fox	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)	2.0 (29)
Coyote	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)	2.4 (41)
Badger	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)	1.0 (100)

[‡] 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, 2004-05 through 2014-15.

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12 [β]	2012-13 [β]	2013-14	2014-15
Small game license sales [a]	287,725	280,156	295,898	298,467	290,064	282,983	282,227	271,768	264,063	258,581	258,109
State duck stamp sales	114,003	102,143	101,792	100,134	95,675	89,942	88,069	89,681	90,052	90,483	90,376
Pheasant stamp sales	114,653	117,301	129,546	129,315	123,270	110,456	104,286	86,868	90,541	74,668	70,406
Estimated harvest [b]											
Ducks	727,206	676,741	730,559	708,491	658,186	572,220	619,600	681,550	784,360	782,810	699,620
Canada geese	284,714	281,829	324,498	243,705	288,411	227,160	257,530	281,630	301,550	229,120	221,620
Other geese	8,150	9,025	6,658	7,723	13,895	6,250	3,940	4,800	8,820	7,130	6,510
American coot	20,345	15,938	24,909	16,061	23,871	14,810	26,340	10,520	16,720	15,130	17,050
Common snipe	2,130	5,336	4,221	3,933	2,210	1,490	1,940	1,390	1,420	2,310	520
Rails / gallinules	75	0	1,329	2,569	163	300	80	390	80	70	80
Crow	71,943	92,742	69,188	54,319	51,742	56,350	57,300	81,500	90,260	67,440	56,020
American woodcock	41,479	27,919	39,907	27,866	29,210	35,430	29,770	24,980	30,360	31,920	25,810
Mourning dove [d]	96,559	77,749	85,950	101,161	132,577	109,940	100,230	74,000	92,760	80,480	103,370
Ring-necked pheasant	419,712	585,299	587,580	655,443	522,071	398,130	359,400	198,500	250,140	169,100	152,800
Ruffed grouse	194,687	224,309	417,153	293,544	318,338	357,420	465,580	383,150	341,320	288,410	301,190
Spruce grouse	9,204	10,079	26,568	17,705	16,997	19,130	14,960	18,640	11,980	13,110	14,590
Sharp-tailed grouse	10,417	6,387	11,939	13,790	13,695	9,530	16,820	11,600	10,650	7,130	8,530
Gray partridge	12,572	16,289	11,545	11,000	9,660	8,040	9,150	3,950	5,160	2,380	3,590
Gray squirrel	132,659	122,078	140,788	133,194	121,534	109,790	138,920	115,840	126,110	84,010	91,250
Fox squirrel	62,410	62,187	66,068	47,736	51,079	53,970	61,690	48,100	49,750	33,940	40,840
Eastern cottontail	86,508	90,062	77,872	78,588	79,927	57,760	53,870	34,640	64,140	40,710	38,820
White-tailed jack rabbit	6,940	5,493	4,149	9,482	6,446	2,610	7,220	5,180	1,910	1,870	1,050
Snowshoe hare	7,895	10,406	16,801	5,789	11,343	5,360	6,770	8,430	16,800	6,200	7,860
Raccoon (Sept -Feb)	56,970	29,191	62,891	46,739	72,026	66,700	77,690	44,080	48,340	46,690	52,800
Raccoon [c] (Mar –Aug)	20,456	7,331									
Red fox (Sept –Feb)	6,072	10,166	7,872	6,188	4,408	10,270	8,780	7,120	7,990	5,190	3,220
Red fox [c] (Mar –Aug)	836	1,141									
Gray fox	1,758	927	3,593	559	2,443	1,860	2,380	1,160	250	430	600
Coyote	18,230	38,612	20,769	34,377	45,689	46,070	44,050	33,410	51,990	23,630	17,430
Badger	533	924	1,091	159	490	750	600	230	330	290	80

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, 2004-05 through 2014-15.

	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Nonresident licenses issued [a]	6,385	5,897	7,356	7,858	7,114	6,934	6,695	6,312	6,456	6,031	6,056
Questionnaires:											
Number mailed	182	210	185	185	226	196	163	169	166	162	165
Number not delivered	13	10	11	11	15	10	6	11	11	10	12
Number (percent) returned	114 (67)	134 (67)	115 (62)	101 (58)	89 (42)	105 (54)	107 (66)	91 (54)	71 (43)	81 (50)	70 (42)
Estimated nonresidents and (percent) of all licensed nonresidents hunting:											
Ducks	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)	2,340 (38.6)
Canada goose	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)	1,300 (21.4)
Ruffed grouse	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)	2,600 (42.9)
Ring-necked pheasant	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)	1,380 (22.9)
Raccoon [b, c]	0 (0)	44 (0.7)	0 (0)	78 (1.0)	0 (0)	0 (0)	63 (0.9)	0 (0)	0 (0)	80 (1.2)	0 (0)
Estimated nonresident take:											
Ducks	19,269	12,149	12,173	22,718	15,463	11,755	17,055	13,840	20,380	20,410	13,060
Canada goose	6,214	3,946	3,580	3,501	5,762	3,698	6,334	4,050	2,270	3,650	2,680
Ruffed grouse	7,924	6,429	11,522	7,236	6,938	8,651	12,600	8,980	10,090	4,990	9,090
Ring-necked pheasant	11,174	13,656	16,079	17,661	10,642	6,274	8,076	4,860	6,820	3,430	3,720
Raccoon [b, c]	0	887	0	3,268	0	0	593	0	0	1,280	0

[a] Excludes duplicate licenses and nonresident shooting preserve licenses.
[b] In 2002, 2003, 2004, 2006, 2008, 2009, 2011, 2012 and 2014 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 2013 - 2014 and 2014-15 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/pdf/surveys-and-data/HarvestSurveys/MigratoryBirdHuntingActivityandHarvestforthe2013-14and2014-15HuntingSeasons.pdf

Table 1. Species composition of the Minnesota waterfowl harvest, 2013 and 2014. (from: Raftovich, R.V., S.C. Chandler, and K.A. Wilkins. 2015. Migratory Bird Hunting activity and harvest during the 2013-14 and 2014-15 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2014. 68 pp).

	Minnesota Harvest					Mississippi Flyway Harvest		
Species	2013	% of Harvest	2014	% of Harvest	Percent change in Harvest 13-14	2013	2014	Percent change Harvest 13-14
Mallard	166,366	27.37	161,859	28.33	- 3	1,837,000	1,992,886	+8
Domestic mallard	0	0	0	0	0	1,277	680	-88
American black duck	0	0	1,465	0.26	+100	24,951	15,885	-57
Black x mallard	0	0	0	0	0	5,633	1,747	-222
Gadwall	15,254	2.51	12,451	2.18	-23	1,009,467	947,364	- 7
American wigeon	4,767	0.78	7,690	1.35	+38	95,602	84,575	-13
Green-winged teal	33,368	5.49	31,859	5.58	- 5	848,357	911,663	+7
Blue-winged /cinnamon teal	115,360	18.98	82,028	14.36	-41	942,908	648,805	-45
Northern shoveler	15,731	2.59	13,549	2.37	-16	355,367	294,147	-21
Northern pintail	8,104	1.33	2,563	0.45	-216	155,104	115,644	-34
Wood duck	149,681	24.63	114,620	20.06	-31	774,961	602,451	-29
Redhead	19,544	3.22	25,268	4.42	+23	121,598	122,872	+1
Canvasback	8,104	1.33	6,592	1.15	-23	76,103	43,558	-75
Greater scaup	3,814	0.63	366	0.06	-942	49,064	37,927	-29
Lesser scaup	10,011	1.65	2,563	0.45	-291	97,873	156,083	+37
Ring-necked duck	31,838	5.25	67,014	11.73	+52	240,898	250,727	+4
Goldeneye	1,430	0.24	1,099	0.19	-30	29,593	32,910	+10
Bufflehead	14,777	2.43	15,014	2.63	+2	88,370	70,647	-25
Ruddy duck	0	0	2,197	0.38	+100	8,933	20,930	-57
Scoters	0	0	0	0	0	3,091	9,309	+67
Hooded merganser	9,057	1.49	20,873	3.65	+57	45,416	54,723	+17
Other mergansers	0	0	1,465	0.26	+100	13,174	12,811	-3
Total Duck Harvest (retrieved kill)	607,800 ±14%		571,300 ±12%		- 6	6,882,900 ±8%	6,462,800 ±6%	-7

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

Table 2. Top 10 states in number of **adult duck hunters**, 2014, and number of hunter-days and retrieved duck kill, . (from: Raftovich, R.V., S.C. Chandler, and K.A. Wilkins. 2015. Migratory Bird Hunting activity and harvest during the 2013-14 and 2014-15 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2015. 68 pp).

State	**Number of active duck hunters**	**Duck hunter days afield**	**Total duck harvest**	**Seasonal duck harvest per hunter**
Texas	86,300 ± 19%	465,900 ± 22%	1,218,300± 21%	14.1 ± 28%
Louisiana	77,200 ± 6%	561,000 ± 11%	1,861,400 ± 12%	24.1 ± 14%
Minnesota	65,300 ± 9%	349,400 ± 11%	571,300 ± 12%	8.7 ± 15%
Arkansas	58,800 ± 9%	429,100 ± 13%	1,231,300 ± 14%	20.9 ± 16%
Wisconsin	53,900 ± 11%	316,000 ± 11%	414,600 ± 11%	7.7 ± 16%
California	43,000 ± 12%	309,800 ± 8%	949,200 ± 9%	22.0 ± 15%
North Dakota	37,300 ± 6%	177,500 ± 8%	545,000 ± 8%	14.6 ± 10%
North Carolina	33,700 ± 17%	191,100 ± 16%	359,000 ± 15%	10.7 ± 22%
Michigan	32,800 ± 12%	212,300 ± 13%	341,400 ± 15%	10.4 ± 19%
Missouri	32,700 ± 13%	224,900 ±17%	480,100 ±27%	10.7 ±22%
Mississippi Flyway		2,981,900 ± 5%	6,462,800 ± 6%	
United States		5,971,700 ± 3%	13,270,000 ± 4%	

Table 3. Top 10 states in number of **adult goose hunters**, 2014, and number of hunter-days and retrieved goose kill, in . (from: Raftovich, R.V., S.C. Chandler, and K.A. Wilkins. 2015. Migratory Bird Hunting activity and harvest during the 2013-14 and 2014-15 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA July 2015. 68 pp).

State	**Number of active goose hunters**	**Goose hunter days afield**	**Total goose harvest**	**Seasonal goose harvest per hunter**
Minnesota	48,800 ± 10%	219,300 ± 13%	148,900 ± 15%	3.3 ± 18%
Wisconsin	39,700 ± 10%	220,600 ± 14%	90,400 ± 15%	2.3 ± 18%
Texas	47,500 ± 17%	155,500 ± 32%	340,400 ± 92%	7.2 ± 93%
California	38,100 ± 10%	258,700 ± 14%	215,600 ± 17%	5.6 ± 19%
Michigan	34,600 ± 12%	199,100 ± 15%	140,900 ± 16%	4.1 ± 20%
North Dakota	26,700 ± 6%	123,100 ± 8%	190,100 ± 12%	7.1 ± 13%
New York	17,000 ± 8%	89,800 ± 11%	143,800 ± 14%	8.3 ± 16%
Illinois	22,200 ± 13%	168,700 ± 17%	120,800 ± 28%	5.4 ± 31%
Maryland	19,800 ± 7%	99,800 ± 9%	120,100 ± 11%	6.1 ± 13%
Pennsylvania	20,900 ± 17%	102,300 ± 26%	109,200 ± 34%	5.2 ± 38%
Mississippi Flyway		1,419,800 ± 6%	995,200 ± 9%	
United States [b]		3,287,000 ± 4%	3,326,900 ± 11%	

[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 AND SEPTEMBER 2014 EARLY CANADA GOOSE HUNTS IN MINNESOTA

Steve Cordts, Populations and Regulations Unit
Margaret H. Dexter, Wildlife Policy and Research Unit
John Giudice, Biometrics Unit

The August and September Canada goose seasons in Minnesota were 9-24 August, and 6-22 September, 2014 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 (Nicollet County). Goose hunters in both the August and September seasons were required to obtain a $4.00 permit to participate in the seasons. This report documents results of the 2014 August 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 3,039 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 and the higher daily bag limit (10/day) used in the Intensive Harvest Zone.

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 29,603 Special Canada Goose Season permits were sold prior through 22 September, 2014. Response rate to the survey was 44%. Among those respondents, 19% indicated that they hunted during the August season, and 63% indicated they hunted during the September season.

Responses from the survey indicate that 5,500 hunters participated in the August hunt (Table 1), while 18,760 participated in the September hunt (Table 2). A total of 20,290 hunters hunted during either the August and/or September early goose season. Hunters shot and retrieved 21,280 Canada geese during the 2014 August season, and 76,440 during the 2014 September season for a total early season estimated goose harvest of 97,720 geese (Table 3).

We asked hunters how many days they hunted overwater and how many days they hunted away from water. A total of 39% of hunters statewide hunted over water in August and September. The survey indicates that 23% of the geese harvested in the two early seasons (22,580 total geese) were harvested by hunters overwater. These results were similar to the results obtained in the 2013 survey.

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 2014 for the August season was: overall experience 4.4 (4.6 in 2013), geese bagged 3.5 (3.8 in 2013), number of geese seen 3.7 (3.9 in 2013), and regulations 4.7 (5.1 in 2013). Mean satisfaction in 2014 for the September season was: overall experience 5.1 (5.2 in 2013), geese bagged 4.2 (4.3 in 2013), number of geese seen 4.4 (4.4 in 2013), and regulations 5.0 (5.1 in 2013).

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. About 3% of respondents felt the limit was too low, 35% of respondents felt the limit was about right, 15% felt the limit was too high, and 47% of respondents had no opinion.

This project was funded in part by the Wildlife Restoration (Pittman-Robertson) Program.

LITERATURE CITED

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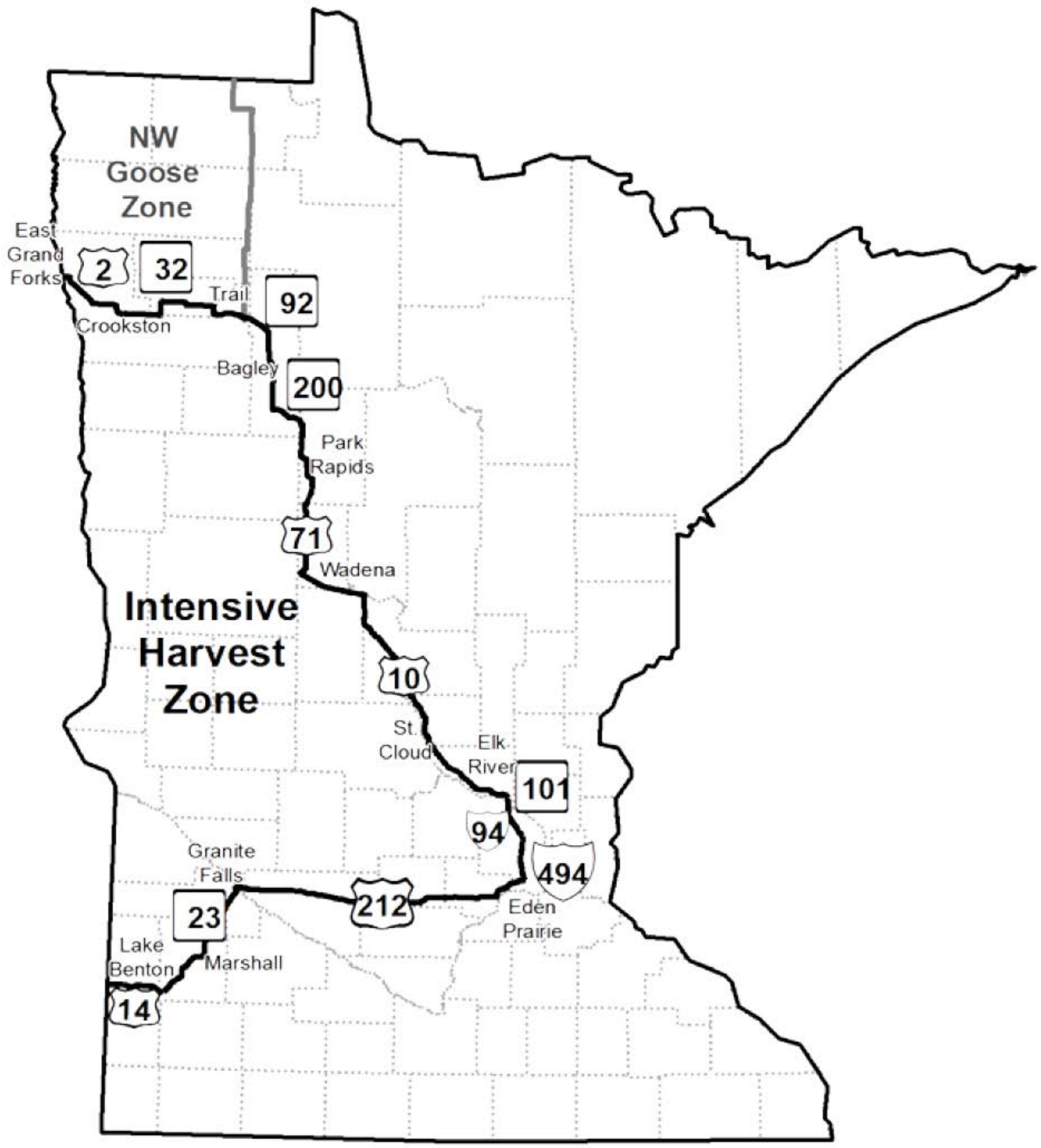


Figure 1. Intensive Harvest Zone in relation to the Northwest (NW) Goose Zone within Minnesota, 2014.

Table 1. Permit sales, hunter activity, and harvest during the August Canada Goose season (9 – 24 August) in Minnesota, 2013 and 2014.

Parameter	2013	2014
Total permits sold (through August season)	13,740	11,065
Questionnaires delivered	3,045	3,039
Useable questionnaires returned	1,400	1,335
% responding	46.0	43.9
Days hunted per active hunter	3.1	2.9
Geese shot and retrieved per active hunter	3.5	3.9
Unretrieved harvest per active hunter	0.5	1.0
% unretrieved harvest	12.8	20.4
EXPANDED:		
Active hunters	6,810	5,500
Hunter days	21,230	15,870
Retrieved harvest	23,570	21,280
Est. unretrieved harvest	3,490	1,430
Total estimated take	27,060	22,710

Table 2. Permit sales, hunter activity, and harvest during the September Canada Goose season (6 – 22 September) in Minnesota, 2013 and 2014.

Parameter	2013	2014
Total permits sold	27,778	29,603
Questionnaires delivered	3,100	3,039
Useable questionnaires returned	1,400	1,335
% responding	46.0	63.4
Days hunted per active hunter	3.9	3.3
Geese shot and retrieved per active hunter	4.8	4.1
Unretrieved harvest per active hunter	0.4	0.4
% unretrieved harvest	8.4	8.4
EXPANDED:		
Active hunters	16,840	18,760
Hunter days	64,970	61,620
Retrieved harvest	81,230	76,440
Est. unretrieved harvest	7,440	7,070
Total estimated take	88,670	83,510

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, 2013-14.

Year	NW	West	SE	Twin Cities Metro	Remainder	Total Geese Harvested	Number Active Hunters	Geese/ Hunter day	Geese/ Hunter	Permits Sold
2000	2,750	18,909	1,183	15,594	51,685	**90,121**	33,202	0.63	2.71	45,277
2001	2,047	27,663	538	8,164	62,608	**101,021**	28,265	0.82	3.57	40,127
2002	1,568	22,075	848	8,504	50,769	**83,764**	26,089	0.68	3.20	40,002
2003	2,805	17,779	2,357	9,890	48,157	**80,988**	30,415	0.74	2.66	42,009
2004	4,326	16,843	1,197	11,090	56,480	**89,936**	29,657	0.80	3.03	42,235
2005	4,888	15,304	1,717	11,139	61,218	**94,266**	27,865	0.89	3.38	38,051
2006	6,826	17,987	1,461	11,844	53,321	**91,439**	28,405	0.86	3.22	39,534
2007	7,948	14,952	1,469	11,702	58,243	**94,314**	25,379	0.91	3.72	37,050
2008	5,530	16,168	2,580	13,656	62,827	**100,748**	27,392	0.98	3.73	37,252
2009	4,442	10,294	2,023	12,794	48,609	**78,151**	25,189	0.85	3.10	35,418
2010						**107,907**	26,848	0.98	4.00	35,817
2011						**123,700**	26,000	1.21	4.80	34,271
2012						**108,300**	25,900	0.98	4.20	34,311
2013						**104,800**	18,570	1.25	5.64	27,778
2014						**97,720**	20,290	1.26	4.82	29,603

APPENDIX A.

2014 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 9–24 or September 6–22, 2014. 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 9-24 Intensive Harvest Zone or September 6-22, 2014 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 2014.

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 9-24 (Intensive Harvest zone)			
September 6-22 (Intensive Harvest zone)			
September 6-22 (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 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. If you hunted geese during the 2014 **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

5. If you hunted geese during the 2014 **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

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

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

2015 LIGHT GOOSE CONSERVATION ORDER HARVEST IN MINNESOTA

Steve Cordts, Wildlife Populations and Regulations Unit
Margaret Dexter, Wildlife Populations and Research Unit

INTRODUCTION

This report documents results of the 2015 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 1 March - 30 April 2015. 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 1,141 permits were issued and 520 responses (46 %) to the questionnaire were obtained (Table 1). In calculating harvest estimates, we assumed that the 621 non-respondents participated in the conservation action and took light geese in the same manner as respondents. Five hundred sixty nine people attempted to take light geese during the 61-day conservation order period. Active participants pursued light geese for 2,434 days and 3,266 light geese were shot and retrieved. This was an average retrieved take of 6 geese per active participant. Another 349 light geese were estimated wounded and not retrieved.

ACKNOWLEDGMENTS

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

Figure 1. Light Goose Conservation Order hunter mail questionnaire, 2015.

MINNESOTA 2015 LIGHT GOOSE HARVEST SURVEY

For the Period of March 1 - April 30, 2015 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, 2015. 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 2015 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, 2015? 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, 2015? ___________
3. How many light geese did you personally shoot and retrieve in Minnesota? ___________
4. How many light geese did you personally shoot, but were UNABLE to retrieve? ___________

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2003 - 2015

	Year												
Statistic	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total permits sold	1,438	1,424	1,383	1,363	1,292	1,406	1,670	952	994	1,048	1,405	1,278	1,141
Useable returns	1,071	1,095	998	955	921	910	1,057	671	659	675	810	759	520
Response rate (%)	74.0	77.0	72.0	70.0	71.0	65.0	63.0	72.3	67.1	65.3	58.3	60.0	46
Active hunters (%)	38.5	48.5	44.7	37.3	39.8	54.9	66.0	40.8	45.7	56.9	54.9	44.0	50
Estimated total hunters	553	690	618	516	514	773	1,103	389	455	600	770	560	569
Estimated hunter days	2,600	3,372	2,643	2,665	2,302	3,404	4,647	1,475	1,830	2,270	3,070	2,580	2,434
Mean days/hunter	4.7	4.9	4.3	5.2	4.5	4.4	4.2	3.8	4.0	3.8	4.0	4.6	4
Estimated harvest (shot & retrieved)	2,005	2,735	1,395	1,360	1,786	2,409	4,366	559	1,554	2,620	2,430	2,880	3,266
Mean harvest/hunter	3.6	4.0	2.3	2.6	3.5	3.1	4.0	1.4	3.4	4.4	3.2	5.1	6
Estimated crippling losses	253	315	150	163	172	302	640	70	145	210	370	210	349
Percent using unplugged guns	50.6	48.2	44.0	42.3	43.6	46.7	46.8	44.9	44.2	43.0	49.4	48.8	NA
Est. number hunters using unplugged guns	280	333	272	215	224	361	516	175	201	260	380	270	NA
Est. number geese **shot** with unplugged guns	996	1,385	777	689	1,032	1,275	2,413	348	742	1,510	1,670	2,060	NA
Est. harvest with shell 4-5-6	401	491	269	287	277	339	822	131	311	460	620	770	NA
Percent using electronic calls	15.7	19.3	17.8	14.4	17.1	19.1	23.5	25.9	21.3	22.2	24.5	27.8	NA
Est. number hunters using e-calls	87	133	110	73	88	148	260	101	97	130	190	160	NA
Est. harvest while using e-calls	474	326	268	280	329	566	1,171	192	531	460	620	1,710	NA
Percent hunting 1/2-hr after sunset	41.2	38.4	42.7	43.9	38.3	42.3	43.1	39.7	39.7	42.4	33.4	36.2	NA
Est. number hunting after 1/2-hr sunset	228	265	264	223	197	326	475	154	180	250	260	200	NA
Est. harvest 1/2-hr after sunset	267	311	242	246	209	511	713	87	238	240	260	550	NA

MINNESOTA'S WILD TURKEY HARVEST – 2015

Steve Merchant, Wildlife Populations and Regulations Manager

This report summarizes the fall 2014 and spring 2015 Minnesota wild turkey harvest information. The fall turkey season was 30 days in length (October 4- November 2) 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 (Figure 1) and 8 time periods using a quota system for the first 3 time periods. The first time period began on April 15, and the final time period concluded on May 28.

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.

Alternatively, firearms hunters could simply purchase a permit for one of the last 5 seasons, while persons with an archery turkey license could hunt the last 5 time periods in their entirety. The goal of this system is to provide quality turkey hunting opportunities by managing hunter interference rates while allowing hunters to take the harvestable surplus of turkeys.

Fall 2014 Turkey Season

The number of permits issued to hunters increased slightly from 8139 permits in 2013 to 8,339 in 2014(Table 1, Figure 2). Hunters still needed to select and hunt within one of the twelve permit areas. There were 1,137 turkeys harvested during fall 2014, which was a 5.5 percent increase from 2013 (Table 1). Hunter success rates in 2014 remained similar to 2013 (13.6% vs. 13.2% respectively), and remain below the 5-year average (16%).

Spring 2015 Turkey Season

There were 46,675 permits issued during the spring season, including 13,085 general lottery and landowner permits, 11,333 youth permits, 5,052 archery permits, and 17,205 surplus over-the-counter permits (Table 6). The number of youth permits declined from 2014 by 7 percent (-846), while archery permits increased by three percent (153). The total number of permits purchased decline from 2014 by three percent (1529). Hunters registered 11,734 turkeys (Table 3 and 5), which was the third highest harvest recorded and above the 5-year average (10,990) (Figure 3). Success rates by license type are found in Table 6. The winter of 2014-15 was mild compared to the previous two winters, and likely was not a significant mortality factor beyond normal winter mortality. Spring weather began very favorably, and the A season harvest was near a record. However wet and sometimes cold weather hampered several of the other seasons, likely depressing effort and harvest.

Table 1. Permits available and issued, applicants, registered harvest, and hunter success rates for fall wild turkey seasons 1990 – 2014, 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
2014	Unlimited	N/A	8,339	1,137	14

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

Table 2. Permits issued, registered harvest, and hunter success during the 2015 Minnesota spring wild turkey season.

Permit Area	Regular Permits Issued [a]	Total Registered Harvest [b]	Regular Gun Harvest [c]	Regular Gun Success Rates
501	8124	3004	2480	30.5%
502	725	228	185	25.5%
503	3323	1432	1072	32.3%
504	797	322	243	30.5%
505	2665	1001	972	36.5%
506	1053	388	266	25.3%
507	7235	2960	2143	29.6%
508	3476	1220	879	25.3%
509	246	141	81	32.9%
510	2382	966	660	27.7%
511	134	38	27	20.1%
512	31	12	8	25.8%

[a] Permits issued for the Camp Ripley disabled veterans hunt, archery, and youth permits were not included.
[b] Total harvest for all license types. Twenty-two turkeys were registered without a permit area designation.
[c] All lottery, military, and surplus permit harvest, excluding youth and archery licenses.

Table 3. Permits available, permits issued, registered harvest, and relative success rates from 1978 – 2015 for all spring wild turkey hunting seasons in Minnesota.

	Permits				
Year	Available	Issued	Issued (%)	Registered harvest	Success (%)[a]
1978	420	411	97.9	94	23
1979	840	827	98.5	116	14
1980	1,200	1,191	99.3	98	8
1981	1,500	1,437	95.8	113	8
1982	2,000	1,992	99.6	106	5
1983	2,100	2,079	99.0	116	6
1984	3,000	2,837	94.6	178	6
1985	2,750	2,449	89.1	323	13
1986	2,500	2,251	90.0	333	15
1987	2,700	2,520	93.3	520	21
1988	3,000	2,994	99.8	674	23
1989	4,000	3,821	95.5	930	24
1990	6,600	6,126	92.8	1,709	28
1991	9,170	8,607	93.9	1,724	20
1992	9,310	9,051	97.2	1,691	19
1993	9,625	9,265	96.3	2,082	23
1994	9,940	9,479	95.4	1,975	21
1995	9,975	9,550	95.7	2,339	25
1996	12,131	10,983	90.5	2,841	26
1997	12,530	11,610	92.7	3,302	28
1998	14,035	13,229	94.3	4,361	33
1999	18,360	16,387	89.3	5,132	31
2000	20,160	18,661	92.6	6,154	33
2001	22,936	21,404	93.3	6,383	30
2002	24,136	22,607	93.7	6,516	29
2003	25,016	22,770	91.0	7,666	34
2004	27,600	25,261	91.5	8,434	33
2005	31,748	27,638	87.1	7,800	28
2006	32,624	27,876	85.4	8,241	30
2007[b]	33,976	28,320	83.4	9,412	33
2008[b]	37,992	31,942	84.1	10,994	34
2009[b]	42,328	36,193	85.5	12,210	34
2010[b]	55,982	46,548[c]	83.0	13,467	29
2011[b]	Unlimited	43,521[c]	N/A	10,055	23
2012[b]	Unlimited	38,906[c]	N/A	11,325	29
2013[b]	Unlimited	34,281[c]	N/A	10,390	30
2014[b]	Unlimited	43,305[c]	N/A	11,447	25
2015[b]	Unlimited	41,623[c]	N/A	11,734	28

[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, 4,899, and 5052 permits issued to archers in 2011, 2012, 2013, 2014, and 2015 respectively.

Table 4. Permits available and issued by license type (resident and non-resident) and time period for the spring 2015 wild turkey season, Minnesota.

Time period	Permits available	Permits issued			
		General lottery [a]	Surplus	Youth [b]	Archery [c]
A 4/15-19	5,936	5,230	8	X	
B 4/20-24	5,936	3,383	1,834	X	
C 4/25-29	5,936	4,457	782	X	
D 4/30-5/4	Unlimited	7	8,209	X	X
E 5/5-9	Unlimited	4	2,082	X	X
F 5/10-14	Unlimited	1	923	X	X
G5/15-21	Unlimited	3	2,172	X	X
H 5/22-28	Unlimited	0	1,248	X	X
Total [a]	Unlimited	13,085	17,205	11,333	5,052

[a] includes landowner licenses.
[b] Youth permits were valid for all time periods.
[c] Archery permits were valid for time periods D-H.

Table 5 Total harvest by time-period, spring 2015 wild turkey season, Minnesota.

Time period	Total Harvest	Percent Harvest
A	3055	26.0
B	1961	16.7
C	1888	16.1
D	2491	21.2
E	811	6.9
F	327	2.8
G	732	6.2
H	469	4.0
Total	11,734	100

Table 6. 2015 Total permits issued, harvest and success rate by type of permit.

	Total Permits Sold	Harvest	Success Rate [a]
Lottery	13,085	4,579	35
Surplus	17,205	4,251	25
Youth	11,333	2,326	21
Archery	5,052	578	11
Total	46,675	11,734	25

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

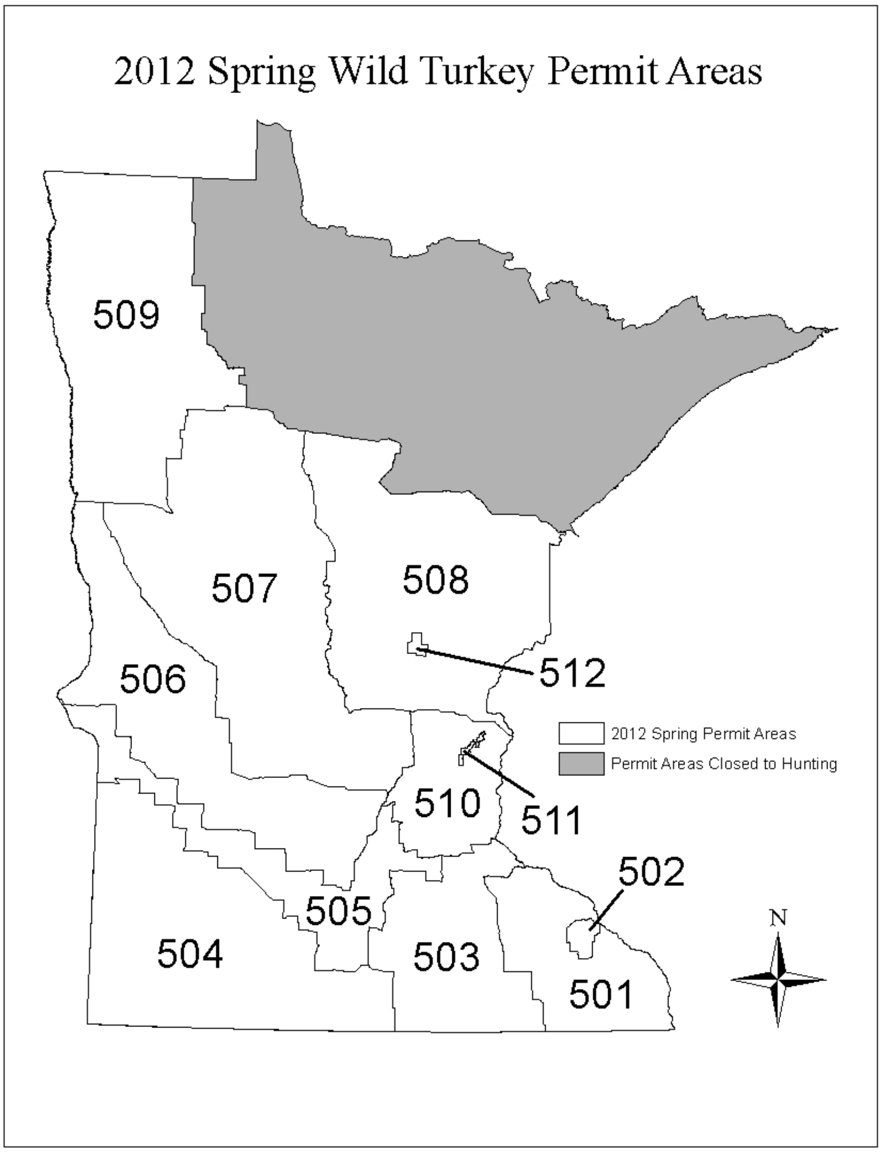


Figure 1. Permit areas open for hunting during the 2015 spring turkey hunting season, Minnesota.

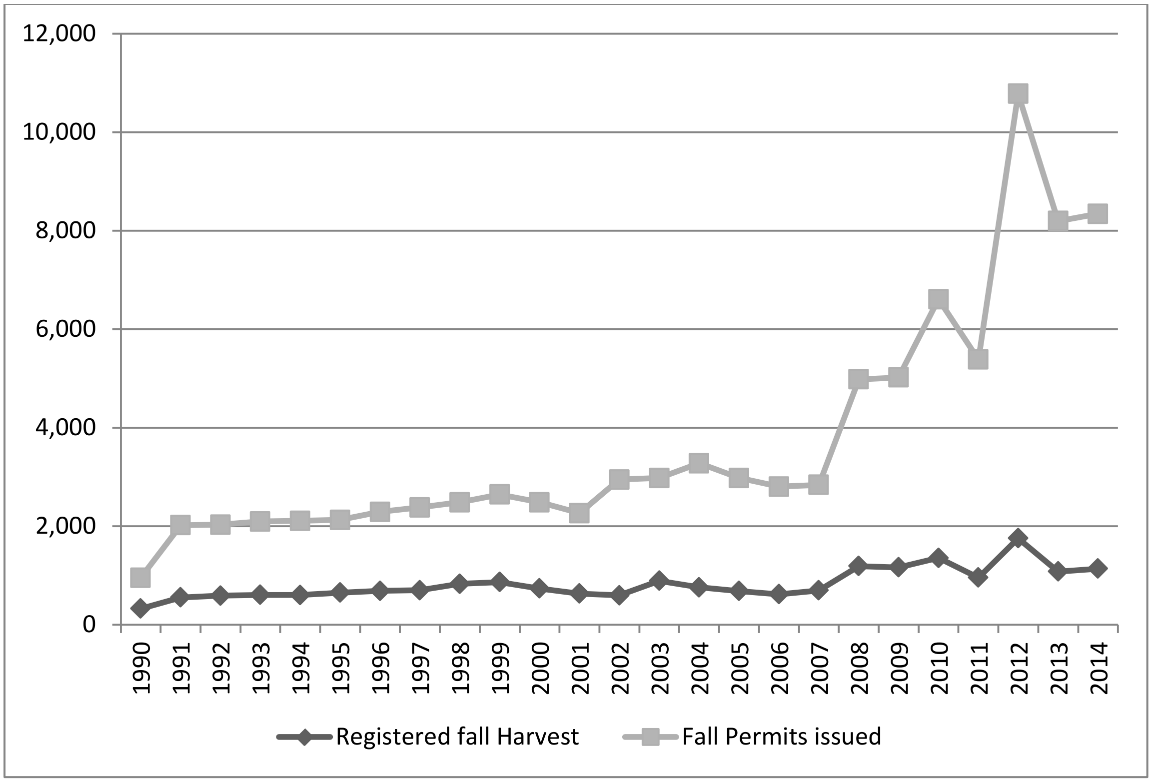


Figure 2. Permits issued and registered harvest for fall wild turkey seasons, 1990-2014, Minnesota.

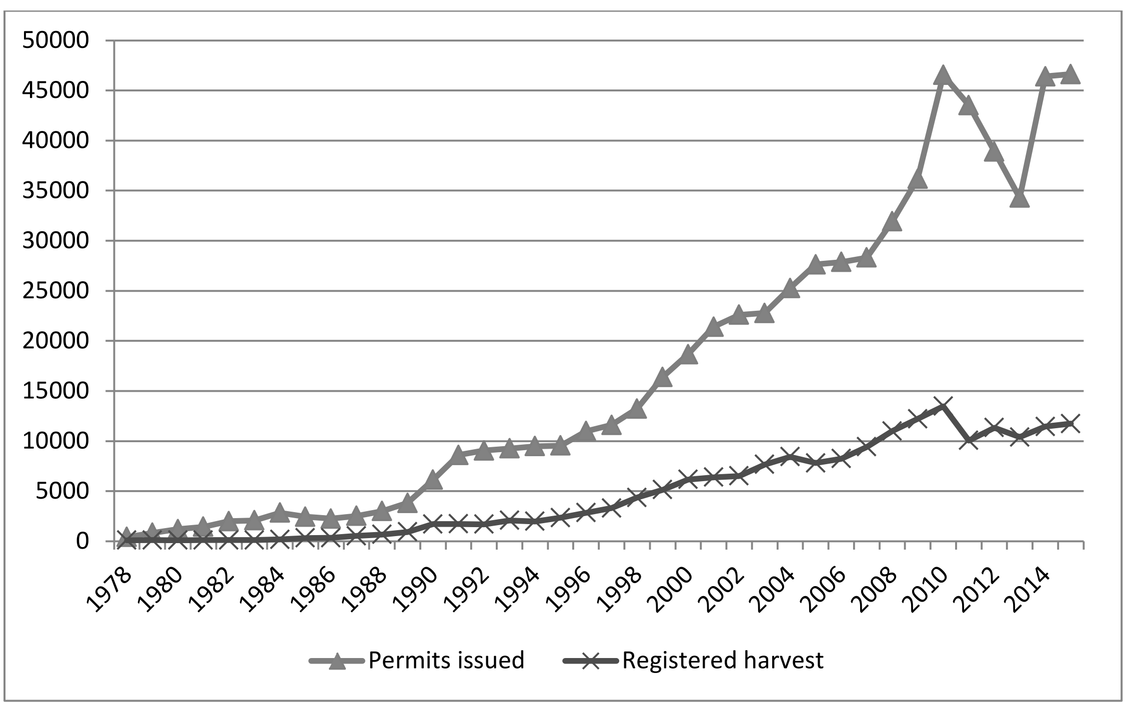


Figure 3. Permits issued and registered harvest for spring wild turkey seasons, 1978-2015, Minnesota.

2014 MINNESOTA PRAIRIE-CHICKEN HARVEST SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

The Minnesota DNR conducts a postcard survey of Greater Prairie-chicken (*Tympanuchus cupido pinnatus*) hunters each year to estimate hunter numbers and harvest, and to evaluate hunter success and satisfaction. The number of hunters going afield was estimated at 102. Prairie-chicken harvest was estimated at 95 and 35 sharp-tailed grouse (*Tympanuchus phasianellus*) were reported as harvested during prairie-chicken hunts. Hunter success (0.54) and satisfaction (3.7 on a scale of 1-5) were higher than before the changes to the permit areas and season (i.e., longer length and earlier dates) in 2013.

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 was moved from mid-October to open in late-September. The earlier season was an attempt to improve hunter success and satisfaction by providing hunting opportunities before pheasant season opened (to reduce hunter interference and flushing distance). These changes were based on hunter comments received by DNR Wildlife Managers during prior years and input received during a public input survey during March 2013. In 2014, the prairie-chicken season opened 27 September and closed 5 October.

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 U.S. 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 purchasers were 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 6 questions: did you purchase a permit, 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 in the analysis. I compared responses from the first mailing to responses from the second mailing to examine possible nonresponse bias. Corrections were made to account for harvest of non-respondents, based on the answers of respondents. I estimated the number of hunters, birds harvested, birds per harvester, and hunter success for each permit area. Average hunter satisfaction was determined for both successful and unsuccessful hunters, as well as a combined mean. Responses received prior to 6 December were included in this report.

RESULTS & DISCUSSION

The combined quota for the 11 permit areas during 2014 was 126, and 305 individuals applied in the lottery (Table 1). Only 2 permit areas (804A and 813A) had fewer applicants than permits available. No surplus permits were available this year. Of the 130 lottery winners, 110 later purchased a permit, of whom, 5 were landowners.

Ninety-four permit purchasers (87%) responded to the survey and 2 surveys were undeliverable; 72 (67%) responded to the first mailing and 22 (20%) to the second mailing. This response rate is slightly lower than survey response rates during 2012 (95%), but similar to 2010 (84%), 2011 (90%), and 2013 (83%). In contrast to 2013, we did not detect a strong response bias between the first and second mailings. Although respondents to the first mailing were slightly more likely than respondents to the second mailing to have hunted (93% vs. 86% of respondents), they hunted a similar number of days (2.3 vs. 2.3), reported harvesting prairie-chickens at similar rates (50% vs. 45%), reported harvesting a similar number of chickens (0.9 vs. 0.8 birds per hunter) and sharp-tailed grouse (0.4 vs. 0.4 birds per hunter), and reported similar satisfaction (mean 3.7 vs. 3.9, median 4 vs. 4), with 88% and 90% of respondents reporting satisfaction scores $\geq$3, respectively. Thus, I combined responses from both mailings this year for the analysis.

Eighty-six respondents reported that they hunted prairie-chickens (Table 2). I estimated the total number of hunters to be 102 (i.e., purchasers who went afield) after accounting for hunting by non-respondents. Hunters reported harvesting 77 prairie-chickens and total harvest after accounting for non-respondents was estimated as 95 prairie-chickens. An estimated 55 hunters bagged $\geq$1 chicken. Survey respondents reported harvesting 35 sharp-tailed grouse while hunting prairie-chickens from permit areas 803A, 804A, 805A, 806A, 807A, and 808A (Fig. 1). Most purchasers (88%) that responded to the survey reported a satisfaction rating $\geq$3. Although successful hunters reported higher average satisfaction (4.3) than respondents that were not successful (3.2), satisfaction of prairie-chicken hunters was high overall.

Prairie-chicken hunter success and satisfaction during 2014 was similar to 2013 and higher than the preceding years (Table 3). Regulations were changed in 2013 in an attempt to improve hunter success and satisfaction, and survey responses indicated that this was achieved by the changes. Write-in comments about the longer (9 day) season with 2 weekends were favorable, with only one survey respondent expressing opposition to this change. Write-in comments about the timing of the season included numerous comments indicating a preference for the former, later season (15% of respondents including non-purchasers), compared to 1% of respondents that commented that they preferred the earlier season. However, a survey question asking directly about the timing of the season should better represent the opinions of hunters, than write-in comments from a minority of respondents. The 2013 Wildlife Public Input Survey asked specifically whether a season on the last Saturday in September was preferred to the opener on the Saturday nearest Oct. 20, and the majority of respondents indicated a preference for the earlier season (64% respondents who expressed an opinion supported the earlier season). Thus, public input appears to have informed season setting and improved hunter satisfaction, although some hunters still prefer the later hunting season.

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 commenting on the report and Jason Abraham for sharing the 2013 Wildlife Public Input Survey results.

Table 1. Prairie-chicken hunt lottery applicants, winners, and hunting permit purchasers in Minnesota during 2014.

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	25	12	0.48	9	0.75	0
804A	12	11	11	1.00	11	1.00	0
805A	12	66	13	0.20	13	1.00	0
806A	12	33	12	0.36	11	0.92	0
807A	20	42	22	0.52	20	0.91	0
808A	15	39	15	0.38	12	0.80	0
809A	15	25	16	0.64	10	0.63	0
810A	15	30	16	0.53	11	0.69	0
811A	5	9	5	0.56	5	1.00	0
812A	5	22	5	0.23	5	1.00	0
813A	5	3	3	1.00	3	1.00	0
All	126	305	130	0.43	110	0.85	0

[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. Surplus permits were not available in 2014.

Table 2. Prairie-chicken harvest in Minnesota during 2014.

Permit area	No. of hunters[a]		Birds harvested		Birds per harvester[b]	Success rate[c]
	Self-reported	Estimated	Self-reported	Estimated		
803A	9	9	6	6	1.5	0.44
804A	8	10	1	1	1.0	0.10
805A	10	13	14	18	1.8	0.77
806A	8	10	10	12	2.0	0.60
807A	15	17	13	15	1.7	0.53
808A	8	12	13	19	1.7	0.92
809A	9	9	4	4	2.0	0.22
810A	10	11	8	9	1.8	0.45
811A	2	3	3	5	1.7	1.0
812A	4	5	5	6	1.5	0.8
813A	3	3	0	0	NA	NA
All	86	102[d]	77	95[d]	1.7[d]	0.54[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.

Table 3. Summary of prairie-chicken hunting in Minnesota during 2003–2014.

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]
2014	126	305	102	95	0.54	3.7

[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 in 2013.

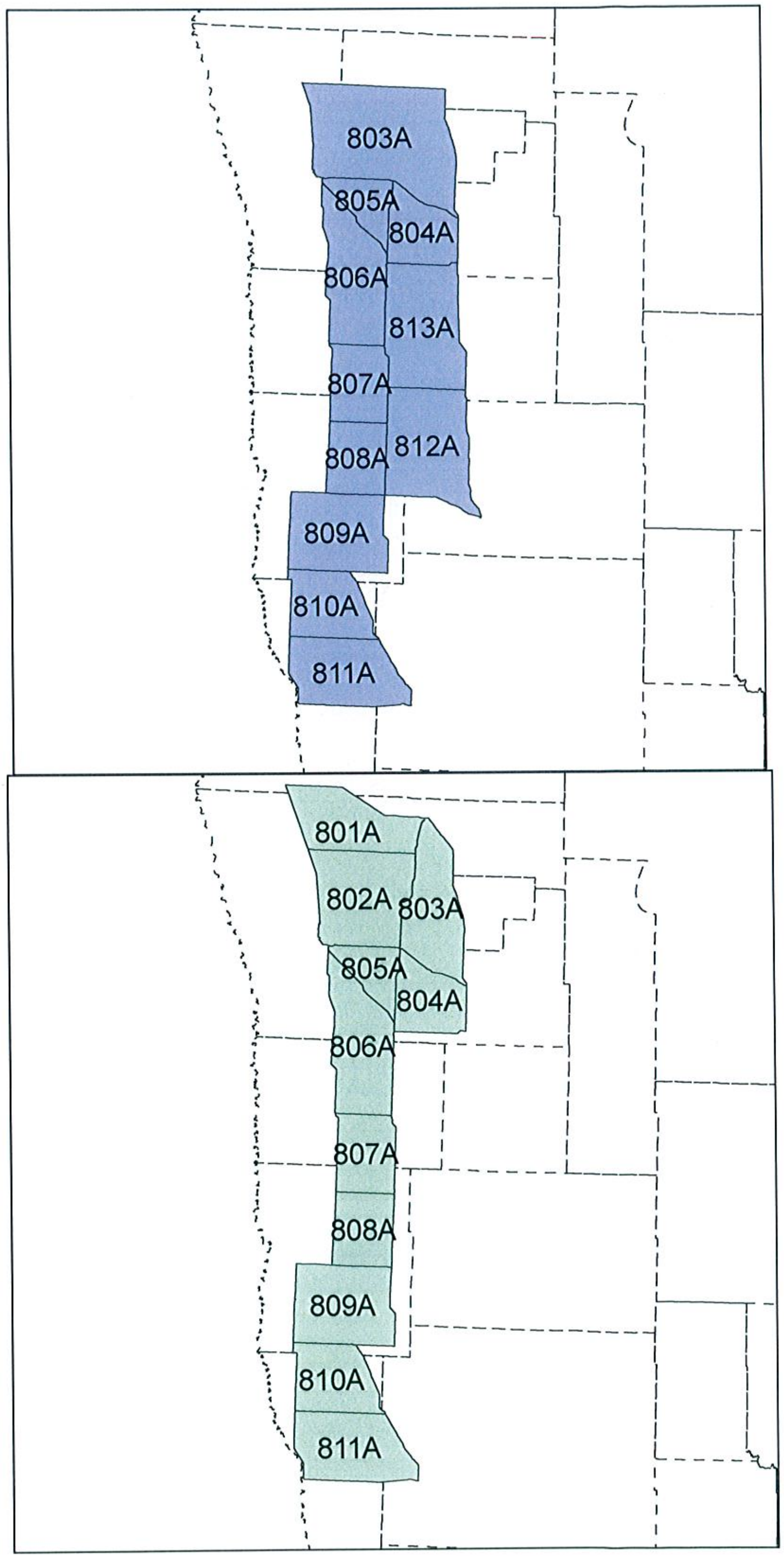


Figure 1a. Prairie-chicken hunting permit area boundaries in northwestern Minnesota during 2013 and 2014 (top) compared to 2012 (bottom). County boundaries are indicated by dashed lines. Permit areas 812A and 813A were added, 801A was eliminated, and 802A and portions of 803A were combined into a revised permit area 803A.

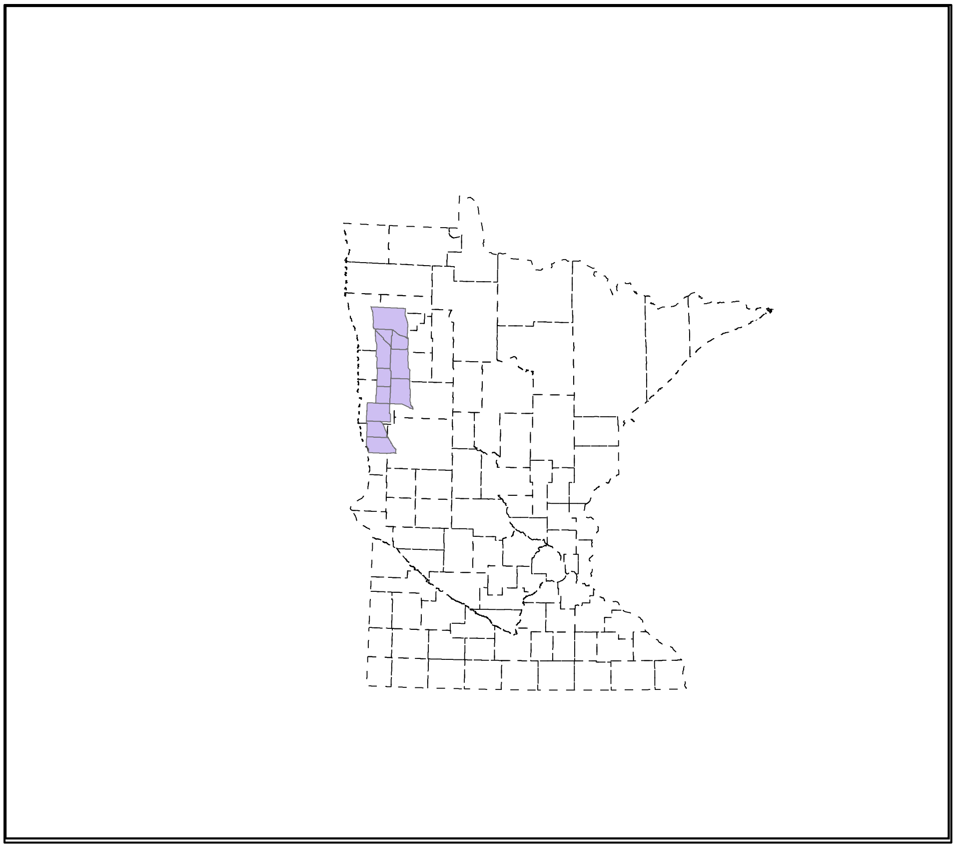


Figure 1b. Northwestern location of prairie-chicken hunting permit areas within the state relative to county boundaries (dashed lines).

2014 MINNESOTA BEAR HARVEST REPORT

David Garshelis, Forest Wildlife and Populations Research Group

INTRODUCTION

The Minnesota bear range is divided into 11 bear management units (BMUs; Fig. 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). 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, either electronically at designated registration stations or by internet or phone. Stations are not staffed by DNR personnel. Harvest data are a simple tally of these registrations. Hunters also are required to submit a tooth from harvested bears, which is used to estimate age, and thus harvest age structure. Tooth envelopes must be acquired at registration stations. We used harvest age structure accumulated since 1980 to reconstruct minimum population size (Downing population reconstruction) and thereby assess population trend.

RESULTS

Permits, licenses, harvest, and success rates

Permit applications for bear licenses has stabilized (18–19,000) at a higher level during 2010–2014 than before that, when permit availability was higher (Table 1). The reduced permit availability also seems to have driven up sales of no-quota licenses, which were the highest on record in 2012 and second highest in 2014.The estimated number of hunters in the field (6,300) was the same in 2014 as last year. The total harvest (1,627) was lower than last year (and the lowest since 1988) due to a lower hunting success. Hunting success is affected by numbers of hunters (i.e., competition; Fig. 2), food supply (affecting bears' attraction to baits), and density of bears.

Quota zone permits and licenses

The number of available quota zone permits was reduced 38% from 2012 to 2013 (Table 2); this reduction was distributed fairly uniformly across Bear Management Units (BMUs; Fig. 1). No changes were made from 2013 to 2014. This was the 4th 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)(Table 3).

Quota zone lottery

As permit allocations have been reduced, the percentage of 1st-year applicants drawn in the lottery diminished (Table 4). In 2010, some 1st-year applicants (preference level 1) were drawn in all BMUs except one (44). In 2013 and 2014, 1st-year applicants were drawn only in BMU 22 (BWCAW). Less than 50% of 2nd-year applicants were drawn in all but 2 BMUs, and no 2nd-year applicants were drawn in 3 BMUs (26, 44, 45).

Harvest by BMU

The statewide harvest and harvest for the quota zone were the lowest since 1988. Four BMUs (12, 24, 26, 41) had record low harvests; 3 of these had record low harvests in 2013, but in each case, the harvests in 2014 were lower yet (Table 5). BMU 11 had the lowest harvest since 1999, 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 increased with reduction of quota zone permits (Fig. 3).

Hunting success by BMU

Hunting success was lower in 2014 than in 2013 for all except 1 BMU (45, which had record high success this year); one BMU (12) had the lowest success in >20 years)(Table 6). With these 2 BMUs as an exception, success rates tended to be about average or above average. For the first time in 2013, 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.

Harvest by date

During years of normal fall food abundance, about 70% of the harvest occurs during the 1st week of the bear season, and ~83% occurs by the end of the 2nd week. This year (and last), harvesting was delayed: only 60% in the first week and 75% after the 2nd week (Table 7).

Predictions of harvest

The 2014 bear harvest closely aligned with harvests predicted, based on regression of harvest as a function of hunter numbers and the fall food productivity index (Fig. 4). This regression is particularly high when only the past 14 years are considered (2000 – 2013).

Harvest sex ratios

Sex ratios of harvested bears 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 general, harvest sex ratios favoring males (the more vulnerable sex, and hence the minority sex in the living population) provide more resilience to the population. Whereas sex ratios vary considerably year to year over the past 2 decades, BMUs 25, 31 and 51 showed increasing trends in percent males. BMUs 13 and 41, which adjoin, showed sharply opposite trends since 2012 (Fig. 5).

Harvest ages

Long-term declining trends in median ages of harvested females were evident in BMUs 41, 24, 25, and 51 (Fig. 6). These likely contributed most to the long-term decline in the median age of harvested females statewide. Conversely, median ages of harvested males have been relatively stable for at least 20 years (Fig. 7). Dramatic trends have occurred in the proportion of the female harvest aged 1–2 years (increasing) versus 4–10 years (declining)(Fig. 8).

Submission of bear teeth for aging

Ages of harvested bears are now used as the principal means of monitoring population trends. Although hunters are required to submit a tooth from their harvested bear, >25% do not comply (Fig. 9), and this missing sample, if somewhat different in age composition than the submitted teeth, may affect the resulting analyses. In 2013 and 2014 hunters could register by phone or internet, and pick up a tooth envelope later: these hunters had much poorer compliance with tooth submission than hunters who registered their bear at a registration station and obtained a tooth envelope at that time (Fig. 10). Compliance in tooth submission also varied considerably among BMUs. Compliance was notably poor in the no-quota zone.

Population trend

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 (Fig. 11). 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.

Population reconstruction assumes equal harvest pressure through time, which is certainly not true. Notably, as harvest pressure is diminished, and fewer bears are killed (as has been the trend since 2003; see Fig. 3), ensuing population estimates will be biased low. Population reconstruction does not provide reliable estimates for the 3 most recent years, even with stable harvest pressure. However, light harvests in 2013 and 2014 should have enabled the population to increase.

Trends in harvest rates

The sex ratio of harvested bears varies by age in accordance with the relative vulnerability of the sexes. With male bears being more vulnerable to harvest than females, males always predominate among harvested 1-3 year-olds. However, older aged bears (>6 years) are always dominated by females, because there are far more of them than old males. The age at which the line fitted to these proportions crosses the 50:50 sex ratio is approximately the inverse of the harvest rate. Segregating the harvest age data into 5-year intervals showed harvest rates increasing from 1980–1999, then declining with reductions in hunter numbers (Fig. 12). Harvest rates since 2010 have been equivalent to what they were in 1980–84, when the population was increasing (Fig. 11).

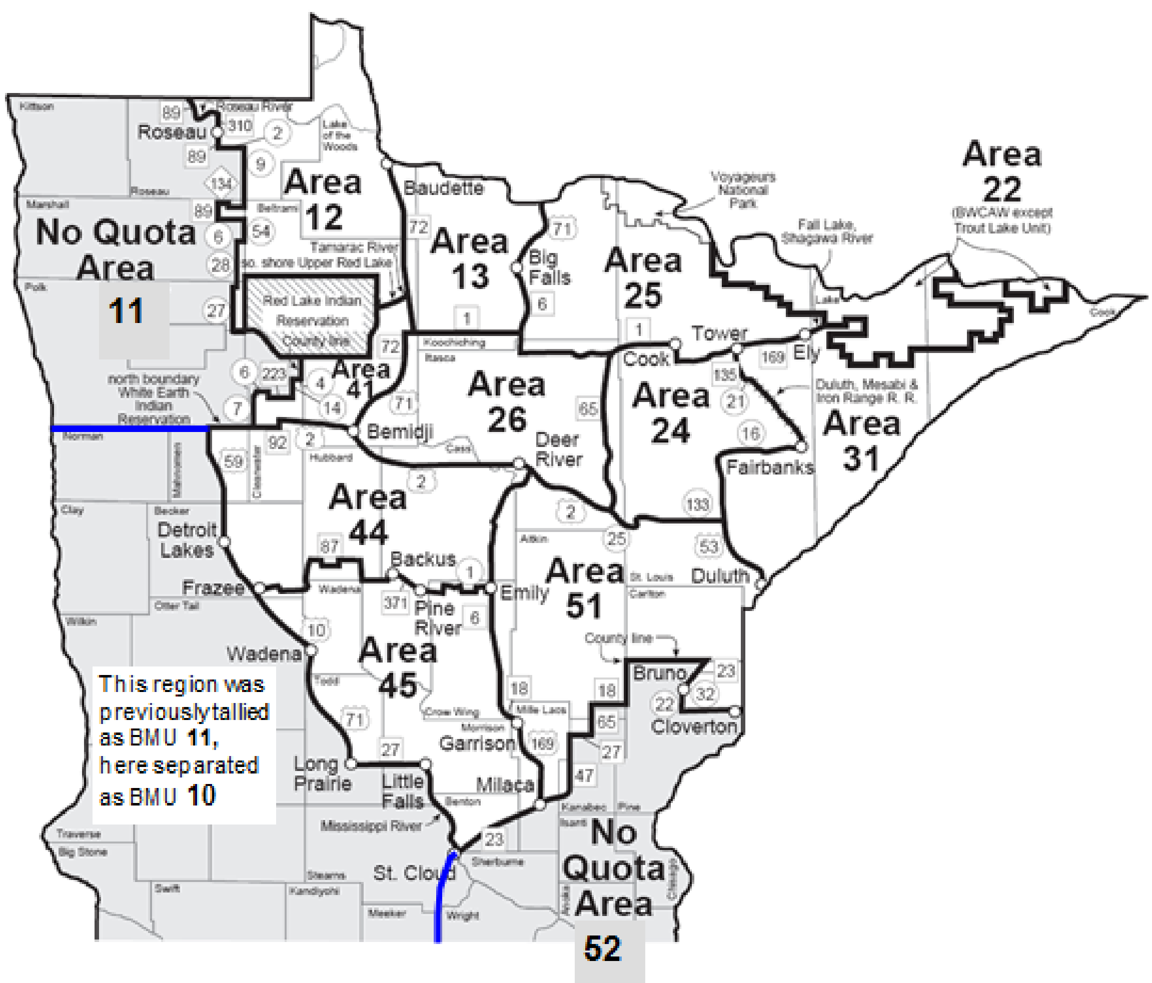


Figure 1. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU, whereas no-quota hunters can hunt anywhere within that zone.

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 1994–2014.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Permit applications	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]	18885[a]
Permits available	9400	11950	12030	11370	18210	20840	20710	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050[b]	6000	3750	3750
Licenses purchased (total)	9826	12448	12414	11440	16737	18355	19304	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589	6620
Quota area [c]	8125	10304	10592	9655	14941	16563	17021	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188	3177
Quota surplus/military [c]								235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578	583
No-quota area [c]	1701	2144	1822	1785	1796	1792	2283	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965[h]	2823	2860
% Licenses bought																					
Of permits available [d]	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	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	84.7
Estimated no. hunters [e]	9100	11600	11500	10300	14500	15900	16800	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9100	8600	6300	6300
Harvest	2329	4956	1874	3212	4110	3620	3898	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866	1627
Harvest sex ratio (%M) [f]	62	47	62	55	55	53	58	56	61	58	57	59	58	57	62	59	59	61	59	62	62
Success rate (%)																					
Total harvest/hunters [g]	26	43	16	31	28	23	23	29	14	26	26	26	26	28	21	30	29	23	30	30	26
Quota harvest/licenses	26	42	15	29	25	20	20	28	14	25	26	25	25	28	21	30	30	24	33	37	33

[a] Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907; 2013 = 2129; 2014=2377).

[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.

[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 2011-14, 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 2011-14 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. After 2012, hunters could take 2 bears only if they bought 2 licenses (1 quota + 1 no-quota): in 2014, only 1 hunter who bought 2 licenses killed 2 bears, and 12 hunters who bought 2 licenses killed 1 bear (7 Quota, 5 NQ).

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

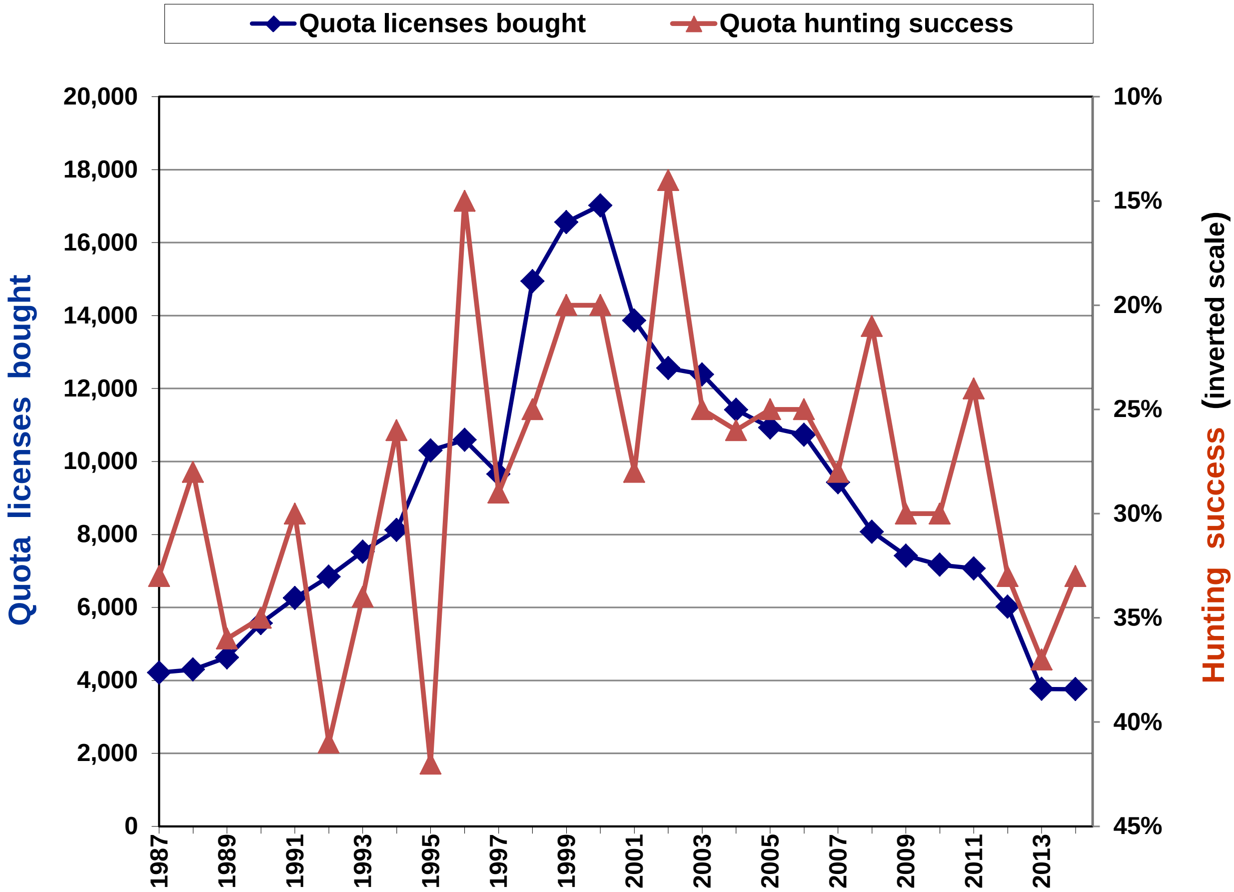


Figure 2. Relationship between licenses sold and hunting success (note inverted scale) in quota zone, 1987–2014 (non-quota zone first partitioned out in 1987). Number of licenses explains 36% of variation in hunting success during this period ($P = 0.0007$). Large variation in hunting success is also attributable to food conditions.

Table 2. Number of bear hunting quota area permits available, 2010–2014 (aligned with permit applications in Table 3 below; highlighted values show drop from previous year).

BMU	2014	2013	2012	2011		2010
				After reduct.[a]	Before reduct.	
12	200	200	300	350	450	450
13	250	250	400	450	600	600
22	50	50	100	100	125	100
24	200	200	300	350	500	550
25	500	500	850	900	1200	1200
26	350	350	550	650	900	900
31	550	550	900	1000	1300	1300
41	150	150	250	300	400	400
44	450	450	700	850	1100	1100
45	150	150	200	250	400	400
51	900	900	1450	1850	2500	2500
Total	3750	3750	6000	7050	9475	9500

[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, 2010–2014[a]. Shaded values indicate undersubscribed areas (applications < permits available).

BMU	2014			2013			2012			2011[b]			2010	
	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Surplus
12	661	164	36	707	160	44	813	244	60	834	267	84	903	5[c]
13	703	218	32	664	213	37	719	325	76	751	366	84	753	
22	65	33	17	55	36	14	83	56	43	90	71	31	114	
24	875	174	26	763	170	30	888	253	47	918	294	56	971	
25	1533	424	76	1575	432	69	1625	713	137	1763	712	190	1811	5[c]
26	1696	298	52	1695	303	47	1666	458	92	1894	512	139	1959	
31	2257	468	82	2261	478	72	2406	758	146	2505	826	174	2414	
41	561	129	21	575	135	15	592	208	42	688	253	47	718	
44	2751	393	57	2682	386	65	2619	612	88	3010	697	154	2923	
45	1403	127	23	1205	141	9	1135	170	30	1019	208	42	937	
51	4003	748	152	3796	734	166	3650	1154	296	4086	1478	372	3950	1[c]
Total[d]	16508	3176	574	15978	3188	568	16196	4951	1057	17558	5684	1373	17453	

[a] Surplus licenses available beginning in 2001. This was discontinued in 2009 and replaced by 2nd choice lottery applicants.
[b] In 2011-14, 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] 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 (unlike Table 1, where they are included).

Table 4. Percentage of quota BMU lottery applicants with preference level 1 (1st-year applicants), 2, and 3 who were drawn for a bear permit, 2010–2014. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn. Likewise, all preference level 3 applicants were drawn, except where 0 preference level 2 applicants were drawn.

BMU	2014			2013			2012		2011		2010	
	Pref 1	Pref 2	Pref 3	Pref 1	Pref 2	Pref 3	Pref 1	Pref 2	Pref 1	Pref 2	Pref 1	Pref 2
12	0	40		0	49		0	80	2		23	
13	0	72		4			33		51		77	
22	72			89			100		100		88	
24	0	13		0	41		0	75	14		49	
25	0	57		0	81		28		35		60	
26	0	0	80	0	7		0	49	0	77	15	
31	0	15		0	45		0	84	11		35	
41	0	19		0	43		0	86	6		31	
44	0	0	41	0	0	68	0	28	0	55	0	90
45	0	0	30	0	0	75	0	29	0	67	24	
51	0	22		0	53		1		25		52	

Table 5. Minnesota bear harvest tally[a] for 2014 by Bear Management Unit (BMU) and sex compared to harvests during 2009–2013 and record high and low harvests (since establishment of each BMU).

BMU	2014 M	(%M)	F	Total	2013	2012	2011	2010	2009	5-year mean	Record low harvest (yr)	Record high harvest (yr)
QUOTA												
12	24	(63)	14	38[d]	62	82	106	95	140	97	62 (13)	263 (01)
13	64	(70)	27	91[e]	95	112	119	155	149	126	71 (88)	258 (95)
22	2	(40)	3	5	9	8	11	9	7	9	3 (03)	41 (89)
24	30	(60)	20	50[f]	76	108	122	124	151	116	76 (13)	288 (95)
25	110	(65)[m]	58	168[g]	197	254	317	307	344	284	149 (96)	584 (01)
26	67	(57)	50	117[h]	121	238	167	232	228	197	121 (13)	513 (95)
31	144	(65)	77	221	197	363	358	363	384	333	157 (88)	697 (01)
41	15	(42)[n]	21	36[i]	40	70	54	71	104	68	38 (96)	201 (01)
44	95	(56)	75	170	181	188	130	248	255	200	130 (11)	643 (95)
45	29	(54)	25	54	48	67	32	58	42	49	32 (11)	178 (01)
51	182	(63)	109	291	349	471	288	501	416	405	247 (91)	895 (01)
Total	762	(61)	479	1241[j]	1375	1961	1704	2163	2220	1885	1192 (88)	4288 (01)
NO QUOTA[B]												
11	52	(68)	25	77[k]	136	224	219	178	315	214	38 (87)	351 (05)
10[c]	7	(87)	1	8	9	14	3	11	9	9		
52	191	(63)	110	301	346	405	205	347	257	312	105 (02)	405 (12)
Total	250	(65)	136	386	491	643	427	536	581	536	198 (87)	678 (95)
STATE	1012	(62)[o]	615	1627[j]	1866	2604	2131	2699	2801	2420		4956 (95)

Table 5. Footnotes:

[a] Hunters receive tooth envelopes at registration stations, but the sex recorded on tooth envelopes may differ from the registered sex:

Sex shown on table is the registered sex because only ~70% of tooth envelopes are submitted (2011: 72%; 2012: 73%; 2013: 75% 2014: 73%).

Also, some tooth envelopes had no corresponding registration data. These were added to the harvest tally. The number of missing registrations was greatly reduced in 2011–2014.

Year	Quota area	No-quota area
2009	19	14
2010	20	8
2011	11	2
2012	6	1
2013	5	1
2014	2	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: 2009: 3; 2010: 14; 2011: 14; 2012: 8; 2013: 11.; 2014: 4.

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 (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] Record low harvest since this area was established in 1990.

[j] Lowest since 1988 (quota—no-quota split in 1987).

[k] Lowest harvest since 1999.

[m] Record high %males.

[n] Record high % females

[o] Ties record high %males (equal to 2013).

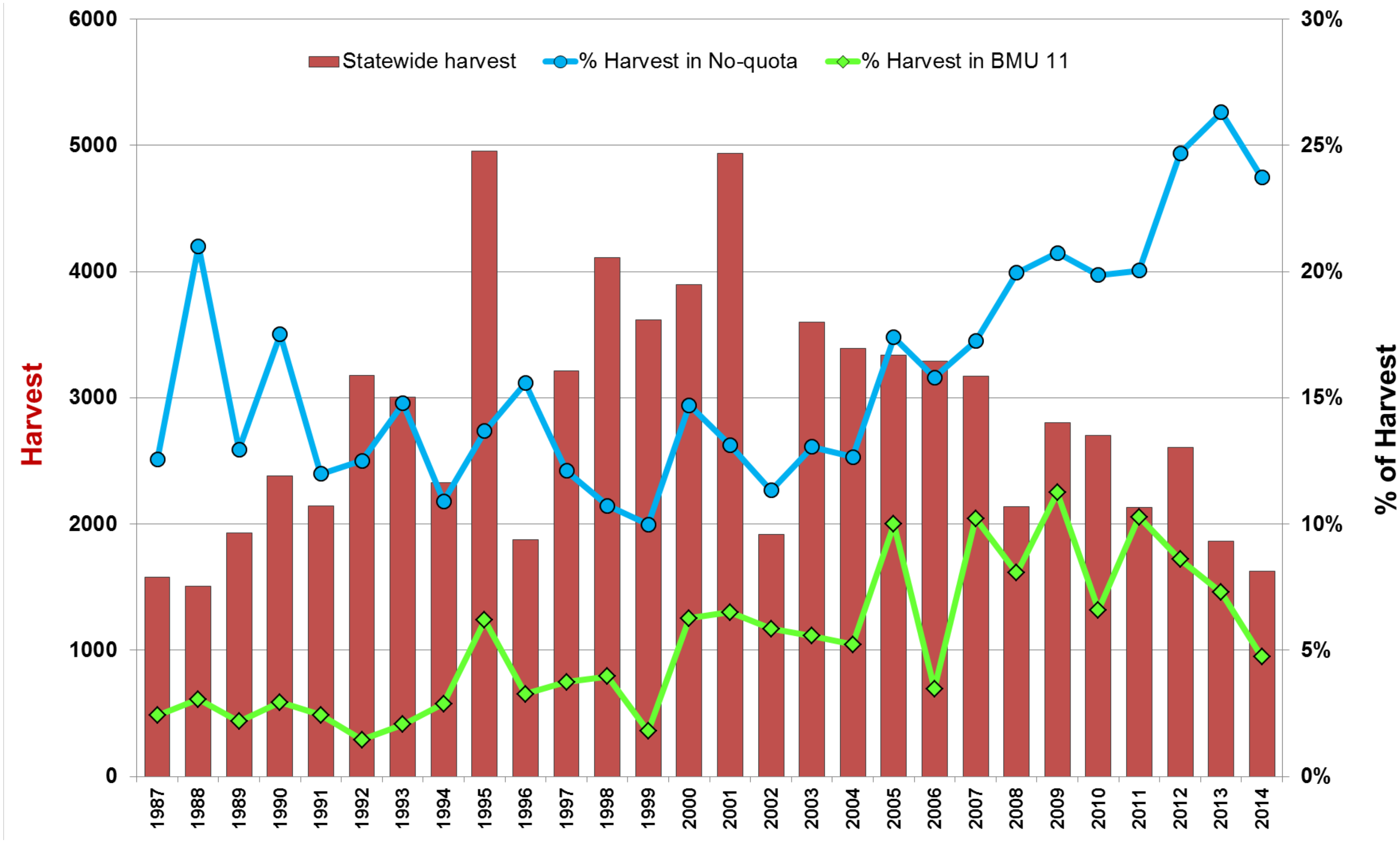


Figure 3. Trends in statewide bear harvest and proportions of harvest in the no-quota zones, 1987–2014.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest divided by the number of licenses sold[a], 2009–2014.

BMU	Max success	(yr)	Mean success 2009-2013	2014	2013	2012	2011	2010	2009
12	49	(95)	31	19[h]	30	27	30	30	39
13	59	(95)	32	36	38[d]	28	26	34[c]	32
22	21	(92)	13	10	18[e]	8	11	14	16[c]
24	45	(92)	34	25	38[e]	36[e]	35[e]	29	31[d]
25	47	(92)	35	34	39[d]	30	35	34	36
26	59	(95)	34	33	34	43[d]	26	34	31
31	55	(92)	37	40	36	40[d]	36	36	38[c]
41	50	(95)	26	24	26	28	18	25	34
44	43	(95)	28	38	40[d]	27	15[f]	28	30
45	33	(12)	22	36[i]	32	33[b]	13	21[d]	11[f]
51	39	(13)	27	32	39[g]	32[d]	16[f]	27	23
Quota	42	(95)	*31*	*33*	*37[d]*	*33[d]*	*24*	*30*	*30*
11[j]				9	15				
10[j]				7	12				
52[j]				16	19				
No Quota	32	(95)	*19*	13	17	20	*15[f]*	*20*	*22*
Statewide	40	(95)	*27*	*25*	*28*	*28*	*22*	*27*	*28[c]*

[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. 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] Lowest success in >20 years (same as 2006).
[i] Record high success.
[j] In 2013 and 2014, 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 (4%), 11 (29%), or 52 (67%) were categorized as such; those hunters who selected blocks in the quota zone(60 = 2%) were distributed in no-quota zones proportional to those who selected blocks in the no-quota zone (note: 1 of them harvested a bear in the no-quota zone, 2 harvested a bear in the quota zone, and the remainder were unsuccessful); 17 hunters chose blocks in SE Minnesota, but none harvested a bear there.

Table 7. Cumulative bear harvest (% of total harvest) by date, 1994–2014.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
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
2014	Mon		60	75	92

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

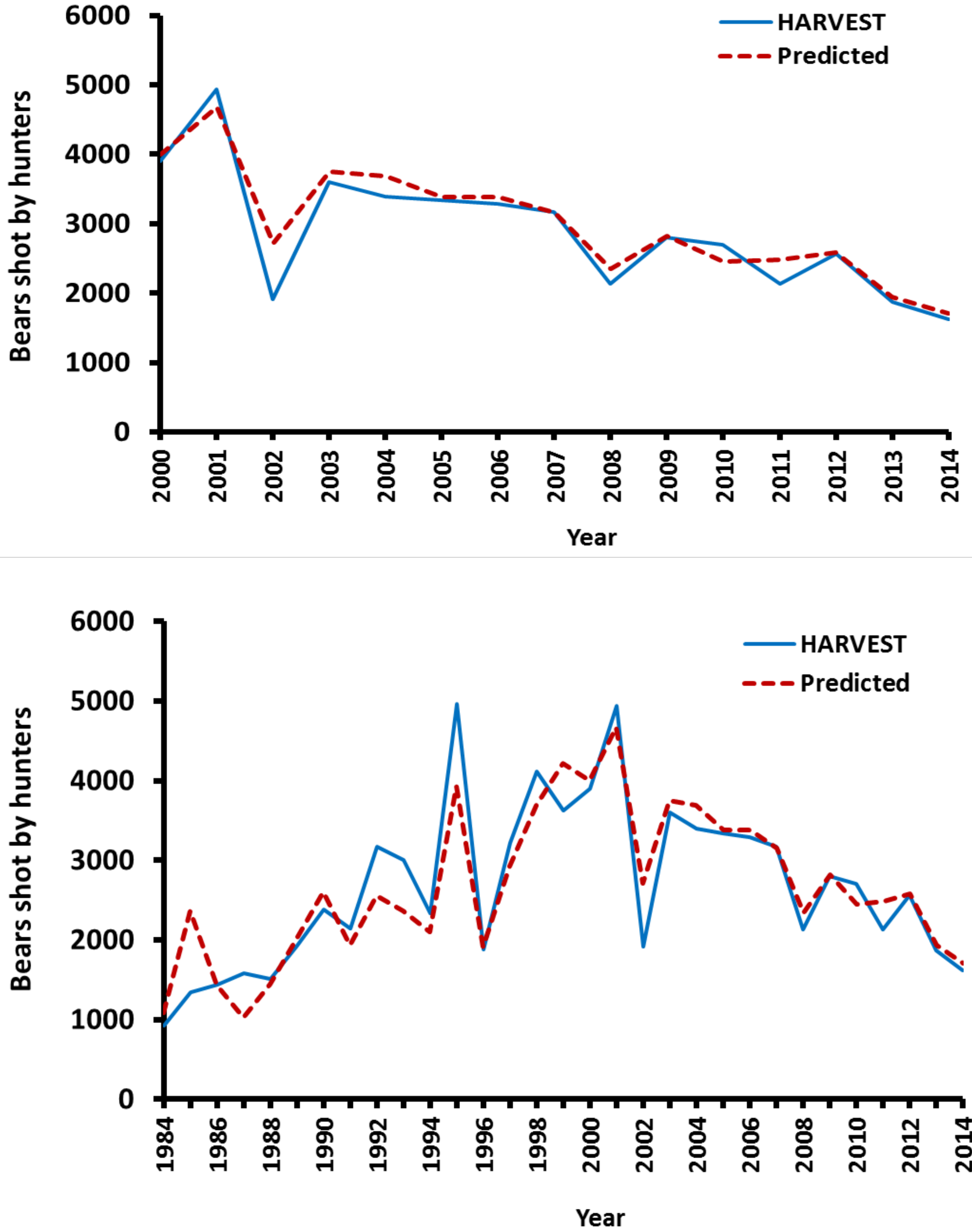
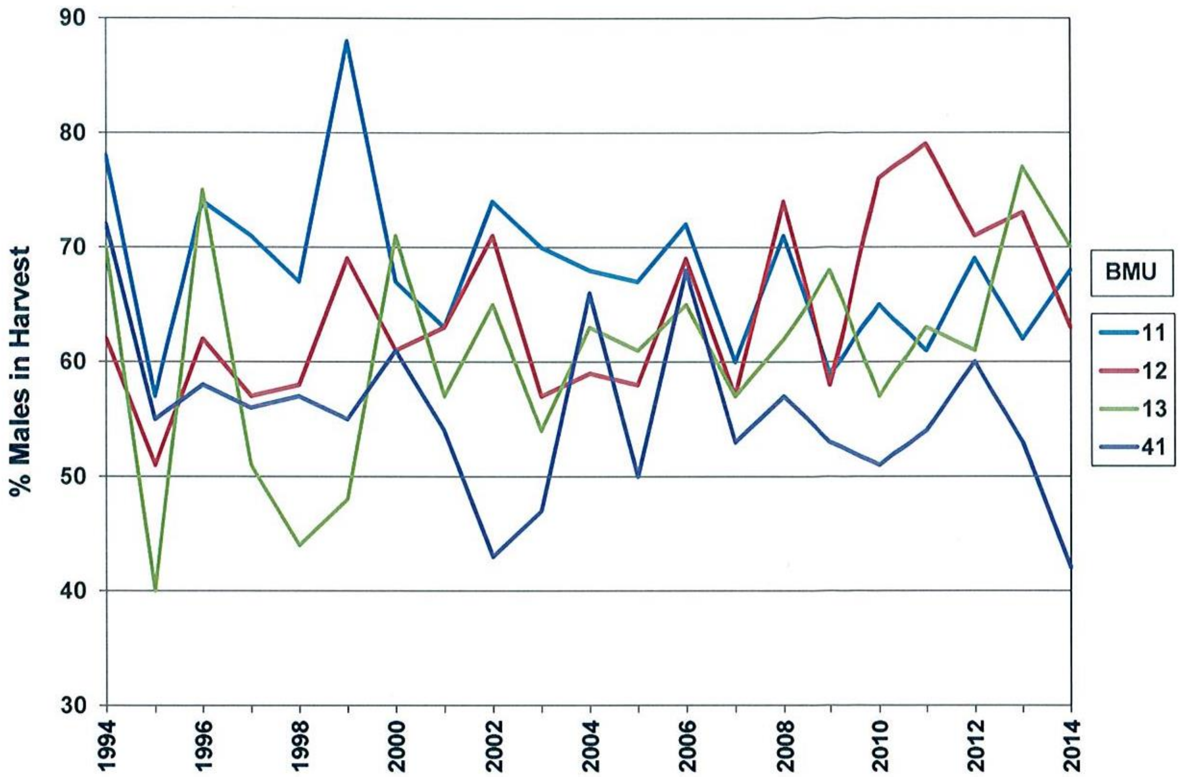


Figure 4. Number of bears harvested vs. number predicted, based on fall food production and the number of hunters: 2000–2014 (R2=0.95; top); 1984–2014 (R2=0.84; bottom).



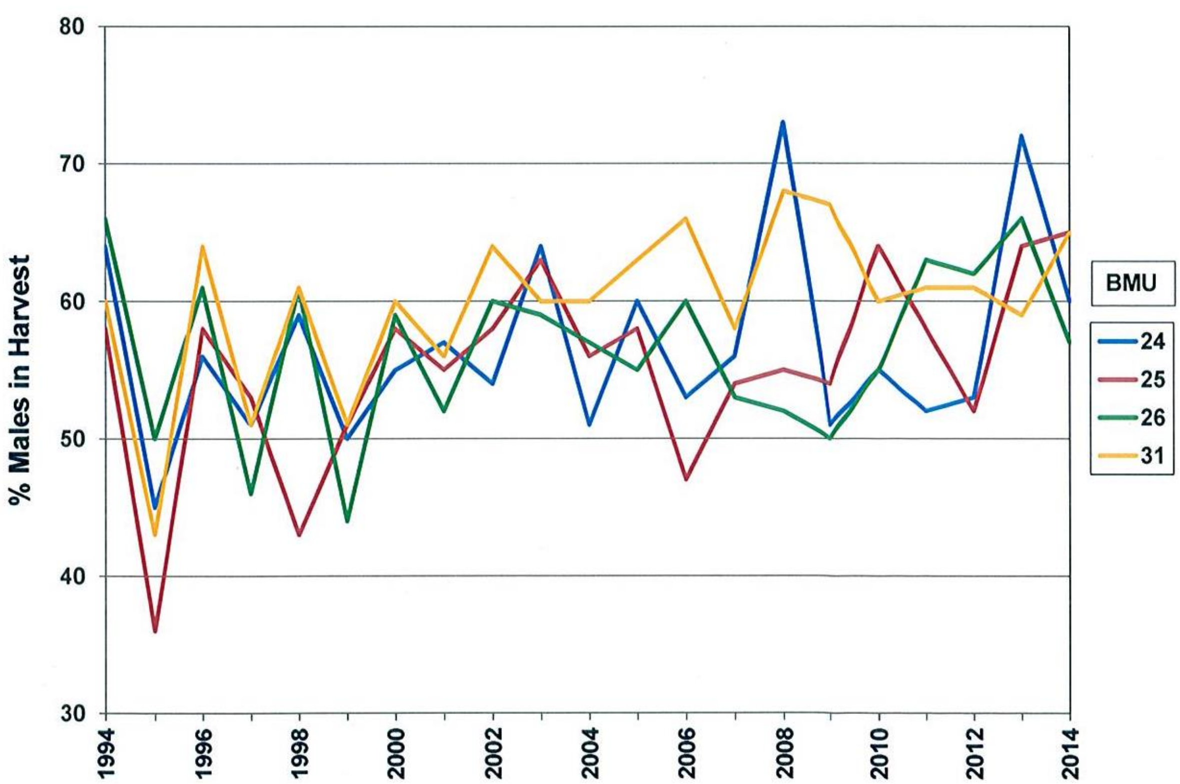


Figure5. Sex ratios of harvested bears by BMU, 1994–2014.

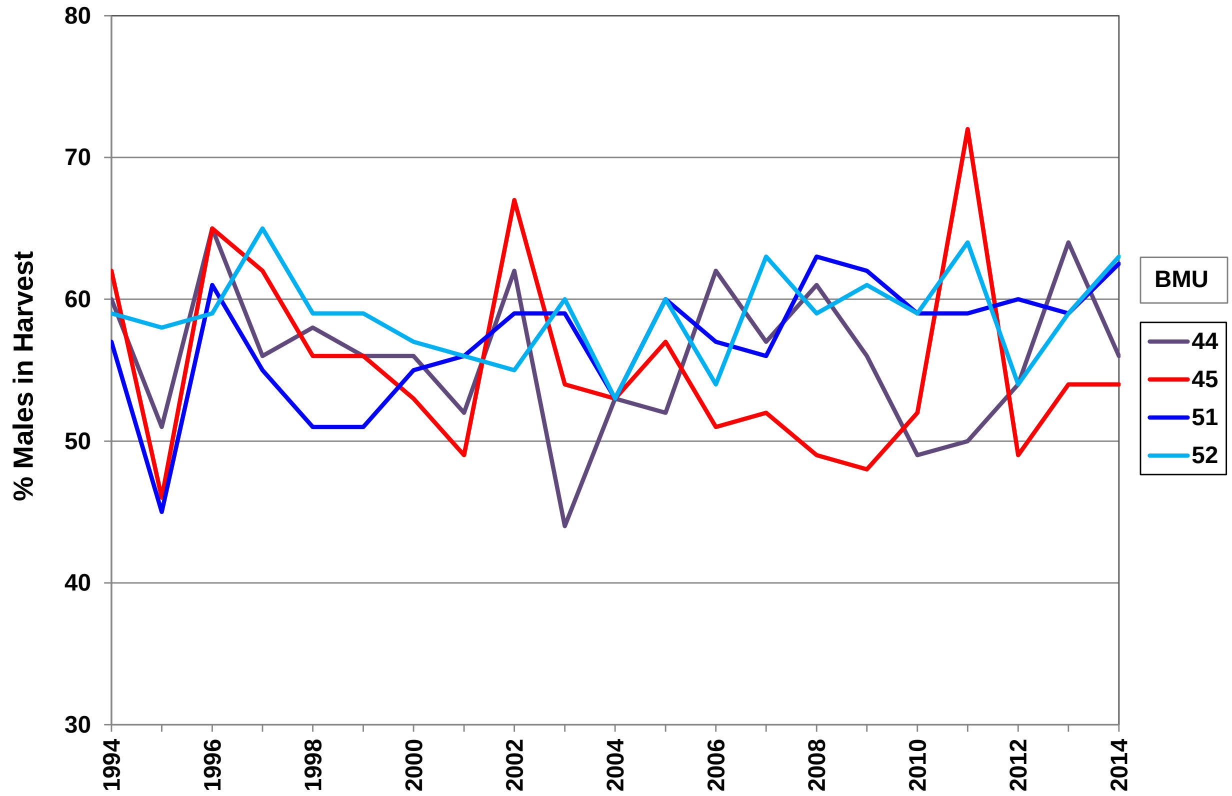


Figure 5. Continued.

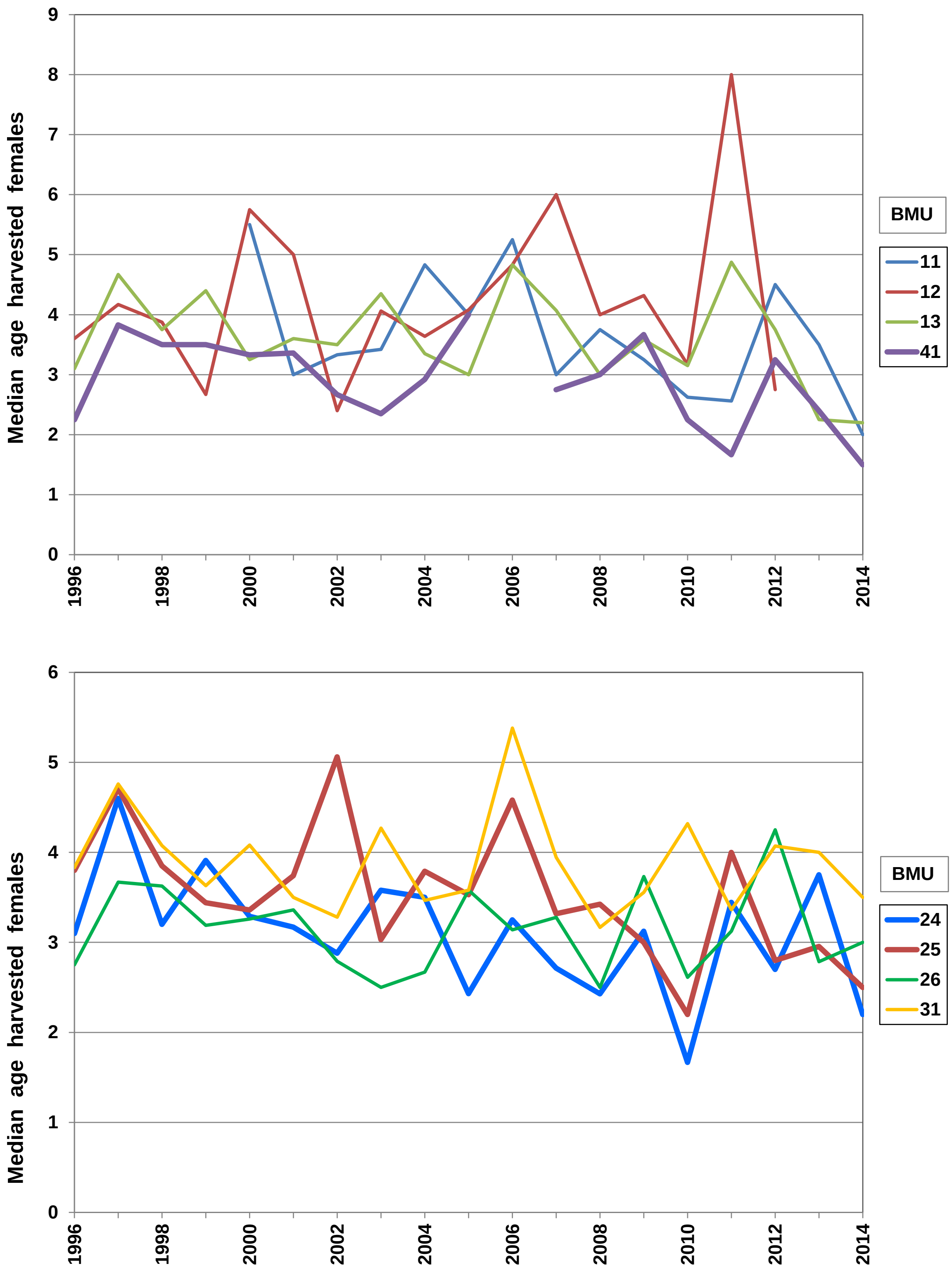


Figure 6. Median ages of harvested female bears by BMU, 1996*–2014.
Curves with thicker lines show significant declines through time.
(*note: most median ages were very high in 1995, so to view trends more accurately, graphs begin in 1996)

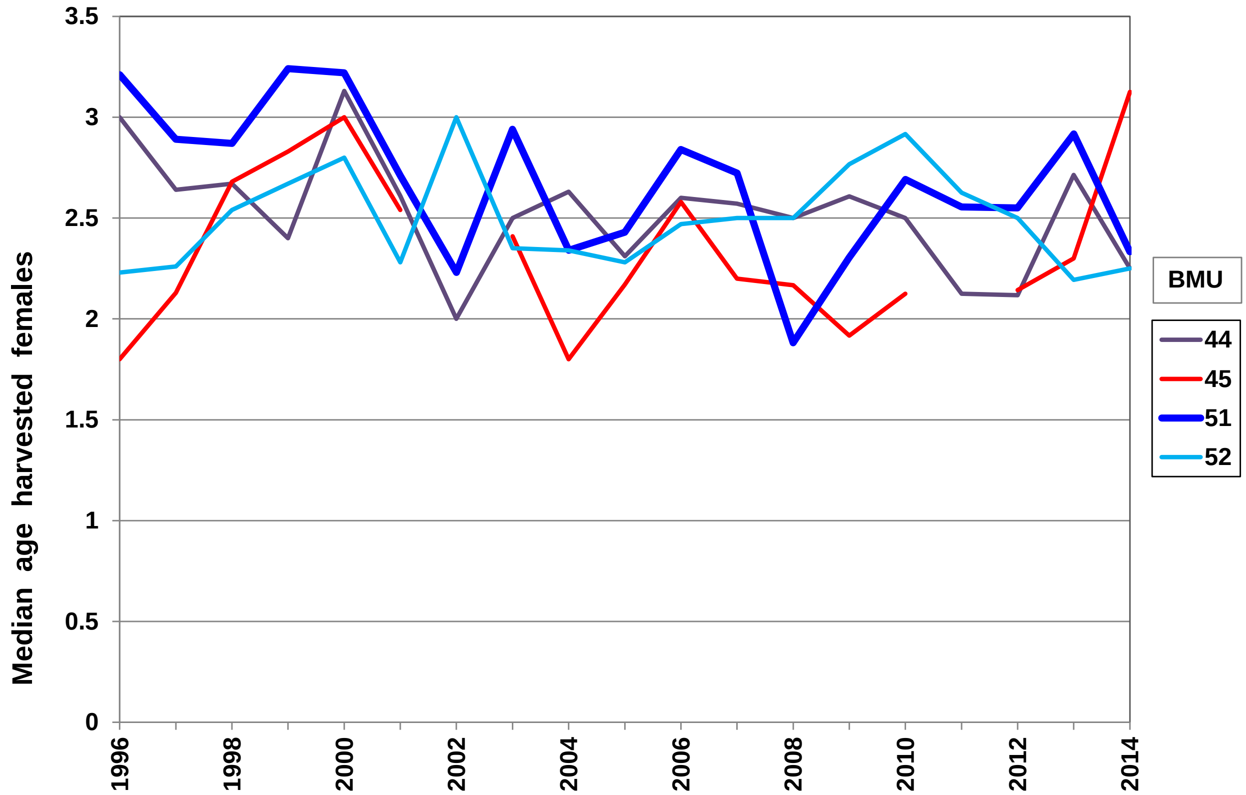


Figure 6. Continued.

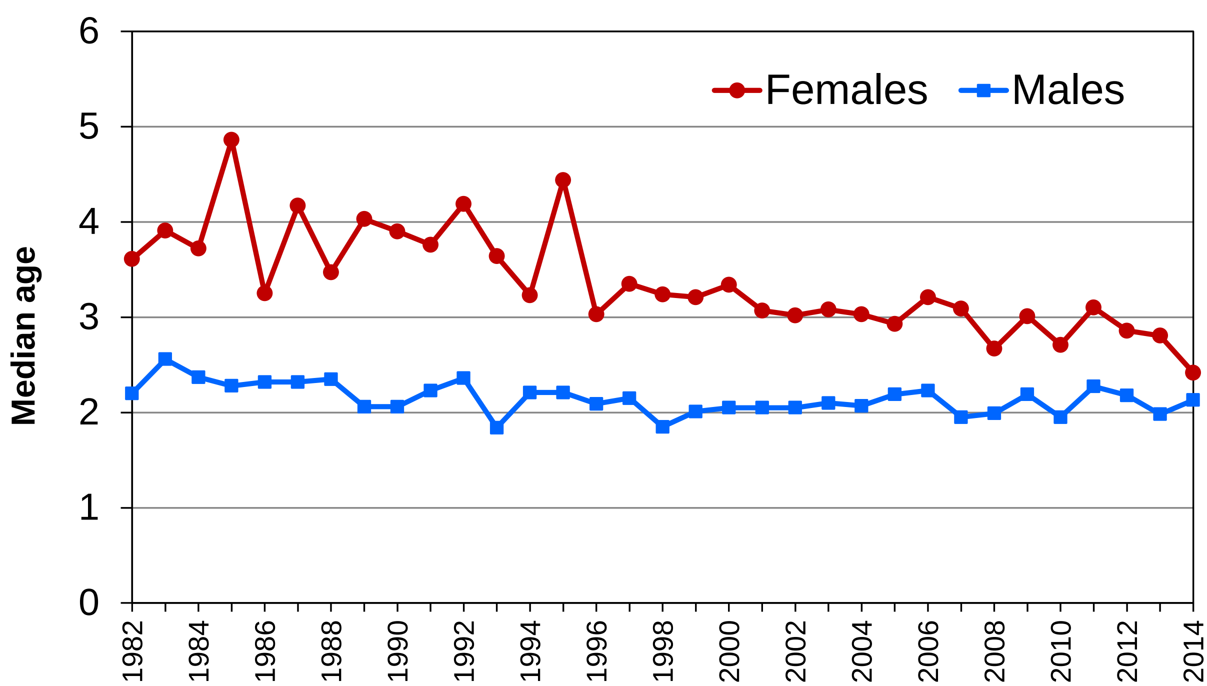


Figure 7. Statewide median ages (yrs) of harvested bears by sex, 1982–2014.

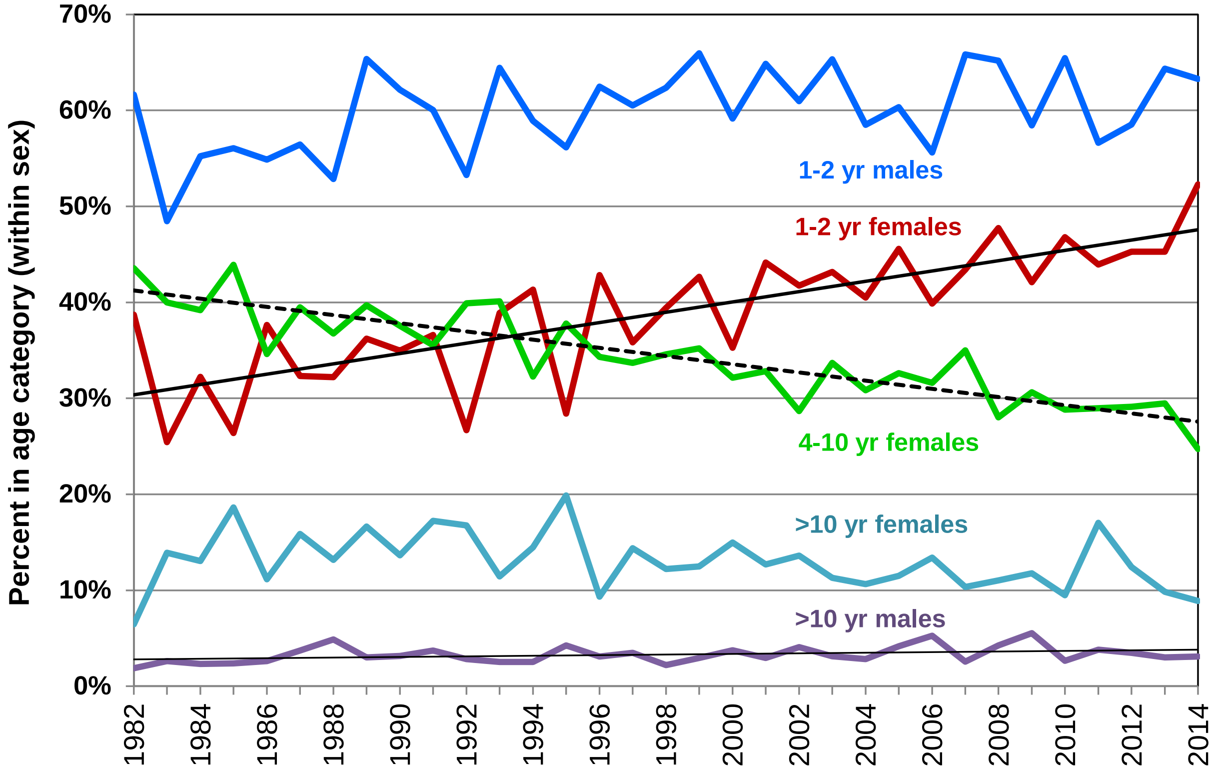


Figure 8. Statewide harvest structure: proportion of each sex in age category, 1982–2014. Trend lines are significant.

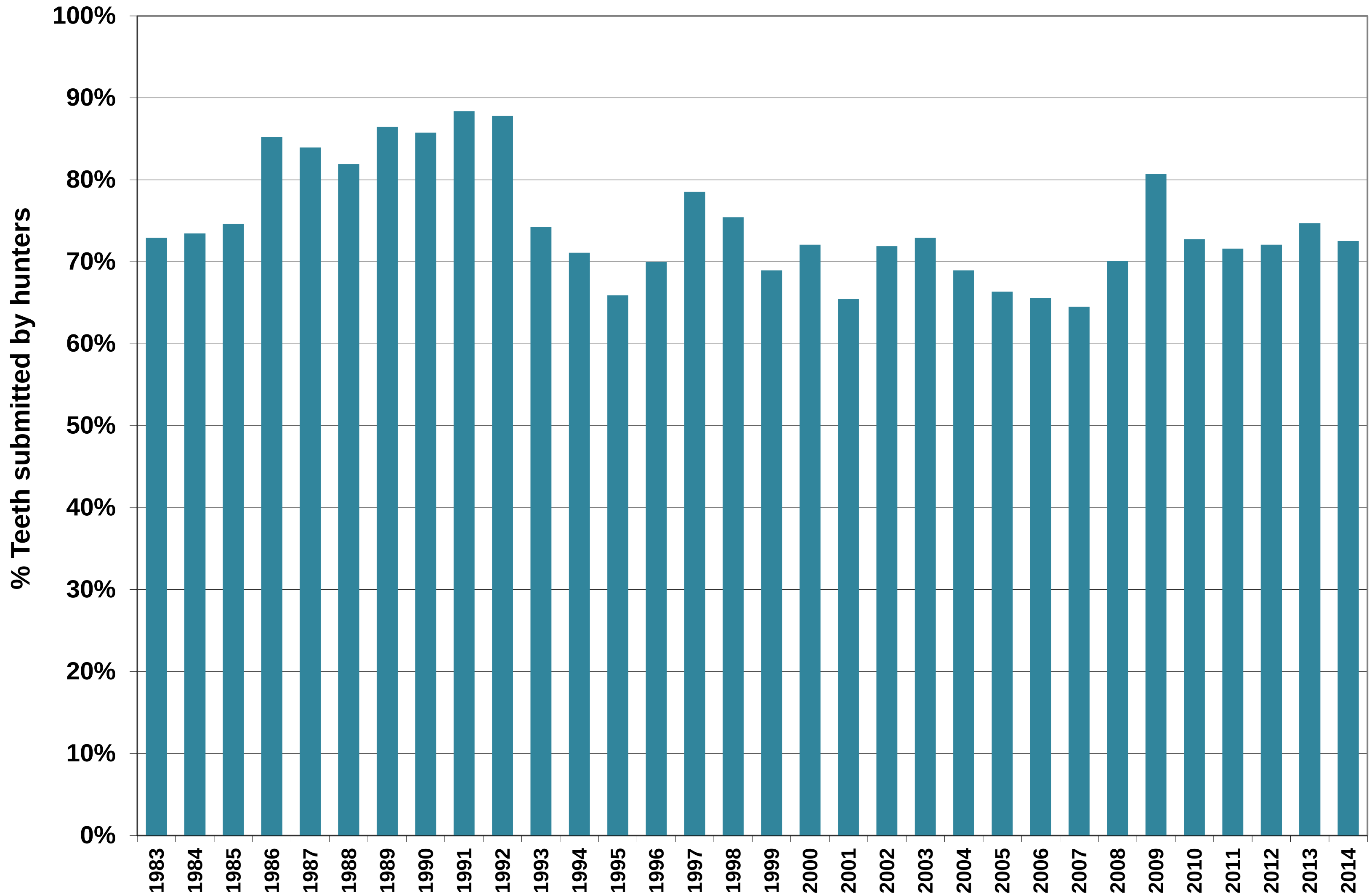
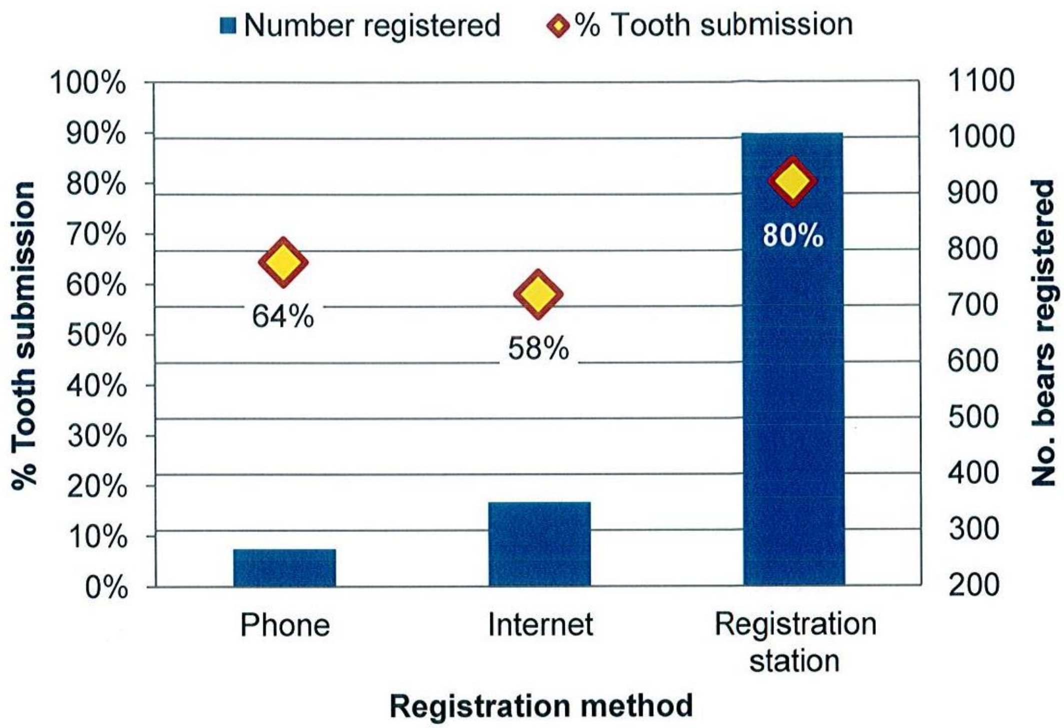


Figure 9. Percent of hunters submitting bear teeth for aging (now vital for population reconstruction, see Fig. 12). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993) and when non-compliant hunters were sent a reminder and second tooth envelope (2009).



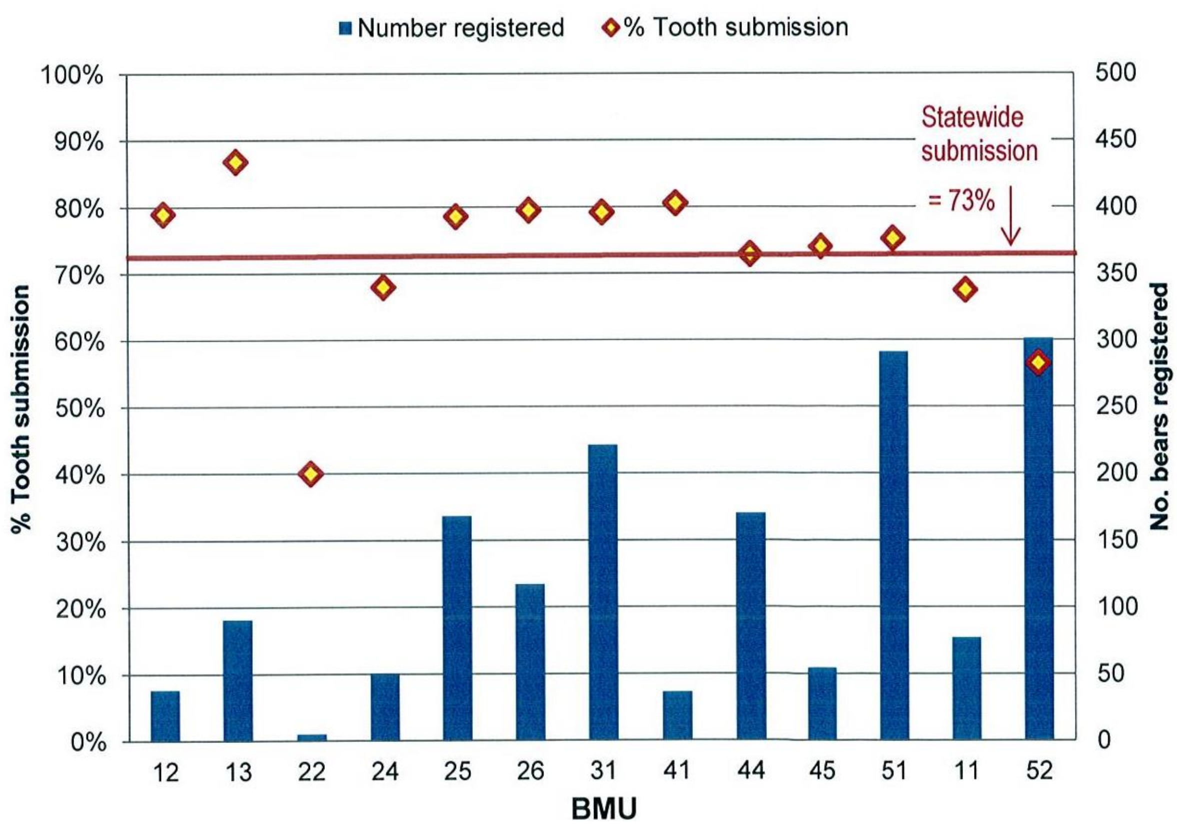


Figure 10. Percent of hunters who submitted a bear tooth in 2014, by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet.

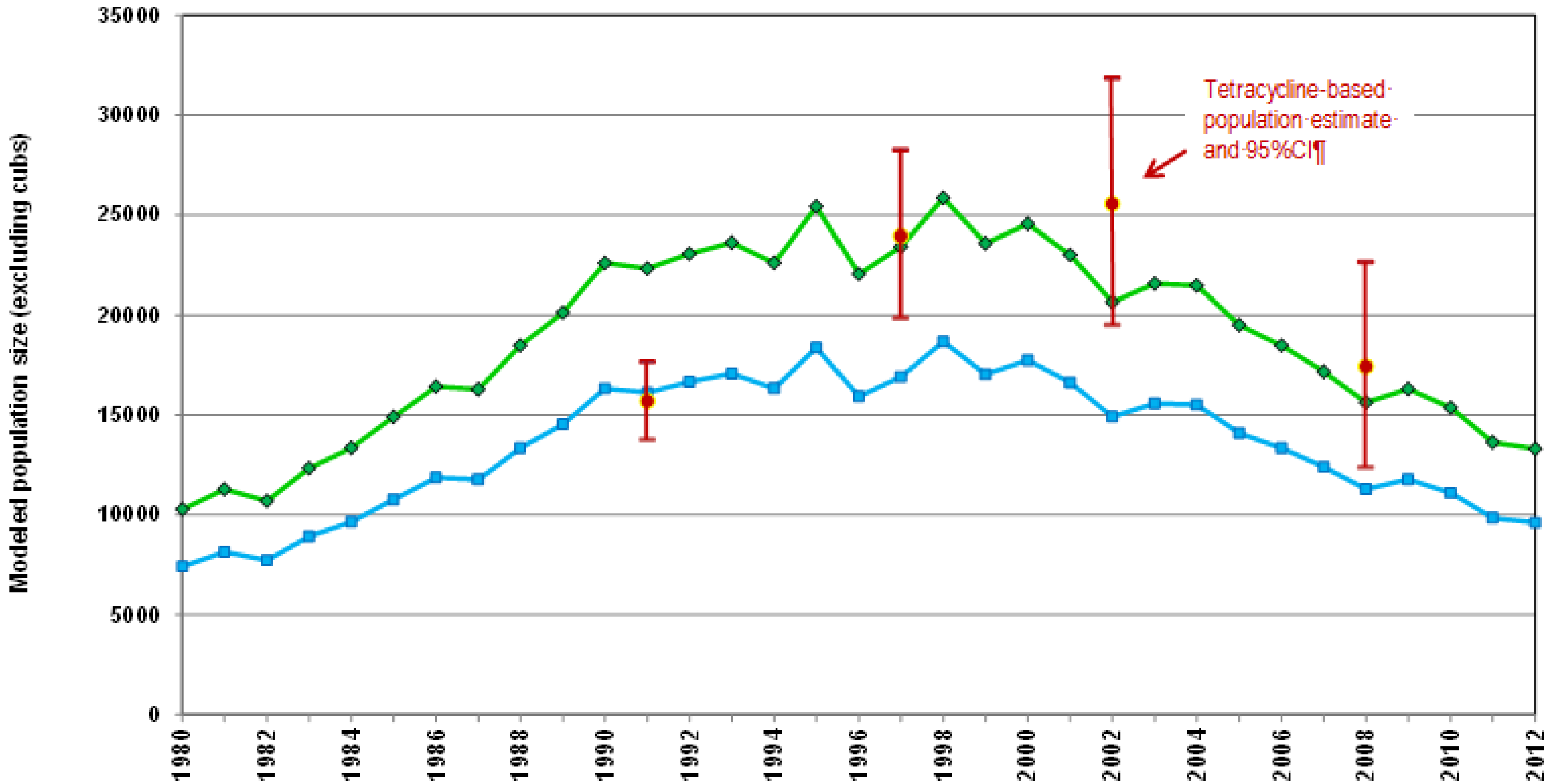


Figure 11. Statewide bear population trend derived from Downing reconstruction using the harvest age structures from 1980−2014. Curves were scaled (elevated) to various degrees to attempt to match the tetracycline-based mark–recapture estimates. Estimates beyond 2012 are unreliable using 2013 and 2014 data.

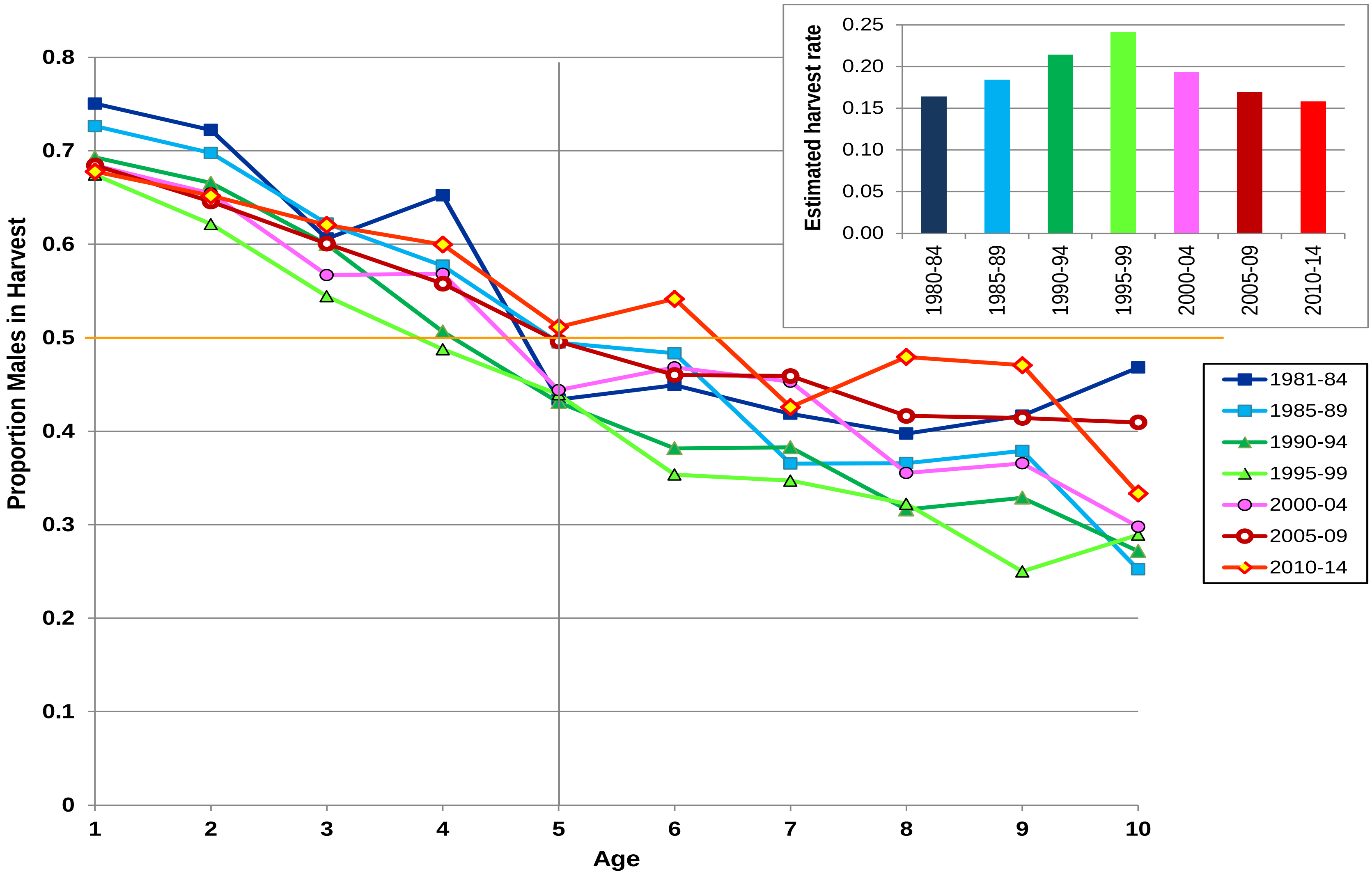


Figure 12. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1981–2014. Higher harvest rates result in steeper curves. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male yields approximately the inverse of the harvest rate (derived rates shown in inset).

2014 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. In 2014, nearly 500,000 hunters participated in the season. 2014 was a conservative season designed to rebuild deer numbers across much of the state. During the archery, firearms and muzzleloader seasons, hunters registered 139,442 deer.

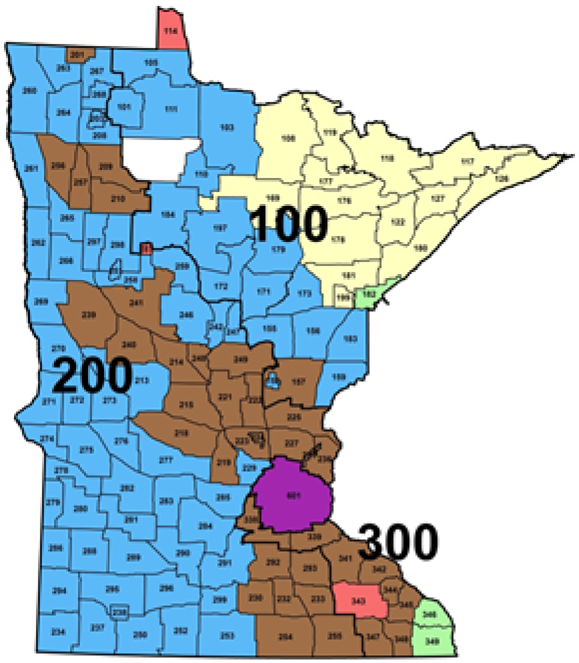
METHODS

Every deer taken by hunting in Minnesota must be registered. In 2014, 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 internet and telephone except in areas under Disease Management tag restrictions. 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.

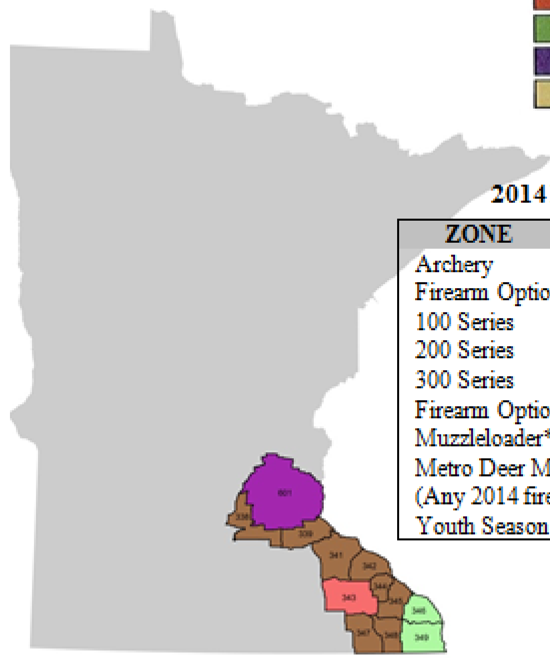
RESULTS

Outcomes of the 2014 deer harvest are presented in the following tables.

STATEWIDE (A) LICENSE



LATE SOUTHEAST (B) LICENSE



KEY

- Lottery – 1 deer limit
- Hunter Choice – 1 deer limit
- Managed – 2 deer limit
- Intensive – 5 deer limit
- No Limit Antlerless
- Bucks-only area – 1 deer limit

2014 Minnesota Deer Seasons

ZONE	DATES
Archery	Sept 13-Dec 31
Firearm Option Statewide (A)*	
100 Series	Nov. 8-23
200 Series	Nov. 8-16
300 Series	Nov. 8-16
Firearm Option Late Southeast (B)**	Nov. 22-30
Muzzleloader****	Nov. 29-Dec. 14
Metro Deer Management Area (601)*** (Any 2014 firearms or muzzleloader.)	Nov. 8-30
Youth Season and Early Antlerless	Oct. 16-19

Figure 1. 2014 Firearms and Archery Deer Seasons.

Table 1. Statewide Firearms, Archery, and Muzzleloader Harvest, License Sales, and Success Rates, 2003-2014.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
REGULAR FIREARMS												
Resident License Sales	344,875	309,698	291,298	299,774	285,286	376,006	377,077	379,866	382,668	391,822	391,967	374,314
Non-Resident License Sales	11,334	12,036	12,523	12,520	12,520	11,883	11,759	11,908	11,955	12,483	12,496	11,674
Bonus Permit Sales	194,201	183,186	184,566	167,343	145,522	190,156	140,920	143,763	142,049	89,750	97,402	29,642
Multi-Zone Buck License Sales	32,929	32,359	28,233	15,984	15,051	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Youth License Sales	34,463	51,347	50,501	49,599	49,242	50,397	56,678	59,726	60,943	62,949	64,748	62,488
All Season Deer License Sales	30,998	46,008	59,090	75,511	76,385	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total License Sales	648,800	634,634	626,211	620,731	584,006	628,442	586,434	595,263	597,615	557,004	566,613	478,118
Registered Buck Harvest[1]	110,440	116,612	95,594	95,695	97,528	85,646	83,820	88,027	76,003	84,729	70,627	70,627
Antlerless Permits Offered	31,625	30,760	28,830	18,925	18,830	32,325	60,100	60,083	15,525	32,854	36,816	26,332
Antlerless Permits Issued	25,386	24,111	25,656	18,925	18,830	32,325	60,100	60,083	15,525	32,854	36,816	26,332
Antlerless Permits App.	30,253	28,454	31,403	31,403	31,403	31,403	90,882	86,783	21,071	67,308	68,811	96,580
Registered AL Harvest[1]	147,420	123,278	119,363	135,981	118,860	98,147	78,525	86,077	88,197	71,140	67,885	46,030
Registered Total Harvest[1]	257,860	239,890	214,957	231,676	216,388	183,793	162,345	174,104	164,200	155,869	145,449	116,657
Registered % Successful[2]	39.7	37.8	34.3	37.3	41.7	34.8	33.8	35.9	32.9	32.0	29.7	25.3
ARCHERY												
Resident License Sales	59,339	50,601	50,293	49,595	52,780	87,872	88,707	91,156	90,252	95,259	92,717	92,301
Non-Resident License Sales	1,428	1,144	1,207	1,286	1,509	1,509	1,610	1,638	1,718	1,814	1,952	1,946
Youth Archery Sales	3,748	7,261	7,489	7,688	7,663	9,005	9,157	9,577	10,306	11,276	12,212	11,965
Mgmt Permit License Sales	N/A	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	60,767	59,006	58,989	58,569	61,952	99,033	99,474	102,371	102,276	108,349	106,881	106,212
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	N/A
Total Archery Harvest	21,691	20,726	23,538	25,360	24,161	22,632	20,629	22,057	20,444	21,605	19,388	17,119
Registered % Successful[2]	22.3	29.2	24.6	24.8	24.3	18.5	17.5	17.8	17.0	18.8	14.5	15.3
MUZZLELOADER												
Total Muzzleloader License Sales	9,142	10,512	9,226	10,781	9,867	64,673	63,282	55,640	59,384	58,363	51,092	43,946
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	N/A
Total Muzzleloader Harvest	9,466	9,289	15,421	13,507	12,138	9,572	7,929	9,023	7,416	7,779	7,045	5,814
Registered % Successful[2]	44.7	37.6	47.4	39.6	28.2	13.4	11.3	14.4	11.6	12.4	12.7	12.7
Antlerless Permits Offered								5,792	1,997	1,626	2,144	1,593
Antlerless Permits App.								7,260	2,615	3,743	3,544	4,588
TOTAL Registered Harvest	290,525	260,604	255,736	270,778	260,434	221,837	194,186	207,313	192,331	186,634	172,781	139,442

[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, 2014.

Firearms/Zone	Hunters	Harvest			Overall Success
		Bucks	Antlerless	Total	
1	162,188	22,488	6,870	29,358	18.0%
2	239,327	41,051	29,052	70,103	29.2%
3A	27,131	4,810	4,652	9,462	31.8%
3B	12,611	998	3,374	4,372	30.5%
Metro	3,068	571	294	865	27.0%
Free Landowner[1]	4,358	0	1,522	1,522	35.1%
Depredation[1]	73	0	75	75	65.8%
Muzzleloader[2]	43,946	2,422	3,392	5,814	12.7%
Archery[3]	106,212	7,998	9,121	17,119	15.3%
TOTAL[4]	**497,838**	**81,036**	**58,406**	**139,442**	**27.0%**

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

[2] Includes Camp Ripley.

[3] 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, 2014. 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	307	8	21	3	339	496	0.62	0.06	0.68
103	1A	545	15	58	10	628	1,824	0.30	0.05	0.34
105	1A	749	15	94	14	872	932	0.80	0.13	0.94
108	1A	657	0	0	0	657	1,701	0.39	0.00	0.39
110	1A	684	37	157	23	901	530	1.29	0.41	1.70
111	1A	334	9	35	5	383	1,440	0.23	0.03	0.27
114	1A	30	6	12	1	49	412	0.07	0.05	0.12
117	1A	26	0	0	0	26	1,129	0.02	0.00	0.02
118	1A	433	3	0	0	436	1,445	0.30	0.00	0.30
119	1A	328	1	0	1	330	946	0.35	0.00	0.35
122	1A	231	0	0	0	231	622	0.37	0.00	0.37
126	1A	274	1	0	0	275	979	0.28	0.00	0.28
127	1A	46	0	0	0	46	587	0.08	0.00	0.08
152	1A	64	9	23	4	100	62	1.04	0.58	1.62
155	1A	949	60	276	42	1,327	639	1.49	0.59	2.08
156	1A	993	47	162	35	1,237	834	1.19	0.29	1.48
157	1A	1799	364	1270	263	3,696	904	1.99	2.10	4.09
159	1A	777	47	186	33	1,043	575	1.35	0.46	1.81
169	1A	933	0	2	2	937	1,202	0.78	0.00	0.78
171	1A	877	54	227	35	1,193	729	1.20	0.43	1.64
172	1A	1425	102	340	58	1,925	786	1.81	0.64	2.45
173	1A	549	25	130	22	726	617	0.89	0.29	1.18
176	1A	1052	1	0	1	1,054	1,150	0.92	0.00	0.92
177	1A	554	2	0	0	556	553	1.00	0.00	1.01
178	1A	1187	1	2	0	1,190	1,325	0.90	0.00	0.90
179	1A	1361	66	269	51	1,747	939	1.45	0.41	1.86
180	1A	504	1	4	0	509	999	0.50	0.01	0.51
181	1A	641	1	3	2	647	746	0.86	0.01	0.87
182	1A	393	82	377	66	918	280	1.40	1.88	3.28
183	1A	748	27	130	26	931	675	1.11	0.27	1.38
184	1A	2219	220	814	156	3,409	1,318	1.68	0.90	2.59
197	1A	727	28	107	24	886	1,343	0.54	0.12	0.66
199	1A	77	2	2	0	81	152	0.51	0.03	0.53
201	2A	94	8	50	12	164	169	0.56	0.41	0.97
203	2A	50	6	8	3	67	132	0.38	0.13	0.51
208	2A	189	8	32	6	235	379	0.50	0.12	0.62
209	2A	462	53	231	55	801	641	0.72	0.53	1.25
210	2A	677	92	362	83	1,214	635	1.07	0.85	1.91
213	2A	1982	178	513	125	2,798	1,161	1.71	0.70	2.41
214	2A	1523	375	886	289	3,073	566	2.69	2.74	5.43
215	2A	1240	285	648	186	2,359	730	1.70	1.53	3.23
218	2A	875	199	580	140	1,794	912	0.96	1.01	1.97
219	2A	478	120	321	92	1,011	427	1.12	1.25	2.37
221	2A	997	237	592	203	2,029	647	1.54	1.60	3.14
222	2A	722	168	435	115	1,440	413	1.75	1.74	3.49
223	2A	524	118	304	89	1,035	385	1.36	1.33	2.69
224	2A	70	12	47	12	141	49	1.43	1.45	2.88
225	2A	1158	247	682	177	2,264	635	1.82	1.74	3.57
227	2A	730	153	382	103	1,368	491	1.49	1.30	2.78

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	206	19	50	13	288	313	0.66	0.26	0.92
230	2A	197	58	144	28	427	464	0.42	0.50	0.92
232	2A	228	41	113	35	417	380	0.60	0.50	1.10
233	2A	157	30	78	15	280	386	0.41	0.32	0.72
234	2A	182	13	82	10	287	637	0.29	0.16	0.45
235	2A	67	6	24	6	103	37	1.82	0.98	2.80
236	2A	526	59	267	44	896	404	1.30	0.92	2.22
237	2A	200	14	82	10	306	737	0.27	0.14	0.42
238	2A	65	3	26	2	96	98	0.67	0.32	0.98
239	2A	1313	276	857	188	2,634	1,110	1.18	1.19	2.37
240	2A	1642	310	929	301	3,182	694	2.37	2.22	4.58
241	2A	2951	657	2003	517	6,128	1,047	2.82	3.03	5.85
242	2A	480	63	171	28	742	307	1.56	0.85	2.42
246	2A	1604	120	306	83	2,113	860	1.87	0.59	2.46
247	2A	528	44	161	39	772	263	2.01	0.93	2.93
248	2A	386	78	218	78	760	229	1.69	1.64	3.33
249	2A	949	255	850	211	2,265	729	1.30	1.80	3.11
250	2A	254	13	77	11	355	730	0.35	0.14	0.49
251	2A	77	10	25	3	115	68	1.13	0.56	1.69
252	2A	254	29	114	19	416	735	0.35	0.22	0.57
253	2A	401	32	102	12	547	987	0.41	0.15	0.55
254	2A	441	77	223	59	800	946	0.47	0.38	0.85
255	2A	361	58	162	36	617	774	0.47	0.33	0.80
256	2A	423	61	253	65	802	654	0.65	0.58	1.23
257	2A	350	49	198	28	625	426	0.82	0.65	1.47
258	2A	759	59	205	55	1,078	381	1.99	0.84	2.83
259	2A	1021	77	244	67	1,409	546	1.87	0.71	2.58
260	2A	336	10	45	7	398	1,252	0.27	0.05	0.32
261	2A	188	11	36	6	241	796	0.24	0.07	0.30
262	2A	191	16	53	11	271	677	0.28	0.12	0.40
263	2A	376	12	37	10	435	513	0.73	0.12	0.85
264	2A	667	24	167	21	879	672	0.99	0.32	1.31
265	2A	466	54	177	35	732	495	0.94	0.54	1.48
266	2A	329	16	68	15	428	625	0.53	0.16	0.68
267	2A	184	5	51	4	244	472	0.39	0.13	0.52
268	2A	303	10	48	4	365	239	1.27	0.26	1.53
269	2A	181	10	68	6	265	652	0.28	0.13	0.41
270	2A	195	4	38	5	242	758	0.26	0.06	0.32
271	2A	242	15	62	9	328	646	0.37	0.13	0.51
272	2A	194	8	34	9	245	544	0.36	0.09	0.45
273	2A	441	46	178	34	699	634	0.70	0.41	1.10
274	2A	235	9	79	8	331	381	0.62	0.25	0.87
275	2A	306	26	115	19	466	777	0.39	0.21	0.60
276	2A	502	41	237	32	812	575	0.87	0.54	1.41
277	2A	1172	119	504	94	1,889	876	1.34	0.82	2.16
278	2A	322	17	73	9	421	422	0.76	0.23	1.00
279	2A	182	13	102	12	309	346	0.53	0.37	0.89
280	2A	199	14	115	10	338	676	0.29	0.21	0.50
281	2A	420	24	122	19	585	579	0.73	0.29	1.01

Table 3. (Continued)

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total	Area Size (sq.mi.)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile
282	2A	126	4	20	6	156	780	0.16	0.04	0.20
283	2A	253	9	73	8	343	640	0.40	0.14	0.54
284	2A	320	29	140	18	507	853	0.37	0.22	0.59
285	2A	324	46	164	25	559	580	0.56	0.40	0.96
286	2A	249	26	124	16	415	458	0.54	0.36	0.91
287	2A	64	33	102	26	225	51	1.26	3.18	4.44
288	2A	337	29	144	31	541	630	0.54	0.32	0.86
289	2A	209	16	58	14	297	820	0.25	0.11	0.36
290	2A	403	33	159	36	631	666	0.61	0.34	0.95
291	2A	640	66	230	53	989	832	0.77	0.42	1.19
292	2A	483	93	281	54	911	517	0.93	0.83	1.76
293	2A	407	79	223	34	743	512	0.79	0.66	1.45
294	2A	302	28	156	19	505	689	0.44	0.29	0.73
295	2A	408	18	126	17	569	855	0.48	0.19	0.67
296	2A	256	15	100	12	383	675	0.38	0.19	0.57
297	2A	146	7	27	4	184	449	0.32	0.08	0.41
298	2A	471	25	64	15	575	677	0.70	0.15	0.85
299	2A	228	26	111	21	386	389	0.59	0.41	0.99
338	3A	145	32	122	20	319	472	0.31	0.37	0.68
338	3B	29	17	44	8	98	472	0.06	0.15	0.21
339	3A	183	46	112	27	368	406	0.45	0.46	0.91
339	3B	29	12	61	19	121	406	0.07	0.23	0.30
341	3A	518	98	280	64	960	626	0.83	0.71	1.53
341	3B	111	82	208	61	462	626	0.18	0.56	0.74
342	3A	418	53	186	48	705	374	1.12	0.77	1.88
342	3B	96	60	203	37	396	374	0.26	0.80	1.06
343	3A	526	144	394	103	1,167	664	0.79	0.97	1.76
343	3B	120	86	221	59	486	664	0.18	0.55	0.73
344	3A	318	52	221	61	652	190	1.68	1.76	3.44
344	3B	47	22	129	28	226	190	0.25	0.94	1.19
345	3A	334	28	133	34	529	335	1.00	0.58	1.58
345	3B	77	51	131	36	295	335	0.23	0.65	0.88
346	3A	750	187	546	134	1,617	328	2.29	2.64	4.93
346	3B	167	115	313	129	724	328	0.51	1.70	2.21
347	3A	368	43	115	40	566	434	0.85	0.46	1.31
347	3B	74	39	117	32	262	434	0.17	0.43	0.60
348	3A	415	55	196	42	708	332	1.25	0.88	2.13
348	3B	72	37	136	29	274	332	0.22	0.61	0.82
349	3A	835	193	662	176	1,866	499	1.67	2.07	3.74
349	3B	176	147	540	141	1,004	499	0.35	1.66	2.01
601	Metro	520	38	124	22	704	1,756	0.74	1.24	1.98
Total		**69,851**	**8,727**	**28,643**	**6,668**	**113,889**	**83,586**	**0.84**	**0.55**	**1.40**

Area size = Total land area (not water) within the DPA, area estimates were recalculated in 2014.

Table 4. Firearm Harvest using Bonus and Disease Management Permits, 2014.

Managed Permit Areas.

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
114	1A	2	6	0	8
287	2A	14	59	21	94
343	3A	87	254	69	410
343	3B	43	115	34	192
Total		**146**	**434**	**124**	**704**

Intensive Permit Areas

Permit Area	Zone	Fawn Male	Adult Female	Fawn Female	Total
182	1A	57	241	42	340
346	3A	128	417	95	640
346	3B	63	185	77	325
349	3A	126	474	144	744
349	3B	85	344	99	528
Total		**459**	**1,661**	**457**	**2,577**

Table 5. Early Antlerless Season Harvest by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
346	31	71	36	138
349	20	53	22	95
Total	**51**	**124**	**58**	**233**

Table 6. Summary of Firearms Special Hunts, 2014. Includes regular, youth, and bonus permits.

Area	Dates	Permits Issued	Harvest Adult Male	Fawn Male	Adult Female	Fawn Female	Total
900 - Cascade River State Park	11/8-11/23	NA†	0	0	0	0	0
901 - Rice Lake Nat. Wildlife Refuge	11/15-11/23	40*	6	0	11	0	17
902 - St. Croix State Park	11/20-11/23	300*	30	10	32	5	77
904 - Gooseberry Falls State Park[1]	11/8-11/23	40*	1	1	9	1	12
905 - Split Rock Lighthouse State Park[1]	11/8-11/23	35*	1	3	7	1	12
906 - Tettegouche State Park[1]	11/8-11/23	135*	6	2	12	2	22
907 - Scenic State Park	11/8-11/23	30*	3	0	2	0	5
908 - Hayes Lake State Park	11/8-11/16	75*	3	1	1	1	6
909 - Lake Bemidji State Park[1]	11/8-11/11	30**	1	2	4	2	9
910 - Zippel Bay State Park[1]	11/8-11/23	55**	1	4	9	2	16
911 - Judge CR Magney State Park	11/8-11/23	N/A†	0	0	0	0	0
912 - Schoolcraft State Park	11/8-11/23	N/A*	0	0	0	1	1
913 - Lake Carlos State Park	11/8-11/9	17**	0	3	4	0	7
914 - William O'Brien State Park[1]	11/15-11/16	50*	9	3	8	2	22
916 - Maplewood State Park	11/8-11/11	100*	29	2	13	1	45
918 - Lake Alexander SNA[1]	11/8-11/16	40*	1	1	5	1	8
919 - Glacial Lakes State Park	11/13-11/16	30**	0	2	12	2	16
921 - Beaver Creek Valley State Park[1]	11/8-11/9	20#	1	0	5	1	7
924 - Whitewater State Game Refuge	11/8-11/11	50**	0	0	5	0	5
925 - Vermillion Highlands WMA[1]	11/8-11/16	20*	3	0	1	0	4
926 - Elm Creek Park Reserve[1]	11/15-11/16	150*	24	9	37	7	77
927 - Whitewater State Park[1]	11/22-11/23	50#	1	6	28	8	43
929 - Frontenac State Park - B[1]	11/22-11/24	60#	11	8	26	4	49
931 - City of Grand Rapids[1]	11/8-11/23	N/A*	9	12	25	9	55
933 - Lake Rebecca Park Reserve[1]	11/22-11/23	80*	11	9	20	6	46
934 - Whitewater State Game Refuge - B	11/22-11/30	75**	0	0	23	1	24
Total			**151**	**78**	**299**	**57**	**585**

1 Bonus permits available *Either sex **Antlerless Only *** Earn-A-Buck
#Antler Point Restriction †Buck only

Table 7. Free Landowner Firearms Harvest by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
157	12	29	6	47
201	1	0	0	1
209	3	6	1	10
210	5	15	4	24
214	29	92	28	149
215	14	45	16	75
218	2	5	1	8
219	1	3	0	4
221	9	43	11	63
222	5	13	4	22
223	3	3	1	7
225	6	15	9	30
227	2	7	1	10
232	2	4	0	6
233	1	1	0	2
236	3	5	1	9
239	11	33	6	50
240	20	63	26	109
241	36	118	27	181
248	1	2	2	5
249	18	53	11	82
254	0	4	0	4
255	2	5	0	7
256	3	15	3	21
257	1	22	4	27
292	2	11	4	17
293	1	4	0	5
338	0	8	0	8
339	0	8	2	10
341	14	28	9	51
342	5	32	8	45
343	3	12	4	19
344	0	11	3	14
345	6	19	5	30
346	9	21	6	36
347	3	17	5	25
348	2	19	3	24
349	9	37	7	53
601	0	1	0	1
Total	**244**	**829**	**218**	**1,291**

Table 8. Archery Harvest by Permit Area, 2014.
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	12	0	2	0	14
103	5	0	8	1	14
105	15	1	15	0	31
108	26	0	0	0	26
110	12	3	14	1	30
111	1	0	2	0	3
114	3	0	6	0	9
117	2	0	0	0	2
118	10	0	0	0	10
119	2	0	0	0	2
122	2	0	0	0	2
126	14	0	0	0	14
152	2	0	3	0	5
155	43	6	43	10	102
156	44	7	38	5	94
157	86	15	89	7	197
159	43	2	28	0	73
169	20	0	1	0	21
171	30	6	36	3	75
172	65	10	89	8	172
173	29	2	19	3	53
176	37	0	0	0	37
177	20	0	0	0	20
178	60	0	1	0	61
179	69	13	86	5	173
180	34	0	1	0	35
181	56	0	0	1	57
182	113	47	269	30	459
183	29	7	37	4	77
184	126	21	79	9	235
197	26	3	21	1	51
199	2	0	0	0	2
201	2	0	6	0	8
208	6	0	3	0	9
209	27	0	14	0	41
210	25	3	16	2	46
213	279	25	160	18	482
214	89	14	68	12	183
215	169	27	98	16	310
218	127	19	104	16	266
219	120	14	101	11	246
221	85	15	77	11	188
222	55	10	48	8	121
223	168	35	127	14	344
224	14	3	11	1	29
225	165	24	101	11	301
227	245	26	138	13	422

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
229	62	12	36	4	114
230	29	3	26	4	62
232	35	6	22	1	64
233	48	6	22	3	79
234	21	1	12	0	34
235	18	0	14	1	33
236	187	18	97	11	313
237	22	3	14	0	39
238	8	0	3	0	11
239	96	11	67	9	183
240	99	10	70	11	190
241	199	24	165	20	408
242	94	8	72	12	186
246	69	13	67	11	160
247	58	9	70	8	145
248	39	7	30	6	82
249	86	12	64	12	174
250	47	5	24	3	79
251	2	1	2	1	6
252	38	5	18	1	62
253	74	6	58	1	139
254	84	5	42	4	135
255	87	5	50	8	150
256	15	1	17	1	34
257	18	0	19	0	37
258	42	8	24	3	77
259	40	8	46	4	98
260	14	0	10	0	24
261	16	0	10	0	26
262	33	2	18	1	54
263	7	0	6	0	13
264	25	2	8	1	36
265	18	2	13	1	34
266	18	1	8	0	27
267	8	0	7	2	17
268	5	1	3	1	10
269	25	1	22	0	48
270	14	0	9	1	24
271	27	2	11	0	40
272	10	0	4	1	15
273	58	4	29	2	93
274	31	1	13	2	47
275	35	1	21	0	57
276	50	5	38	4	97
277	175	15	171	15	376
278	45	4	31	4	84
279	16	1	10	2	29

Table 8. (Continued)

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
280	19	0	18	0	37
281	82	2	41	0	125
282	28	4	11	2	45
283	47	6	24	3	80
284	43	4	22	2	71
285	75	4	48	2	129
286	28	3	20	1	52
288	62	5	61	2	130
289	32	1	18	0	51
290	58	6	37	2	103
291	140	8	101	8	257
292	79	7	58	6	150
293	105	12	60	7	184
294	26	1	18	1	46
295	42	1	49	6	98
296	34	2	11	1	48
297	6	0	2	0	8

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
298	10	2	6	1	19
299	50	11	48	7	116
338	43	4	35	5	87
339	53	4	45	8	110
341	140	13	87	11	251
342	109	8	44	5	166
343	278	42	400	41	761
344	53	6	30	6	95
345	92	5	30	5	132
346	184	48	281	59	572
347	94	7	53	7	161
348	105	5	25	7	142
349	205	46	312	61	624
601	763	321	1397	253	2,734
970	24	6	34	6	70
971	28	9	27	4	68
Total	**7,998**	**1,190**	**7,005**	**926**	**17,119**

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

Table 9. Archery Harvest using Bonus Permits by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
114	0	4	0	4
182	39	226	27	292
343	31	329	35	395
346	41	251	54	346
349	35	289	52	376
601	289	1274	233	1796
Total	**435**	**2,373**	**401**	**3,209**

Table 10. Summary of Archery Special Hunts, 2014. Includes Regular, Youth, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
970 - Camp Ripley	10/15 - 10/16	2,000	24	34	6	6	70
971 - Camp Ripley	10/25 - 10/26	2,000	28	27	9	4	68
975 - Vermillion Highlands WMA	9/13-10/31; 12/20-12/31	60	0	6	0	1	7
976 - City of New Ulm	10/19 - 12/31	50	0	21	12	6	39
977 - City of Red Wing	9/13 - 12/31	Unl.	12	21	4	6	43
979 - City of Fergus Falls	9/13 - 12/31	25	3	12	1	0	16
980 - City of Duluth	9/13 - 12/31	400	72	239	68	65	444
981 - City of Mankato	10/11 - 12/31	40	0	2	1	0	3
982 - City of Granite Falls	9/13 - 12/31	10	1	0	0	0	1
983 - City of Ortonville	9/13 - 12/31	30	2	19	2	0	23
984 - City of Canby	9/13 - 12/31	20	0	3	0	0	3
985 - City of Bemidji	9/13 - 12/31	40	0	11	5	3	19
988 - City of Tower & Soudan Underground SP	11/29 - 12/14	10	1	4	1	0	6
990 - City of Owatonna	11/1 - 12/14	15	0	17	2	2	21
991 - East Minnesota River Refuge	9/13 - 12/31	Unl.	1	6	0	0	7
992 - City of Hallock	9/13 - 12/31	30	0	4	0	3	7
993 - City of Cook	9/13 - 12/31	25	0	3	1	1	5
995 - City of Grand Rapids	9/13 - 12/31	Unl.	1	26	9	9	45
996 - St. Croix State Park	9/29-10/31; 11/3-11/7	100	2	8	1	1	12
998 - City of Red Lake Falls	10/1 - 10/14	10	0	1	0	0	1
Total			**147**	**464**	**122**	**107**	**840**

*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, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
157	0	2	0	2
201	0	1	0	1
210	0	2	0	2
214	1	7	0	8
215	1	8	0	9
219	0	1	0	1
221	0	2	0	2
222	0	1	0	1
223	0	1	0	1
225	0	2	0	2
232	0	1	0	1
236	0	1	0	1
239	0	2	0	2
240	0	4	1	5
241	2	12	2	16
248	0	4	0	4
249	0	4	0	4
255	0	1	0	1
256	0	1	0	1
257	0	1	0	1
292	0	3	0	3
293	0	2	0	2
341	1	4	1	6
342	1	7	0	8
343	1	3	0	4
344	0	1	0	1
345	0	4	1	5
346	0	5	0	5
347	0	2	0	2
348	1	3	0	4
349	0	5	3	8
Total	**12**	**61**	**11**	**84**

Table 12. Muzzleloader Harvest by Permit Area, 2014.
Includes Regular, Muzzleloader, Youth, and Bonus permits. Does not include Park hunts.

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
101	7	1	0	0	8
103	2	0	1	0	3
105	15	0	0	0	15
108	6	0	0	0	6
110	7	0	2	0	9
111	7	0	0	0	7
114	2	2	0	0	4
117	1	0	0	0	1
118	12	0	0	0	12
119	2	0	0	0	2
122	1	0	0	0	1
126	7	0	0	0	7
127	1	0	0	0	1
155	6	0	6	0	12
156	2	0	0	0	2
157	9	9	43	4	65
159	4	0	1	0	5
169	9	0	0	0	9
171	2	0	4	0	6
172	9	1	7	3	20
173	2	0	1	0	3
176	2	0	0	0	2
177	1	0	0	0	1
178	10	0	0	0	10
179	12	0	6	1	19
180	7	0	1	0	8
181	2	0	0	0	2
182	4	2	17	1	24
183	7	0	3	0	10
184	31	3	12	2	48
197	5	1	0	0	6
199	0	0	1	0	1
201	6	2	5	0	13
203	8	2	4	1	15
208	11	0	2	0	13
209	19	3	16	3	41
210	10	0	16	4	30
213	65	2	42	3	112
214	24	9	61	10	104
215	60	18	75	15	168
218	67	24	86	11	188
219	40	15	75	11	141
221	32	17	56	13	118
222	19	1	31	6	57
223	35	13	42	11	101
224	1	1	0	1	3
225	34	11	44	11	100

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
227	53	10	66	4	133
229	18	1	8	0	27
230	8	3	14	2	27
232	14	2	11	3	30
233	23	7	17	3	50
234	10	2	9	0	21
235	2	0	4	1	7
236	26	9	34	6	75
237	34	1	6	0	41
238	4	0	3	0	7
239	26	11	35	11	83
240	26	11	57	4	98
241	51	21	108	21	201
242	10	2	7	0	19
246	16	1	14	3	34
247	13	0	10	1	24
248	5	2	14	4	25
249	17	13	57	6	93
250	24	1	16	1	42
251	3	0	0	0	3
252	22	2	14	0	38
253	34	1	20	2	57
254	24	8	36	4	72
255	26	7	25	3	61
256	17	3	12	0	32
257	15	2	12	2	31
258	4	3	5	1	13
259	18	0	6	1	25
260	23	0	3	1	27
261	12	0	0	1	13
262	10	0	2	0	12
263	25	1	6	0	32
264	40	3	6	1	50
265	25	1	10	2	38
266	11	1	4	0	16
267	8	0	1	1	10
268	16	0	2	0	18
269	16	1	9	0	26
270	19	2	8	0	29
271	21	1	7	1	30
272	10	0	2	0	12
273	30	4	16	4	54
274	22	5	12	2	41
275	24	3	23	2	52
276	41	3	37	4	85
277	99	6	72	6	183
278	55	3	20	4	82

Table 12. (Continued).

Permit Area	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
279	25	2	26	0	53
280	16	1	4	0	21
281	42	2	17	1	62
282	6	0	1	0	7
283	31	3	7	1	42
284	25	3	10	0	38
285	13	7	14	1	35
286	37	2	16	3	58
287	5	1	5	2	13
288	31	6	23	3	63
289	17	1	8	0	26
290	45	2	29	5	81
291	61	8	30	4	103
292	30	7	38	5	80
293	30	14	42	1	87
294	33	1	12	4	50
295	40	4	10	0	54
296	29	3	10	2	44
297	3	2	2	0	7
298	3	0	1	0	4
299	9	2	20	2	33
338	11	6	19	0	36
339	11	2	8	1	22
341	15	8	48	10	81
342	23	12	38	5	78
343	28	11	76	12	127
344	6	4	33	7	50
345	19	3	9	4	35
346	32	22	102	22	178
347	18	2	36	0	56
348	15	4	32	2	53
349	37	37	162	32	268
601	14	3	15	2	34
TOTAL	**2,435**	**479**	**2,423**	**354**	**5,691**

Table 13. Muzzleloader Harvest using Bonus Permits by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
114	2	0	0	2
182	2	12	1	15
287	1	2	0	3
343	8	43	8	59
346	17	72	17	106
349	29	121	24	174
TOTAL	**59**	**250**	**50**	**359**

Table 14. Summary of Muzzleloader Special Hunts, 2014.

Includes Regular, Youth, and Bonus Permits.

Area	Dates	Permits Issued	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
935 - Jay Cook SP[1]	12/6-12/10	120*	5	4	21	2	32
936 - Crow Wing SP	12/5-12/7	25*	1	1	1	2	5
937 - Soudan Mine and Lake Vermilion SP[1]	11/29-12/14	20*	1	0	4	0	5
938 - City of Tower[1]	11/29-12/14	20*	2	0	3	0	5
939 - Lake Shetek SP[1]	12/6-12/7	15**	0	3	5	0	8
940 - Lake Maria SP[1]	12/6-12/8	25***	1	2	10	1	14
941 - Nerstrand Big Woods SP[1]	12/6-12/7	50***	4	12	13	2	31
943 - Rice Lake SP[1]	12/6-12/7	20**	0	1	13	5	19
944 - Vermillion Highlands WMA[1]	11/29-12/14	20*	1	1	1	0	3
945 -Camp Ripley Deployed Solider[1]	12/1-12/3	100*	11	3	13	2	29
946 -City of Grand Rapids[1]	11/29-12/14	Unl.*	0	1	0	0	1
947 -Lake Bemidji State Park[1]	12/5-12/7	30*	1	1	2	0	4
Total			**27**	**29**	**86**	**14**	**156**

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

Table 15. Free Landowner Muzzleloader Harvest by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
157	0	1	0	1
210	0	2	0	2
214	2	1	2	5
215	1	3	1	5
218	1	3	0	4
221	0	4	2	6
222	0	2	0	2
223	1	1	0	2
227	0	1	0	1
232	0	2	1	3
239	0	1	1	2
240	2	4	1	7
241	2	13	2	17
249	3	5	2	10
255	1	1	0	2

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
257	0	1	1	2
292	0	1	0	1
293	0	4	0	4
338	1	1	0	2
339	0	1	0	1
341	0	3	1	4
342	0	4	1	5
343	0	5	0	5
344	0	1	1	2
345	0	0	1	1
346	1	6	2	9
347	0	3	0	3
348	0	4	0	4
349	1	5	0	6
257	0	1	1	2
Total	**16**	**83**	**19**	**118**

Table 16. Summary of Youth Hunts and Youth Season, 2014.

.			Harvest				
Area	Dates	Permits Issued	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
950 - Camp Ripley Archery	10/11-10/12	175	3	5	1	1	10
951 - Afton SP	11/8-11/9	20	8	5	3	0	16
953 - Zipple Bay SP	10/18-10/19	20	0	0	1	0	1
954 - Lake Bemidji SP	10/18-10/19	20	0	1	2	0	3
955 - Lake Alexander Preserve	10/11 - 10/12	20	1	1	0	0	2
956 - St. Croix SP	11/1-11/2	90	8	4	1	0	13
957 - Rydell NWR	10/18-10/19	20	0	0	0	0	0
958 - Savanna Portage SP	10/25-10/26	25	0	2	0	0	2
959 - Buffalo River SP	11/8-11/9	14	2	3	1	0	6
960 - Tettegouche SP	10/18-10/19	10	0	1	1	0	2
961 - Itasca SP	10/25-10/26	75	1	2	1	1	5
962 - Great River SP	10/25-10/26	20	0	0	0	0	0
965 - Banning SP	11/1-11/2	6	3	0	0	0	3
966 - Blue Mounds SP	11/22-11/23	10	4	1	0	0	5
967 - Camden SP	11/1-11/2	12	2	4	1	0	7
968 - Lake Shetek SP	10/25-10/26	12	4	2	0	0	6
969 - Split Rock Creek SP	10/25-10/26	10	1	1	0	0	2
159 - St Croix SP Adult	11/1-11/2	10	0	3	0	0	3
Total		**569**	**37**	**35**	**12**	**2**	**86**

* Includes special youth and adult mentored hunts

Youth Deer Season - October 16 - 19, unlimited permits

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	9	6	0	2	17
105	21	28	6	1	56
111	7	5	3	0	15
114	0	2	0	0	2
201	6	1	2	0	9
203	1	1	0	1	3
208	10	8	3	2	23
209	19	18	4	1	42
256	25	15	2	5	47
257	15	8	9	2	34
260	29	20	4	3	56
263	16	9	2	4	31
264	29	23	7	6	65
267	12	12	3	3	30
268	10	7	0	1	18
338	8	6	0	1	15
339	7	4	1	0	12
341	26	26	9	6	67
342	18	7	7	9	41
343	25	4	4	3	36
344	19	12	6	6	43
345	25	10	4	3	42
346	29	10	5	4	48
347	19	9	8	1	37
348	11	9	3	1	24
349	29	13	7	7	56
601	10	1	4	0	15
Total	**435**	**274**	**103**	**72**	**884**

Table 17. Total Deer Harvest by Permit Area, 2014.

Includes all license types, permits, and special hunts.

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
101	335	29	9	5	378
103	552	67	15	11	645
105	800	137	22	15	974
108	690	0	0	0	690
110	703	173	40	24	940
111	349	42	12	5	408
114	35	20	8	1	64
117	29	0	0	0	29
118	455	0	3	0	458
119	332	0	1	1	334
122	234	0	0	0	234
126	295	0	1	0	296
127	47	0	0	0	47
152	66	26	9	4	105
155	998	325	66	52	1,441
156	1039	200	54	40	1,333
157	1894	1402	388	274	3,958
159	824	218	49	33	1,124
169	962	3	0	2	967
171	909	267	60	38	1,274
172	1499	436	113	69	2,117
173	580	150	27	25	782
176	1091	0	1	1	1,093
177	575	0	2	0	577
178	1257	3	1	0	1,261
179	1442	361	79	57	1,939
180	545	6	1	0	552
181	699	3	1	3	706
182	510	663	131	97	1,401
183	784	170	34	30	1,018
184	2376	905	244	167	3,692
197	758	128	32	25	943
199	79	3	2	0	84
201	108	62	12	12	194
203	59	13	8	5	85
208	216	45	11	8	280
209	527	279	60	59	925
210	712	394	95	89	1,290
213	2326	715	205	146	3,392
214	1636	1015	398	311	3,360
215	1469	821	330	217	2,837
218	1069	770	242	167	2,248
219	638	497	149	114	1,398
221	1114	726	270	227	2,337
222	796	514	179	129	1,618
223	727	473	166	114	1,480
224	85	58	16	14	173
225	1357	827	282	199	2,665
227	1028	586	189	120	1,923
229	286	94	32	17	429
230	234	184	64	34	516
232	277	146	49	39	511
233	228	117	43	21	409
234	213	103	16	10	342
235	88	42	7	9	146
236	739	398	86	61	1,284
237	256	102	18	10	386
238	77	32	3	2	114
239	1435	959	298	208	2,900
240	1767	1056	331	316	3,470
241	3201	2276	702	558	6,737
242	584	251	73	40	948
246	1689	387	134	97	2,307
247	599	241	53	48	941
248	432	268	90	88	878
249	1052	971	280	229	2,532
250	325	117	19	15	476
251	82	27	11	4	124
252	314	146	36	20	516
253	509	180	39	15	743
254	549	301	90	67	1,007
255	474	237	70	47	828
256	480	297	67	71	915
257	398	237	60	32	727
258	805	234	70	59	1,168
259	1079	296	85	72	1,532
260	402	78	14	11	505
261	217	46	11	7	281
262	234	73	18	12	337
263	424	58	15	14	511
264	761	204	36	29	1,030
265	509	200	57	38	804
266	358	80	18	15	471
267	212	71	8	10	301
268	334	60	11	6	411
269	222	99	12	6	339
270	228	55	6	6	295
271	290	80	18	10	398
272	214	40	8	10	272
273	529	223	54	40	846
274	288	104	15	12	419
275	365	159	30	21	575
276	593	312	49	40	994
277	1446	747	140	115	2,448
278	422	124	24	17	587
279	223	138	16	14	391
280	234	137	15	10	396
281	544	180	28	20	772

Table 17. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
282	160	32	8	8	208
283	331	104	18	12	465
284	388	172	36	20	616
285	412	226	57	28	723
286	314	160	31	20	525
287	69	107	34	28	238
288	430	228	40	36	734
289	258	84	18	14	374
290	506	225	41	43	815
291	841	361	82	65	1,349
292	592	377	107	65	1,141
293	542	325	105	42	1,014
294	361	186	30	24	601
295	490	185	23	23	721
296	319	121	20	15	475
297	155	31	9	4	199
298	484	71	27	16	598
299	287	179	39	30	535
338	236	226	59	34	555
339	283	230	65	55	633
341	810	649	210	152	1,821
342	664	487	142	106	1,399
343	977	1095	287	218	2,577
344	443	425	90	108	1,066
345	547	358	100	90	1,095
346	1162	1323	408	384	3,277
347	573	330	99	80	1,082
348	618	398	104	81	1,201
349	1282	1742	450	439	3,913
601	1309	1537	366	278	3,490
901	6	11	0	0	17
902	30	32	10	5	77
904	1	9	1	1	12
905	1	7	3	1	12
906	6	12	2	2	22
907	3	2	0	0	5
908	3	1	1	1	6
909	1	4	2	2	9
910	1	9	4	2	16
912	0	0	0	1	1
913	0	4	3	0	7
914	9	8	3	2	22
916	29	13	2	1	45
918	1	5	1	1	8
919	0	12	2	2	16
921	1	5	0	1	7
924	0	5	0	0	5
925	3	1	0	0	4
926	24	37	9	7	77
927	1	28	6	8	43
929	11	26	8	4	49
931	9	25	12	9	55
933	11	20	9	6	46
934	0	23	0	1	24
935	5	21	4	2	32
936	1	1	1	2	5
937	1	4	0	0	5
938	2	3	0	0	5
939	0	5	3	0	8
940	1	10	2	1	14
941	4	13	12	2	31
943	0	13	1	5	19
944	1	1	1	0	3
945	11	13	3	2	29
946	0	0	1	0	1
947	1	2	1	0	4
950	3	5	1	1	10
951	8	5	3	0	16
953	0	0	1	0	1
954	0	1	2	0	3
955	1	1	0	0	2
956	8	4	1	0	13
958	0	2	0	0	2
959	2	3	1	0	6
960	0	1	1	0	2
961	1	2	1	1	5
965	3	0	0	0	3
966	4	1	0	0	5
967	2	4	1	0	7
968	4	2	0	0	6
969	1	1	0	0	2
970	24	34	6	6	70
971	28	27	9	4	68
975	0	6	0	1	7
976	0	21	12	6	39
977	12	21	4	6	43
979	3	12	1	0	16
980	72	239	68	65	444
981	0	2	1	0	3
982	1	0	0	0	1
983	2	19	2	0	23
984	0	3	0	0	3
985	0	11	5	3	19
988	1	4	1	0	6
990	0	17	2	2	21
991	1	6	0	0	7
992	0	4	0	3	7
993	0	3	1	1	5
995	1	26	9	9	45
996	2	8	1	1	12

Table 17. (Continued).

Permit Area	Adult Male	Adult Female	Fawn Male	Fawn Female	Total
998	0	1	0	0	1
TOTAL	**81,036**	**39,354**	**10,792**	**8,260**	**139,442**

Table 18. Estimated firearm hunter numbers, density, and harvest by Permit Area, 2014.

Excludes data from all 900-series hunts.

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
101	1,830	496	3.7	0.7
103	2,993	1,820	1.6	0.3
105	3,821	740	5.2	1.2
108	4,103	1,651	2.5	0.4
110	4,175	528	7.9	1.7
111	2,426	1,438	1.7	0.3
114	227	116	2.0	0.4
117	163	927	0.2	0.0
118	2,937	1,220	2.4	0.4
119	2,707	770	3.5	0.4
122	1,755	603	2.9	0.4
126	1,696	941	1.8	0.3
127	472	564	0.8	0.1
152	838	61	13.7	1.6
155	7,536	593	12.7	2.2
156	8,530	825	10.3	1.5
157	13,654	673	20.3	5.5
159	6,514	571	11.4	1.8
169	6,806	1,124	6.1	0.8
171	6,423	701	9.2	1.7
172	10,373	687	15.1	2.8
173	4,841	584	8.3	1.2
176	6,368	1,113	5.7	0.9
177	3,319	480	6.9	1.2
178	8,248	1,280	6.4	0.9
179	9,756	862	11.3	2.0
180	4,394	977	4.5	0.5
181	5,218	708	7.4	0.9
182	2,833	267	10.6	3.4
183	7,215	663	10.9	1.4
184	14,087	1,229	11.5	2.8
197	5,595	954	5.9	0.9
199	498	148	3.4	0.5
201	611	161	3.8	1.0
203	281	83	3.4	0.8
208	1,088	414	2.6	0.6
209	2,686	639	4.2	1.3
210	4,486	615	7.3	2.0
213	9,677	1,057	9.2	2.6
214	7,642	554	13.8	5.5
215	7,013	701	10.0	3.4
218	5,571	884	6.3	2.0
219	3,573	391	9.1	2.6

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
221	5,689	642	8.9	3.2
222	5,121	413	12.4	3.5
223	3,340	375	8.9	2.8
224	749	47	15.8	3.0
225	7,252	618	11.7	3.7
227	5,044	472	10.7	2.9
229	1,463	284	5.1	1.0
230	1,498	452	3.3	0.9
232	1,316	377	3.5	1.1
233	1,015	385	2.6	0.7
234	847	636	1.3	0.5
235	639	34	19.0	3.1
236	3,026	370	8.2	2.4
237	1,229	728	1.7	0.4
238	299	95	3.1	1.0
239	7,920	919	8.6	2.9
240	7,916	643	12.3	5.0
241	15,405	996	15.5	6.2
242	2,644	214	12.4	3.5
246	11,174	840	13.3	2.5
247	3,574	228	15.7	3.4
248	2,240	214	10.5	3.5
249	6,451	715	9.0	3.2
250	1,529	713	2.1	0.5
251	566	55	10.3	2.1
252	1,407	715	2.0	0.6
253	2,071	974	2.1	0.6
254	2,715	929	2.9	0.9
255	1,924	774	2.5	0.8
256	2,519	654	3.9	1.2
257	2,041	412	5.0	1.5
258	4,308	343	12.6	3.1
259	7,327	490	15.0	2.9
260	1,932	1,249	1.5	0.3
261	803	795	1.0	0.3
262	1,045	677	1.5	0.4
263	1,744	512	3.4	0.8
264	3,528	669	5.3	1.3
265	2,101	494	4.3	1.5
266	1,985	617	3.2	0.7
267	1,046	472	2.2	0.5
268	1,254	228	5.5	1.6
269	1,347	650	2.1	0.4

Table 18. (Continued).

Permit Area	Firearm Hunters	Area Size (sq mi)	Hunters/ mile^2	Harvest/ mile^2
270	1,022	747	1.4	0.3
271	1,092	632	1.7	0.5
272	1,117	531	2.1	0.5
273	2,812	571	4.9	1.2
274	1,123	354	3.2	0.9
275	1,939	764	2.5	0.6
276	3,104	542	5.7	1.5
277	6,454	812	8.0	2.3
278	1,942	402	4.8	1.0
279	1,195	344	3.5	0.9
280	1,447	675	2.1	0.5
281	2,431	575	4.2	1.0
282	877	778	1.1	0.2
283	1,545	613	2.5	0.6
284	1,724	837	2.1	0.6
285	2,417	549	4.4	1.0
286	1,471	446	3.3	0.9
287	642	46	14.0	4.9
288	1,863	625	3.0	0.9
289	1,018	815	1.2	0.4
290	2,273	662	3.4	1.0
291	3,900	800	4.9	1.2
292	3,053	479	6.4	1.9
293	2,623	511	5.1	1.5
294	1,360	686	2.0	0.7
295	2,158	839	2.6	0.7
296	1,866	667	2.8	0.6
297	1,095	438	2.5	0.4
298	3,351	618	5.4	0.9
299	1,540	386	4.0	1.0
338	2,104	454	4.6	0.9
339	1,862	393	4.7	1.2
341	5,116	612	8.4	2.3
342	3,876	349	11.1	3.2
343	4,742	663	7.2	2.5
344	3,218	189	17.0	4.6
345	2,859	322	8.9	2.6
346	4,670	318	14.7	7.8
347	2,901	434	6.7	1.9
348	3,319	332	10.0	3.0
349	6,320	490	12.9	6.0
601	3,082	1,625	1.9	0.5
Total	**448,545**	**78,855**	**5.7**	**1.4**

Area Size = Total land area (not water) within the DPA, area estimates were recalculated in 2014

Table 19. Deer harvest per square mile by season, 2014.

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	0.03	0.68	0.02		0.03	0.76
103	1,820	0.01	0.35	0.00			0.35
105	740	0.04	1.18	0.02		0.08	1.32
108	1,651	0.02	0.40	0.00		0.00	0.42
110	528	0.06	1.70	0.02			1.78
111	1,438	0.00	0.27	0.00		0.01	0.28
114	116	0.08	0.42	0.03		0.02	0.55
117	927	0.00	0.03	0.00			0.03
118	1,220	0.01	0.36	0.01			0.38
119	770	0.00	0.43	0.00			0.43
122	603	0.00	0.38	0.00			0.39
126	941	0.01	0.29	0.01			0.31
127	564	0.00	0.08	0.00			0.08
152	61	0.08	1.64	0.00			1.72
155	593	0.17	2.24	0.02			2.43
156	825	0.11	1.50	0.00			1.62
157	673	0.29	5.50	0.10			5.89
159	571	0.13	1.83	0.01			1.96
169	1,124	0.02	0.83	0.01			0.86
171	701	0.11	1.70	0.01			1.82
172	687	0.25	2.80	0.03			3.08
173	584	0.09	1.24	0.01			1.34
176	1,113	0.03	0.95	0.00			0.98
177	480	0.04	1.16	0.00			1.20
178	1,280	0.05	0.93	0.01			0.99
179	862	0.20	2.03	0.02			2.25
180	977	0.04	0.52	0.01			0.57
181	708	0.08	0.91	0.00			1.00
182	267	1.72	3.44	0.09			5.24
183	663	0.12	1.40	0.02			1.54
184	1,229	0.19	2.77	0.04			3.00
197	954	0.05	0.93	0.01			0.99
199	148	0.01	0.55	0.01			0.57
201	161	0.05	1.02	0.08		0.06	1.20
203	83	0.00	0.81	0.18		0.04	1.03
208	414	0.02	0.57	0.03		0.06	0.68
209	639	0.06	1.25	0.06		0.07	1.45
210	615	0.07	1.97	0.05			2.10
213	1,057	0.46	2.65	0.11			3.21
214	554	0.33	5.55	0.19			6.06
215	701	0.44	3.36	0.24			4.05
218	884	0.30	2.03	0.21			2.54
219	391	0.63	2.58	0.36			3.57
221	642	0.29	3.16	0.18			3.64
222	413	0.29	3.48	0.14			3.91
223	375	0.92	2.76	0.27			3.94
224	47	0.61	2.98	0.06			3.66
225	618	0.49	3.66	0.16			4.31
227	472	0.89	2.90	0.28			4.08

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
229	284	0.40	1.01	0.09			1.51
230	452	0.14	0.94	0.06			1.14
232	377	0.17	1.11	0.08			1.36
233	385	0.21	0.73	0.13			1.06
234	636	0.05	0.45	0.03			0.54
235	34	0.98	3.06	0.21			4.24
236	370	0.85	2.42	0.20			3.47
237	728	0.05	0.42	0.06			0.53
238	95	0.12	1.01	0.07			1.20
239	919	0.20	2.87	0.09			3.16
240	643	0.30	4.95	0.15			5.40
241	996	0.41	6.15	0.20			6.77
242	214	0.87	3.47	0.09			4.43
246	840	0.19	2.52	0.04			2.75
247	228	0.64	3.38	0.11			4.12
248	214	0.38	3.55	0.12			4.05
249	715	0.24	3.17	0.13			3.54
250	713	0.11	0.50	0.06			0.67
251	55	0.11	2.09	0.05			2.25
252	715	0.09	0.58	0.05			0.72
253	974	0.14	0.56	0.06			0.76
254	929	0.15	0.86	0.08			1.08
255	774	0.19	0.80	0.08			1.07
256	654	0.05	1.23	0.05		0.07	1.40
257	412	0.09	1.52	0.08		0.08	1.76
258	343	0.22	3.15	0.04			3.41
259	490	0.20	2.88	0.05			3.13
260	1,249	0.02	0.32	0.02		0.04	0.40
261	795	0.03	0.30	0.02		0.00	0.35
262	677	0.08	0.40	0.02			0.50
263	512	0.03	0.85	0.06		0.06	1.00
264	669	0.05	1.31	0.07		0.10	1.54
265	494	0.07	1.48	0.08			1.63
266	617	0.04	0.69	0.03			0.76
267	472	0.04	0.52	0.02		0.06	0.64
268	228	0.04	1.60	0.08		0.08	1.80
269	650	0.07	0.41	0.04			0.52
270	747	0.03	0.32	0.04			0.39
271	632	0.06	0.52	0.05			0.63
272	531	0.03	0.46	0.02			0.51
273	571	0.16	1.22	0.09			1.48
274	354	0.13	0.93	0.12			1.18
275	764	0.07	0.61	0.07			0.75
276	542	0.18	1.50	0.16			1.83
277	812	0.46	2.33	0.23			3.02
278	402	0.21	1.05	0.20			1.46
279	344	0.08	0.90	0.15			1.14

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	675	0.05	0.50	0.03			0.59
281	575	0.22	1.02	0.11			1.34
282	778	0.06	0.20	0.01			0.27
283	613	0.13	0.56	0.07			0.76
284	837	0.08	0.61	0.05			0.74
285	549	0.24	1.02	0.06			1.32
286	446	0.12	0.93	0.13			1.18
287	46	0.00	4.92	0.28			5.21
288	625	0.21	0.87	0.10			1.18
289	815	0.06	0.36	0.03			0.46
290	662	0.16	0.95	0.12			1.23
291	800	0.32	1.24	0.13			1.69
292	479	0.31	1.90	0.17			2.38
293	511	0.36	1.45	0.17			1.98
294	686	0.07	0.74	0.07			0.88
295	839	0.12	0.68	0.06			0.86
296	667	0.07	0.57	0.07			0.71
297	438	0.02	0.42	0.02			0.45
298	618	0.03	0.93	0.01			0.97
299	386	0.30	1.00	0.09			1.39
338	454	0.19	0.92	0.08		0.03	1.22
339	393	0.28	1.24	0.06		0.03	1.61
341	612	0.41	2.32	0.13		0.11	2.97
342	349	0.48	3.15	0.22		0.12	3.97
343	663	1.15	2.49	0.19		0.05	3.89
344	189	0.50	4.63	0.26		0.23	5.63
345	322	0.41	2.56	0.11		0.13	3.20
346	318	1.80	7.37	0.56	0.43	0.15	10.31
347	434	0.37	1.91	0.13		0.09	2.50
348	332	0.43	2.96	0.16		0.07	3.62
349	490	1.27	5.85	0.55	0.19	0.11	7.98
601	1,625	1.68	0.45	0.00		0.01	2.15
Total	**78,855**	**0.22**	**1.46**	**0.07**	**0.01**	**0.00**	**1.75**

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

Area Size = Total land area (not water) within the DPA, area estimates were recalculated in 2014
EA harvest is reported based on total permit area; actual harvest density is higher due to sub-permit area designation

Table 20. Harvest using Depredation Permits, by Permit Area, 2014.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
342	9	2	2	13
345	45	9	8	62
TOTAL	**54**	**11**	**10**	**75**

Table 21. 2014 Firearm Lottery Distribution Report.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
101	1	191	0	191	0	**24**	**0.0%**
	2	257	0	236	21		
	3	2	0	0	2		
	4	1	0	0	1		
		451	**0**	**427**	**24**		
103	1	330	2	330	0	**49**	**0.0%**
	2	336	0	336	0		
	3	422	0	388	34		
	4	10	0	0	10		
	5	4	0	0	4		
	6	1	0	0	1		
		1,103	**2**	**1,054**	**49**		
105	1	543	0	543	0	**99**	**0.0%**
	2	812	1	720	92		
	3	6	0	0	6		
	9	1	0	0	1		
		1,362	**1**	**1,263**	**99**		
110	1	1,925	2	1,705	220	**347**	**0.0%**
	2	108	0	0	108		
	3	14	0	0	14		
	4	5	0	0	5		
		2,052	**2**	**1,705**	**347**		
111	1	338	1	338	0	**49**	**0.0%**
	2	454	0	408	46		
	3	3	0	0	3		
		795	**1**	**746**	**49**		
152	1	257	0	87	170	**194**	**0.0%**
	2	21	0	0	21		
	3	3	0	0	3		
		281	**0**	**87**	**194**		
155	1	2,865	0	2,865	0	**493**	**0.0%**
	2	528	0	70	458		
	3	29	0	0	29		
	4	5	0	0	5		
	5	1	0	0	1		
		3,428	**0**	**2,935**	**493**		
156	1	3,203	5	3,190	13	**296**	**0.0%**
	2	233	0	0	233		
	3	39	0	0	39		
	4	7	0	0	7		
	5	2	0	0	2		
	5	2	0	0	2		
		3,486	**5**	**3,190**	**296**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
159	1	2,240	4	1,914	326	**493**	**0.0%**
	2	136	0	0	136		
	3	26	0	0	26		
	4	4	0	0	4		
	5	1	0	0	1		
		2,407	**4**	**1,914**	**493**		
171	1	1,673	1	1,673	0	**295**	**0.0%**
	2	1,479	0	1,205	274		
	3	16	1	0	16		
	4	4	0	0	4		
	5	1	0	0	1		
		3,173	**2**	**2,878**	**295**		
172	1	2,449	0	2,449	0	**492**	**0.0%**
	2	2,370	0	2,370	0		
	3	481	2	0	481		
	4	6	0	0	6		
	5	2	0	0	2		
	6	1	0	0	1		
	9	2	0	0	2		
		5,311	**2**	**4,819**	**492**		
173	1	1,762	1	1,762	0	**297**	**0.0%**
	2	379	1	107	272		
	3	18	0	0	18		
	4	6	0	0	6		
	9	1	0	0	1		
		2,166	**2**	**1,869**	**297**		
179	1	3,453	4	3,453	0	**495**	**0.0%**
	2	518	1	89	429		
	3	51	0	0	51		
	4	9	0	0	9		
	5	3	0	0	3		
	6	3	0	0	3		
		4,037	**5**	**3,542**	**495**		
183	1	2,317	0	2,317	0	**98**	**0.0%**
	2	672	0	599	73		
	3	21	2	0	21		
	4	2	0	0	2		
	5	2	1	0	2		
		3,014	**3**	**2,916**	**98**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
184	1	5,583	7	3,878	1,705	**2,949**	**0.0%**
	2	1,220	4	0	1,220		
	3	14	0	0	14		
	4	3	0	0	3		
	5	4	0	0	4		
	9	3	0	0	3		
		6,827	**11**	**3,878**	**2,949**		
197	1	1,561	0	1,561	0	**198**	**0.0%**
	2	862	0	683	179		
	3	16	0	0	16		
	4	2	0	0	2		
	5	1	0	0	1		
		2,442	**0**	**2,244**	**198**		
203	1	72	0	72	0	**25**	**0.0%**
	2	39	0	15	24		
	3	1	0	0	1		
		112	**0**	**87**	**25**		
208	1	325	4	263	62	**98**	**0.0%**
	2	33	0	0	33		
	3	2	0	0	2		
	5	1	0	0	1		
		361	**4**	**263**	**98**		
213	1	4,051	4	2,753	1,298	**1,936**	**0.0%**
	2	610	0	0	610		
	3	20	0	0	20		
	4	7	0	0	7		
	5	1	0	0	1		
		4,689	**4**	**2,753**	**1,936**		
229	1	423	0	193	230	**292**	**0.0%**
	2	56	0	0	56		
	3	3	0	0	3		
	4	3	0	0	3		
		485	**0**	**193**	**292**		
234	1	248	1	20	228	**273**	**0.0%**
	2	45	0	0	45		
		293	**1**	**20**	**273**		
237	1	217	0	180	37	**185**	**0.0%**
	2	128	0	0	128		
	3	18	0	0	18		
	4	2	0	0	2		
		365	**0**	**180**	**185**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
238	1	77	0	9	68	**96**	**0.0%**
	2	23	0	0	23		
	3	5	0	0	5		
		105	**0**	**9**	**96**		
242	1	881	1	505	376	**487**	**0.0%**
	2	96	0	0	96		
	3	11	0	0	11		
	4	4	0	0	4		
		992	**1**	**505**	**487**		
246	1	4,325	1	4,325	0	**492**	**0.0%**
	2	972	1	550	422		
	3	60	0	0	60		
	4	9	0	0	9		
	9	1	0	0	1		
		5,367	**2**	**4,875**	**492**		
247	1	845	1	845	0	**290**	**0.0%**
	2	750	0	481	269		
	3	18	0	0	18		
	4	3	0	0	3		
		1,616	**1**	**1,326**	**290**		
250	1	377	0	371	6	**267**	**0.0%**
	2	232	0	0	232		
	3	28	0	0	28		
	5	1	0	0	1		
		638	**0**	**371**	**267**		
251	1	189	0	162	27	**96**	**0.0%**
	2	69	0	0	69		
		258	**0**	**162**	**96**		
252	1	345	0	185	160	**367**	**0.0%**
	2	179	0	0	179		
	3	28	0	0	28		
		552	**0**	**185**	**367**		
253	1	423	0	423	0	**266**	**0.0%**
	2	229	0	85	144		
	3	122	0	0	122		
		774	**0**	**508**	**266**		
258	1	1,768	1	1,620	148	**490**	**0.0%**
	2	332	0	0	332		
	3	9	0	0	9		
	5	1	0	0	1		
		2,110	**1**	**1,620**	**490**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
259	1	2,677	1	2,677	0	**487**	**0.0%**
	2	957	0	507	450		
	3	28	0	0	28		
	4	7	0	0	7		
	5	1	0	0	1		
	9	1	0	0	1		
		3,671	**1**	**3,184**	**487**		
260	1	379	0	379	0	**97**	**0.0%**
	2	213	0	116	97		
		592	**0**	**495**	**97**		
261	1	181	0	77	104	**140**	**0.0%**
	2	36	0	0	36		
		217	**0**	**77**	**140**		
262	1	300	0	263	37	**136**	**0.0%**
	2	95	0	0	95		
	3	4	0	0	4		
		399	**0**	**263**	**136**		
263	1	357	0	357	0	**97**	**0.0%**
	2	305	1	208	97		
	3	0	1	0	0		
		662	**2**	**565**	**97**		
264	1	876	0	876	0	**492**	**0.0%**
	2	557	0	67	490		
	3	1	0	0	1		
	4	1	0	0	1		
		1,435	**0**	**943**	**492**		
265	1	611	0	327	284	**486**	**0.0%**
	2	202	0	0	202		
	3	0	1	0	0		
		813	**1**	**327**	**486**		
266	1	517	0	517	0	**140**	**0.0%**
	2	221	0	81	140		
		738	**0**	**598**	**140**		
267	1	176	0	176	0	**98**	**0.0%**
	2	140	1	44	96		
	3	1	0	0	1		
	9	1	0	0	1		
		318	**1**	**220**	**98**		
268	1	208	1	208	0	**96**	**0.0%**
	2	252	0	158	94		
	3	2	0	0	2		
		462	**1**	**366**	**96**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
269	1	317	1	317	0	**229**	**0.0%**
	2	238	0	13	225		
	3	3	0	0	3		
	4	1	0	0	1		
		559	**1**	**330**	**229**		
270	1	225	0	225	0	**91**	**0.0%**
	2	114	0	48	66		
	3	25	0	0	25		
		364	**0**	**273**	**91**		
271	1	291	0	172	119	**224**	**0.0%**
	2	100	0	0	100		
	3	4	0	0	4		
	4	1	0	0	1		
		396	**0**	**172**	**224**		
272	1	238	0	238	0	**97**	**0.0%**
	2	169	0	83	86		
	3	9	0	0	9		
	4	1	0	0	1		
	9	1	0	0	1		
		418	**0**	**321**	**97**		
273	1	1,166	0	343	823	**947**	**0.0%**
	2	112	0	0	112		
	3	9	0	0	9		
	4	2	0	0	2		
	5	1	0	0	1		
		1,290	**0**	**343**	**947**		
274	1	245	2	245	0	**215**	**0.0%**
	2	180	0	30	150		
	3	61	0	0	61		
	4	4	0	0	4		
		490	**2**	**275**	**215**		
275	1	461	1	292	169	**468**	**0.0%**
	2	254	2	0	254		
	3	40	0	0	40		
	4	4	0	0	4		
	5	1	0	0	1		
		760	**3**	**292**	**468**		
276	1	1,070	3	414	656	**1,015**	**0.0%**
	2	340	0	0	340		
	3	17	0	0	17		
	4	2	0	0	2		
		1,429	**3**	**414**	**1,015**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
277	1	2,205	0	1,268	937	**1,835**	**0.0%**
	2	869	0	0	869		
	3	27	1	0	27		
	4	2	0	0	2		
		3,103	**1**	**1,268**	**1,835**		
278	1	464	0	464	0	**174**	**0.0%**
	2	328	1	271	57		
	3	112	0	0	112		
	4	4	2	0	4		
	5	1	0	0	1		
		909	**3**	**735**	**174**		
279	1	430	0	12	418	**533**	**0.0%**
	2	100	0	0	100		
	3	15	0	0	15		
		545	**0**	**12**	**533**		
280	1	365	0	177	188	**371**	**0.0%**
	2	169	0	0	169		
	3	11	0	0	11		
	4	3	0	0	3		
		548	**0**	**177**	**371**		
281	1	486	0	486	0	**264**	**0.0%**
	2	301	0	153	148		
	3	116	0	0	116		
		903	**0**	**639**	**264**		
282	1	78	0	78	0	**23**	**0.0%**
	2	55	0	55	0		
	3	48	0	36	12		
	4	11	0	0	11		
		192	**0**	**169**	**23**		
283	1	244	0	244	0	**183**	**0.0%**
	2	162	0	143	19		
	3	160	0	0	160		
	4	4	0	0	4		
		570	**0**	**387**	**183**		
284	1	367	0	367	0	**276**	**0.0%**
	2	178	0	107	71		
	3	187	0	0	187		
	4	17	0	0	17		
	5	1	0	0	1		
		750	**0**	**474**	**276**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
285	1	886	1	127	759	**1,012**	**0.0%**
	2	238	1	0	238		
	3	14	0	0	14		
	4	1	0	0	1		
		1,139	**2**	**127**	**1,012**		
286	1	444	0	240	204	**353**	**0.0%**
	2	120	2	0	120		
	3	25	0	0	25		
	4	3	0	0	3		
	5	1	0	0	1		
		593	**2**	**240**	**353**		
288	1	469	1	240	229	**444**	**0.0%**
	2	184	0	0	184		
	3	23	0	0	23		
	4	7	0	0	7		
	9	1	0	0	1		
		684	**1**	**240**	**444**		
289	1	228	0	176	52	**182**	**0.0%**
	2	98	0	0	98		
	3	27	0	0	27		
	4	5	0	0	5		
		358	**0**	**176**	**182**		
290	1	498	1	498	0	**345**	**0.0%**
	2	348	0	194	154		
	3	189	0	0	189		
	4	2	0	0	2		
		1,037	**1**	**692**	**345**		
291	1	913	0	913	0	**711**	**0.0%**
	2	684	0	122	562		
	3	149	0	0	149		
		1,746	**0**	**1,035**	**711**		
294	1	410	0	29	381	**459**	**0.0%**
	2	64	0	0	64		
	3	13	0	0	13		
	4	1	0	0	1		
		488	**0**	**29**	**459**		
295	1	378	0	378	0	**267**	**0.0%**
	2	285	0	220	65		
	3	199	1	0	199		
	4	3	0	0	3		
		865	**1**	**598**	**267**		

Table 21. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
296	1	422	0	422	0	**265**	**0.0%**
	2	245	0	130	115		
	3	147	0	0	147		
	4	3	1	0	3		
		817	**1**	**552**	**265**		
297	1	206	0	206	0	**96**	**0.0%**
	2	119	0	24	95		
	3	1	0	0	1		
		326	**0**	**230**	**96**		
298	1	666	1	666	0	**98**	**0.0%**
	2	512	0	424	88		
	3	9	0	0	9		
	4	1	0	0	1		
		1,188	**1**	**1,090**	**98**		
299	1	374	1	328	46	**352**	**0.0%**
	2	239	0	0	239		
	3	67	0	0	67		
		680	**1**	**328**	**352**		
TOTAL		**93,506**	**83**	**67,180**	**26,326**	**26,326**	

Table 22. 2014 Muzzleloader Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
101	1	5	0	5	0	**1**	**0.0%**
	2	2	0	1	1		
		7	**0**	**6**	**1**		
103	1	5	0	5	0	**1**	**0.0%**
	2	9	0	9	0		
	3	1	0	0	1		
		15	**0**	**14**	**1**		
105	1	4	0	4	0	**1**	**0.0%**
	2	6	0	5	1		
		10	**0**	**9**	**1**		
110	1	18	0	17	1	**3**	**0.0%**
	2	1	0	0	1		
	3	1	0	0	1		
		20	**0**	**17**	**3**		
111	1	7	0	7	0	**1**	**0.0%**
	2	5	0	4	1		
		12	**0**	**11**	**1**		
152	1	8	0	2	6	**6**	**0.0%**
		8	**0**	**2**	**6**		
155	1	40	0	38	2	**7**	**0.0%**
	2	4	0	0	4		
	4	1	0	0	1		
		45	**0**	**38**	**7**		
156	1	38	0	37	1	**4**	**0.0%**
	2	2	0	0	2		
	3	1	0	0	1		
		41	**0**	**37**	**4**		
159	1	32	0	27	5	**7**	**0.0%**
	2	2	0	0	2		
		34	**0**	**27**	**7**		
171	1	33	0	33	0	**5**	**0.0%**
	2	16	0	12	4		
	3	1	0	0	1		
		50	**0**	**45**	**5**		
172	1	43	0	43	0	**8**	**0.0%**
	2	40	0	32	8		
		83	**0**	**75**	**8**		
173	1	22	0	21	1	**3**	**0.0%**
	2	2	0	0	2		
		24	**0**	**21**	**3**		
179	1	37	0	33	4	**5**	**0.0%**
	2	1	0	0	1		
		38	**0**	**33**	**5**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
183	1	48	0	48	0	**2**	**0.0%**
	2	11	0	9	2		
		59	**0**	**57**	**2**		
184	1	96	0	66	30	**51**	**0.0%**
	2	19	0	0	19		
	4	2	0	0	2		
		117	**0**	**66**	**51**		
197	1	20	0	20	0	**2**	**0.0%**
	2	8	0	6	2		
		28	**0**	**26**	**2**		
208	1	7	0	5	2	**2**	**0.0%**
		7	**0**	**5**	**2**		
213	1	138	0	87	51	**64**	**0.0%**
	2	13	0	0	13		
		151	**0**	**87**	**64**		
229	1	10	0	5	5	**8**	**0.0%**
	2	2	0	0	2		
	4	1	0	0	1		
		13	**0**	**5**	**8**		
234	1	26	0	0	26	**27**	**0.0%**
	2	1	0	0	1		
		27	**0**	**0**	**27**		
237	1	16	0	12	4	**15**	**0.0%**
	2	11	0	0	11		
		27	**0**	**12**	**15**		
238	1	3	0	0	3	**4**	**0.0%**
	2	1	0	0	1		
		4	**0**	**0**	**4**		
242	1	23	0	12	11	**13**	**0.0%**
	2	2	0	0	2		
		25	**0**	**12**	**13**		
246	1	79	0	79	0	**8**	**0.0%**
	2	7	0	0	7		
	3	1	0	0	1		
		87	**0**	**79**	**8**		
247	1	34	0	34	0	**10**	**0.0%**
	2	19	0	12	7		
	3	3	0	0	3		
		56	**0**	**46**	**10**		
250	1	53	0	38	15	**33**	**0.0%**
	2	18	0	0	18		
		71	**0**	**38**	**33**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
251	1	8	0	6	2	**4**	**0.0%**
	2	2	0	0	2		
		10	**0**	**6**	**4**		
252	1	30	0	13	17	**33**	**0.0%**
	2	16	0	0	16		
		46	**0**	**13**	**33**		
253	1	65	0	54	11	**34**	**0.0%**
	2	22	0	0	22		
	3	1	0	0	1		
		88	**0**	**54**	**34**		
258	1	35	0	32	3	**10**	**0.0%**
	2	7	0	0	7		
		42	**0**	**32**	**10**		
259	1	80	0	80	0	**13**	**0.0%**
	2	16	0	6	10		
	3	1	0	0	1		
	4	2		0	2		
		99	**0**	**86**	**13**		
260	1	13	0	13	0	**3**	**0.0%**
	2	3	0	0	3		
		16	**0**	**13**	**3**		
261	1	11	0	4	7	**10**	**0.0%**
	2	3	0	0	3		
		14	**0**	**4**	**10**		
262	1	28	0	24	4	**14**	**0.0%**
	2	10	0	0	10		
		38	**0**	**24**	**14**		
263	1	14	0	14	0	**3**	**0.0%**
	2	3	0	0	3		
		17	**0**	**14**	**3**		
264	1	15	0	15	0	**8**	**0.0%**
	2	8	0	0	8		
		23	**0**	**15**	**8**		
265	1	20	0	9	11	**14**	**0.0%**
	2	3	0	0	3		
		23	**0**	**9**	**14**		
266	1	34	0	34	0	**10**	**0.0%**
	2	13	0	3	10		
		47	**0**	**37**	**10**		
267	1	3	0	3	0	**2**	**0.0%**
	2	2	0	0	2		
		5	**0**	**3**	**2**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
268	1	8	0	8	0	**4**	**0.0%**
	3	9	0	5	4		
		17	**0**	**13**	**4**		
269	1	28	0	25	3	**21**	**0.0%**
	2	18	0	0	18		
		46	**0**	**25**	**21**		
270	1	26	0	25	1	**9**	**0.0%**
	2	8	0	0	8		
		34	**0**	**25**	**9**		
271	1	35	0	15	20	**26**	**0.0%**
	2	5	0	0	5		
	3	1	0	0	1		
		41	**0**	**15**	**26**		
272	1	10	0	10	0	**3**	**0.0%**
	2	3	0	0	3		
		13	**0**	**10**	**3**		
273	1	61	0	15	46	**53**	**0.0%**
	2	7	0	0	7		
		68	**0**	**15**	**53**		
274	1	51	0	33	18	**35**	**0.0%**
	2	17	0	0	17		
		68	**0**	**33**	**35**		
275	1	35	0	16	19	**32**	**0.0%**
	2	13	0	0	13		
		48	**0**	**16**	**32**		
276	1	94	0	25	69	**85**	**0.0%**
	2	16	0	0	16		
		110	**0**	**25**	**85**		
277	1	189	0	91	98	**165**	**0.0%**
	2	63	0	0	63		
	3	3	0	0	3		
	9	1	0	0	1		
		256	**0**	**91**	**165**		
278	1	77	0	77	0	**26**	**0.0%**
	2	39	0	13	26		
		116	**0**	**90**	**26**		
279	1	64	0	0	64	**67**	**0.0%**
	2	3	0	0	3		
		67	**0**	**0**	**67**		
280	1	31	0	11	20	**29**	**0.0%**
	2	9	0	0	9		
		40	**0**	**11**	**29**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available	% Under-Subscribed
		Total	Rejected				
281	1	65	0	65	0	**36**	**0.0%**
	2	42	0	7	35		
	9	1	0	0	1		
		108	**0**	**72**	**36**		
282	1	6	0	6	0	**2**	**0.0%**
	2	2	0	2	0		
	3	3	0	2	1		
	4	1		0	1		
		12	**0**	**10**	**2**		
283	1	22	0	22	0	**17**	**0.0%**
	2	20	0	9	11		
	3	6	0	0	6		
		48	**0**	**31**	**17**		
284	1	36	0	35	1	**24**	**0.0%**
	2	17	0	0	17		
	3	6	0	0	6		
		59	**0**	**35**	**24**		
285	1	82	0	3	79	**88**	**0.0%**
	2	9	0	0	9		
		91	**0**	**3**	**88**		
286	1	62	0	23	39	**47**	**0.0%**
	2	8	0	0	8		
		70	**0**	**23**	**47**		
288	1	57	0	20	37	**56**	**0.0%**
	2	18	0	0	18		
	3	1	0	0	1		
		76	**0**	**20**	**56**		
289	1	24	0	15	9	**18**	**0.0%**
	2	9	0	0	9		
		33	**0**	**15**	**18**		
290	1	85	0	85	0	**55**	**0.0%**
	2	49	0	3	46		
	3	9	0	0	9		
		143	**0**	**88**	**55**		
291	1	122	0	105	17	**89**	**0.0%**
	2	71	0	0	71		
	3	1	0	0	1		
		194	**0**	**105**	**89**		
294	1	36	0	0	36	**41**	**0.0%**
	2	5	0	0	5		
		41	**0**	**0**	**41**		

Table 22. Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available	% Under-Subscribed
295	1	47	0	47	0	**33**	**0.0%**
	2	43	0	16	27		
	3	6	0	0	6		
		96	**0**	**63**	**33**		
296	1	60	0	59	1	**35**	**0.0%**
	2	26	0	0	26		
	3	8	0	0	8		
		94	**0**	**59**	**35**		
297	1	8	0	8	0	**4**	**0.0%**
	2	4	0	0	4		
		12	**0**	**8**	**4**		
298	1	13	0	13	0	**2**	**0.0%**
	2	5	0	3	2		
		18	**0**	**16**	**2**		
299	1	46	0	33	13	**48**	**0.0%**
	2	34	0	0	34		
	3	1	0	0	1		
		81	**0**	**33**	**48**		
TOTAL		**3,627**	**0**	**2,028**	**1,599**	**1,599**	

Table 23. 2014 Special Permit Areas for Firearms Hunters.

Special Hunt	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
901 - Rice Lake NWR	1	46	0	32	14	**40**
	2	23	0	0	23	
	3	5	0	0	5	
		74	**0**	**32**	**42**	
902 - Saint Croix State Park	1	360	0	269	91	**300**
	2	195	0	0	195	
	3	14	0	0	14	
		569	**0**	**269**	**300**	
904 - Gooseberry Falls State Park	1	44	0	22	22	**40**
	2	17	0	0	17	
	3	1	0	0	1	
		62	**0**	**22**	**40**	
905 - Split Rock Lighthouse State Park	1	34	0	3	31	**35**
	2	4	0	0	4	
		38	**0**	**3**	**35**	
906 - Tettegouche State Park	1	110	0	0	110	**135**
	2	6	0	0	6	
	3	1	0	0	1	
		117	**0**	**0**	**117**	
907 - Scenic State Park	1	33	0	10	23	**30**
	2	7	0	0	7	
		40	**0**	**10**	**30**	
908 - Hayes Lake State Park	1	32	0	0	32	**75**
	2	15	0	0	15	
		47	**0**	**0**	**47**	
909 - Lake Bemidji State Park	1	31	0	4	27	**30**
	2	2	0	0	2	
	3	1	0	0	1	
		34	**0**	**4**	**30**	
910 - Zippel Bay State Park	1	50	0	6	44	**55**
	2	11	0	0	11	
		61	**0**	**6**	**55**	
913 - Lake Carlos State Park	1	26	0	9	17	**17**
	2	2	0	0	2	
		28	**0**	**9**	**19**	
914 - William O'Brien State Park	1	143	0	143	0	**50**
	2	75	0	29	46	
	3	4	0	0	4	
		222	**0**	**172**	**50**	

Table 23. Continued.

Special Hunt	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	Rejected			
916 - Maplewood State Park	1	116	0	116	0	**100**
	2	117	0	117	0	
	3	100	0	39	61	
	4	37	0	0	37	
	9	2	0	0	2	
		372	**0**	**272**	**100**	
918 - Lake Alexander Woods SNA	1	30	0	21	9	**40**
	2	31	0	0	31	
		61	**0**	**21**	**40**	
919 - Glacial Lakes State Park	1	30	0	0	30	**30**
	2	1	0	0	1	
		31	**0**	**0**	**31**	
921 - Beaver Creek Valley State Park	1	76	0	76	0	**20**
	2	54	0	40	14	
	3	7	0	0	7	
		137	**0**	**116**	**21**	
924 - Whitewater State Game Refuge (A)	1	35	0	0	35	**50**
	2	5	0	0	5	
		40	**0**	**0**	**40**	
925 - Vermillion Highlands Research, Recreation, and WMA	1	45	0	45	0	**17**
	2	24	0	18	6	
	3	12	0	0	12	
		81	**0**	**63**	**18**	
925 - Vermillion Highlands Research, Recreation, and WMA	1	8	0	8	0	**3**
	2	4	0	0	4	
		12	**0**	**8**	**4**	
926 - Elm Creek Park Reserve	1	237	0	237	0	**137**
	2	152	0	52	100	
	3	38	0	0	38	
	9	1	0	0	1	
		428	**0**	**289**	**139**	
926 - Elm Creek Park Reserve	1	28	0	27	1	**13**
	2	8	0	0	8	
	3	4	0	0	4	
		40	**0**	**27**	**13**	
927 - Whitewater State Park (B)	1	82	0	78	4	**50**
	2	46	0	0	46	
	3	1	0	0	1	
	4	1	0	0	1	
		130	**0**	**78**	**52**	
929 - Frontenac State Park - B	1	64	0	32	32	**60**
	2	29	0	0	29	
		93	**0**	**32**	**61**	

Table 23. Continued.

Special Hunt	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	Rejected			
931 - City of Grand Rapids	1	43	0	0	43	**44**
	2	1	0	0	1	
		44	**0**	**0**	**44**	
933 - Lake Rebecca Park Reserve	1	142	0	135	7	**75**
	2	59	0	0	59	
	3	8	0	0	8	
	4	1	0	0	1	
		210	**0**	**135**	**75**	
933 - Lake Rebecca Park Reserve	1	7	0	7	0	**5**
	2	5	0	0	5	
	3	1	0	0	1	
		13	**0**	**7**	**6**	
934 - Whitewater State Game Refuge (B)	1	75	0	13	62	**75**
	2	14	0	0	14	
	3	1	0	0	1	
		90	**0**	**13**	**77**	
Total		**3,074**	**0**	**1,588**	**1,486**	**1,526**

Table 24. 2014 Special Permit Areas for Muzzleloader Hunts.

Permit Area Number	Preference Level	Applications: Total	Applications: Rejected	Unsuccessful	Winners	Permits Available
935 - Jay Cooke SP	1	102	0	85	17	**120**
	2	95	0	0	95	
	3	9	0	0	9	
		206	**0**	**85**	**121**	
936 - Crow Wing SP	1	38	0	38	0	**25**
	2	24	0	24	0	
	3	28	0	13	15	
	4	12	0	0	12	
		102	**0**	**75**	**27**	
937 - Soudan Underground Mine and Lake Vermilion SP	1	25	0	9	16	**20**
	2	4	0	0	4	
		29	**0**	**9**	**20**	
938 - City of Tower	1	7	0	0	7	**20**
		7	**0**	**0**	**7**	
939 - Lake Shetek SP	1	32	0	32	0	**15**
	2	25	0	18	7	
	3	9	0	0	9	
		66	**0**	**50**	**16**	
940 - Lake Maria SP	1	76	0	76	0	**25**
	2	45	0	45	0	
	3	26	0	2	24	
	9	1	0	0	1	
		148	**0**	**123**	**25**	
941 - Nerstrand Big Woods SP	1	109	0	109	0	**50**
	2	74	0	74	0	
	3	54	0	2	52	
		237	**0**	**185**	**52**	
943 - Rice Lake SP	1	35	0	32	3	**20**
	2	11	0	0	11	
	3	7	0	0	7	
		53	**0**	**32**	**21**	
944 - Vermilion Highlands WMA	1	27	0	27	0	**20**
	2	14	0	14	0	
	3	19	0	0	19	
	9	1	0	0	1	
		61	**0**	**41**	**20**	
946 - City of Grand Rapids	1	13	0	0	13	**16**
	2	1	0	0	1	
	3	2	0	0	2	
		16	**0**	**0**	**16**	
947 - Lake Bemidji State Park	1	30	0	6	24	**30**
	2	6	0	0	6	
		36	**0**	**6**	**30**	
TOTAL		**961**	**0**	**606**	**355**	**361**

GRAND TOTAL		**101,168**	**83**	**71,402**	**29,766**	**29,812**

2014 MINNESOTA ELK HARVEST REPORT

Leslie McInenly, Big Game Program Leader
Ruth Anne Franke, Area Wildlife Supervisor
Graham Parson, Asst. Area Wildlife Manager
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INTRODUCTION

A limited number of licenses are offered to Minnesota residents to hunt elk. In 2014, 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 2014 because the population was below goal (Figure 2). In 2014, there were two regular season hunts (September 13-21; September 27 – October 5). Hunts were held during the first season in both zones and during the remaining season only in zone 20. The hunts were structured so that they fell within the breeding season when bull elk are most vulnerable and elk can be located by vocalizations.

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 9 licenses were available and 1167 individuals or parties applied for the opportunity to hunt elk (Table 1). A first random drawing was applied to landowners who applied for the one landowner license available in Zone 20, Season A. All remaining landowners were then placed into the general drawing for remaining elk licenses. For Zone 20, applicants were given the opportunity to select either the first or second season in which to hunt. Licenses were distributed through a second random drawing conducted per Zone and season. In 2014, a total of 6 elk were harvested in the zones (Table 2). Long-term elk harvest for the zones is depicted in Tables 3 and 4.

Table 1. License allocation and application numbers for three elk hunting zones, 2014.

Zone	Either-Sex	Antlerless	Bull-only	Total	Total Applicants
20 – Kittson Central	0	0	7	7	890
Season A	*0*	*0*	*4*	*4*	*484*
Season B	*0*	*0*	*3*	*3*	*406*
30 – Kittson NE	0	0	2	2	277
Total	0	0	9	9	1167

Table 2. Distribution of the 2014 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 13 - 21	4	0	3	0	3
Sept. 27 - Oct. 5	3	0	1	0	1
Total	7	0	4	0	4

Kittson County Northeast Hunt Zone (30)

Season	Bull-only Licenses	Bulls taken	Total elk taken
September 13 - 21	2	2	2
Total	2	2	2

Table 3. Grygla elk harvests, 1987-2014.

	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	2	2	3	0
2012	2	1	3	0
2013	Closed	0	Closed	0
2014	Closed	0	Closed	0
Total	**27**	**19**	**67**	**39**

Table 4. Kittson County elk harvests, 2008-2014.

Kittson County (Combined)

	Bulls (or Either-Sex)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
2008	1	1	10	10
2009	12	9[a]	4	5
2010	1	1	3	3
2011	2	3[b]	8[c]	4
2012	5	4[d]	13	3
2013	8	6	15	6
2014	7	4	0	0
Total	**36**	**28**	**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.

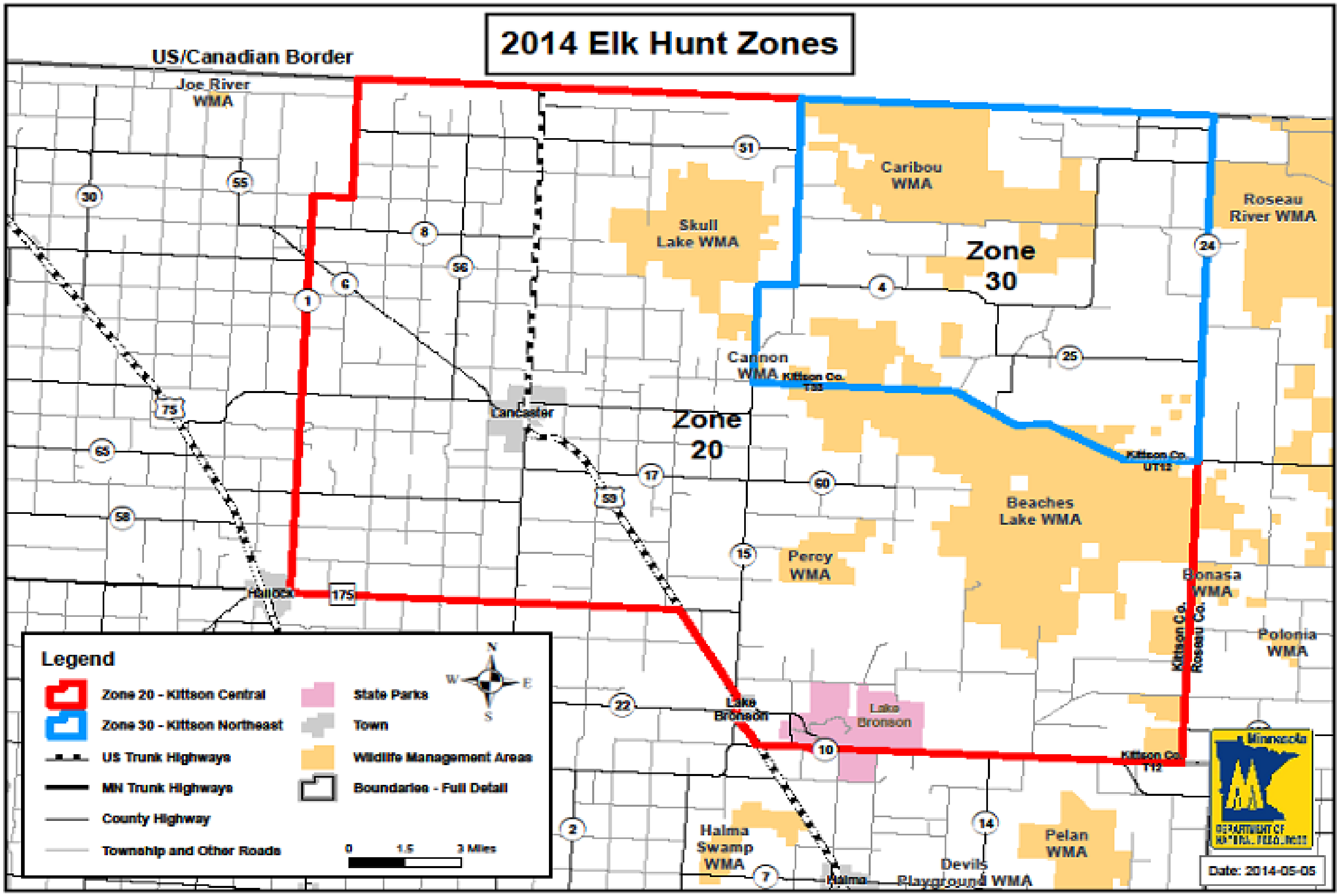

Figure 1. Kittson County Zones.

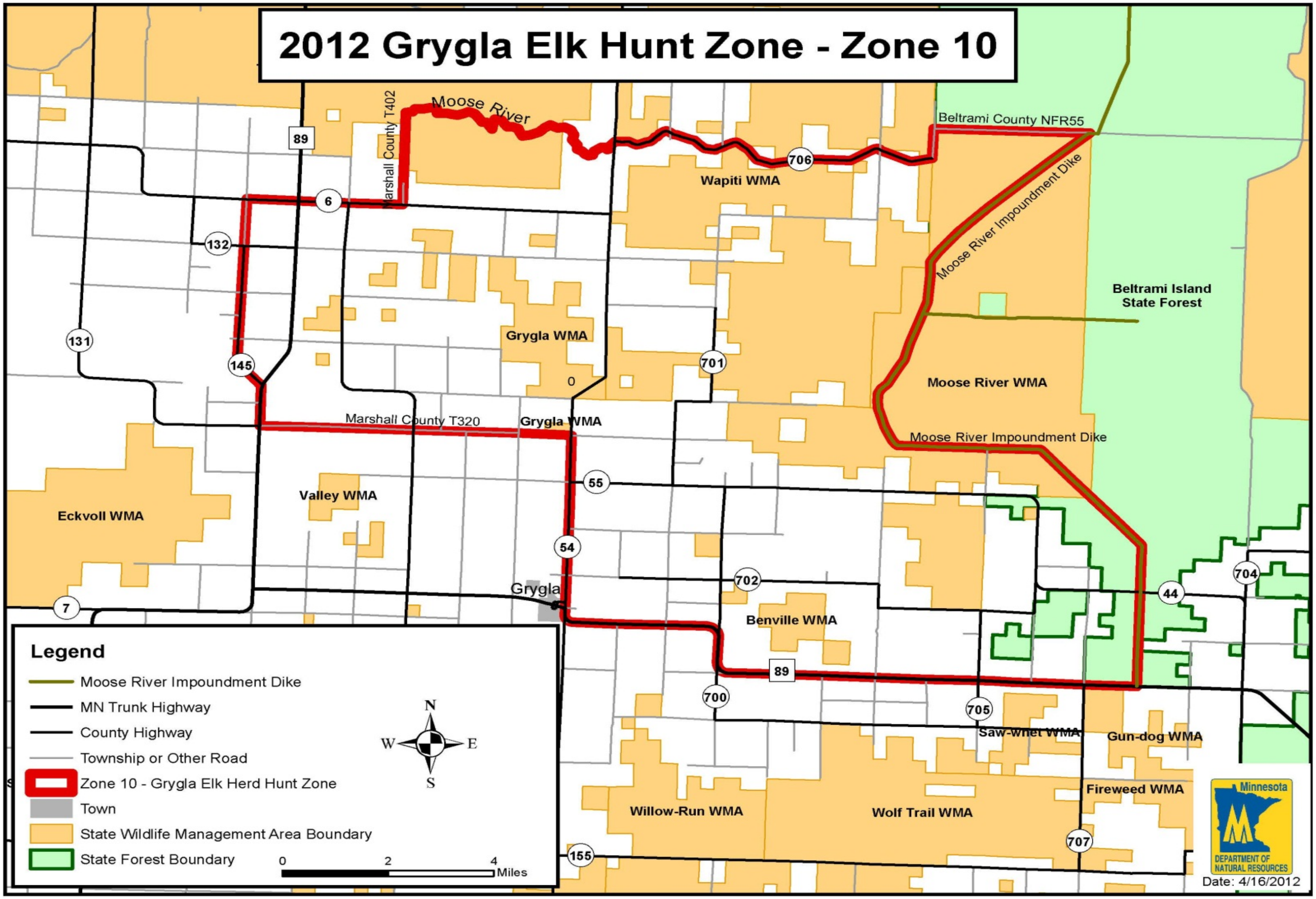

Figure 2. Grygla Elk Hunt Zone.

MINNESOTA SANDHILL CRANE HARVEST REPORT, 2014

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 for the first two years with a daily limit of 2 and a possession limit of 4 (Table 1). In 2012 the season was shifted to a week later but the limits remained the same. The possession limit increased from 4 to 6 in 2013. In 2014 limits were reduce to 1 daily and 3 in possession. Hunters were required to purchase a $3.00 sandhill crane permit. A sample of sandhill crane permit holders were selected to receive a harvest survey from the U.S. Fish and Wildlife Service after the season. This survey is used to monitor harvest levels and hunting activity (Table 2).

LITERATURE CITED

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Table 1. Sandhill Crane season dates and limits in Minnesota, 2010 – 2014.

Year	Dates	Daily limit	Possession limit
2010	4 Sept – 10 Oct	2	4
2011	3 Sept – 9 Oct	2	4
2012	15 Sept – 21 Oct	2	4
2013	14 Sept – 20 Oct	2	6
2014	13 Sept – 19 Oct	1	3

Table 2. Sandhill crane permit sales, estimated number of active hunters and harvest for NW Minnesota, 2010-2014. (Kruse, K.L. et al. 2015).

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
2014	1,216	401	247

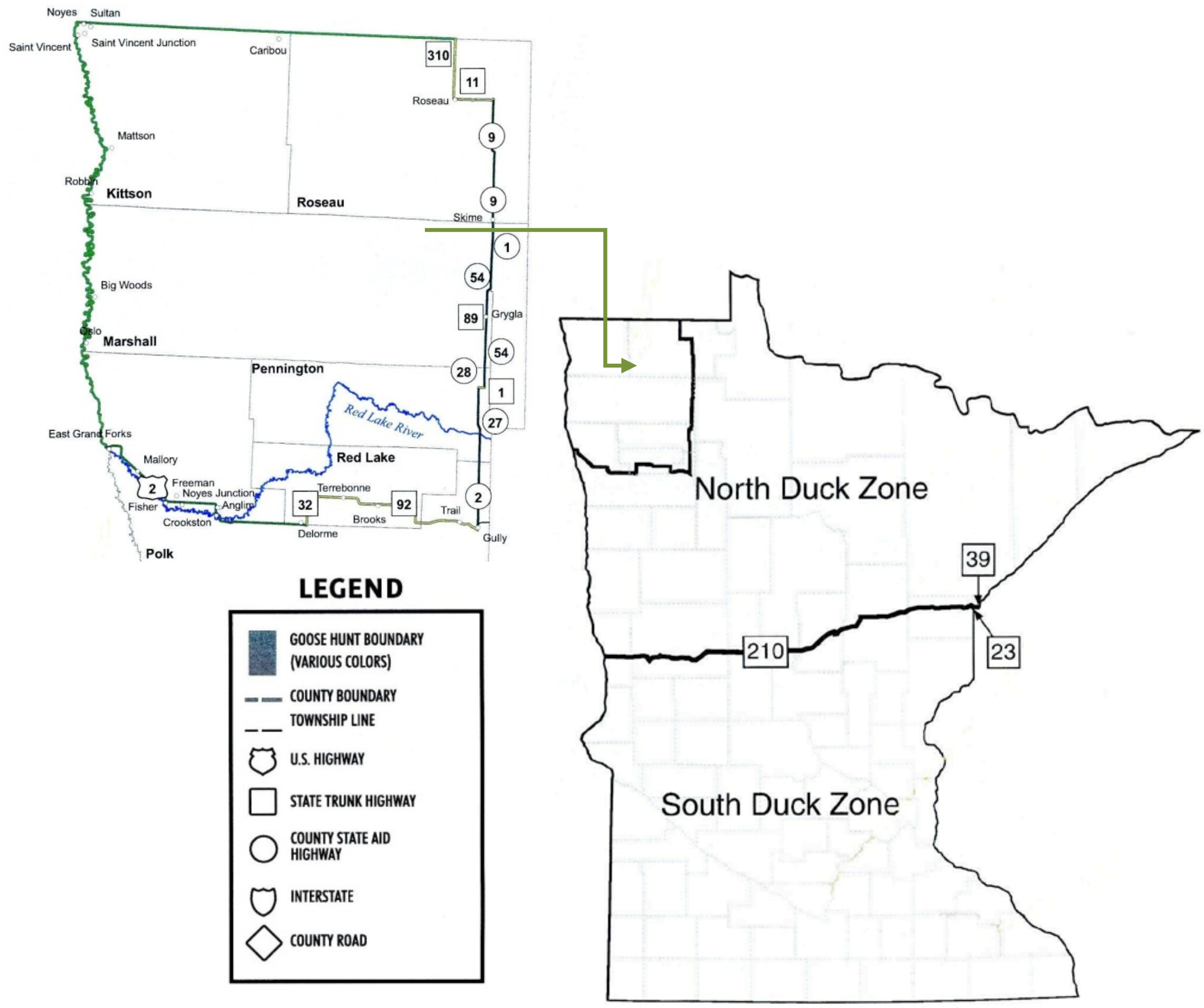

Figure 1. Sandhill crane hunting zone in Minnesota, 2010-2014.

TRAPPING HARVEST STATISTICS

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

2014 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. Information concerning registered harvest (fisher, marten, bobcat, and otter) is obtained from mandatory registration of these animals. Details regarding methods and results can be found in the Registered Furbearer Harvest report on the DNR website.

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 2015. There were 9,540 active trapping licenses in the ELS database, which consisted of 7,239 Resident Regular Trappers, 489 Resident Junior Trappers, 1,259 Resident Senior Trappers, 542 “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 = 71%, range: 56–79%). 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 (R version 3.1.2 (2014-10-31); R Development Core Team [RDCT] 2014) to summarize responses.

RESULTS

We mailed out 9,540 surveys, 106 surveys were undeliverable and 5,245 were returned for an adjusted response rate of 55.6%. Seventy two percent of respondents (adults = 72%, youth = 77%) reported setting traps for at least one species (Table 1, Figure 2). Historic trapper estimates are presented in Table 2, Table 3, and Table 4.

ACKNOWLEDGMENTS

This project was funded in part by the Wildlife Restoration Program. Special thanks to John Giudice for continued statistical support and critical review.

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

Dear Trapper:

You are being asked as a trapping license buyer to assist us in evaluating the 2014-2015 trapping season **(March 2014-February 2015).** For Spring Beaver, please report only animals taken between March 2014 and April 2014. We need this information to estimate the season's harvest and to help set future furbearer trapping seasons. Similar to past years we are also asking for the **average number of traps you set per day** for each species. If a trap is set for multiple species, count the trap for both species when answering the question. For example, if you ran 20 mink/coon traps each day, enter 20 traps/day for both mink and coon.

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

Please fill out the attached questionnaire and mail as soon as possible. No envelope or stamp is necessary; just tear along the perforation and drop into a mailbox.

THANK YOU FOR YOUR COOPERATION

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

2014 Trapper Report

2

17656

1. Did you set traps / snares in Minnesota during the 2014-2015 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 '14)	81				
Beaver (Oct '14-Feb '15)	82				
Pine marten	37				
Otter	38				
Fisher	36				
Badger	35				
Long-tailed weasel	31				
Short-tailed weasel	30				
Opossum	10				
Bobcat	98				
Raccoon	94				
Red Fox	95				

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

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

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

POSTAGE WILL BE PAID BY ADDRESSEE

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

Figure 1. Trapper survey card 2014.

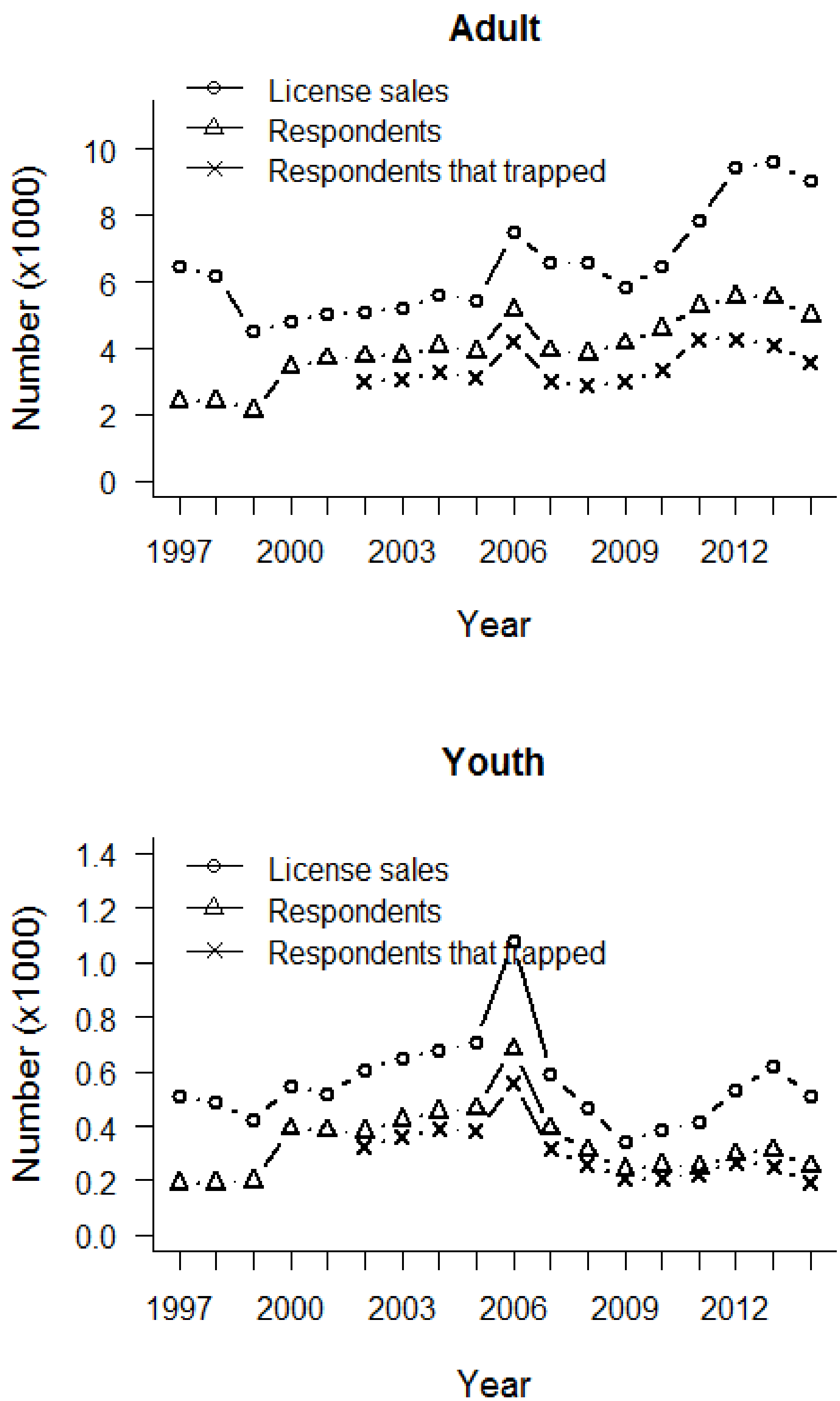

Figure 2. Trapper license sales and mail survey response by age class (Adult vs Youth), 1997-98 through 2014-15.

Table 1. Use of trapper licenses, 2002-03 through 2014-15.

Year	Status	Returns from mail survey	Projections from license sales
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 (100.0%)	4,737 1,104 5,841[a]
2004-05	Trapped Did not trap	3,697 (81.9%) 815 (18.1%) 4,512 (100.0%)	5,136 1,135 6,271[a]
2005-06	Trapped Did not trap	3,495 (80.0%) 875 (20.0%) 4,370 (100.0%)	4,930 1,233 6,163[a]
2006-07	Trapped Did not trap	4,782 (81.9%) 1,053 (18.1%) 5,835 (100.0%)	7,008 1,549 8,557[a]
2007-08	Trapped Did not trap	3,322 (77.2%) 980 (22.8%) 4,302 (100.0%)	5,533 1,634 7,167[a]
2008-09	Trapped Did not trap	3,154 (75.7%) 1,012 (24.3%) 4,166 (100.0%)	5,319 1,708 7,027[a]
2009-10	Trapped Did not trap	3,202 (72.7%) 1,202 (27.3%) 4,404 (100.0%)	4,467 1,677 6,144[a]
2010-11	Trapped Did not trap	3,546 (73.2%) 1,298 (26.8%) 4,844 (100.0%)	5,032 1,843 6,875[a]
2011-12	Trapped Did not trap	4,498 (81.5%) 1,019 (18.5%) 5,517 (100.0%)	6,748 1,532 8,280[a]
2012-13	Trapped Did not trap	4,537 (77.6%) 1,307 (22.4%) 5,844 (100.0%)	7,747 2,236 9,983[a]
2013-14	Trapped Did not trap	4,342 (74.6%) 1,480 (25.4%) 5,822 (100.0%)	7,627 2,597 10,224[a]
2014-15	Trapped Did not trap	3,786 (72.2%) 1,459 (27.8%) 5,245 (100.0%)	6,888 2,652 9,540[a]

[a] excludes duplicates.

Table 2. Estimated number of trappers of various furbearers, 2001-02 through 2014-15.

	Estimated number of trappers													
	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	2014-15
Muskrat	2419	2137	2117	2269	2351	4228	2371	2393	2088	2760	4,320	4,110	3,410	2,902
Mink	2117	1945	1917	2085	1864	3033	2168	2044	1541	1847	2,470	3,110	2,780	2,158
Short-tailed weasel	411	408	473	470	349	864	595	511	417	546	800	690	510	666
Long-tailed weasel	313	312	374	299	211	694	434	345	254	333	560	540	480	519
Raccoon (Sept -Feb)	2249	2427	2384	2505	2315	3766	3189	3150	2320	2567	4,060	4,680	4,660	4,182
Raccoon (Mar -Aug)[a]	334	354	338	406	322									
Striped skunk	955	1052	1102	1161	1023	1644	1485	1488	949	1130	1,800	1,940	1,610	1,541
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	250	237	292	310	219	347	330	293	206	229	310	360	390	284
Opossum	610	754	934	1037	957	1511	1392	1169	701	645	830	1,100	1,110	575
Red fox (Sept -Feb)	1093	1319	1290	1179	991	1608	1320	1232	1006	1068	1,900	2,240	2,080	2,012
Red fox (Mar -Aug)[a]	91	111	113	110	85									
Gray fox	277	421	441	451	407	806	654	657	529	555	970	1,180	1,060	1,035
Coyote	606	813	812	826	857	1379	1203	1141	888	998	1,720	2,360	2,200	2,396
Beaver (Oct 14- Feb 15)	2054	1844	1883	2171	1965	2659	2008	1877	1650	1722	2,360	2,620	2,710	2,189
Beaver (Mar 14- Apr 14)	1345	1296	1233	1449	1455	1710	1408	1257	1260	1367	1,510	1,810	1,150	1,305

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.
Note: Estimates prior to 2009 may differ from values published in previous reports because of rounding and more recent estimates were recomputed using a standardized historic dataset (vs. being carried forward from previous reports).

Table 3. Estimated take per trapper of various furbearers, 2000-01 through 2014-2015.

	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	2014-15
Muskrat	42	42	36	33	32	39	58	32	34	48	66	82	59	36	39
Mink	13	14	11	9	11	10	9	9	9	9	8	7	6	6	5
Short-tailed weasel	9	11	8	8	6	7	10	7	7	8	10	10	7	5	8
Long-tailed weasel	5	8	4	5	4	4	6	5	3	4	6	6	4	3	5
Raccoon (Sept -Feb)	21	27	26	23	23	22	21	24	23	20	23	25	18	16	15
Raccoon (Mar Aug)[a]	11	20	12	15	13	12									
Striped skunk	9	8	8	8	8	7	7	8	7	7	8	7	7	6	6
Eastern spotted skunk	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
Badger	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Opossum	12	9	12	13	14	13	14	13	10	8	7	6	7	7	7
Red fox (Sept -Feb)	7	7	6	6	4	4	5	4	3	3	4	4	4	3	4
Red fox (Mar -Aug)[a]	5	5	6	6	4	3									
Gray fox	3	2	3	3	2	2	3	3	3	3	2	3	3	2	2
Coyote	5	4	5	5	5	5	4	5	4	5	5	6	5	5	5
Beaver (Oct 14-Feb 15)	15	18	13	13	14	14	13	11	12	12	10	12	10	9	8
Beaver (Mar 14 - Apr 14)	27	32	27	22	27	25	25	19	23	20	22	20	20	9	16

[a] Raccoon and red fox season continuous May 1994 thru March 15, 2006.
Note: Estimates may differ from values published in previous reports because of rounding and they were recomputed using a ratio of estimated totals (estimated harvest / estimated trappers), which were computed from the standardized, historic harvest dataset.

Table 4. Minnesota trapper license sales and estimated annual harvest, 2000-01 through 2014-2015[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	2014-15
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	9,540
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	111,998
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	10,211
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	4,806
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	2,568
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	58,868
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	7,956
Eastern spotted skunk [g]	Closed	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	347
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	3,524
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	6,040
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	1,902
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	11,703
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	15,671
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	20,820
Registered harvest [d]															
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	2,148
Lynx [g]	Closed	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	1,380
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	919
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	1,055

[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, 2015 - 9,540 trapping licenses were sold in 2014: 489 (5.1%) were junior licenses, 7,239 (75.8%) were Regular adult licenses, 1,259 (13.2%) were Senior licenses, 542 (5.7%) were Lifetime licenses, and 11 (<1%) were Nonresident (MN Landowner) licenses. Duplicate licenses excluded.
[c] Based upon trappers' responses to mail surveys. [d.] Registered harvest information as reported from annual, mandatory registration.
[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 2014-2015 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 2015, questionnaires were mailed to the 47 licensed fur buyers in Minnesota. The survey asked them to report the number and type of fur purchased from Minnesota trappers and hunters in 2014-15 and the "average price" paid to those hunters and trappers based on all furs purchased. A total of 37 usable surveys were received, for a return rate of 77 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 2014-15 was $723,852.40, a 9 percent decrease from 2013-2014.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2014-15.

Species	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	30,917	2.50	6.00	4.85
Mink Female	1,453	3.00	10.25	7.45
Mink male	1,828	6.00	18.00	10.50
Raccoon	22,089	6.00	15.00	8.64
Red Fox	1,354	10.00	30.00	20.41
Gray Fox	237	7.50	20.00	14.17
Coyote	4,684	10.00	40.00	25.10
Bobcat	157	40.00	90.00	66.67
River Otter	397	20.00	50.00	34.57
Beaver 10-12	2,872	5.00	15.00	12.40
Beaver 3-4	3,180	5.00	15.00	10.69
L.T. Weasel	58	2.00	2.00	2.00
S.T. Weasel	369	1.00	5.00	1.78
Striped Skunk	240	1.00	5.00	3.86
Badger	129	5.00	20.00	9.52
Opossum	131	0.50	1.50	1.17
Fisher Male	131	15.00	80.00	41.76
Fisher Female	128	10.00	80.00	50.87
Marten Male	63	30.00	50.00	38.92
Marten Female	49	25.00	44.29	32.20
Deer Hides	16,044	3.00	9.00	5.59
Bear Hides	34	25.00	45.00	32.94

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 2004-05 through 2014-15.

	Average pelt prices paid hunters and trappers in Minnesota (dollars)										
Species	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Muskrat	1.9	2.81	5.79	2.96	1.85	4.43	5.33	5.86	7.91	8.72	4.85
Mink (female)	10.22	10.23	13.18	9.05	7.45	8.02	9.33	11.54	17.53	13.72	7.45
Mink (male)	11.34	14.29	18.04	12.32	9.14	9.37	13.66	14.68	18.27	18.11	10.50
S.T. Weasel	2.52	2.6	3.58	3.18	3.57	3.02	1.50	2.10	2.51	0.00	2.00
L.T. Weasel	3.05	2.56	4.35	5	2.21	3.12	2.87	4.02	4.10	2.35	1.78
Raccoon	10.49	9.61	11.92	14.32	9.34	9.18	10.87	12.57	16.60	16.58	8.64
Striped Skunk	3.95	3.77	4.46	5.27	2.56	3.66	3.29	3.55	5.00	4.14	3.86
Badger	12.94	13.4	15.71	13.92	7.70	8.81	10.43	13.47	14.54	13.72	9.52
Opossum	1.51	1.4	1.52	1.76	1.21	1.30	2.64	5.80	1.52	1.52	1.17
Red Fox	17.28	16.96	17.68	14.69	11.79	10.85	13.35	22.87	33.52	30.90	20.41
Gray Fox	12.58	15	22.36	30.09	14.08	11.55	14.64	15.11	19.20	21.27	14.17
Coyote	15.24	13.57	17.76	13.51	7.12	8.62	9.47	17.99	22.04	21.30	25.10
Bobcat	98.99	95.74	101.07	93.41	74.74	42.77	71.44	98.18	144.79	88.63	66.67
Beaver (fall-winter)	13.62	14.48	18.35	14.6	14.63	12.49	11.95	14.29	18.47	16.52	12.40
Beaver (spring)	13.8	16.49	14.81	17.77	9.36	14.47	14.50	19.96	12.80	14.77	10.69
Otter	87.23	88.89	42.85	29.49	24.33	35.65	34.53	51.40	72.12	61.32	34.57
Fisher (male)	30.02	36.03	76.33	63.09	22.27	34.45	38.19	47.69	62.38	61.32	41.76
Fisher (female)	27.47	31.46	67.82	48.24	37.22	34.90	37.31	39.59	63.02	67.73	50.87
Marten (male)	30.65	37.47	74.04	58.72	30.61	26.76	39.80	42.32	56.57	74.10	38.92
Marten (female)	27.42	31.53	66.09	50.05	28.19	29.95	36.57	39.49	54.29	70.94	32.20
Deer Hides	3.95	4.14	4.51	3.92	3.53	4.44	4.41	3.95	5.18	6.09	5.59
Bear Hides	46.61	39.3	43.03	36.57	29.81	43.00	33.38	28.79	30.28	42.63	32.94

REGISTERED FURBEARER HARVEST STATISTICS

Forest Wildlife Populations and Research Group
1201 East Highway 2
Grand Rapids, MN 55744
(218) 327-4432

REGISTERED FURBEARER HARVEST STATISTICS
2014-15 REPORT

John Erb, Forest Wildlife Populations and Research Group

INTRODUCTION

Monitoring harvest is an important component of population management for some wildlife populations. For many species, harvest represents a large proportion of overall mortality. Obtaining harvest information can be useful for documenting changes in the distribution and abundance of animals, as well as the effects of changes in harvest seasons, harvest techniques, and habitat. The level of detail or accuracy necessary in harvest information may vary across species, depending on such factors as population density, harvest pressure, habitat sensitivity of the species, and reproductive potential.

In Minnesota, detailed harvest information is collected on 4 carnivores – 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). There were no changes to season structures this year compared to the 2013 season. All harvest summaries are provided in the following tables and graphs. Data for years prior to those presented in this report is available (back to 1977) by contacting the Minnesota DNR.

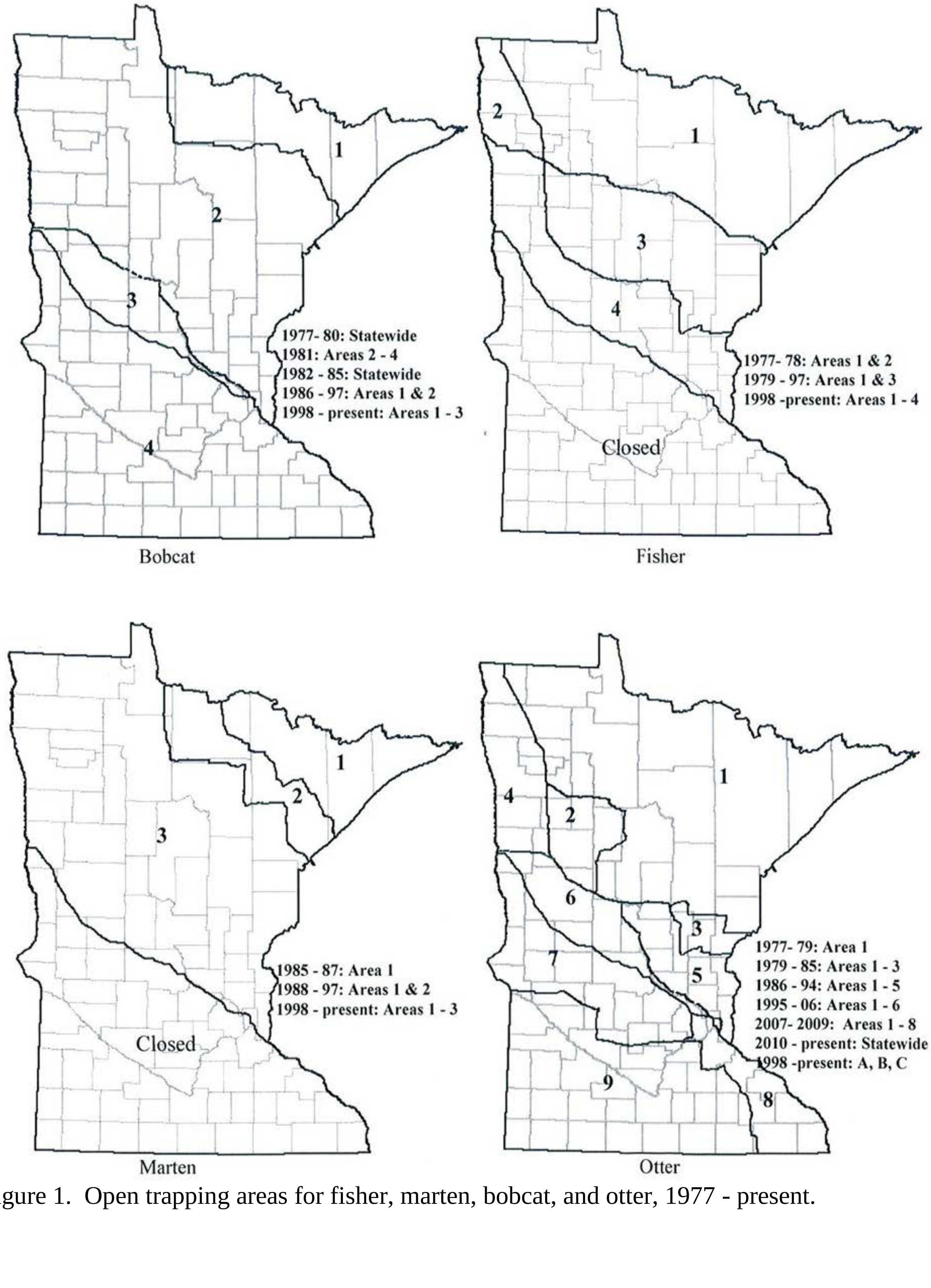

Figure 1. Open trapping areas for fisher, marten, bobcat, and otter, 1977 - present.

Table 1. Registered furbearer seasons and harvests, 1986-2014.

	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
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
2014-15	11/29-1/4	37	5	1384	11/29-12/4	6	2	943	11/29-12/4	6	2	1059	10/25-1/4	71	4	2154

[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).

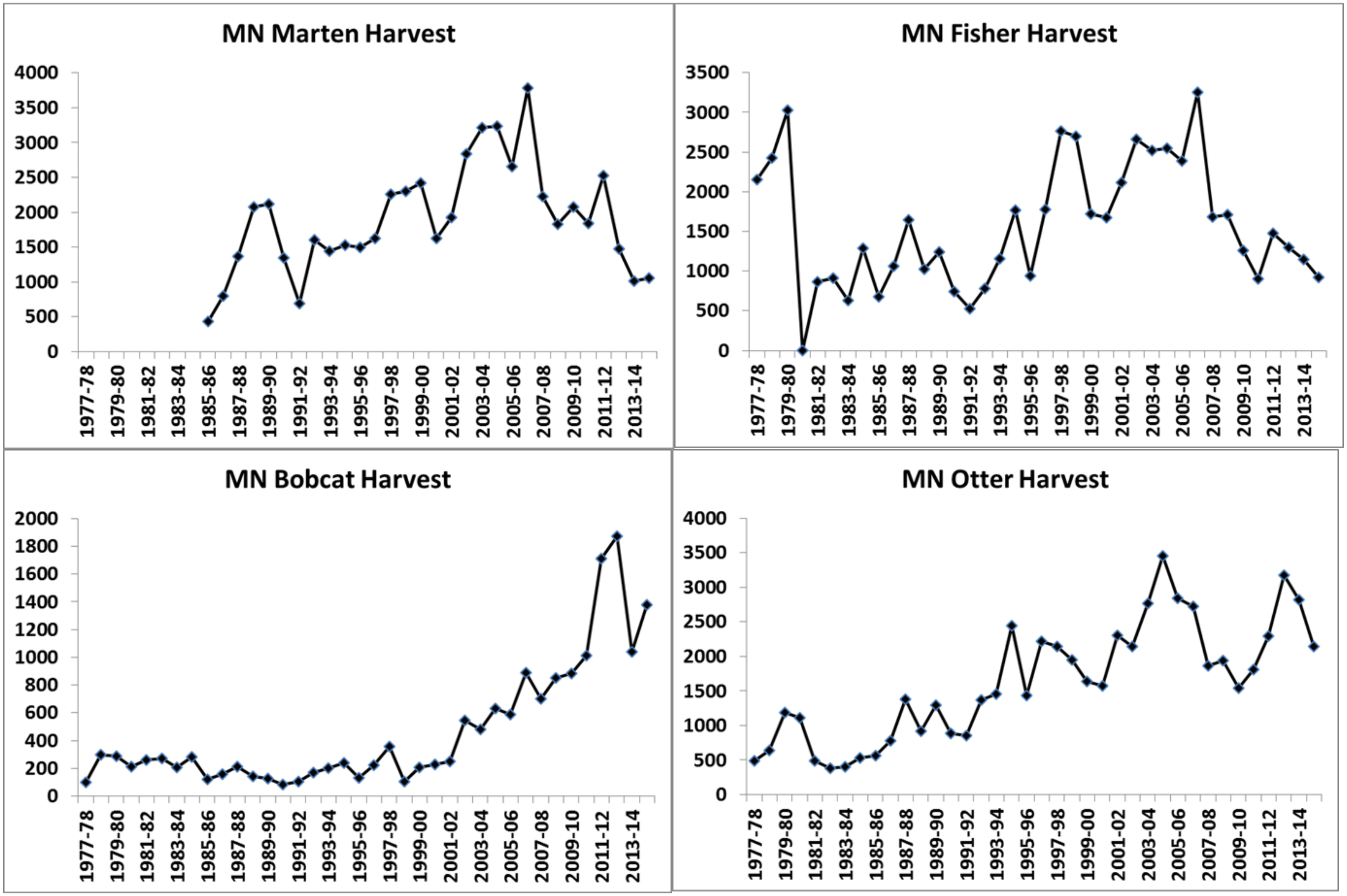

Figure 2. Harvest of registered furbearers in Minnesota, 1977-present.

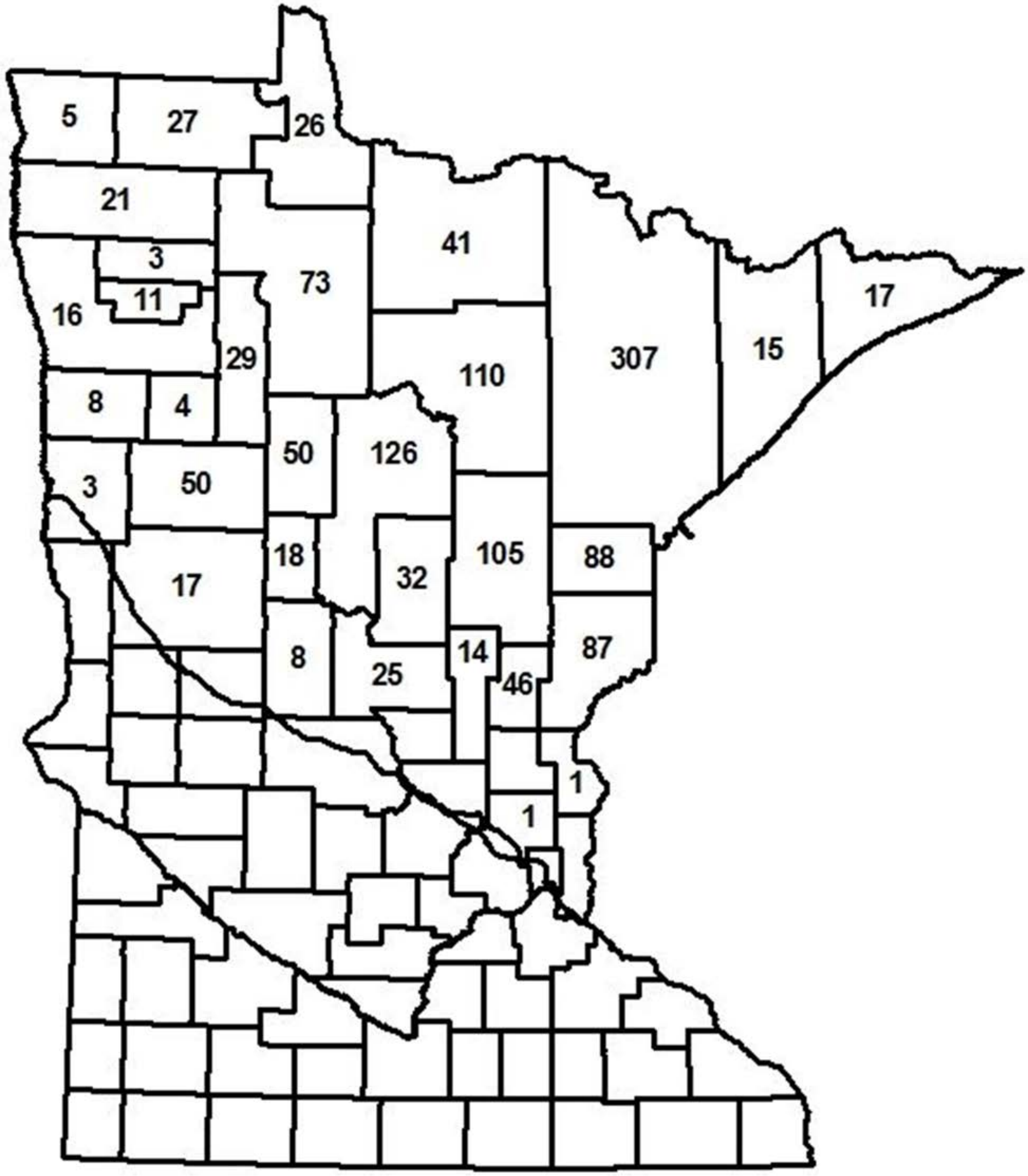

Figure 3. Bobcat harvest by county, 2014-15.

Table 2. Bobcat harvest by county and sex, 2014-15.

County	Sex* Male	Female	Unknown	Total	Harvest/ 100 Mile^2
Aitkin	43	62		105	5.27
Anoka	1	0		1	0.22
Becker	26	22		48	3.32
Beltrami	37	36		73	2.39
Benton	0	0		0	0.00
Carlton	41	47		88	10.06
Cass	60	66		126	5.22
Chisago	1	0		1	0.23
Clay	2	1		3	0.28
Clearwater	14	15		29	2.82
Cook	4	13		17	1.06
Crow Wing	15	17		32	2.77
Douglas	0	0		0	0.00
Hubbard	29	21		50	5.00
Isanti	0	0		0	0.00
Itasca	46	64		110	3.76
Kanabec	23	23		46	8.63
Kittson	2	3		5	0.45
Koochiching	21	19		40	1.27
Lake	3	12		15	0.66
Lake of the Woods	12	14		26	1.46
Mahnomen	0	4		4	0.69
Marshall	8	13		21	1.16
Mille Lacs	8	6		14	2.06
Morrison	16	8	1	25	2.17
Norman	1	7		8	0.91
Otter Tail	6	11		17	0.76
Pennington	1	2		3	0.49
Pine	39	48		87	6.07
Polk	5	11		16	0.80
Red Lake	7	4		11	2.54
Roseau	15	12		27	1.61
St. Louis	129	178		307	4.56
Sherburne	0	0		0	0.00
Stearns	0	0		0	0.00
Todd	6	2		8	0.82
Wadena	7	11		18	3.31
Unknown	1	2		3	
Total	629	754	1	1384	

* 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, 2004-2014.

County	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Aitkin	37	32	46	56	64	82	73	121	142	65	105
Anoka	0	0	0	0	0	0	0	1	0	0	1
Becker	28	19	46	24	37	25	39	70	58	36	48
Beltrami	66	34	90	33	49	70	108	139	139	59	73
Benton	0	0	0	1	5	2	0	4	3	3	0
Carlton	27	25	34	25	45	44	37	94	63	42	88
Cass	56	103	137	50	98	115	117	164	150	76	126
Chisago	0	0	0	3	0	0	1	0	3	1	1
Clay	0	0	0	0	0	1	3	1	3	2	3
Clearwater	18	18	42	25	43	27	30	58	40	19	29
Cook	2	3	0	0	1	0	1	3	3	9	17
Crow Wing	19	18	27	21	36	38	29	64	65	19	32
Douglas	0	0	0	0	0	0	0	0	1	1	0
Hubbard	35	22	69	40	49	81	59	129	105	51	50
Isanti	0	1	0	0	0	0	0	0	0	1	0
Itasca	93	68	113	86	72	106	132	186	194	93	110
Kanabec	17	11	14	16	23	11	16	21	46	16	46
Kittson	6	3	5	4	9	4	9	10	7	5	5
Koochiching	14	22	16	37	31	25	54	66	82	50	40
Lake	1	2	1	0	1	2	7	15	21	13	15
Lake of the Woods	6	3	2	9	12	16	10	28	13	20	26
Mahnomen	7	2	7	8	0	4	2	9	7	4	4
Marshall	20	16	19	32	18	15	31	42	44	15	21
Mille Lacs	11	9	8	13	11	10	10	13	23	7	14
Morrison	18	18	17	23	28	13	23	25	35	15	25
Norman	0	0	1	0	0	1	0	3	6	3	8
Otter Tail	5	1	7	9	7	7	14	21	38	18	17
Pennington	6	3	2	11	9	6	5	4	13	7	3
Pine	59	47	59	87	101	49	50	94	135	54	87
Polk	4	1	3	0	4	9	9	17	20	10	16
Red Lake	0	6	1	0	0	7	16	20	25	6	11
Roseau	27	28	36	32	18	19	26	46	60	38	27
St. Louis	37	44	45	39	58	56	81	202	283	255	307
Sherburne	0	0	0	0	0	1	0	3	0	0	0
Stearns	0	0	0	1	0	0	0	0	0	2	0
Todd	5	7	12	6	14	10	9	14	16	5	8
Wadena	3	17	16	9	7	21	9	17	23	18	18
Unknown	4	7	15	2	3	7	2	7	9	0	3
Total	631	590	890	702	853	884	1012	1711	1875	1038	1384

Table 4. Bobcat harvest by sex and week, 2014-15 season.

Date	Sex*			Total	% of Total	Cumulative %
	Male	Female	Unknown			
Nov.29 - Dec.5	147	184		331	23.92	23.92
Dec.6 - Dec.12	121	150		271	19.58	43.50
Dec.13 - Dec.19	114	121		235	16.98	60.48
Dec.20 - Dec.26	120	158		278	20.09	80.56
Dec.27 - Jan.4**	108	118		226	16.33	96.89
Unknown	19	23	1	43	3.11	100.00
Total	629	754	1	1384	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, 1989-2014.

Number (%) of Takers	Number Taken					
	1	2	3	4	5	Total Takers
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
2014-15	383 (54)	131 (19)	84 (12)	49 (7)	58 (8)	705

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

Table 6. Bobcat harvest by method of take, 1987-2014.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
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
2013-14	1384	1260	91	622	2.0	44	124	9	86	1.4	56

[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

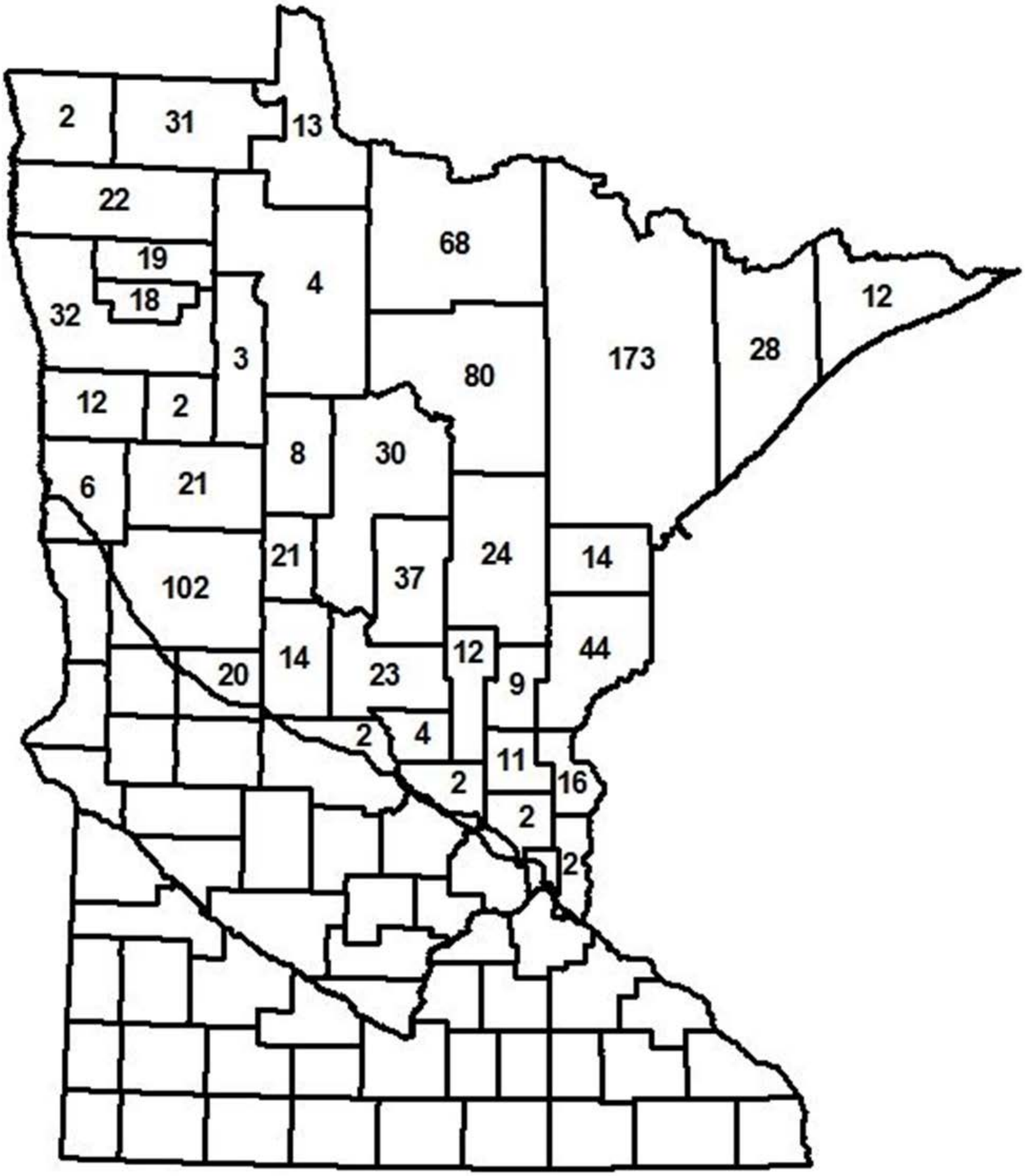

Figure 4. Fisher harvest by county, 2014.

Table 7. Fisher harvest by county and sex, 2014 season.

County	Sex: Male	Sex: Female	Sex: Unknown	Total	Harvest/ 100 Mile^2
Aitkin	14	9	1	24	1.20
Anoka	0	2		2	0.45
Becker	12	9		21	1.45
Beltrami	2	2		4	0.13
Benton	2	2		4	0.97
Carlton	8	6		14	1.60
Cass	12	18		30	1.24
Chisago	6	10		16	3.62
Clay	5	1		6	0.57
Clearwater	1	2		3	0.29
Cook	6	5		11	0.69
Crow Wing	20	14		34	2.94
Douglas	11	9		20	2.78
Grant	0	0		0	0.00
Hubbard	4	4		8	0.80
Isanti	5	6		11	2.44
Itasca	32	46		78	2.67
Kanabec	3	6		9	1.69
Kittson	2	0		2	0.18
Koochiching	37	30		67	2.12
Lake	14	14		28	1.22
Lake of the Woods	7	5		12	0.67
Mahnomen	1	1		2	0.34
Marshall	10	12		22	1.21
Mille Lacs	3	9		12	1.76
Morrison	14	8	1	23	2.00
Norman	5	7		12	1.37
Otter Tail	56	46		102	4.58
Pennington	11	8		19	3.07
Pine	30	14		44	3.07
Polk	15	17		32	1.60
Red Lake	15	3		18	4.16
Roseau	15	17		32	1.91
St. Louis	86	85		171	2.54
Sherburne	0	2		2	0.44
Stearns	2	0		2	0.14
Todd	6	9		15	1.53
Wadena	13	6	2	21	3.87
Washington	1	1		2	0.47
Wilkin	0	0		0	0.00
Unknown	5	3		8	
Total	491	448	4	943	

Table 8. Comparison of fisher harvest by county, 2003-2014.

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aitkin	124	96	97	156	67	75	50	35	55	52	47	24
Anoka	1	0	0	0	0	2	0	0	1	2	1	2
Becker	88	92	49	87	57	36	44	30	32	45	38	21
Beltrami	74	71	47	54	40	15	22	10	25	21	17	4
Benton	1	0	1	1	0	3	2	0	5	5	2	4
Carlton	42	40	35	49	13	19	15	12	12	14	8	14
Cass	205	186	149	209	80	77	57	43	41	37	23	30
Chisago	5	6	2	18	7	4	10	6	10	3	4	16
Clay	0	0	0	1	0	3	0	6	10	6	5	6
Clearwater	52	41	35	54	19	37	13	6	8	5	12	3
Cook	28	24	40	35	29	10	11	17	28	11	13	11
Crow Wing	106	113	79	140	81	116	42	48	64	55	51	34
Douglas	3	3	3	6	2	5	2	6	15	24	8	20
Grant	0	0	0	0	0	0	0	1	0	0	0	0
Hubbard	62	32	20	51	20	38	18	13	10	11	10	8
Isanti	0	2	3	5	1	5	9	1	4	6	11	11
Itasca	319	323	320	405	195	195	166	88	142	105	116	78
Kanabec	21	13	15	26	11	26	20	13	21	27	30	9
Kittson	11	2	7	2	5	8	5	7	5	9	11	2
Koochiching	171	179	209	221	105	115	96	51	116	80	51	67
Lake	74	87	85	87	49	54	49	45	56	53	35	28
Lake of the Woods	78	33	63	74	17	42	21	9	33	21	13	12
Mahnomen	14	13	9	27	25	6	3	0	3	0	4	2
Marshall	21	25	18	26	19	26	6	7	13	14	17	22
Mille Lacs	22	14	16	20	15	17	18	18	17	20	17	12
Morrison	3	7	5	23	21	14	10	8	10	24	25	23
Norman	1	11	6	4	9	12	7	4	10	19	21	12
Otter Tail	40	52	60	158	110	152	67	100	138	121	117	102
Pennington	18	42	22	22	16	8	2	4	8	8	11	19
Pine	54	56	42	82	39	74	30	26	22	42	46	44
Polk	65	47	38	72	61	49	31	25	54	58	45	32
Red Lake	16	29	34	32	29	23	23	10	17	16	24	18
Roseau	141	114	110	127	84	89	58	20	79	61	42	32
St. Louis	611	740	688	898	407	283	296	186	350	233	220	171
Sherburne	2	0	0	0	0	0	3	1	6	2	2	2
Stearns	0	1	0	0	0	1	1	0	4	1	4	2
Todd	14	18	23	21	13	33	22	18	15	29	22	15
Wadena	32	31	40	44	27	37	23	23	31	25	23	21
Washington	0	0	0	0	1	0	0	0	1	1	0	2
Wilkin	0	0	0	0	0	0	0	0	1	0	0	0
Unknown	2	9	18	14	8	3	7	6	1	27	0	8
Total	2,521	2,552	2,388	3,251	1,682	1,712	1,259	903	1,473	1,293	1,146	943

Table 9. Fisher harvest by date and sex, 2014 season.

Date	Sex			Total	% of Known Total	Cumulative %
	Male	Female	Unknown			
Nov. 29	6	4		10	1.06	1.06
Nov. 30	101	82	2	185	19.62	20.68
Dec. 1	108	112	1	221	23.44	44.11
Dec. 2	98	97	1	196	20.78	64.90
Dec. 3	88	68		156	16.54	81.44
Dec. 4	76	69		145	15.38	96.82
Unknown	14	16		30	3.18	100%
Total	491	448	4	943	100%	

Table 10. Distribution of fisher harvest* among trappers, 1993-2014.

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
2014	434 (63)	254 (37)	----	----	----	688	1.4

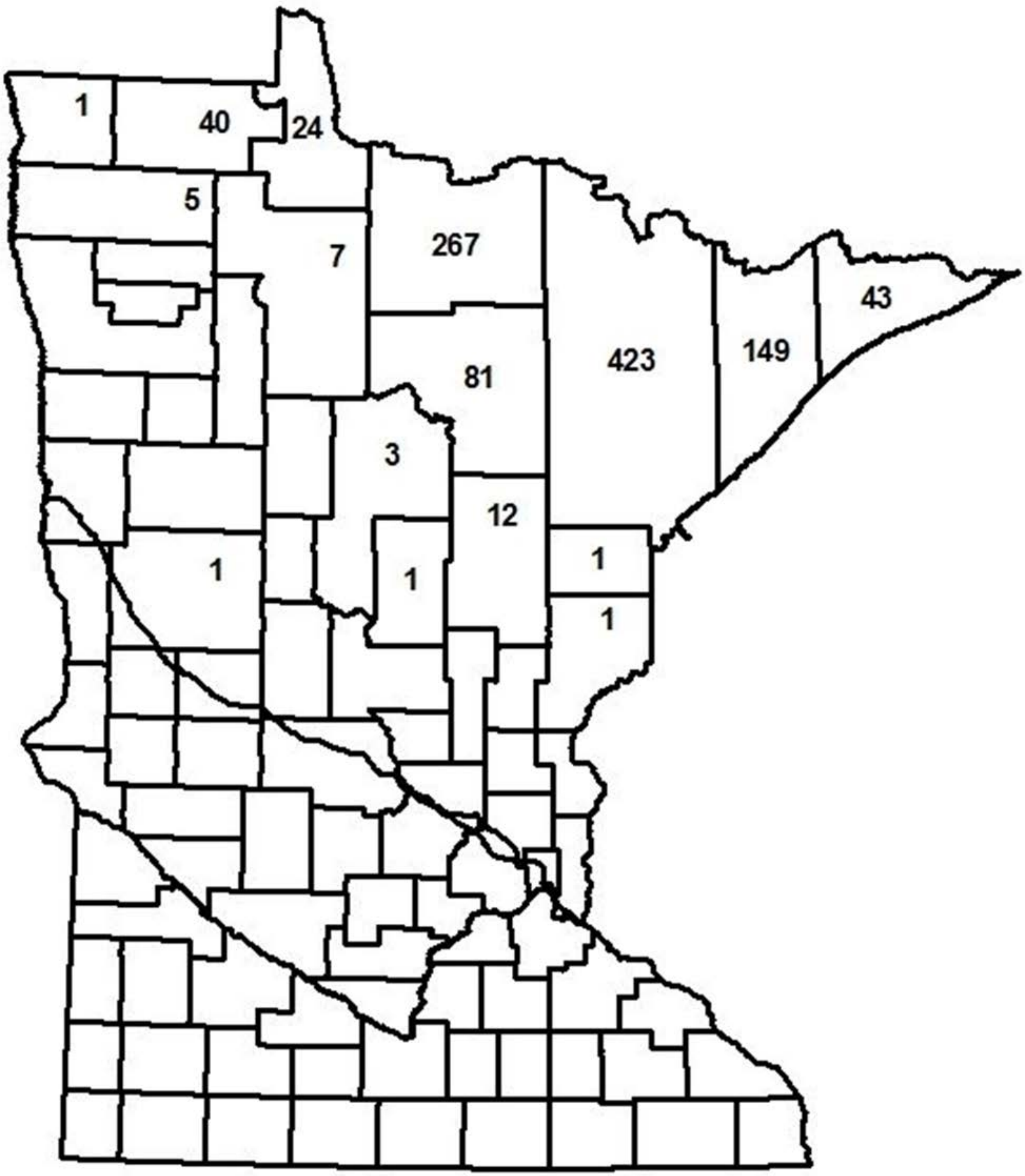

Figure 5. Marten harvest by county, 2014.

Table 11. Marten harvest by county and sex, 2014 season.

County	Sex			Total	Harvest/ 100 Mile^2
	Male	Female	Unknown		
Aitkin	11	0	1	12	0.60
Beltrami	6	1		7	0.23
Carlton	1	0		1	0.11
Cass	1	2		3	0.12
Clearwater	0	0		0	0.00
Cook	28	15		43	2.68
Crow Wing	0	1		1	0.09
Itasca	46	33		79	2.70
Kanabec	0	0		0	0.00
Kittson	1	0		1	0.09
Koochiching	176	87	2	265	8.40
Lake	98	50	1	149	6.51
Lake of the Woods	15	7	1	23	1.29
Mahnomen	0	0		0	0.00
Marshall	2	3		5	0.28
Otter Tail	0	1		1	0.04
Pennington	0	0		0	0.00
Pine	0	1		1	0.07
Red Lake	0	0		0	0.00
Roseau	23	17		40	2.38
St. Louis	277	144		421	6.25
Unknown	6	1		7	
Total	691	363	5	1,059	

Table 12. Comparison of marten harvest by county in Minnesota, 2003-2014.

County	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aitkin	6	6	6	13	4	12	5	4	13	10	8	12
Beltrami	38	65	17	19	8	6	10	2	11	20	15	7
Carlton	11	1	10	6	1	4	8	5	6	3	1	1
Cass	2	3	1	4	0	1	2	1	2	0	0	3
Clearwater	1	1	0	0	0	0	0	0	0	0	0	0
Cook	411	318	369	446	269	151	244	191	205	148	78	43
Crow Wing	0	0	0	0	0	0	1	0	1	0	0	1
Itasca	141	136	98	155	74	72	91	73	118	46	62	79
Kanabec	0	0	0	2	0	0	0	0	0	0	0	0
Kittson	0	0	0	0	0	0	0	1	0	4	0	1
Koochiching	534	549	418	592	348	300	354	336	516	276	218	265
Lake	541	551	536	892	520	438	496	491	577	290	185	149
Lake of the Woods	71	122	54	46	31	17	17	13	49	32	18	23
Mahnomen	0	2	0	0	0	0	0	0	0	0	0	0
Marshall	1	5	3	0	1	0	4	0	3	3	5	5
Otter Tail	0	0	0	0	0	0	0	0	0	0	0	1
Pennington	0	0	0	0	1	0	0	0	0	0	0	0
Pine	1	2	1	1	1	0	0	1	0	0	0	1
Red Lake	0	0	0	0	0	0	0	0	0	1	1	0
Roseau	104	127	51	31	69	46	32	13	98	77	37	40
St. Louis	1,352	1,346	1,065	1,579	885	769	803	709	926	562	386	421
Unknown	0	7	24	2	9	7	6	2	0	0	0	7
Total	3,214	3,241	2,653	3,788	2,221	1,823	2,073	1,842	2,525	1,472	1,014	1,059

Table 13. Marten harvest by date and sex, 2014 season.

Date	Sex: Male	Sex: Female	Sex: Unknown	Total	% of Known Total	Cumulative %
Nov. 29	9	2		11	1.04	1.04
Nov. 30	205	86	4	295	27.86	28.90
Dec. 1	135	79		214	20.21	49.10
Dec. 2	125	77		202	19.07	68.18
Dec. 3	96	53		149	14.07	82.25
Dec. 4	98	59	1	158	14.92	97.17
Unknown	23	7		30	2.83	100%
Total	691	363	5	1,059	100%	

Table 14. Distribution of marten harvest* among trappers, 1993-2014.

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
2014	307 (45)	376 (55)	----	----	----	683	1.6

Table 15. Number of trappers with different fisher/marten combinations, 2014. (Combined limit = 2)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		162	374			
	1	288	147				
	2	254					
	3						
	4						
	5				Total takers of at least 1 fisher or marten		1,225

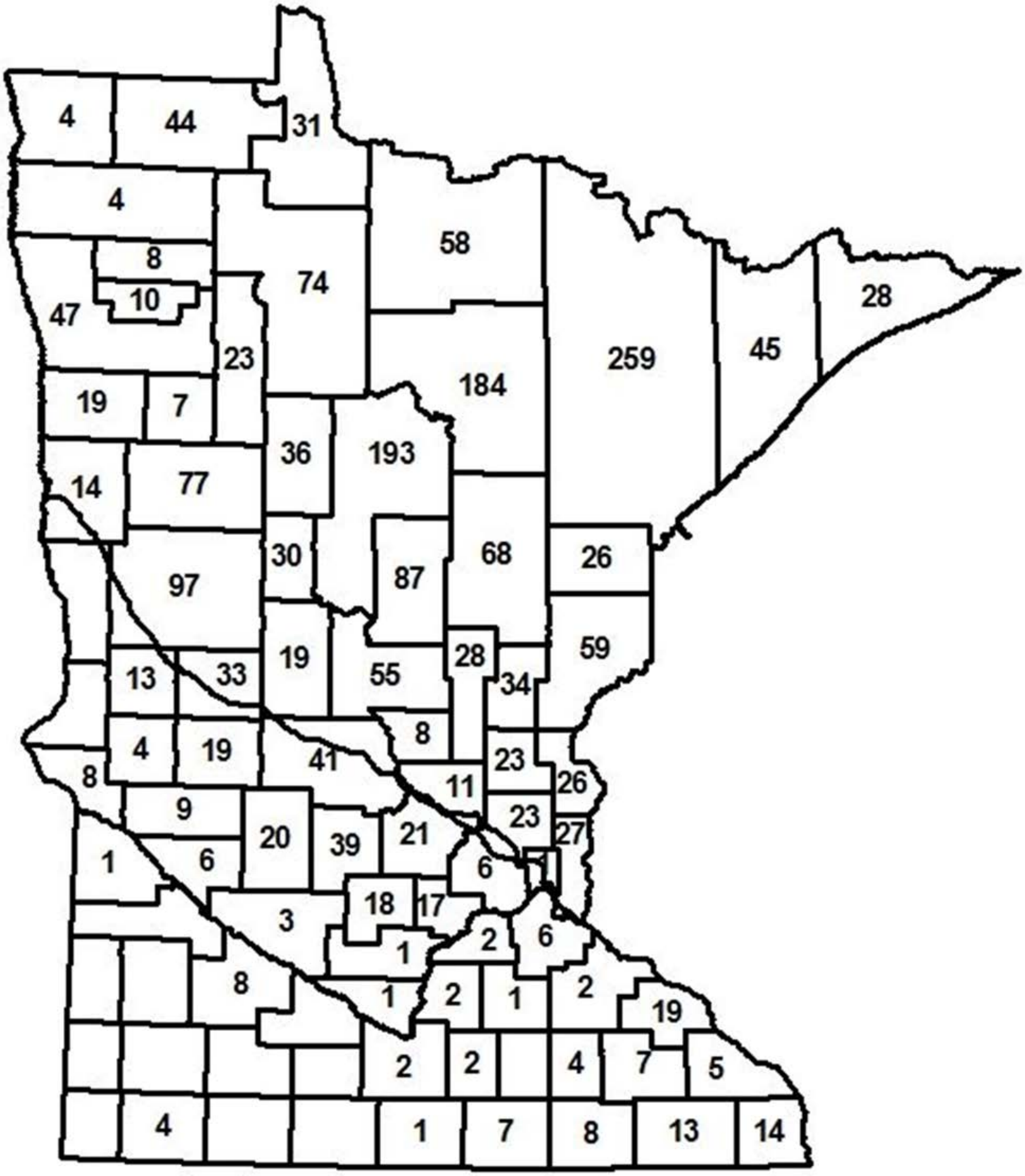

Figure 6. Otter harvest by county, 2014-15.

Table 16. Otter harvest by county and sex, 2014-15 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile^2
Aitkin	46	21		67	3.36
Anoka	12	11		23	5.16
Becker	39	38		77	5.33
Beltrami	43	31		74	2.42
Benton	6	2		8	1.94
Big Stone	7	1		8	1.51
Blue Earth	2	0		2	0.26
Carlton	18	8		26	2.97
Carver	12	5		17	4.52
Cass	96	96	1	193	8.00
Chippewa	4	2		6	1.02
Chisago	13	13		26	5.88
Clay	8	6		14	1.33
Clearwater	14	9		23	2.23
Cook	20	8		28	1.74
Crow Wing	53	30		83	7.18
Dakota	4	2		6	1.02
Dodge	3	1		4	0.91
Douglas	22	11		33	4.58
Faribault	1	0		1	0.14
Fillmore	6	7		13	1.51
Freeborn	4	3		7	0.97
Goodhue	1	1		2	0.26
Grant	9	4		13	2.26
Hennepin	3	3		6	0.99
Houston	9	5		14	2.46
Hubbard	21	15		36	3.60
Isanti	15	8		23	5.10
Itasca	108	76		184	6.29
Kanabec	12	20	2	34	6.38
Kandiyohi	10	10		20	2.32
Kittson	2	2		4	0.36
Koochiching	32	22	1	55	1.74
Lac Qui Parle	1	0		1	0.13
Lake	29	16		45	1.97
Lake of the Woods	24	7		31	1.74
Le Sueur	1	1		2	0.42
Lincoln	0	0		0	0.00
McLeod	13	5		18	3.56
Mahnomen	6	1		7	1.20
Marshall	3	1		4	0.22
Martin	0	0		0	0.00
Meeker	11	20	4	35	5.43
Mille Lacs	14	14		28	4.11
Morrison	29	21		50	4.34
Mower	5	3		8	1.13
Nicollet	1	0		1	0.21
Nobles	1	3		4	0.55
Norman	12	7		19	2.17
Olmsted	3	4		7	1.07
Otter Tail	54	42	1	97	4.36
Pennington	6	2		8	1.29
Pine	38	21		59	4.12
Polk	25	22		47	2.35
Pope	11	8		19	2.65
Ramsey	0	1		1	0.59

Table 16 (continued). Otter harvest by county and sex, 2013-14 season.

County	Sex			Total	Harvest/
	Male	Female	Unknown		100 Mile[2]
Red Lake	4	6		10	2.31
Redwood	6	2		8	0.91
Renville	1	1	1	3	0.30
Rice	1	0		1	0.19
Rock	0	0		0	0.00
Roseau	22	22		44	2.62
St. Louis	151	107		258	3.83
Scott	1	1		2	0.54
Sherburne	6	4		10	2.22
Sibley	2	0		2	0.33
Stearns	22	19		41	2.95
Steele	0	0		0	0.00
Stevens	0	4		4	0.69
Swift	5	4		9	1.20
Todd	8	11		19	1.94
Traverse	0	0		0	0.00
Wabasha	12	6	1	19	3.46
Wadena	21	9		30	5.52
Waseca	2	0		2	0.46
Washington	19	8		27	6.38
Watonwan	0	0		0	0.00
Wilkin	0	0		0	0.00
Winona	3	2		5	0.78
Wright	13	8		21	2.94
Yellow Medicine	0	0		0	0.00
Unknown	10	8		18	
Total	1,251	892	11	2,154	

Table 17. Comparison of otter harvest by county, 2003-2014.

County	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Aitkin	87	113	132	124	53	65	54	59	107	111	90	67
Anoka	13	32	22	16	26	18	26	8	13	31	25	23
Becker	105	178	107	117	54	55	39	53	95	127	87	77
Beltrami	173	216	170	154	105	80	74	77	112	120	98	74
Benton	7	19	14	16	9	11	3	13	13	21	17	8
Big Stone	0	0	0	0	0	2	1	0	3	3	9	8
Blue Earth	0	0	0	0	0	0	0	0	2	3	1	2
Carlton	38	53	36	39	36	29	30	35	29	38	37	26
Carver	0	0	0	0	2	5	6	5	15	8	9	17
Cass	198	255	231	236	124	160	90	135	140	183	161	193
Chippewa	0	0	0	0	0	0	0	5	7	8	12	6
Chisago	22	20	28	33	16	15	18	23	19	24	32	26
Clay	7	15	18	35	8	14	7	23	42	23	16	14
Clearwater	52	62	48	41	39	35	19	38	41	46	47	23
Cook	41	56	46	39	13	12	16	19	36	55	57	28
Crow Wing	119	141	102	111	63	99	76	66	107	117	96	83
Dakota	0	0	0	0	0	5	7	1	0	11	10	6
Dodge	0	0	0	0	0	0	0	3	1	1	3	4
Douglas	12	27	16	30	18	28	11	14	34	37	23	33
Faribault	0	0	0	0	0	0	0	0	1	12	3	1
Fillmore	0	0	0	0	6	1	1	5	5	10	6	13
Freeborn	0	0	0	0	0	0	0	5	10	10	1	7
Goodhue	0	0	0	0	3	3	7	11	7	18	2	2
Grant	0	0	0	0	3	3	6	1	8	12	6	13
Hennepin	0	0	0	0	1	3	6	2	3	4	5	6
Houston	0	0	0	0	9	15	11	11	10	26	22	14
Hubbard	70	91	80	72	59	72	41	52	42	67	61	36
Isanti	27	35	38	30	30	17	18	14	9	18	28	23
Itasca	382	483	362	334	205	201	191	247	281	346	345	184
Kanabec	38	57	79	62	44	29	23	17	22	52	45	34
Kandiyohi	0	0	0	0	2	6	6	8	8	10	20	20
Kittson	3	3	3	5	11	2	3	8	2	9	7	4
Koochiching	164	167	131	118	70	95	61	81	62	127	115	55
Lac Qui Parle	0	0	0	0	0	0	0	2	6	15	6	1
Lake	81	88	65	60	35	34	45	28	36	66	67	45
Lake of the Woods	42	31	34	24	30	17	8	15	27	27	27	31
Le Sueur	0	0	0	0	0	0	0	3	0	9	5	2
Lincoln	0	0	0	0	0	0	0	0	0	4	0	0
McLeod	0	0	0	0	6	6	8	12	18	19	22	18
Mahnomen	23	24	29	26	24	7	7	9	20	15	25	7
Marshall	34	29	18	7	6	2	0	13	13	15	15	4
Martin	0	0	0	0	0	0	0	0	0	1	0	0
Meeker	0	0	0	0	13	13	16	12	28	19	32	35
Mille Lacs	33	48	51	21	33	26	28	19	15	30	39	28
Morrison	46	64	77	60	45	43	31	29	29	52	52	50

Table 17 (continued). Comparison of otter harvest by county, 2002-2013.

County	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Mower	0	0	0	0	0	0	0	8	20	14	9	8
Nicollet	0	0	0	0	0	0	0	2	1	5	7	1
Nobles	0	0	0	0	0	0	0	0	0	0	0	4
Norman	1	16	17	11	9	17	11	12	21	45	27	19
Olmsted	0	0	0	0	0	2	3	2	3	0	7	7
Otter Tail	45	113	85	81	50	82	32	65	109	173	154	97
Pennington	16	18	33	15	9	0	1	4	2	12	5	8
Pine	78	99	51	111	50	74	37	38	44	66	98	59
Polk	72	104	45	47	32	25	19	36	49	83	71	47
Pope	0	0	0	0	11	12	12	11	20	22	14	19
Ramsey	0	0	0	0	0	0	0	0	0	3	1	1
Red Lake	35	58	26	30	19	8	20	22	19	26	11	10
Redwood	0	0	0	0	0	0	0	0	2	4	6	8
Renville	0	0	0	0	0	0	0	0	1	6	0	3
Rice	0	0	0	0	0	0	0	1	9	4	8	1
Rock	0	0	0	0	0	0	0	0	0	2	0	0
Roseau	72	69	60	53	32	53	23	32	33	64	48	44
St. Louis	483	508	428	344	290	251	233	253	239	363	293	258
Scott	0	0	0	0	3	3	1	4	2	4	3	2
Sherburne	24	25	15	29	26	10	17	7	19	12	9	10
Sibley	0	0	0	0	0	0	0	6	6	6	3	2
Stearns	13	22	21	33	9	38	24	13	41	53	53	41
Steele	0	0	0	0	0	0	0	1	0	3	1	0
Stevens	0	0	0	0	1	3	1	6	1	3	12	4
Swift	0	0	0	0	9	4	5	2	11	10	10	9
Todd	49	53	63	81	35	37	32	41	63	55	55	19
Traverse	0	0	0	0	1	0	2	0	1	4	1	0
Wabasha	0	0	0	0	15	7	18	7	8	20	21	19
Wadena	35	34	38	32	15	19	15	16	20	43	30	30
Waseca	0	0	0	0	0	0	0	0	0	0	0	2
Washington	10	8	11	16	18	19	11	16	18	12	24	27
Watonwan	0	0	0	0	0	0	0	0	0	0	1	0
Wilkin	0	0	0	0	2	0	0	0	0	3	2	0
Winona	0	0	0	0	11	19	13	15	20	21	17	5
Wright	2	3	2	5	7	9	8	11	17	23	26	21
Yellow Medicine	0	0	0	0	0	0	0	0	0	7	9	0
Unknown	14	13	14	22	6	18	12	2	17	40	2	18
Totals	2,766	3,450	2,846	2,720	1,861	1,938	1,544	1,814	2,294	3,171	2,824	2,154

Table 18. Otter harvest by sex and week, 2014-15 season.

Date	Sex			Total	% of	Cumulative
	Male	Female	Unknown	Harvest	Total	%
Oct.25 - Oct.31	120	81		201	9.33	9.33
Nov.1 - Nov.7	359	274	3	636	29.53	38.86
Nov.8 - Nov.14	170	112	3	285	13.23	52.09
Nov.15 - Nov.21	91	63	3	157	7.29	59.38
Nov.22 - Nov.28	95	52	1	148	6.87	66.25
Nov.29 - Dec.5	106	81	1	188	8.73	74.98
Dec.6 - Dec.12	77	58		135	6.27	81.24
Dec.13 - Dec.19	78	64		142	6.59	87.84
Dec.20 - Dec.26	77	53		130	6.04	93.87
Dec.27 - Jan.4*	63	44		107	4.97	98.84
Unknown	15	10		25	1.16	100.00
Total	1,251	892	11	2,154	100%	

* 9-day interval.

Table 19. Distribution of otter harvest* among trappers, 1993-2014.

Number (%) of Takers	Number Taken					
	1	2	3	4	Total Takers	Ave. Take
1993-94	193 (33)	115 (19)	100 (17)	184 (31)	592	2.5
1994-95	250 (27)	185 (20)	143 (15)	349 (38)	927	2.6
1995-96	183 (31)	134 (23)	88 (15)	180 (31)	585	2.5
1996-97	257 (29)	205 (23)	140 (16)	283 (32)	885	2.5
1997-98	304 (33)	235 (26)	117 (13)	255 (28)	911	2.4
1998-99	263 (32)	183 (23)	139 (17)	226 (28)	811	2.4
1999-00	222 (33)	124 (19)	99 (15)	217 (33)	662	2.5
2000-01	206 (32)	122 (19)	108 (17)	201 (32)	637	2.5
2001-02	147 (23)	175 (27)	138 (21)	187 (29)	647	2.6
2002-03	253 (33)	147 (19)	122 (16)	241 (32)	763	2.5
2003-04	269 (27)	201 (20)	152 (16)	361 (37)	983	2.6
2004-05	302 (25)	235 (19)	182 (15)	498 (41)	1217	2.7
2005-06	291 (27)	213 (20)	186 (17)	386 (36)	1076	2.6
2006-07	372 (34)	216 (19)	194 (17)	328 (30)	1110	2.4
2007-08	308 (39)	153 (19)	119 (15)	207 (26)	787	2.3
2008-09	293 (37)	157 (20)	121 (15)	216 (27)	787	2.3
2009-10	237 (38)	131 (21)	93 (15)	171 (27)	632	2.3
2010-11	263 (34)	166 (22)	130 (17)	206 (27)	765	2.4
2011-12	438 (42)	227 (22)	149 (14)	236 (22)	1050	2.2
2012-13	468 (35)	330 (24)	175 (13)	376 (28)	1349	2.3
2013-14	561 (43)	291 (22)	196 (15)	271 (21)	1319	2.1
2014-15	424 (42)	231 (23)	154 (15)	200 (20)	1009	2.1

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