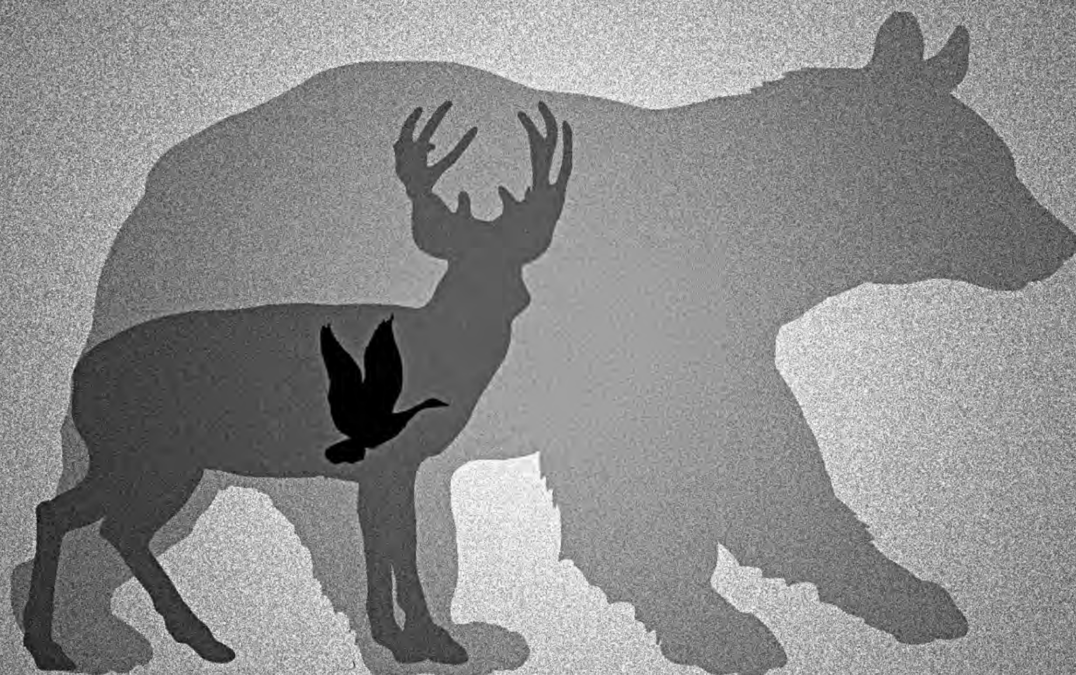

Status of Wildlife Populations

Fall 2021

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

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Status of Wildlife Populations, Fall 2021

(Including 2011-2021 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 2021

(Including 2011-2021 Hunting and Trapping Harvest Statistics)

This is the 45th year that the DNR has compiled this booklet; it is primarily an administrative document intended for DNR personnel. Since 1984 we have also generated a companion volume, *Summaries of Wildlife Research Findings*, containing annual summaries of activities and findings from ongoing research projects in the Wildlife Policy and Research Unit. This publication will be posted on the DNR website and available in other formats upon request. In the on-line format links are available to the U.S. Fish and Wildlife Service Division of Migratory Bird Management to access their reports for Waterfowl Population Status; Migratory Bird Harvest Information Preliminary Estimates; American Woodcock Population Status; and Mourning Dove Population Status.

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

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

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WILDLIFE RESTORATION

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TABLE OF CONTENTS

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INDEX

FARMLAND WILDLIFE POPULATIONS

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2021 MINNESOTA AUGUST ROADSIDE SURVEY

Timothy P. Lyons

SUMMARY OF FINDINGS

INTRODUCTION

Since 1955, the Minnesota Department of Natural Resources (MN DNR) wildlife and enforcement personnel have conducted the annual August Roadside Survey (ARS) during the first two weeks of August throughout Minnesota's farmland regions (Figure 1). Initially developed to provide indices of common upland game species (ring-necked pheasant, grey (Hungarian) partridge, eastern cottontail rabbits, white-tailed jackrabbits, and mourning doves, the survey now formally indexes white-tailed deer and sandhill cranes. The current ARS includes 172 survey routes in 70 counties throughout Minnesota. The results of the annual survey are made publicly available in the annual August Roadside Survey report (e.g. Lyons 2021).

OBJECTIVES

1. Index game birds and other wildlife within the historic "pheasant range" of Minnesota and throughout the farmland and transition zones of the state.
2. Analyze results provide public information about population trends of focal species.
3. Summarize weather and habitat conditions that may impact population trends of pheasants or other focal species

METHODS

Survey protocol

Observers drove each route during the early morning (starting at or near sunrise) at 15-20 mi/hr and recorded the number of pheasants, gray (Hungarian) partridge, eastern cottontail rabbits, white-tailed jackrabbits, white-tailed deer, mourning doves, sandhill cranes they observed including information on sex and age of these species. Surveys are only performed on mornings with dew, cloud cover less than 60%, and wind speeds under 10mph. 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 that are used to monitor annual changes and long-term trends in regional and range-wide populations. Results are reported by agricultural region and range-wide; however, population indices for species with low detection rates (e.g., white-tailed jackrabbits) are imprecise and unreliable.

Observers recorded the number of male (rooster), female (hen), and juvenile pheasants, whether the females were present with a brood, and the estimated age of the chicks in the brood. The same measurements were recorded for gray partridge, but adult birds were not sexed because they are not sexually dimorphic. Age and sex were recorded for both white-tailed deer and sandhill cranes when observed. Observers only reported a total count (no sex or age information) for mourning doves and rabbits.

Habitat data collection

We queried the MNDNR GIS database files of Wildlife Management Areas and summed the total area of parcels by county to obtain an estimate of protected habitat. Due to difficulties in classifying vegetation types from remotely-sensed data products, this estimate includes areas that are unsuitable upland habitat (i.e. closed-canopy forest). Aquatic Management Areas and State Parks were not included in this tally as we assume they do not make a meaningful contribution to upland habitat within the state. We obtained information on additional public lands, primarily National Wildlife Refuges and Waterfowl Production Areas from the U.S. Fish and Wildlife Service. Finally, we obtained estimates of potential upland habitat on private lands from the Minnesota Board of Water and Soil Resources. These lands were enrolled in state or federal programs that retire cropland temporarily (e.g. Conservation Reserve Program) or permanently (e.g. Conservation Reserve Enhancement Program, Reinvest in Minnesota, etc.).

Weather data collection

We obtained precipitation and temperature data summaries from the Midwest Regional Climate Center ([MRCC]; 2021) for each of the agricultural regions covered by the ARS. We used weekly maps of interpolated snow depth, provided by the Minnesota State Climatology Office, to compute the mean snow depth for the winter season (December 1 through March 31) in each agricultural region.

Analysis

We computed averages and annual change 10-yr, and long-term (since 1955) trend statistics for each of the focal species. We computed statistics at the state and regional scale, though results from regional analyses are more heavily biased due to the smaller sample sizes. In the analysis, we treated each year and route combination as an independent sample when computing annual change and trend statistics. Thus, the average proportional change for the state or region is the mean of proportional changes at the route level. Confidence intervals were calculated using critical values from Students T-distribution.

We calculated additional statics for pheasants, including the mean estimated hatch date and proportion of hens with a brood. We estimated the mean hatch date back calculating the hatch date for each brood based on its estimated age during the survey. We used the proportion of hens with broods as an index of breeding success among hens.

RESULTS

Habitat Conditions

Habitat on private lands showed mixed trends in 2021. Conservation Reserve Program (CRP) lands declined approximately 5,000 acres but was offset by an increase in lands enrolled in the Conservation Reserve Enhancement Program (CREP; approximately 10,000 acres) and Reinvest in Minnesota (RIM; approximately 2,000 acres). Lands enrolled in Wetland Reserve Program (WRP) and RIM-WRP did not change. Publicly owned habitat also increased in 2021. Federally managed U.S. Fish and Wildlife Service (USFWS) Waterfowl Production Areas (WPA), wildlife refuges, and conservation easements increased by almost 10,000 acres. Habitat managed by the DNR as Wildlife Management Areas (WMA) increased approximately 14,000 acres to 442,113 acres within the pheasant range. Protected habitat accounts for 6.5% of the landscape within the pheasant range and is greatest in the West Central and Southwest regions (range by agricultural regions: 3.3-9.5%; Table 1).

Minnesota's Walk-in Access (WIA) program continues to provide public hunting opportunities on private land already enrolled in existing conservation programs or has natural habitat. The program has grown each year since inception, and in 2021, features more than 260 sites totaling more than 30,000 acres, primarily in the South Central, Southwest, and West Central regions. In 2021, the program was expanded to include additional counties within the Central, East Central and Southeast regions. Sites are open to public hunting 1 September – 31 May where boundary signs are present. Hunters must purchase a $3 WIA Validation which allows access to all WIA lands statewide. For more information on the WIA program, including the code of conduct for WIA lands, a printable atlas of enrolled sites by county, aerial photos of each site, interactive maps, and Global Positioning System (GPS) downloads, visit the WIA program website. The WIA program is currently funded through a grant from the Natural Resource Conservation Service of the U.S. Department of Agriculture. Other funding sources are provided through a surcharge on nonresident hunting licenses, a one-time appropriation from the Minnesota Legislature in 2012, and donations from hunters.

Weather Summary

Following National Oceanic and Atmospheric Administration conventions, the 30-year period used to calculate normal temperatures now includes 1991-2020. Weather conditions for pheasants were mixed in 2020-2021. Winter conditions were milder, with above average temperatures throughout most of the winter and lower than typical snow depths throughout the state (Table 2). The major exception was February, during which temperatures were 7-10 degrees below normal and when snow depths reached their maximum throughout the state. Spring temperatures were near normal, while summer temperatures were 3-4 degrees above average (Table 2). Spring and summer precipitation was below normal and led to widespread drought conditions throughout most of the pheasant range (Table 2).

Survey Conditions

Weather conditions during surveys were challenging in 2021. Surveyors reported drier conditions, slightly more wind, but similar temperatures compared to previous years. Greater cloud cover than average as well as smoke from wildfires further complicated survey conditions. Consequently, detection of pheasants may have been lower in 2021 than in previous years.

Species Reports

Ring-necked Pheasant

The pheasant index decreased approximately 25% in 2021 (40.7 birds/100 mi) compared to 2020 (54.5 birds/100 mi; Table 3, Figure 2A). Indices of adult pheasants were similar to the previous year but number of broods and chicks declined slightly. Still, indices among all age and sex classes remained equivalent to the 10-year average (Table 3). Counts of pheasants among all classes remained below the long-term average (range: -49%, -56%; Table 3, Figure 2A). The ratio of broods per 100 hens, an indicator of breeding success, was down slightly compared to 2020 (-9%) and the 10 year average (-4%) but remained near the long-term average (+9%; Table 3). The number of chicks per brood in 2021 (4.8) remained constant compared to 2020 (5.0) and the 10-year average (4.6) but remained 17% below the long-term average (5.7; Table 3). Generally, this suggests that breeding success, not chick survival or overwinter survival, drove apparent declines this year.

Annual changes in roadside counts among regions generally mirrored statewide trends. Proportional declines were greatest in the West Central (-33%), Southwest (-30%) and Central (-38%) regions, but indices remained similar to 2020 in the South Central and East Central regions (Table 4). Only the Southeast saw an increase in the pheasant index in 2021, though counts are lowest there (Table 4). Despite the apparent annual declines, indices among all regions remained at or greater that their respective 10-year averages and the South Central, Southwest, and West Central regions all reported indices that were greater than the statewide average (Tables 3 and 4).

Gray Partridge

The 2021 range-wide gray partridge index (2.5 birds/100 mi) was similar to 2020 and the 10-year average but remained below the long-term average (-80%; Table 3, Figure 2B). Partridge are generally rare throughout the state, but may be locally abundant. The Southwest, South Central, and Southeast regions provide the best opportunities for harvesting gray partridge in 2021 (Table 4).

Cottontail Rabbit and White-tailed Jackrabbit

The 2021 eastern cottontail rabbit index (4.7 rabbits/100 mi) was unchanged from 2020 (4.8 rabbits/100 mi) but remains below the 10-year average (-16%) and the long-term average (-22%; Table 3, Figure 3A). Annual changes in the cottontail index varied among regions, but differences were small which suggests that the index remained relatively constant (Table 4). The best rabbit hunting opportunities will be in the East Central, South Central, and Southeast regions (Table 4).

Single white-tailed jackrabbits were observed on three routes in the Central region (Table 3). Jackrabbits are rarely detected, making annual or short-term trend comparisons difficult. Still, the jackrabbit index remains >90% below the long-term average (Table 3, Figure 3B). Minnesota’s jackrabbit population peaked in the late 1950s, declined to low levels in the 1980s, and has remained at low levels since then. The long-term decline in jackrabbits can primarily be attributed to loss of preferred habitats (e.g., pasture, hayfields, and small grains)..

White-tailed Deer

The 2021 white-tailed deer index (30.2 deer/100 mi) remained similar to 2020 (29.6 deer/100 mi) but remained above the 10-year average (+32%) and the long-term average (+138%; Table 3, Figure 4A). Regional indices for deer declined in the Northwest and West Central regions, increased among the Central, Southwest, and Southeast regions, and showed no change in the South Central and East Central regions (Table 4).

Mourning Dove

The 2021 range-wide mourning dove index (110.9 doves/100 mi) was unchanged compared to 2020 (111.4 doves/100 mi) but remained below the 10-year (-27%) and long-term averages (-54%; Table 3, Figure 4B). The dove index showed small decreases in the West Central, Central, and South Central regions, stayed relatively constant in the Northwest region, and increased in all other regions (Table 4). The dove index was greatest in the Southwest, South Central, and West Central regions; opportunities for harvesting doves should be greatest there as well.

Sandhill Crane

The 2021 roadside index of sandhill cranes (13.5 cranes/100 mi) was similar to the 2020 index (Table 3). The indices of all cranes and juveniles among the farmland regions remained stable near the 10-year average. Though the West Central, South Central, and Southeast regions reported either no substantial changes or minor decreases, the crane index is generally low in these regions (Table 4). The majority of cranes are reported in the Northwest, Central, and East Central regions which exhibited an increase, no change, and a decline in 2021 (range: -43%, +68%; Table 4). The Northwest and Central region indices were above the 10-year average, though the East Central region remains below. Cranes have not yet been reported in roadside counts in the Southwest region.

Other Species

Notable incidental sightings recorded by observers included: Osprey (Wright county), prairie chickens (Polk County), red-headed woodpecker (Mower, Redwood, Renville, and Watonwan counties), sharp-tailed grouse (Red Lake, Roseau, and Polk counties), Eurasian-collared doves (Goodhue, Wabasha, and Nicollet counties) and red fox (Dodge and Yellow Medicine counties).

ACKNOWLEDGMENTS

We thank the many cooperators for completing the routes required for this survey; without their efforts, this survey would not be possible. Tonya Klinkner and Katie Steffl were invaluable in providing logistical assistance and entering route data. Jason Beckler (Minnesota Board of Water and Soil Resources) provided enrollment data on cropland retirement programs in Minnesota and Allison McCluskey (U.S. Fish and Wildlife Service) provided federal land acquisition data. John Giudice, Nicole Davros, and Seth Goreham (MN DNR Wildlife Research) reviewed an earlier draft of this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

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Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within Minnesota's pheasant range, 2021, by agricultural region (AGREG).

	Cropland Retirement (private lands)[a]					Public Lands				
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[b]	MNDNR[c]	Total	% of landscape	Density ac/mi^2
WC	255,502	41,456	24,920	18,092	20,934	215,054	124,868	700,826	9.5	61.0
SW	122,333	32,982	20,800	2,553	766	26,014	67,875	273,323	7.2	46.2
C	125,159	19,247	44,300	7,265	2,997	93,425	55,327	347,720	5.8	36.8
SC	101,789	33,882	13,665	10,779	9,108	11,894	38,153	219,270	5.4	34.7
SE	75,702	3,517	7,294	1,070	1,578	37,134	58,712	185,006	5	31.9
EC	2,174	0	1,139	0	4	4,994	97,178	105,489	3.3	21.0
Total	682,659	131,084	112,118	39,759	35,387	388,515	442,113	1,831,634	6.5	41.7

[a] Unpublished data, Jason Beckler, BWSR, 25 August 2021.
[b] Includes Waterfowl Production Areas (WPA), USFWS refuges, & USFWS conservation easements
[c] MN DNR Wildlife Management Areas (WMA). The data source for this field was changed in 2020 and comparisons to earlier years are not valid.

Table 2. Average temperature, snow depth, and precipitation by season and agricultural region in Minnesota, 2021.

	Agricultural Region							
	NW	WC	C	EC	SW	SC	SE	STATE
Winter (December 1 - March 31)								
Temperature (average °F)	18.6	22.2	22.0	20.8	23.9	23.8	23.4	22.1
Departure from normal (°F)[a]	4.6	4.1	2.9	2.4	2.9	2.3	1.6	3.0
Snow Depth (average inches)	4.0	2.9	3.8	5.8	2.8	3.9	3.4	3.8
Spring (April 1 - May 31)								
Temperature (average °F)	47.1	50.3	50.6	48.8	50.8	52.0	51.5	50.2
Departure from normal (°F)[a]	-0.2	0.4	0.5	0.2	-0.2	0.2	0.3	0.2
Precipitation (total inches)	1.4	2.2	2.3	2.4	2.2	2.1	2.7	2.2
Departure from normal (inches)[a]	-0.8	-0.5	-0.8	-0.8	-1.2	-1.8	-1.4	-1.0
Summer (June 1 - July 31)								
Temperature (average °F)	70.8	72.7	72.3	70.2	72.8	72.8	72.1	72.0
Departure from normal (°F)	4.4	4.1	3.7	3.4	3.2	2.8	3.0	3.5
Precipitation (total inches)	1.3	2.0	1.7	1.9	1.8	2.2	3.4	2.0
Departure from normal (inches)[a]	-2.5	-2.1	-2.6	-2.6	-2.4	-2.5	-1.5	-2.3

[a] Departures calculated using 30-year NOAA average (1991-2020) over respective time period.

Table 3. Range-wide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2021.

Species	Change from 2019[a]					Change from 10-year average[b]				Change from long-term average (LTA)[c]			
Subgroup	*n*	2020	2021	%	95% CI	*n*	2011-2020	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	148	54.5	40.7	-25	:16	146	37.7	7	.5	146	90.6	-56	±9
Cocks	148	7.0	5.1	-27	:22	146	5.5	-8	.7	146	10.4	-52	±12
Hens	148	7.6	6.4	-15	:17	146	5.7	10	.6	146	13.2	-52	±12
Broods	148	8.3	6.4	-23	:16	146	5.8	6	.5	146	12.0	-49	±9
Broods per 100 hens	148	104.6	95.0	-9			100.8	-4			88.7	9	
Chicks per brood[d]	221	5.0	4.8	-5			4.6	2			5.7	-17	
Median hatch date[d]	221	8-Jun	16-Jun				11-Jun				8-Jun		
Gray partridge	163	3.8	2.5	-34	:52	163	2.4	14	33	153	13.2	-80	±15
Eastern cottontail	163	4.8	4.7	-2	:42	163	5.6	-16	35	153	6.4	-22	±31
White-tailed jackrabbit	163	0.1	0.1			163	0.1			153	1.5	-95	
White-tailed deer	163	29.6	30.2	2	±7	163	22.9	32	9	164	12.9	138	±15
Mourning dove	163	111.4	110.9	0	±2	163	150.7	-27	1	153	249.5	-54	±1
Sandhill crane[e]													
Total cranes	163	12.6	13.5	7	:16	163	12.6	10	.6				
Juveniles	163	1.6	2.2	35	122	163	1.7	30	18				

[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 = long-term average during years 1955-2020, except for deer (1974-2021). Estimates for all species except deer based on routes (*n*) surveyed $\geq$40 years; estimates for deer based on routes surveyed $\geq$25 years. The Northwest region (8 counties in Northwest were added to the survey in 1982) included only for deer.

[d] Sample size is the total number of broods observed across all surveys rather than the number of routes run in 2021.

[e] Sandhill cranes were added to the survey in 2009; thus, long-term averages are not calculated

Table 4. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2021.

Region	Change from 2020[a]					Change from 10-year average[b]				Change from long-term average (LTA)[c]			
Species	*n*	2020	2021	%	95% CI	*n*	2011-2020	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	15	2.7	0	-100	±80	17	0.8			18	2.5	-30	15
Eastern cottontail	15	1.3	1.1	-20	±161	17	0.9			18	0.9	0	15
White-tailed jackrabbit	15	0	0			17	0.1			18	0.5		15
White-tailed deer	15	64.5	55.3	-14	±3	17	52.2	5	±4	18	37	57	15
Mourning dove	15	67	65.2	-3	±3	17	81.3	-23	±3	18	110.2	-36	15
Sandhill crane[e]	15	30.9	51.8	68	±7	17	41.4	19	±5				15
West Central[f]													
Ring-necked pheasant	38	64.1	43.3	-33	±3	36	42.6	-5	±5	36	93.6	-57	38
Gray partridge	38	0.2	0.2			36	0.3			36	8.6	-97	38
Eastern cottontail	38	2.2	1.6	-29	±92	36	2.5	-33	±83	36	3.8	-56	38
White-tailed jackrabbit	38	0.1	0			36	0.1			36	2		38
White-tailed deer	38	33.6	29.6	-12	±6	36	25	13	±8	36	12.6	125	38
Mourning dove	38	147.2	126.7	-14	±1	36	193.3	-34	±1	36	351.9	-64	38
Sandhill crane[e]	38	5	4.4	-11	±41	36	2.3	96	±90				38
Central													
Ring-necked pheasant	30	55.4	34.1	-38	±34	30	33.1	3	±6	30	67.3	-49	30
Gray partridge	30	2.8	0.4	-86	±73	30	1.6	-75	±126	30	8.1	-95	30
Eastern cottontail	30	5.5	4.9	-10	±37	30	5.1	-3	±40	30	6.2	-20	30
White-tailed jackrabbit	30	0	0.4			30	0.1			30	1.1		30
White-tailed deer	30	35.1	44.1	26	±6	30	21.3	108	±10	30	8.8	399	30
Mourning dove	30	95.8	84.3	-12	±2	30	134	-37	±2	30	214.7	-61	30
Sandhill crane[e]	30	26.9	28.3	5	±8	30	22.1	28	±9				30
East Central													
Ring-necked pheasant	10	34	32.4	-5	±7	10	36.2	-11	±6	10	79.8	-59	10
Gray partridge	10	0	0			10	0.3			10	0.2		10
Eastern cottontail	10	9.1	9.6	5	±25	10	13.1	-27	±17	10	9.6	0	10
White-tailed jackrabbit	10	0	0			10	0			10	0.1		10
White-tailed deer	10	31.5	30.4	-4	±7	10	27.5	10	±8	10	12.8	137	10
Mourning dove	10	47.1	62	32	±5	10	64.6	-4	±4	10	109.3	-43	10
Sandhill crane[e]	10	44.7	25.6	-43	±5	10	53.3	-52	±4				10

Table 4. Continued.

Region Species	Change from 2020[a] *n*	2019	2020	%	95% CI	Change from 10-year average[b] *n*	2009-2019	%	95% CI	Change from long-term average (LTA)[c] *n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	90.5	63.2	-30	±2	19	59	7	±4	19	109.4	-42	±2
Gray partridge	19	9.5	5.3	-44	±22	19	4.9	8	±43	19	36	-85	±6
Eastern cottontail	19	5.5	4.4	-19	±38	19	5.3	-17	±40	19	7.7	-42	±27
White-tailed jackrabbit	19	0.4	0			19	0.3			19	3.3		
White-tailed deer	19	15.6	20.6	32	±14	19	19.7	5	±11	19	10.9	89	±19
Mourning dove	19	123.6	155.8	26	±2	19	200.9	-22	±1	19	294.9	-47	±1
Sandhill crane[e]	19	0	0			19	0						
South Central													
Ring-necked pheasant	31	54	49.8	-8	±4	31	39.5	26	±5	31	118.9	-58	±2
Gray partridge	31	7.2	5.7	-21	±28	31	4.9	15	±41	31	16.7	-66	±12
Eastern cottontail	31	4.4	7	59	±47	31	7.5	-7	±27	31	7.7	-10	±27
White-tailed jackrabbit	31	0	0			31	0.1			31	1.5		
White-tailed deer	31	14.3	11.9	-17	±14	31	8.8	35	±23	31	4.7	150	±43
Mourning dove	31	141.4	130.6	-8	±1	31	187.3	-30	±1	31	246.7	-47	±1
Sandhill crane[e]	31	4.3	3.6	-15	±48	31	2.2	66	±94				
Southeast													
Ring-necked pheasant	20	11.8	14.4	22	±18	20	13.3	8	±16	20	64.1	-78	±3
Gray partridge	20	4.2	5.6	33	±50	20	3.3	69	±63	20	12.3	-55	±17
Eastern cottontail	20	8.8	7	-21	±24	20	9.4	-25	±22	20	8	-13	±26
White-tailed jackrabbit	20	0	0			20	0			20	0.5		
White-tailed deer	20	23.4	28.8	23	±9	20	19.3	49	±11	20	12.4	132	±17
Mourning dove	20	74.5	106.6	43	±3	20	96.7	10	±2	20	202.2	-47	±1
Sandhill crane[e]	20	0.8	2.2			20	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 = long-term average during years 1955-2021, except for Northwest region (1982-2021) and white-tailed deer (1974-2021). Estimates based on routes (*n*) surveyed ≥40 years (1955-2021), 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] Sandhill cranes were added to the survey in 2009; thus, long-term averages are not calculated.
[f] Two routes were added to the West Central region in 2014.

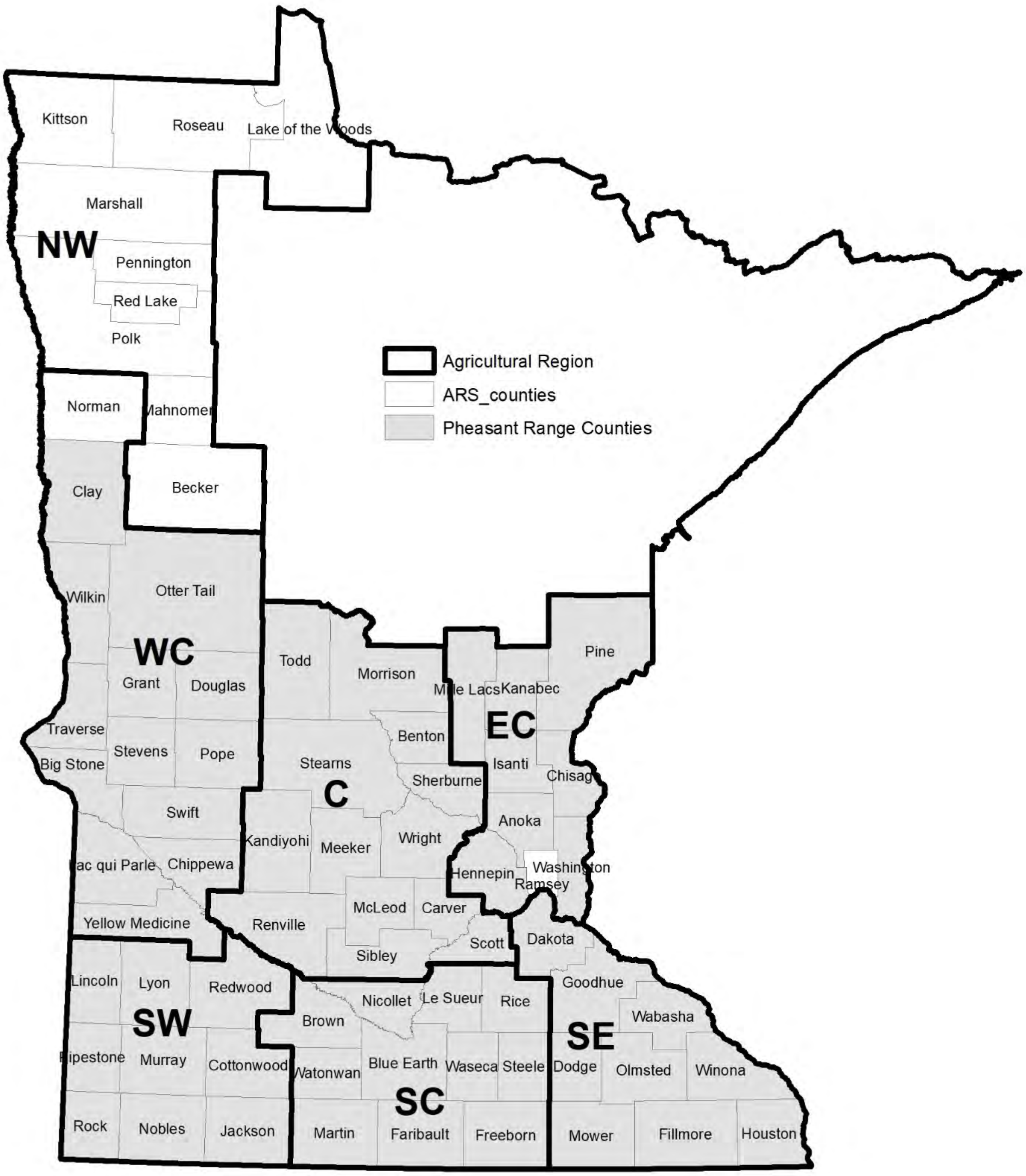


Figure 1. Survey regions and ring-necked pheasant range delineation for Minnesota's August roadside survey, 2021

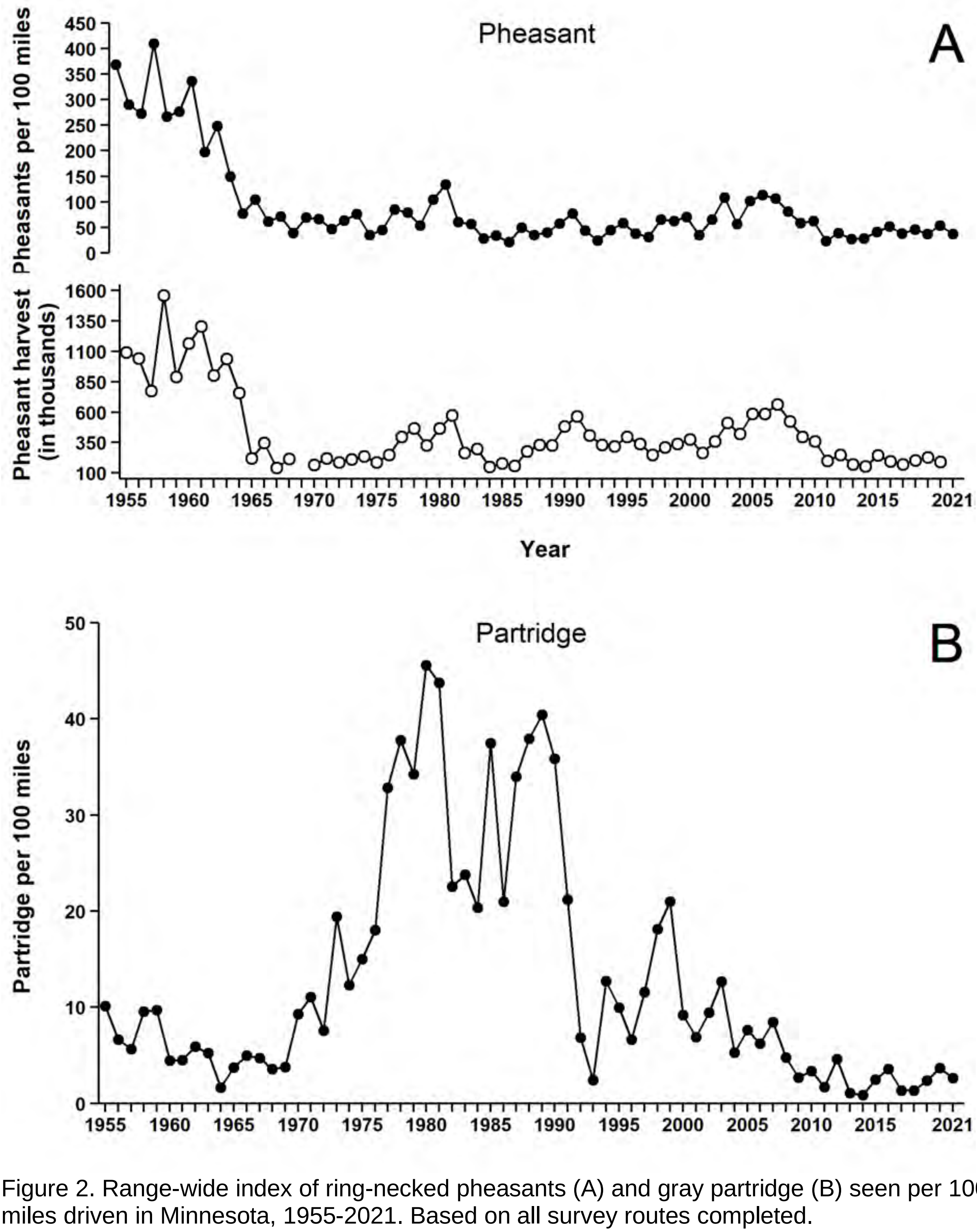
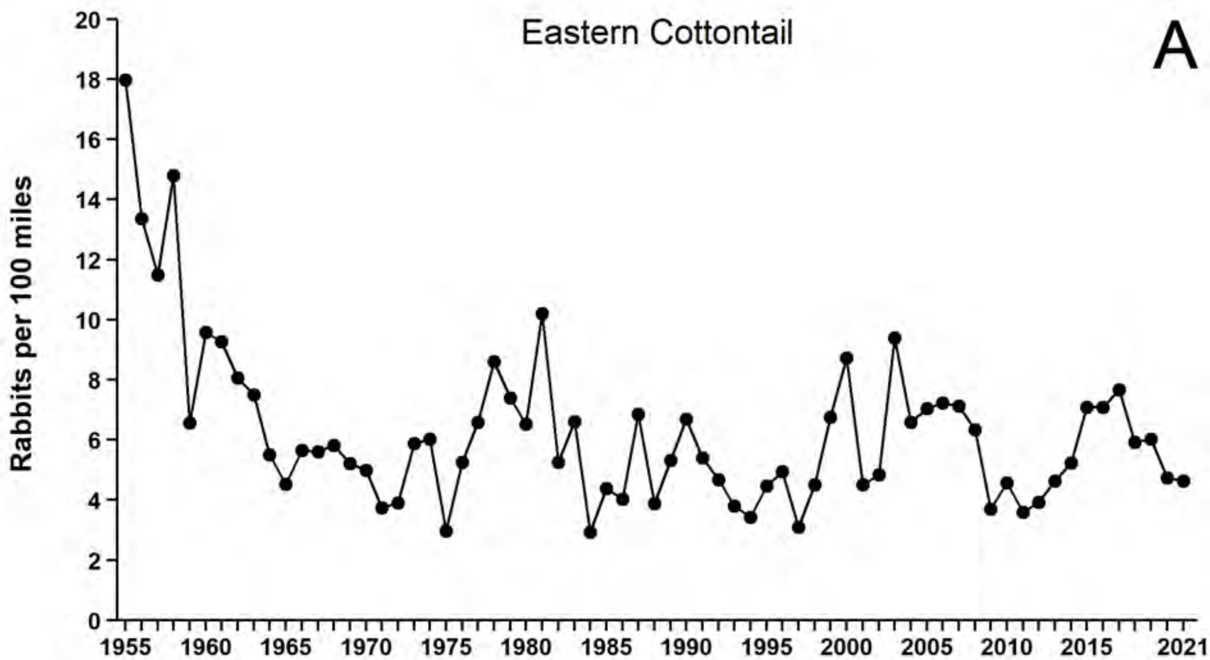


Figure 2. Range-wide index of ring-necked pheasants (A) and gray partridge (B) seen per 100 miles driven in Minnesota, 1955-2021. Based on all survey routes completed.



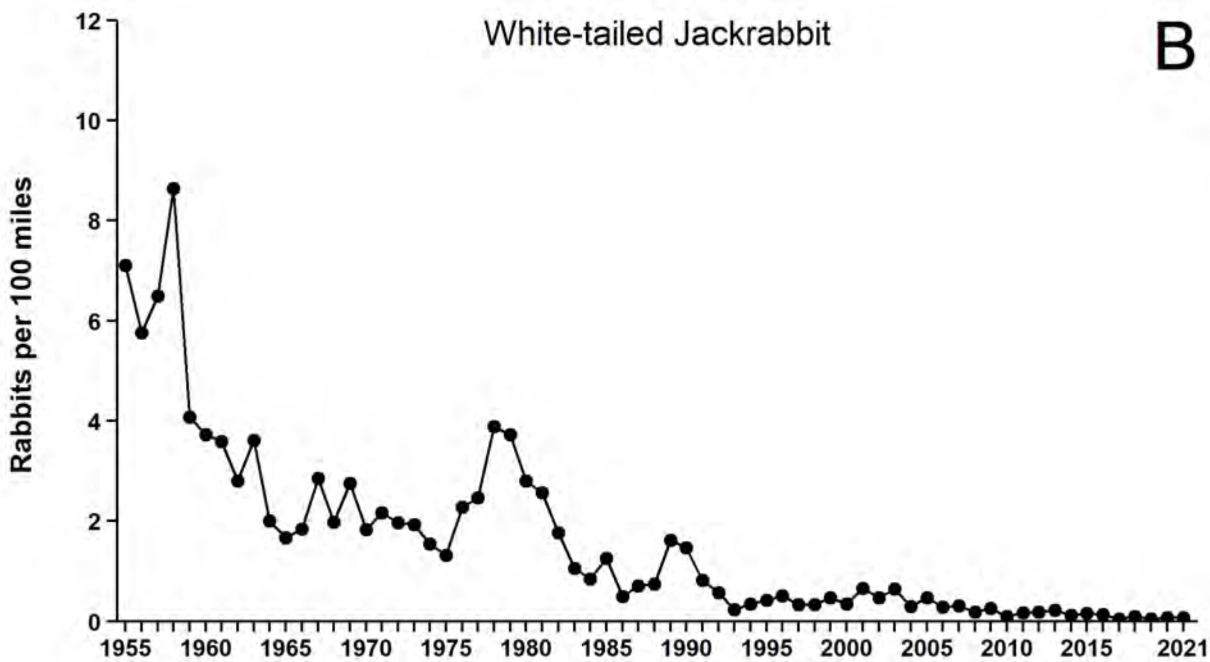


Figure 3. Range-wide index of eastern cottontail (A) and white-tailed jackrabbits (B) seen per 100 miles driven in Minnesota, 1955-2021. Based on all survey routes completed.

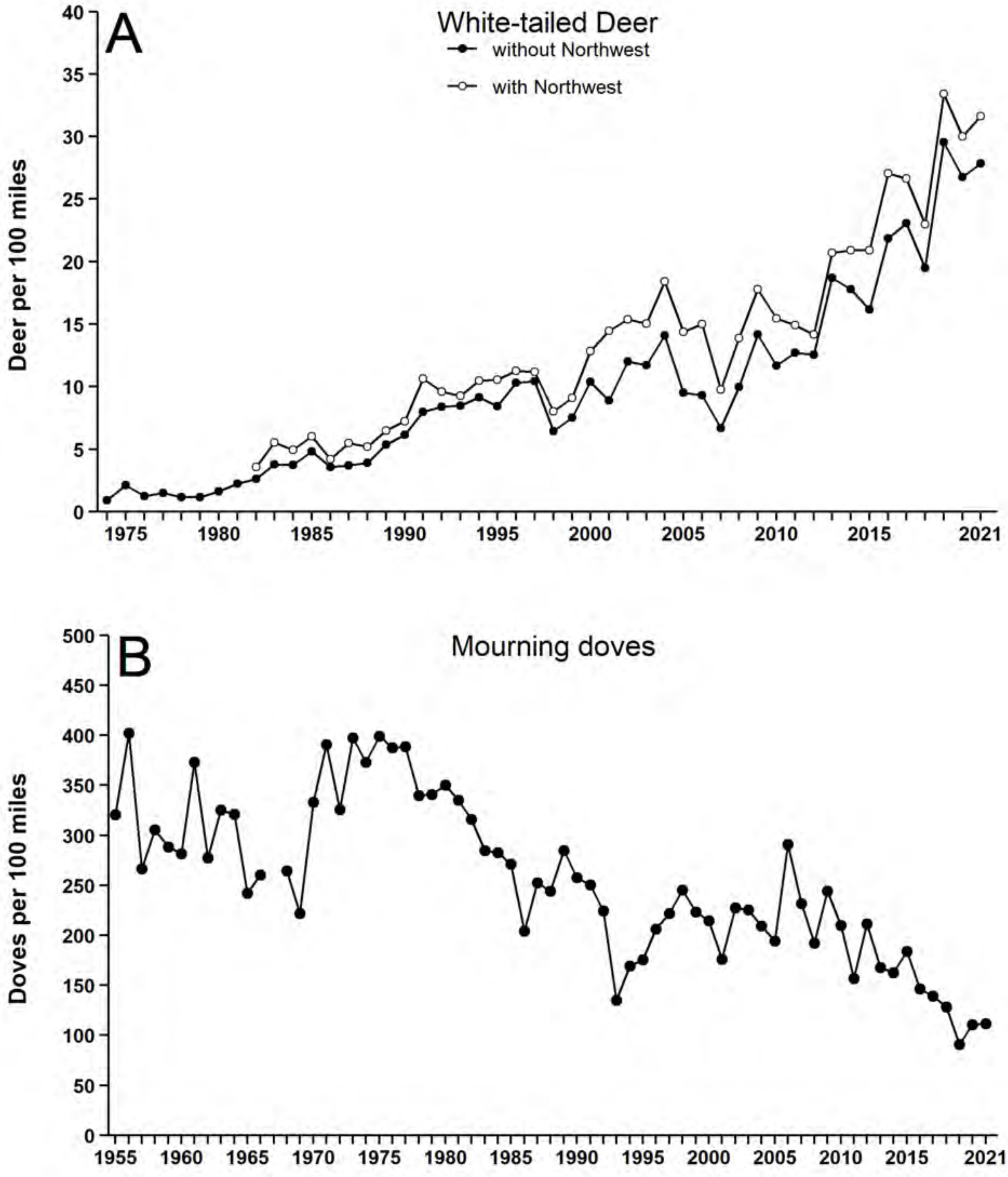


Figure 4. Range-wide index of: (A) white-tailed deer seen per 100 miles driven in Minnesota, 1974-2021, with and without the Northwest region included; and (B) mourning doves seen per 100 miles driven in Minnesota, 1955-2021. Doves were not counted in 1967. Based on all survey routes completed.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA – 2021

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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 annual hunting regulations to adjust deer harvest to meet management goals. MNDNR wildlife researchers conduct simulation modeling of deer populations to explore the impacts of various hunting regulations on populations, to understand historical deer herd dynamics, and to predict relative population sizes. To aid in decision-making, MNDNR Biologists consider output from population modeling 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. This report summarizes the structure and parameters of the simulation model and provides a description of recent trends in modeled density estimates and harvest recommendations.

METHODS

Prior to 2019, we modeled deer populations at the deer permit area (DPA) level. However, with over 130 DPAs, this was a major annual undertaking that limited the time the modeler could devote to each modeling unit, including exploring the sensitivity of the model in each case. Furthermore, we typically lacked empirical data on population vital rates (other than harvest) at the DPA scale and it would be cost prohibitive to collect such data. Conversely, collecting annual or periodic population data over larger modeling units might be feasible. Therefore, beginning in 2019, we consolidated DPAs into deer modeling units (DMUs; Figure 1). DMUs are generally consistent with goal-setting blocks (GSBs), except some DMUs may contain less than the full set of DPAs within a GSB if there were major boundary changes in the last 5 years (which makes it difficult to interpret harvest data and population trends). However, we recognize that annual regulatory decisions still occur at the DPA level and we need to link DMU-level modeling results to DPA-level decision making. Therefore, we used the annual proportional buck harvest in each DPA to convert DMU population estimates to DPA-level density estimates, which we acknowledge is a simplification of factors that can influence variation in deer densities among DPAs and years. Thus, we advise caution when interpreting annual DPA-level estimates of absolute density.

Model Structure

We used the spring of the initial year before reproduction occurred (Figure 2) as the starting period for each multi-year simulation. We specified an initial population density (see Modeling Procedures section) and the model then converted the initial population density into a total population size by multiplying the density by the total land area of the DMU. We set the proportion of adult deer by age- and sex-class in the initial population (adult females mean = 0.45 [SD = 0.02], adult males mean = 0.20 [SD = 0.02]). We allocated the remaining proportion approximately equally (with some small variation for primary sex ratio) to young-of-year (YOY) males and females.

Within each annual cycle, we applied age-specific fecundity rates to females to estimate reproduction. We subjected all age- and sex-classes to spring/summer mortality, and the result was the pre-hunt fall population. We also subtracted hunter-harvested deer from the pre-hunt population. We estimated winter mortality rates by age-class relative to winter severity, and we then applied winter mortality rates 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 DMU were equal.

Reproduction

We used fecundity rates from a range of values reported for Iowa, Minnesota, and Wisconsin (Iowa DNR unpublished data, Fuller 1990, McCaffery et al. 1998, DelGiudice et al. 2007, Dunbar 2007, Grund 2011, Storm 2014, Storm 2015, Dittrich 2016). We partitioned fecundity rates by 2 age-classes of breeding females (i.e., <1 year old [YOY] when bred and $\geq$1 years old [adult] when bred) and allowed rates to vary by 3 eco-geographic zones (northeast, farmland and transition areas, and southeast) that reflected relative differences in climate and habitat quality. We estimated fecundity rates to be lowest in the northeast (YOYs, mean = 0.06 [SD = 0.005]; adults, mean = 1.55 [SD = 0.001]), moderate in the farmland and transition zone (YOYs, mean = 0.07 [SD = 0.017]; adults, mean = 1.71 [SD = 0.022]), and greatest in the southeast (YOYs, mean = 0.13 [SD = 0.029]; adults, mean = 1.81 [SD = 0.055]). Sex ratio of fawns at birth in most deer populations is approximately 50:50 but may vary annually (Ditchkoff 2011). Therefore, we allowed the proportion of male fawns at birth to vary uniformly between 0.48-0.52.

Spring/Summer Survival

Winter survival rates of deer 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). Minnesota Information Technology (MNIT) Services/MNDNR staff calculate an annual winter severity index (WSI) in each DPA based on snow depth and minimum daily temperatures. 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.

We used estimates reported in the primary literature for deer in Minnesota and populations in similar habitats for fawn spring/summer survival (Wisconsin DNR unpublished data, Huegel et al. 1985, Nelson and Mech 1986a, Nelson and Woolf 1987, Kunkel and Mech 1994, Brinkman et al. 2004, Vreeland et al. 2004, Rohm et al. 2007, Hiller et al. 2008, Carstensen et al. 2009, Warbington et al. 2017). We adjusted fawn survival rates to estimate the effects of winter severity on the condition of adult females during the previous winter. Mean spring/summer fawn survival values were 0.70 (SD = 0.031), 0.55 (SD = 0.037), and 0.45 (SD = 0.037) when WSI<100, 100≤WSI<180, and 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 similar 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 = 0.011], male = 0.98 [SD = 0.015]). 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 Recovery Rates

Hunter harvest represents the greatest source of mortality for deer populations in most DPAs in Minnesota during 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, special hunts, and harvest reported by Native American Tribes within DPAs.

We recognized that some deer were not registered during the hunting season or they were harvested illegally (Dusek et al. 1992, Rupp et al. 2000), wounded and not recovered (Nixon et al. 2001), or died from other non-hunting causes (e.g., deer-vehicle-collision, Norton 2015). We applied a mean multiplier of 1.05 (SD = 0.002) to the numerical harvest to account for non-registered deer that died during the hunting season. Because we expect the true multiplier to be greater than 1.05, density estimates are conservative, but resulting population trends will likely be similar when different multipliers are used based on the modeling procedures.

Winter Survival

Winter severity, particularly snow depth, increases risk of deer mortality via starvation and predation with fawns being more susceptible than adults (Nelson and Mech 1986b, DelGiudice et al. 2002, Norton 2015). We estimated winter survival rates relative to winter severity based on studies conducted in Minnesota (Nelson and Mech 1986a, DelGiudice et al. 2002, Brinkman et al. 2004, Grund and Woolf 2004, DelGiudice et al. 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, Norton 2015).

For adult deer, we set mean winter survival at 0.95 when WSI≤25. When WSI>25, we used an equation to calculate survival to account for increased winter severity based on previous research in Minnesota. For fawns, we set the mean winter survival rate at 0.85 when WSI≤60.When WSI was above 60 and less than 100, we applied the same equation used to calculate adult survival. However, we subtracted an additional mortality rate of 0.05 to represent lower survival of fawns versus adults. For more severe winters (100≤WSI≤240), we adjusted the equation to represent increased mortality reported for fawns in field studies. When WSI exceeded 240, we set fawn survival at 0.033.

Modeling Procedures

Simulation models can be sensitive to the parameter for initial population size (e.g., Grund 2014). Therefore, we used density estimates from last year's models as starting points for this year's models. However, we explored alternative starting values in cases where the simulated population was growing or declining at an unrealistic rate (e.g., due to adding new harvest data and, possibly, removing harvest data that are now outside the modeling window). This can lead to some discrepancies with previously reported model estimates, which is not an ideal situation. However, it reflects an important limitation of simulation models. Thus, we advise caution when interpreting estimates of absolute density (vs. population trends).

We ran model simulations for 5 years (2016-2021) with the final population estimate occurring pre-fawning for the spring following the most recent deer hunting season (i.e., spring 2021). We performed all simulations with the R programming language (ver. 3.6.2, R Core Team 2019) and used 500 Monte Carlo simulations until we determined the most reasonable set of starting parameters. We then used 5,000 simulations for the final run.

RESULTS

Deer Population Trends and Management Recommendations

Although we derived the model parameters from studies of deer in Minnesota or from studies from states that have similar habitats and environmental conditions, uncertainty is inherent in modeling wild deer populations. Our modeling allowed input parameters to vary stochastically to represent natural variation that occurs in wild populations, and model outputs 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 for 23 DMUs (Table 1) and derived subsequent density estimates in 106 of 131 DPAs in Minnesota to estimate deer densities before reproduction during spring 2021 (Table 2; Figure 3).

Deer populations in most DPAs increased through 2021. Management designations in 2021 were consistent in most DPAs compared to 2020 in an attempt to stabilize or reduce densities that had exceeded goals. Each ecogeographic zone observed some DPAs that were below goal (southwestern farmland zone, n = 2; farmland-forest transition zone, n = 1; northeastern forest region, n = 4). Although firearm hunting season conditions across some areas in the state were mostly below average in 2020 due to abnormally high temperatures during opening weekend, total harvest increased in 2020 from 2019. Regardless, liberal antlerless seasons in 2021 will be required again to effectively manage deer populations in DPAs with average and above average productivity.

In terms of management intensity, the 2021 designations afford more antlerless deer harvest opportunities to hunters in about 12% of the DPAs versus the 2020 season. About 5% of DPA designations afford less antlerless harvest opportunity in 2021 compared to 2019 with a majority (83%) of designations providing the same antlerless opportunity as 2020.

Farmland Zone

We produced density estimates for 34 of 37 total farmland zone DPAs. Of those 34 DPAs, 24 were at goal, 2 were below goal, and 8 were above goal based on modeling or buck harvest trends. Modeling deer densities in the farmland with harvest data continues to be a challenge, and relatively stable buck harvests the past 20 years suggests a stable population with limited potential for growth, likely a result of habitat constraints. We selected management designations to stabilize deer numbers with consistent regulations across years whenever possible. Most farmland DPAs (n = 22) were under a Lottery designation. Four of the DPAs required Hunter Choice, 7 were under Managed designations, 3 were under the Intensive designation, and 1 was designated as Five Deer Limit with an Early Antlerless season, to stabilize or reduce deer numbers at appropriate levels.

Farmland-Forest Transition Zone

Deer populations in the farmland-forest transition zone are highly productive due to excellent habitat and generally milder winters compared to the forest zone. Historical harvests and modeled population trends suggested that Lottery designations were not sufficient to stabilize deer numbers in most transition zone DPAs as evidenced by few DPAs with Lottery recommendations. We produced density estimates for 40 of the 50 transition zone DPAs. Of those 40 DPAs, 10 were at goal, 1 was below goal, and 12 were above goal based on modeling. Establishing whether the remaining 17 DPAs for which we derived density estimates for were at goal was not feasible because outdated goals (will undergo goal setting in 2021 or 2022) were not directly comparable to current density estimates derived from the DMU model. For the 2021 season designations, Lottery will be used for 3 DPAs, Hunter Choice for 4 DPAs, and Managed for 7 DPAs. In 28 DPAs, Intensive designations will be necessary to continue reducing deer densities toward goal level, 10 of which have additional antlerless seasons. In the metro area (DPA 701) and the chronic wasting disease management zone (DPAs 605, 643, 645, 646, 647, 648, and 649), a Five Deer Limit with an Early Antlerless season will be available during the legal hunting seasons.

Forest Zone

Many deer populations in the forest zone with adequate habitat have recovered from the severe winter of 2013-14. We produced density estimates for 32 of 44 forest zone DPAs. Of the 32 DPAs, 9 were at goal and 4 were below goal based on modeling or buck harvest trends. Establishing whether the remaining 19 DPAs (for which we derived density estimates) were at goal was not feasible because outdated goals (will undergo goal setting in 2021 or 2022) were not directly comparable to current density estimates derived from the DMU model. For 2021 season designations, Bucks-only will be used in 5 DPAs, Lottery in 19 DPAs, Hunter Choice in 11 DPAs, Managed in 6 DPAs, Intensive in 2 DPAs, and Five Deer Limit with an Early Antlerless Season in 1 DPA.

ABRIDGED DESCRIPTIONS OF DEER HUNTING SEASON DESIGNATIONS (MNDNR 2021)

Bucks-only. All hunters, including youth and archery hunters, are restricted to harvesting only legal bucks. No antlerless deer may be harvested; limited exceptions for hunters ≥84 years of age or persons in veterans homes. The bag limit is **one** deer.

Antlerless Permit Lottery. A hunter may apply for authorization to harvest one either-sex deer during either the firearm or muzzleloader season. Archery hunters can take a deer of either sex. Under this scenario, archers, youth, and disabled hunters can kill a deer of either-sex. The bag limit is **one** deer.

Either Sex. The initial license is either-sex and bonus permits cannot be used. There is no antlerless permit lottery application and all hunters potentially could harvest an antlerless deer, regardless of season. The bag limit is **one** deer.

Two-deer Limit. The initial license is either-sex and a maximum of **two** deer (one buck) can be taken using any combination of licenses and permits.

Three-deer Limit. The initial license is either-sex and the maximum of **three** deer (one buck) can be taken using any combination of licenses and permits.

Five-deer Limit. The initial license is either-sex and the maximum of five deer (one buck, except the SE 600-series) can be taken using any combination of licenses and permits.

***Early Antlerless.** A hunter could harvest **five additional** deer in these permit areas during the early antlerless season (e.g. the annual limit in an intensive permit area with an early antlerless season would be eight deer).

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Table 1. Estimated mean pre-fawn deer densities (deer/mi^2) for deer management units (DMUs) derived from population model simulations in Minnesota, 2016-2021.

		Pre-fawn Deer Density					
Deer Management Unit	Land Area (mi^2)	2016	2017	2018	2019	2020	2021
1	1470	4	5	6	6	8	9
2	2027	11	12	13	14	16	18
[a]3a	1384	4	4	5	5	6	8
[a]3b	782	6	6	7	7	7	8
4	2466	4	5	5	4	4	5
5	2779	3	3	3	3	3	4
6	3750	8	10	11	11	12	15
7	3926	18	20	22	21	23	27
8	5537	12	13	14	13	14	17
9	3772	11	11	12	12	12	14
[a]10a	692	23	26	27	26	29	34
[a]10b	1667	25	30	33	36	43	51
11	1549	30	32	34	33	35	38
12	3331	20	23	25	25	28	30
13	2550	4	4	5	5	7	8
14	2810	13	15	17	18	22	26
15	3648	18	21	24	26	29	33
16	546	8	10	11	13	15	18
17	2995	4	5	5	6	6	7
18	2792	6	6	7	7	8	8
19	2102	5	5	6	6	7	8
20	5881	4	4	5	6	7	8
21	3505	6	8	9	10	12	15
22	603	17	19	22	24	28	31
[a]23a	540	20	22	25	28	32	37
[a]23b	1137	23	25	27	29	31	34

[a]Indicates DPAs with major boundary changes were not included within the specified DMU and thus the DMU was divided into a and b for modeling purposes.

Table 2. Estimated mean pre-fawn deer densities (deer/mi²) for deer permit areas based on population model simulations in Minnesota deer management units, 2016-2021.

		Pre-fawn Deer Density					
Deer Permit Area	Land Area (mi²)	2016	2017	2018	2019	2020	2021
101	496	10	12	11	12	12	13
[a]104	1414	-	-	-	-	-	-
[a]105	1199	-	-	-	-	-	-
[a]107	472	-	-	-	-	-	-
[a]109	1182	-	-	-	-	-	-
110	529	15	18	18	18	21	23
111	1438	4	4	5	5	6	8
[a]114	123	-	-	-	-	-	-
117	936	1	0.4	0.5	0.3	0.4	0.6
118	1239	5	5	5	5	5	6
[a]119	782	-	-	-	-	-	-
126	942	6	7	6	6	6	8
130	747	3	3	4	3	2	3
131	901	1	1	2	2	2	1
132	481	4	5	6	5	5	6
133	352	12	14	8	8	10	10
152	60	14	16	14	16	19	22
[a]155	499	-	-	-	-	-	-
156	819	11	12	13	12	13	14
157	888	25	32	35	38	41	51
159	571	14	14	16	16	17	22
169	1124	10	12	12	12	14	15
[a]171	627	-	-	-	-	-	-
[a]172	692	-	-	-	-	-	-
173	584	8	8	8	8	8	7
176	917	12	13	11	11	10	13
177	491	12	12	13	14	14	17
178	1192	10	12	13	12	13	18
179	857	17	17	20	18	20	23
181	629	9	10	10	12	11	12
[a]182	278	-	-	-	-	-	-
183	664	10	12	14	13	14	16
184	1229	21	23	24	25	25	27
197	957	14	15	16	16	16	18
199	153	5	6	6	6	7	7
201	161	10	10	10	12	11	12
203	118	7	6	6	7	5	7
208	378	8	8	8	9	10	13

[a]Indicates deer permit area was not included in DMU population model.

Table 2. Continued

		Pre-fawn Deer Density					
Deer Permit Area	Land Area (mi^2)	2016	2017	2018	2019	2020	2021
209	639	9	11	13	13	15	17
210	615	12	13	15	15	18	23
213	1059	21	23	25	25	28	30
214	553	28	29	34	33	35	40
215	701	20	22	26	25	26	31
218	884	12	14	16	18	21	25
219	392	17	17	19	20	23	25
221	643	16	21	23	26	30	34
222	413	19	22	26	28	32	36
223	377	19	21	23	25	28	32
224	46	19	26	24	26	32	31
225	618	21	25	29	32	35	40
227	471	23	24	27	30	34	39
229	285	10	11	13	14	16	17
230	454	6	7	8	9	12	14
232	377	8	10	11	13	15	18
233	384	6	9	9	11	14	16
234	636	3	3	4	5	6	6
235	35	20	19	18	22	30	35
236	368	20	21	23	26	29	32
237	728	3	4	4	5	6	7
238	95	8	9	11	11	13	16
239	928	16	18	20	21	23	24
240	643	26	29	32	33	36	39
241	997	31	34	34	34	35	36
[a]246	784	-	-	-	-	-	-
248	216	29	27	32	36	45	53
249	502	25	28	31	33	48	54
250	712	4	5	6	7	7	9
251	55	17	14	13	14	13	17
252	716	4	4	5	6	7	8
253	974	5	6	7	8	9	10
254	930	7	7	8	10	12	15
[a]255	392	-	-	-	-	-	-
256	654	9	11	12	11	12	14
257	412	10	13	14	15	18	20
258	343	24	24	25	28	32	39
259	490	25	28	31	23	26	28

[a]Indicates deer permit area was not included in DMU population model.

Table 2. Continued

Deer Permit Area	Land Area (mi^2)	Pre-fawn Deer Density 2016	2017	2018	2019	2020	2021
[a]260	1055	-	-	-	-	-	-
261	793	4	5	6	6	7	8
262	677	5	5	6	7	9	11
[a]263	706	-	-	-	-	-	-
264	669	14	14	16	17	18	22
265	494	11	12	14	14	17	20
266	617	7	8	8	10	11	13
267	472	7	8	9	10	11	14
268	228	17	19	21	19	26	27
269	650	4	5	6	6	8	9
270	736	3	3	4	4	6	7
271	632	4	4	6	6	6	9
272	532	4	4	5	5	7	7
273	572	8	10	11	12	15	16
274	355	5	5	6	5	6	7
275	764	5	6	7	7	8	9
276	542	10	12	15	16	18	20
277	812	18	20	22	26	31	38
278	402	7	7	8	9	10	10
279	344	5	5	6	6	7	7
280	674	3	3	4	4	4	6
281	575	6	7	7	7	8	9
282	778	2	2	2	2	3	3
283	613	5	6	6	7	8	10
284	840	4	5	5	6	7	7
285	546	8	10	11	13	15	19
286	447	5	6	6	6	7	9
287	47	15	22	17	13	11	16
288	624	5	6	6	7	7	8
289	816	3	3	4	3	4	4
290	661	5	5	6	6	7	7
291	799	7	8	8	8	8	9
[a]292	362	-	-	-	-	-	-
[a]293	278	-	-	-	-	-	-
294	687	5	5	5	5	6	6
295	839	6	6	7	8	9	11
296	665	4	5	6	6	7	9
297	438	5	5	6	6	6	5
298	619	10	11	11	11	12	13
299	387	9	10	12	14	17	21

[a]Indicates deer permit area was not included in DMU population model.

Table 2. Continued

		Pre-fawn Deer Density					
Deer Permit Area	Land Area (mi^2)	2016	2017	2018	2019	2020	2021
[a]338	316	-	-	-	-	-	-
341	603	17	19	22	24	28	31
342	350	19	23	27	28	30	39
[a]343	320	-	-	-	-	-	-
344	190	21	20	22	27	36	34
[a]604	673	-	-	-	-	-	-
[a]643	351	-	-	-	-	-	-
645	326	14	16	17	19	20	23
646	319	29	31	33	40	40	41
[a]647	434	-	-	-	-	-	-
[a]648	122	-	-	-	-	-	-
649	492	25	27	29	28	31	35
[a]655	387	-	-	-	-	-	-
[a]701	1324	-	-	-	-	-	-

[a]Indicates deer permit area was not included in DMU population model.

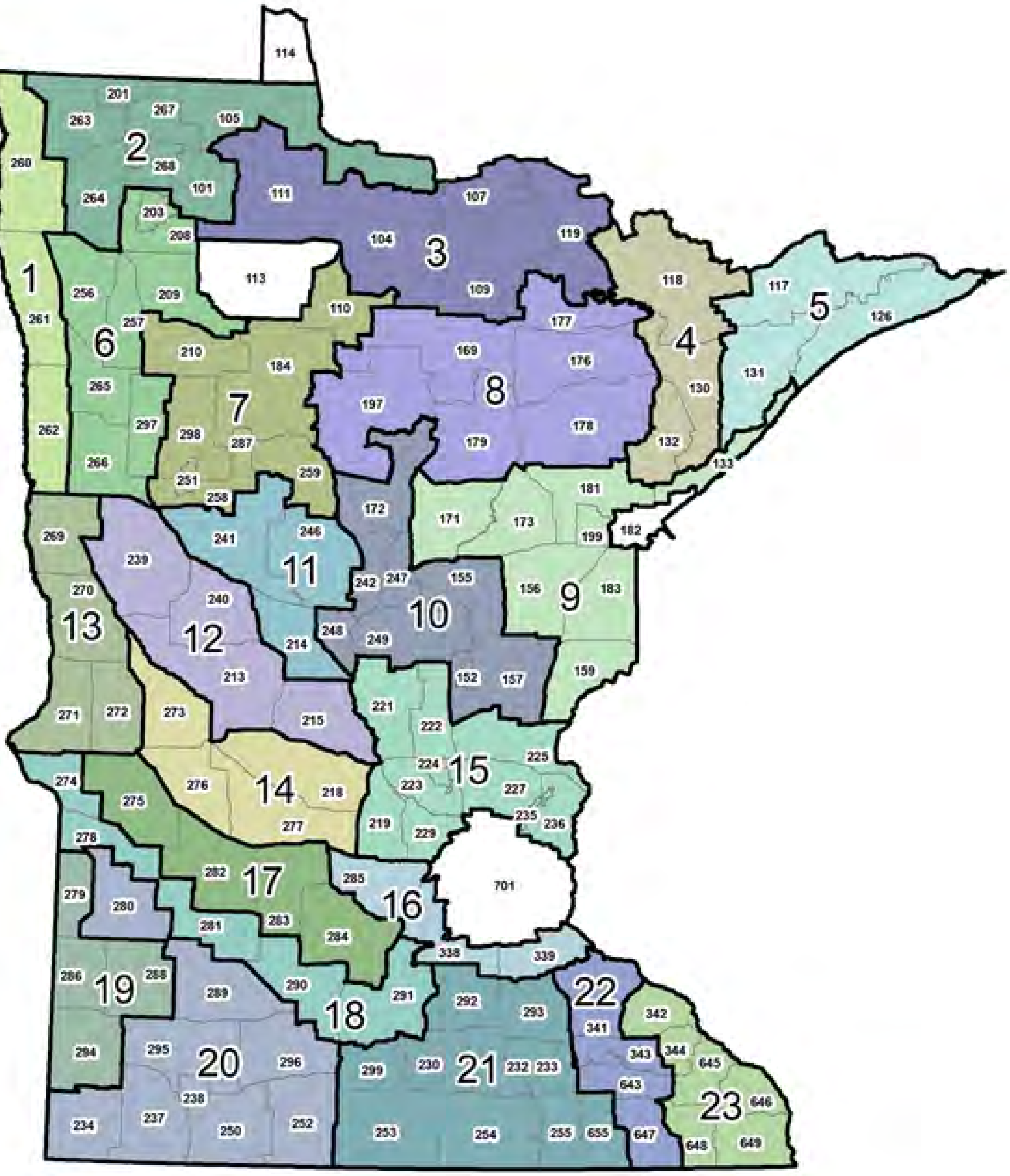

Figure 1. Deer permit areas (DPAs; 100 through 701) aggregated into deer modeling units (DMUs; 1 through 23). DPAs not colored were not included in aggregated units.

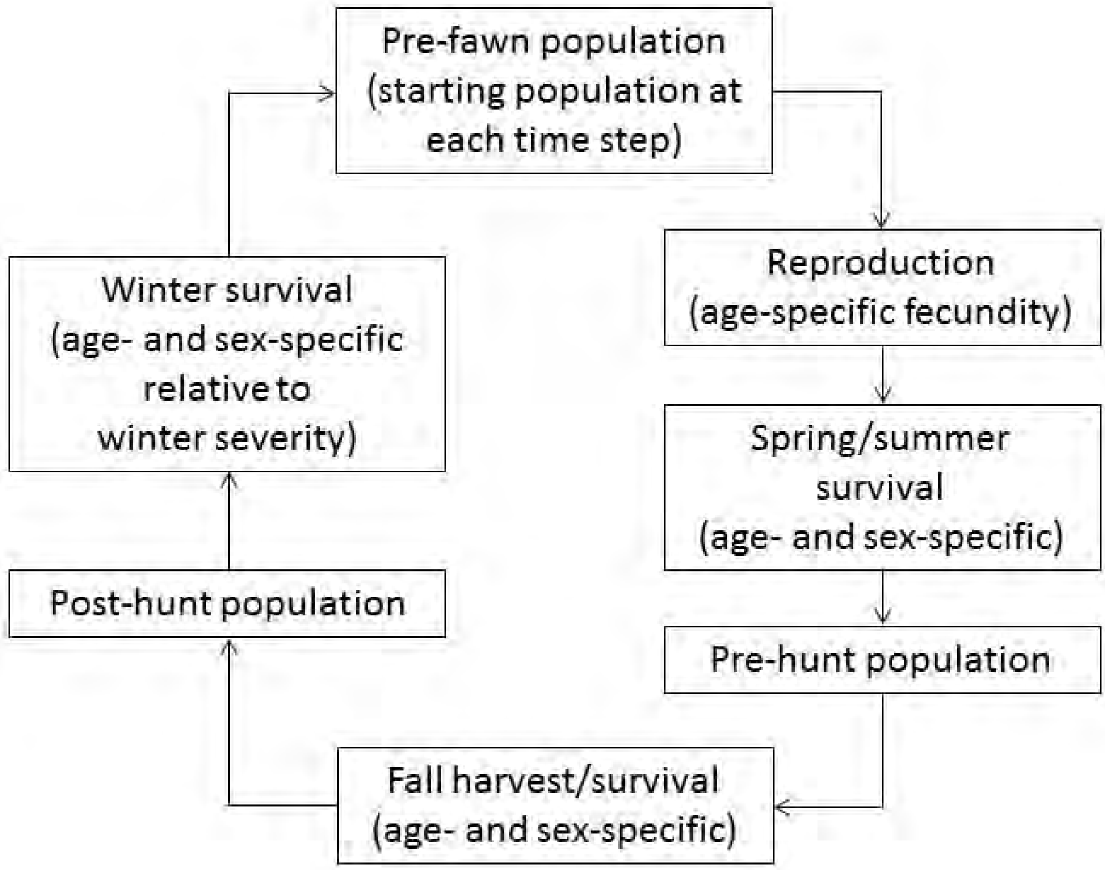

Figure 2. Model structure for simulations of white-tailed deer populations in Minnesota.

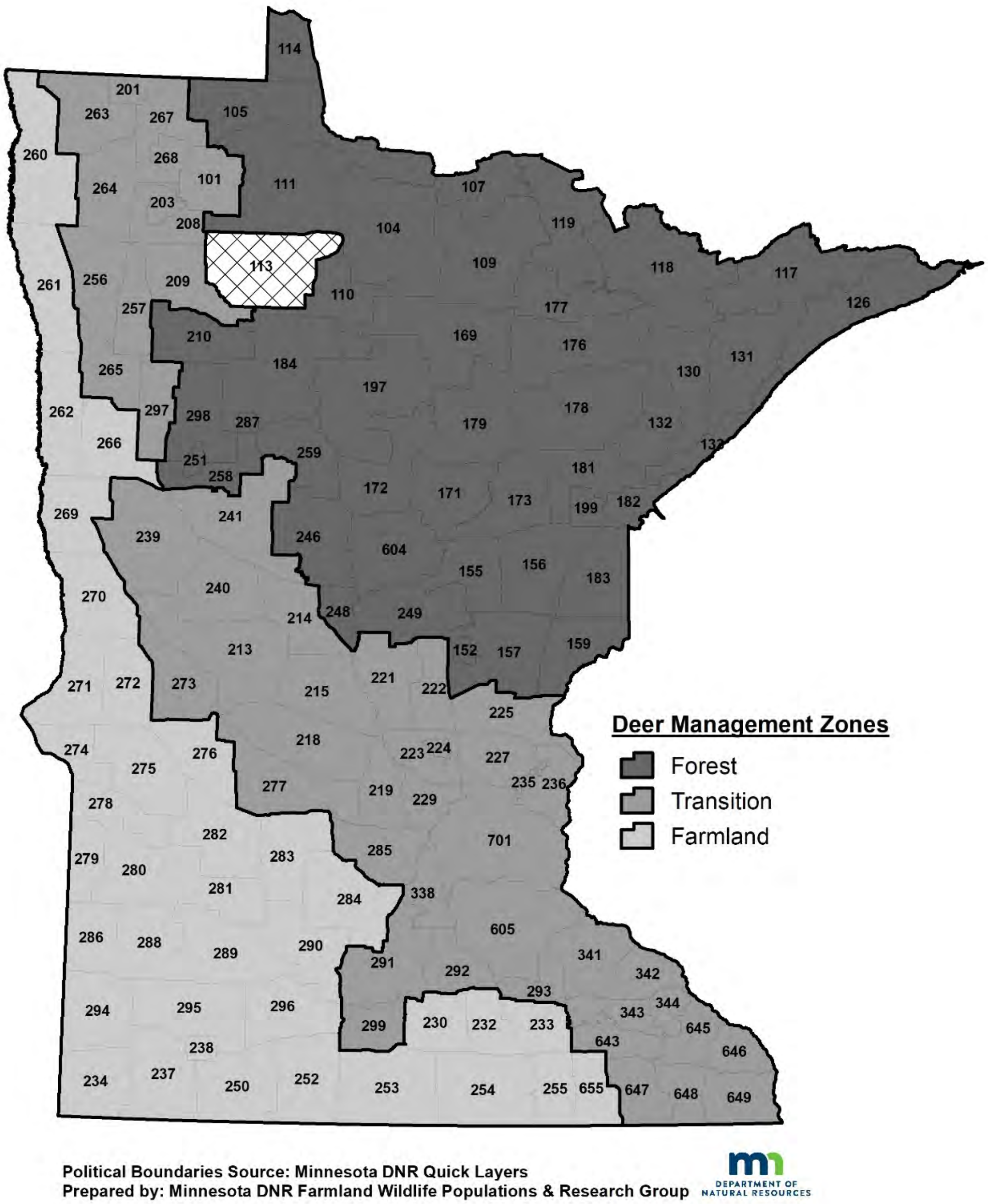

Figure 3. Deer permit areas (DPAs) in Minnesota and deer management zones used to describe deer population and harvest trends, 2021. DPAs were assigned to forest, transition, or farmland zones based on historical land cover and current woody cover. Generally, forested DPAs were composed of ≥60% woody cover, transition DPAs were composed of 6%-50% woody cover, and farmland DPAs were composed of ≤5% woody cover.

2021 WHITE-TAILED DEER AERIAL SURVEYS

Brian S. Haroldson, Farmland Wildlife Populations and Research Group

John H. Giudice, Wildlife Biometrics Unit

INTRODUCTION

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

The Minnesota Department of Natural Resources (MNDNR) uses a harvest-based population model to estimate and track changes in white-tailed deer (*Odocoileus virginianus*) abundance and, subsequently, to aid in developing annual harvest recommendations to manage deer populations toward goal levels (Michel and Giudice 2019). Currently, MNDNR collects annual data on winter severity, hunter-reported harvest, and hunter effort (license sales) at the deer permit area (DPA) scale. Reliability of harvest-based models can be improved by incorporating annual information on spatial and temporal variation in survival and reproduction rates and other model parameters. However, collection of such data is generally cost-prohibitive, especially at the DPA scale.

An alternative approach would be to collect independent recurrent information on population abundance or trends, which could be used to calibrate the population model. One potential approach in the farmland zone is road-based distance-sampling surveys. We used aerial surveys by helicopter to provide independent estimates of deer abundance to compare with a concurrent study of road-based distance-sampling surveys (Giudice et al. 2021).

METHODS

We cancelled surveys during 2021 due to the coronavirus pandemic.

RESULTS AND DISCUSSION

We cancelled surveys during 2021 due to the coronavirus pandemic.

ACKNOWLEDGMENTS

We cancelled surveys during 2021 due to the coronavirus pandemic.

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2020 MINNESOTA DEER HUNTER OBSERVATION SURVEY REPORT

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INTRODUCTION

White-tailed deer (*Odocoileus virginianus*) hunting season recommendations should incorporate objective and reliable information to move populations towards a desired density goal. Because the Minnesota Department of Natural Resources (MNDNR) adjusts regulatory decisions (seasons and bag limits) annually, agencies require current information. In Minnesota, deer are managed by individual deer permit areas (DPAs; N = 131) with traditional firearm season lengths of 9 (200-series areas), 16 (100-series areas), or 18 (300-series areas; 2 seasons) days. Bag limits also vary by permit area and range from bucks only (1 antlered deer) to 3-deer limit (1 buck and up to 2 antlerless deer) management designations. Additionally, early antlerless seasons are used in limited situations, and DPAs within disease management zones have allowable harvests of up to 5 deer, including one legal buck per each archery, firearm, and muzzleloader season per hunter up to 3. To inform these annual decisions, the MNDNR incorporates mandatory hunter-reported harvest, hunter effort, winter severity, and vital rate parameters (survival, fecundity, etc) into a population model to make population trend inferences (lambda [λ]; Norton and Giudice 2017). Population model indices are sensitive to varying hunting season regulations and changes in the relationship between winter severity and deer survival. Confidence in the population model is improved by collecting annually recurrent information to independently estimate the population trend. The Office of Legislative Auditors conducted an independent evaluation of the MNDNR deer population management program (OLA 2016) and recommended additional data collection to improve deer population estimates. Winter aerial surveys can provide an index, but logistical and environmental (e.g., adequate snow cover) constraints limit their use to every 5- to 10-years. Furthermore, aerial surveys are not considered reliable across much of northern Minnesota where predominant coniferous cover results in insufficient detection probability (Haroldson 2014) or across southwestern Minnesota where deer movements vary throughout the year (winter migrations).

Several Midwestern states have explored the use of annual hunter observation surveys for monitoring white-tailed deer population trends (Rolley et al. 2016) and trends of populations of other species of interest (Bauder et al. 2021). We conducted a pilot study from 2017 to 2019 to collect archery hunters' observations of deer using survey methods (mail and online versions). Although the information MNDNR biologists gained from this bowhunter survey was useful in developing age and sex ratios to use as indices to measure deer model performance, response rates were low. Therefore, in an attempt to increase hunter participation, we took a community science approach by allowing all deer hunters, regardless of the season they are hunting, to provide observational data in an online format. Our primary objective was to evaluate this community science approach for monitoring trends in white-tailed deer and other wildlife populations. Our secondary objective was to compare trends in fawn:adult female ratios from deer hunter observations to other recruitment metrics. In Minnesota, there is greater diversity in biogeography than other Midwestern states. Because of the variability of habitat, we chose to report results for three ecozones: 1) farmland, 2) transition, and 3) forest (Figure 1).

METHODS

We moved from a traditional mail survey to a community science approach by soliciting participation using a variety of methods. We solicited participation using agency social media (e.g., Facebook, Twitter, etc) and through agency newsletters such as the Deer Notes emails that go out to subscribers. Hunters had the option to print off observation logs and mail in the logs once completed or they could document their observations online.

We asked deer hunters to document white-tailed deer, badger *(Taxidea taxus),* bear *(Ursus americanus),* bobcat *(Lynx rufus),* coyote *(Canis latrans),* fisher *(Martes pennanti),* gray fox *(Urocyon cinereoargenteus),* gray wolf *(Canis lupus),* and wild turkey *(Meleagris gallopavo)* observations and differentiate between antlered, adult female, fawn, and unknown deer age-sex classes while hunting. We also asked hunters to record DPA for hunting trip observations and provide a distance and direction from the nearest town. We also collected locations (latitude and longitude), weather information, antler points of harvested deer, and inside antler spread of harvested deer.

We quantified dates of hunting trips, hunting trips per hunter, hours hunted per trip, and observation rates for the farmland, transition, and forest ecozones separately. We estimated variances using Taylor series linearization and constructed 95% confidence intervals using the normal approximation. We estimated hours hunted per hunting trip and observation rates per hour using Program R and the survey library (Lumley 2004, R Development Core Team 2016).

We did not compare hunter observation rates among ecozones because hunter distribution, similar to deer populations, is not randomly distributed. Thus, hunter observation rates among ecozones vary by hunter distribution and self-selected participation. For example, deer densities are highest in the transition ecozone (Norton and Giudice 2017), but hunter observation rates per 1,000 hours were greatest in the farmland ecozone (Norton et al. 2017). Therefore, we only compared the relative proportion of species hunters observed across ecozones.

RESULTS

There were 132 participants during the 2020 deer hunting season, down from 2,180 in 2019. On average, participants completed 5.8 (SE = 0.87) observation logs each (Figure 2) and hunted about 4.1 hours per trip (SE = 0.24; Table 1). Mean hunting observation date responses occurred on 29 October (Figure 3). Mean hours hunted per observation log for the forest, transition, and farmland ecozone were 4.7 (SE = 0.52), 3.8 (SE = 0.24), and 4.1 (SE = 0.65), respectively (Figure 4; Appendix I).

Overall, the percent of antlered deer among total deer observations was similar to previous years and comparable among regions with the greatest observations occurring in the farmland ecozone ($\bar{x}$ = 0.26), followed by the forest ecozone ($\bar{x}$ = 0.20), then the transition ecozone ($\bar{x}$ = 0.18). The greatest observed fawn:doe ratio was in the transition ecozone ($\bar{x}$ = 0.80), followed by the forest ecozone ($\bar{x}$ = 0.73) and farmland ecozone ($\bar{x}$ = 0.26, Figures 5–7). We found the greatest buck:doe ratio in the forest ecozone ($\bar{x}$ = 0.49) followed by the farmland ($\bar{x}$ = 0.48) and transition ecozones ($\bar{x}$ = 0.45, Figures 5–7). Among other species surveyed, diversity was greater in the forest ecozone with relatively more bear, bobcat, wolf, fisher, and gray fox observations compared to the transition and farmland ecozones (Appendix I). Turkeys had the greatest proportion reported (compared to all other species) in the transition ecozone (Appendix I).

For the hunter-harvested data recorded, 35 hunters harvested 37 adult bucks. The adult bucks averaged 7.2 points (SE = 0.40, range = 2–12, *n* = 37) with an inside spread of 12.4 inches (SE = 0.99, range = 3–21, *n* = 26).

DISCUSSION

Using a community science approach does not allow for a direct comparison of response rates to prior data collection efforts. However, the total number of participants was 94% lower in 2020 than in 2019. One of our main objectives for switching to a community science approach was to increase the total number of responses and increase coverage of responses throughout the state. We will need to incorporate various methods (e.g., sending out an increased number of reminders via social media platforms, directed emails, etc) to increase the total number of participants and increase coverage throughout Minnesota.

Although the total number of participants dramatically decreased from 2019 to 2020, most of the metrics were comparable between the former mail/online bowhunter survey and the new community science approach using all deer hunters. The fawn:doe ratio reported for the farmland ecozone in 2020 was ~35% lower than in 2019; however, this is likely due to a small sample size (n = 15). Although metrics are comparable between years, increased sample size will improve precision of the estimates, which will also improve their use as independent indices for comparison to modeled deer densities.

We used the data collected from 2017 to 2020 to calculate total deer observed per hour (Figure 8) and sex and age composition (percent adult males, adult females, and fawns; Figure 9) for comparison to our modeled output in 2021. The total deer observed per hour metric serves as an independent index to assess population trends over time while the sex and age composition metric allows us to compare the compositions we obtain through the deer hunter survey to the compositions derived from the deer population model. These data will also potentially help inform an integrated population model, which we are developing. Although we are already using this information in our deer modeling reports (Figures 8, 9), trends will become more apparent and these indices will only become more useful once we have at least five years of data.

ACKNOWLEDGMENTS

We thank all deer hunters that participated in this survey and the MNDNR Farmland Wildlife Populations and Research Group staff that provided feedback on earlier versions of the survey and this report. We also thank Pete Takash, Barb Keller, Nyssa Gesch, and David Schueller for their help coordinating outreach and communication to solicit hunter participation.

Table 1. Statewide mean (± standard error) and 95% confidence intervals of responses for hours hunted per hunting trip and observation rates per 1,000 hours from the deer hunter observation survey in Minnesota, USA, 19 September – 31 December 2020.

Parameter	Mean (SE)	95% CI
Hours/Trip	4.11 (0.24)	3.64 – 4.59
Antlered Deer/1,000 Hours	143.34 (19.47)	105.18 – 188.49
Adult Female Deer/1,000 Hours	312.33 (33.03)	247.59 – 377.06
Fawn Deer/1,000 Hours	219.66 (45.97)	129.56 – 309.75
Unknown Deer/1,000 Hours	70.23 (16.23)	38.41 – 102.05
Total Deer/1,000 Hours	745.55 (89.34)	570.45 – 920.65
Turkeys/1,000 Hours	387.69 (100.53)	190.66 – 584.72
Bears/1,000 Hours	1.60 (1.33)	0 – 4.21
Coyotes/1,000 Hours	19.88 (6.25)	7.63 – 32.14
Bobcats/1,000 Hours	1.92 (1.65)	0 – 5.16
Wolves/1,000 Hours	2.57 (1.52)	0 – 5.55
Fisher/1,000 Hours	1.92 (0.79)	0.38 – 3.46
Gray Foxes/1,000 Hours	2.89 (1.55)	0 – 5.92
Badgers/1,000 Hours	0.32 (0.32)	0 – 0.95

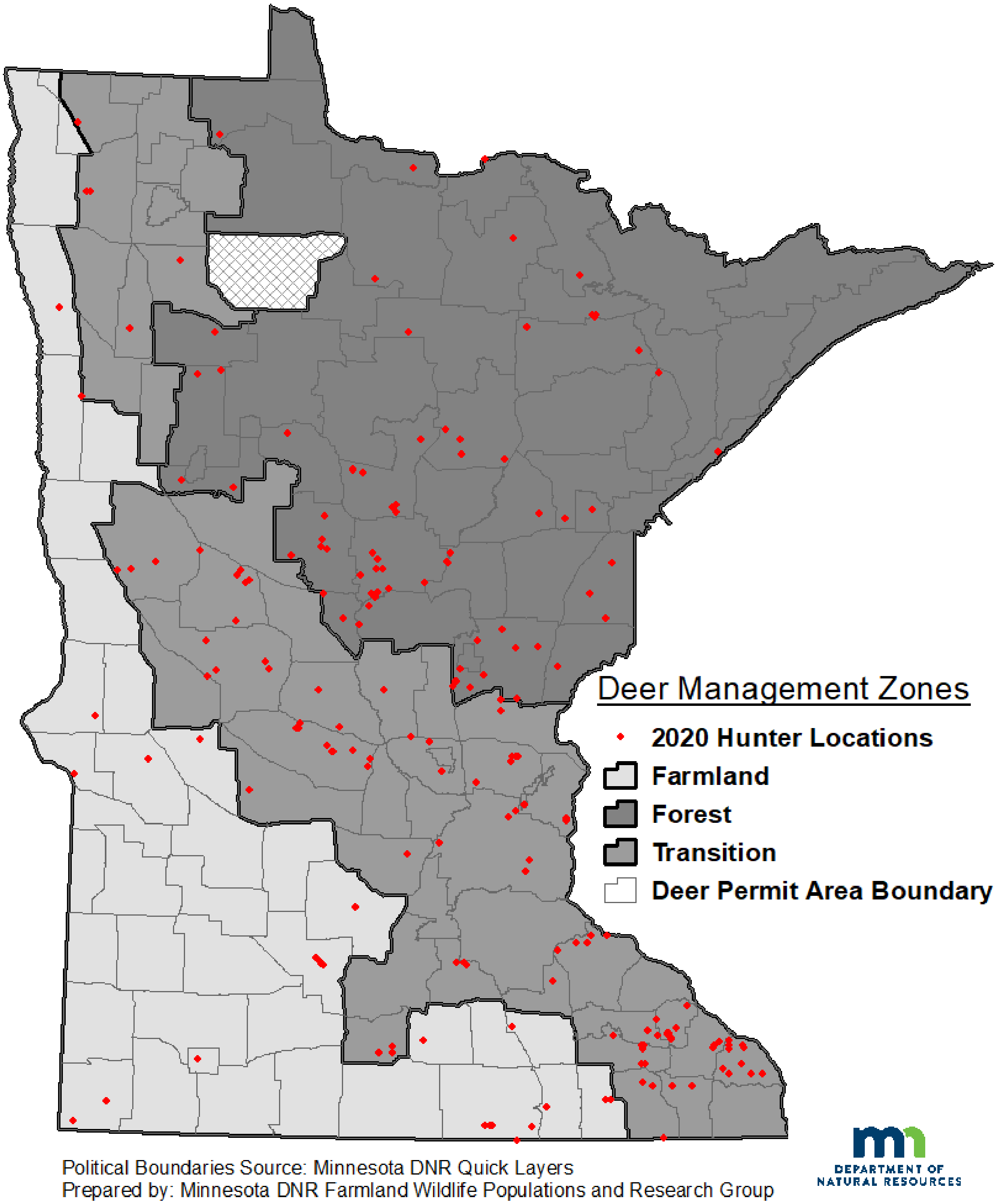

Figure 1. Deer management zones used to describe results of deer hunter observation surveys in Minnesota, USA during 2020. Red circles depict hunter locations (*n* = 132) during all deer seasons (19 September – 31 December 2020). Generally, forested deer permit areas (DPAs) were composed of $\geq$60% woody cover, transition DPAs were composed of 6%-50% woody cover, and farmland DPAs were composed of $\leq$5% woody cover.

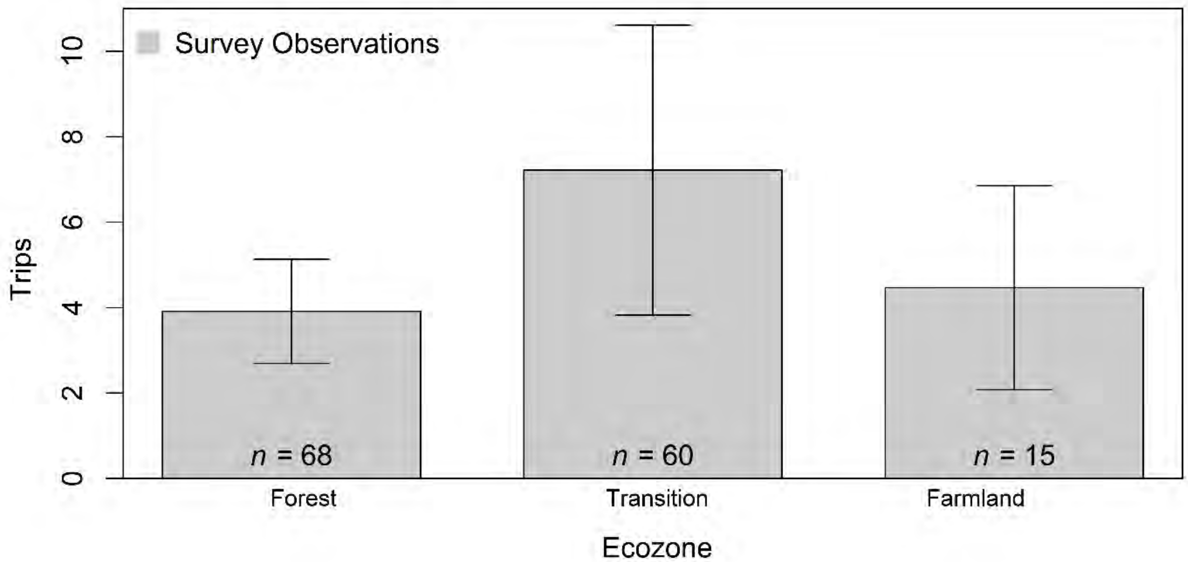

Figure 2. Mean hunting observation trips per deer hunter by ecozone with 95% confidence intervals during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

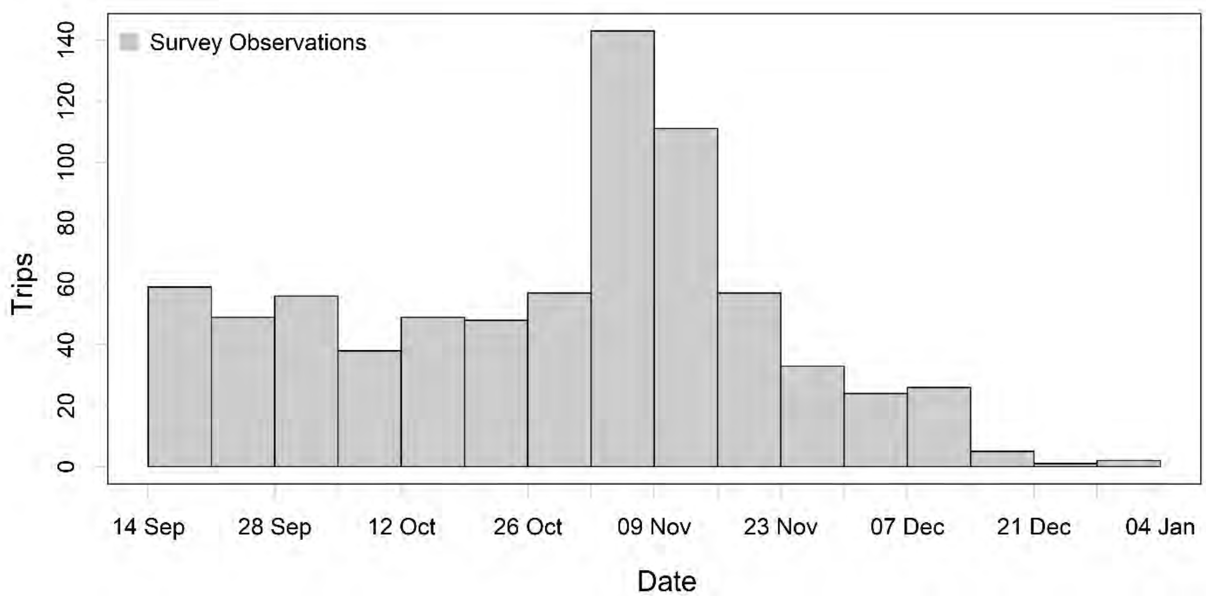

Figure 3**.** Date of hunting observation trips for respondents during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

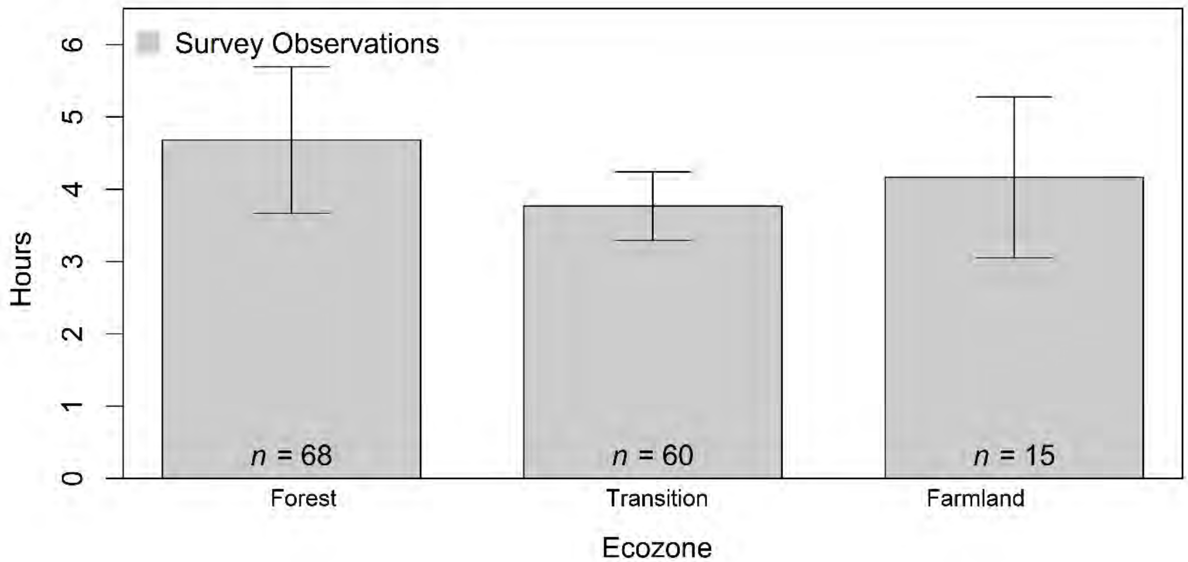

Figure 4. Mean hours hunted per trip with 95% confidence intervals during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

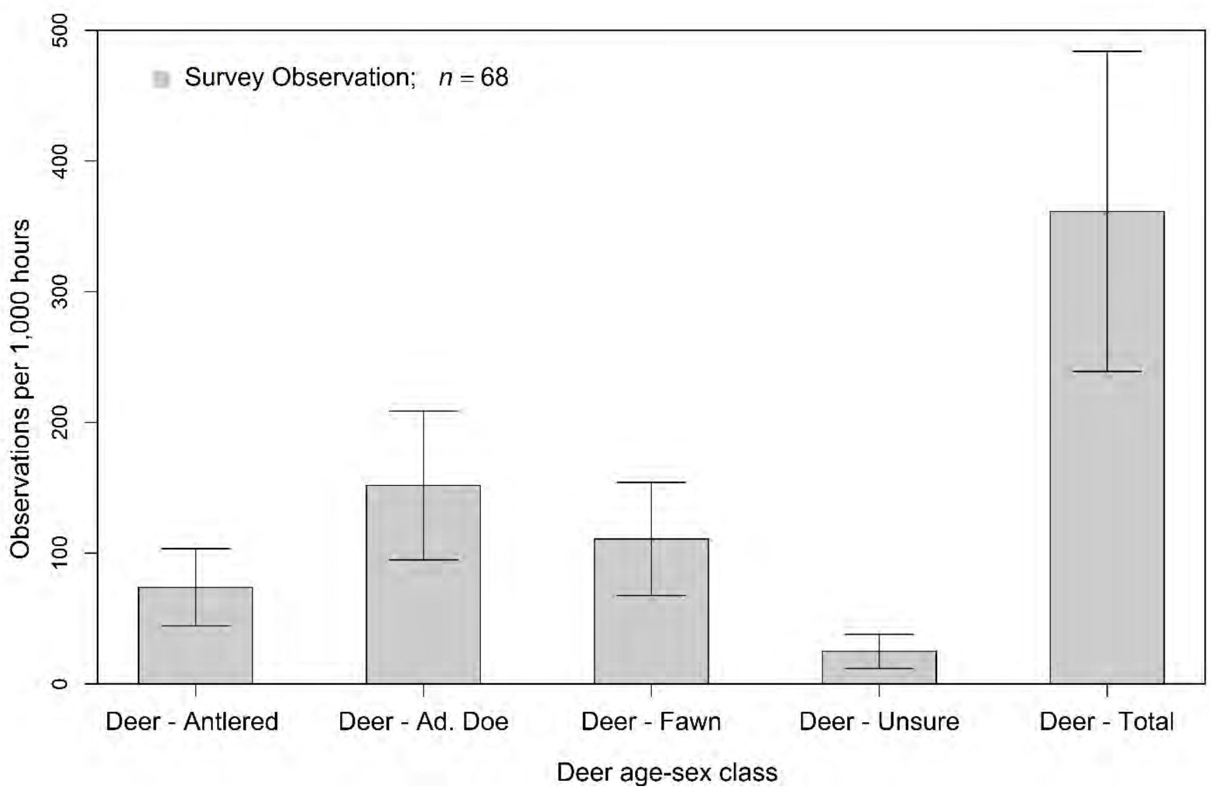

Figure 5. Mean deer observation rates per 1,000 hours with 95% confidence intervals in the forest ecozone during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

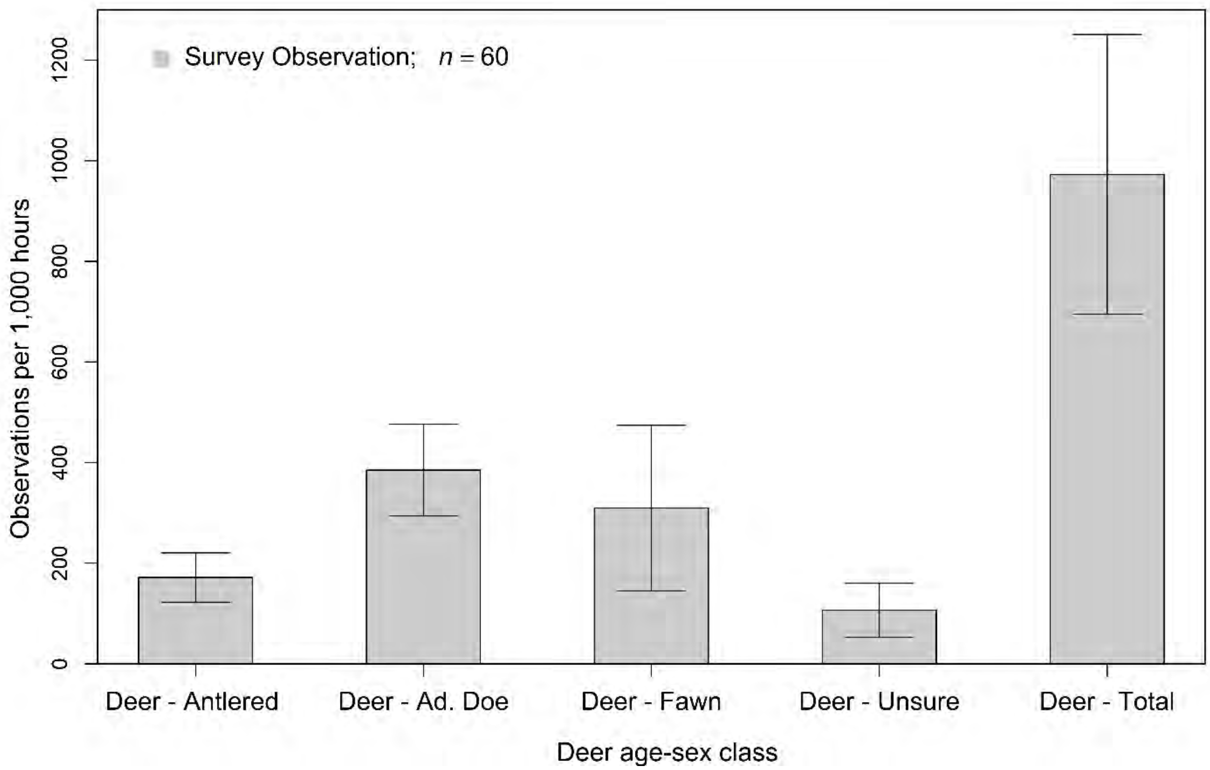

Figure 6. Mean deer observation rates per 1,000 hours with 95% confidence intervals in the transition ecozone during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

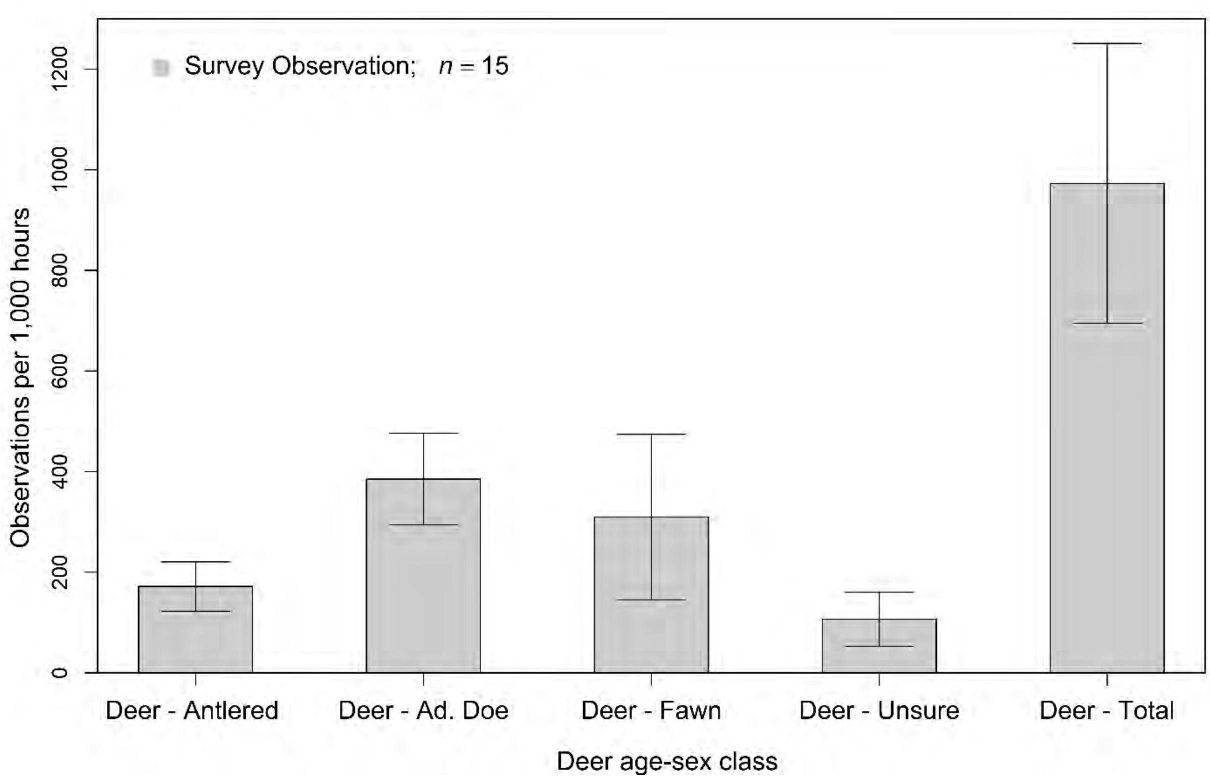

Figure 7**.** Mean deer observation rates per 1,000 hours with 95% confidence intervals in the farmland ecozone during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

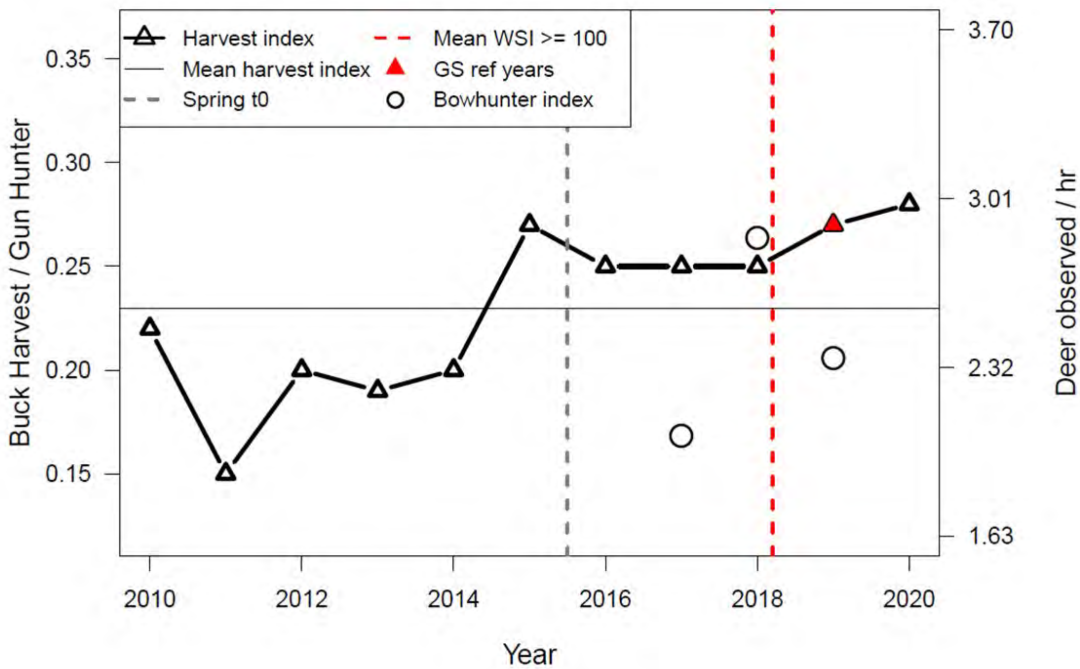

Figure 8. The number of bucks harvested per gun hunter (triangles) and total deer observed per hour (circles) to assess deer population trends over time per deer permit area. Spring t0 indicates the starting year used the deer population model (e.g., spring 2015). GS ref years indicates the year goal setting occurred.

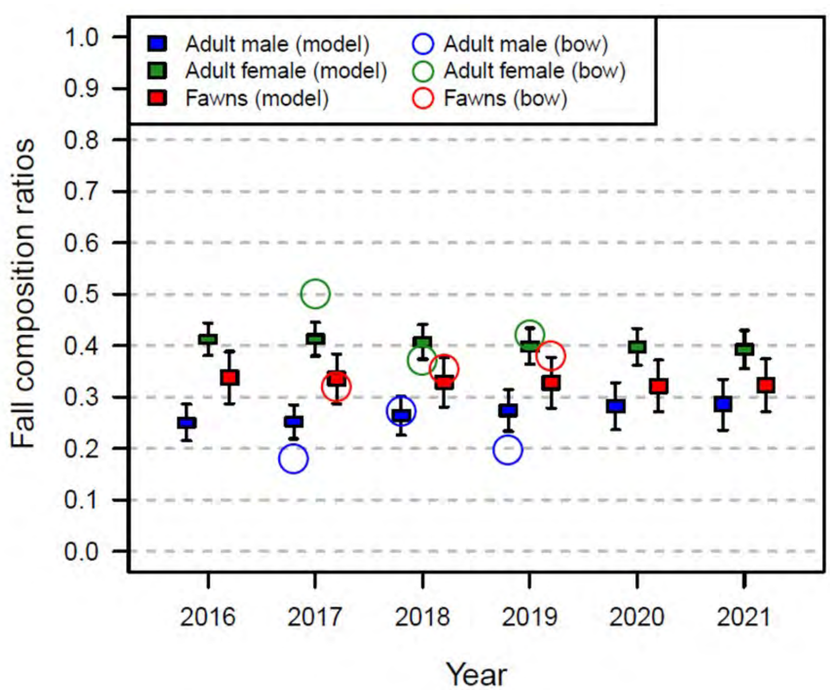

Figure 9. Age and sex proportions derived from the deer population model (squares) and from the deer hunter survey (circles). Age and sex proportions are used in the deer population model to estimate deer density for each deer permit area.

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APPENDIX I. Mean observation rates of other species per 1,000 hours and hours per trip with 95% confidence intervals by ecozone during the deer hunting season (19 September – 31 December 2020) in Minnesota, USA.

Parameter	Ecozone	Mean	95% CI
Hours/Trip	Forest	4.68 (SE = 0.52)	3.67 – 5.69
Antlered Deer/1,000 Hours	Forest	73.90 (SE = 15.02)	44.45 – 103.34
Adult Female Deer/1,000 Hours	Forest	151.81 (SE = 28.98)	95.01 – 208.60
Fawn Deer/1,000 Hours	Forest	110.84 (SE = 22.00)	67.73 – 153.95
Not Sure Deer/1,000 Hours	Forest	24.90 (SE = 6.63)	11.90 – 37.90
Total Deer/1,000 Hours	Forest	361.45 (SE = 62.22)	239.50 – 483.39
Turkeys/1,000 Hours	Forest	172.69 (SE = 74.81)	26.07 – 319.31
Bears/1,000 Hours	Forest	3.21 (SE = 3.21)	0 – 9.51
Coyotes/1,000 Hours	Forest	5.62 (SE = 2.44)	0.84 – 10.40
Bobcats/1,000 Hours	Forest	0.80 (SE = 0.81)	0 – 2.40
Wolves/1,000 Hours	Forest	6.43 (SE = 3.87)	0 – 14.01
Fisher/1,000 Hours	Forest	2.41 (SE = 1.44)	0 – 5.23
Gray Foxes/1,000 Hours	Forest	6.43 (SE = 3.87)	0 – 13.80
Badgers/1,000 Hours	Forest	0 (SE = 0)	0 – 0
Hours/Trip	Transition	3.77 (SE = 0.24)	3.29 – 4.24
Antlered Deer/1,000 Hours	Transition	170.73 (SE = 24.83)	122.07 – 219.39
Adult Female Deer/1,000 Hours	Transition	383.54 (SE = 46.27)	292.85 – 474.22
Fawn Deer/1,000 Hours	Transition	308.54 (SE = 83.44)	145.00 – 472.07
Not Sure Deer/1,000 Hours	Transition	106.10 (SE = 27.13)	52.92 – 159.28
Total Deer/1,000 Hours	Transition	968.90 (SE = 140.99)	692.57 – 1245.24
Turkeys/1,000 Hours	Transition	568.29 (SE = 180.42)	214.67 – 921.92
Bears/1,000 Hours	Transition	0 (SE = 0)	0 – 0
Coyotes/1,000 Hours	Transition	27.44 (SE = 9.65)	8.53 – 46.35
Bobcats/1,000 Hours	Transition	0 (SE = 0)	0 – 0
Wolves/1,000 Hours	Transition	0 (SE = 0)	0 – 0
Fisher/1,000 Hours	Transition	1.83 (SE = 1.03)	0 – 3.85
Gray Foxes/1,000 Hours	Transition	0 (SE = 0)	0 – 0
Badgers/1,000 Hours	Transition	0 (SE = 0)	0 – 0

Appendix I continued.

Parameter	Ecozone	Mean	95% CI
Hours/Trip	Farmland	4.10 (SE = 0.65)	2.82 – 5.38
Antlered Deer/1,000 Hours	Farmland	321.20 (SE = 175.13)	0 – 664.44
Adult Female Deer/1,000 Hours	Farmland	668.09 (SE = 199.06)	277.94 – 1058.24
Fawn Deer/1,000 Hours	Farmland	175.59 (SE = 62.09)	53.90 – 297.28
Not Sure Deer/1,000 Hours	Farmland	59.96 (SE = 61.74)	0 – 180.97
Total Deer/1,000 Hours	Farmland	1224.84 (SE = 418.19)	405.20 – 2044.48
Turkeys/1,000 Hours	Farmland	265.52 (SE = 96.67)	76.05 – 455.00
Bears/1,000 Hours	Farmland	4.28 (SE = 4.41)	0 – 12.93
Coyotes/1,000 Hours	Farmland	42.83 (SE = 44.10)	0 – 129.27
Bobcats/1,000 Hours	Farmland	21.41 (SE = 22.05)	0 – 64.63
Wolves/1,000 Hours	Farmland	0 (SE = 0)	0 – 0
Fisher/1,000 Hours	Farmland	0 (SE = 0)	0 – 0
Gray Foxes/1,000 Hours	Farmland	4.28 (SE = 4.41)	0 – 12.93
Badgers/1,000 Hours	Farmland	4.28 (SE = 4.41)	0 – 12.93

FOREST WILDLIFE POPULATIONS

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CARNIVORE SCENT STATION SURVEY SUMMARY, 2020

John Erb, Minnesota Department of Natural Resources, 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 46th 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 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 or 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 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 182 routes and 1,664 stations were surveyed this year, the second fewest since the survey became fully operational in the early 1980's. Route density varied from 1 route per 855 km^2 in the Forest Zone to 1 route per 1,840 km^2 in the Farmland Zone (Figure 1). The recent decline in survey effort is likely a result of staffing shortages and competing workload demands.

Statewide, route visitation rates (% of routes with detection), in order of increasing magnitude, were opossums (5%), bobcats (13%), wolves (14%), domestic dogs (19%), domestic cats (26%), skunks (30%), coyotes (31%), red foxes (35%), and raccoons (36%). Regionally, species-specific route visitation rates were as follows: red fox – TR 27%, FA 27%, FO 42%; coyote – FO 21%, TR 35%, FA 51%; skunk – TR 23%, FO 24%, FA 57%; raccoon – FO 14%, TR 42%, FA 86%; domestic cat – FO 12%, TR 33%, FA 51%; domestic dog – FO 13%, TR 16%, FA 31%; opossum - FO 0%, TR 6%, FA 19%; wolf - FA 0%, TR 2%, FO 25%; and bobcat - FA 0%, TR 8%, FO 21%.

Figures 2-5 show station visitation indices (% of stations visited) from the survey's inception through the current year. Although the survey is intended to document long-term trends in populations, confidence intervals (CI) improve interpretation of the significance of any annual changes. However, I refrain from formal significance testing (e.g., determination of whether a CI on the difference between means overlaps 0) and instead use more informal methods (i.e., degree of CI overlap; Cumming and Finch 2005) to highlight changes from last year that likely represent significant differences. Using this approach, the only notable changes this year were an increase in domestic dog detections in both the Transition and Forest zones, and declines in bobcat and striped skunk indices in the Transition Zone (Figures 3 - 5).

In the Farmland Zone (Figure 2), red fox indices continue to remain well below their long-term average, as they have for nearly 20 years. Conversely, coyote and raccoon indices remain at or near record levels. Low red fox numbers are likely related, in part, to increased coyote abundance (Levi and Wilmers 2012). No consistent long-term trends are evident for other species in the Farmland Zone.

Similar to the Farmland, red fox and coyote indices have primarily exhibited inverse patterns in the Transition Zone, with red fox indices remaining low and coyote indices steadily increasing (Figure 3). Following a significant increase last year, there was a significant decrease this year in the striped skunk index in the Transition Zone, though long-term data do not show any consistent trend and current indices are just below their long-term average. Also following a significant increase last year, and in spite of large CIs, bobcat indices in the Transition Zone decreased significantly to 'typical' levels observed before last year's spike (Figure 5). Raccoon indices in the Transition zone have been comparatively stable and near their long-term averages over the past 2 decades. Wolves had exhibited a mild increase in the Transition Zone over time, but indices have been below the long-term average (and at or near 0) the past 3 years, with a moderate increase this year.

With the exception of increased domestic dog detections, no significant changes were noted in the Forest Zone (Figures 4 and 5). Unlike in the Farmland and Transition Zones, the Forest Zone coyote index has not increased over time and has been below average and stable for 2 decades, likely attributable to increased wolf abundance in the Forest Zone (Levi and Wilmers 2012). Red foxes, raccoons, and skunks have not exhibited consistent or notable trends over the past 20 years and all remain near or slightly below their long-term averages. Conversely, wolves and bobcats have exhibited increasing trends in the Forest Zone over the past 2 decades, though some shorter-term declines have occurred during this period.

ACKNOWLEDGMENTS

I wish to thank all of the cooperators who participated in the 2020 survey: DNR Division of Wildlife staff; Superior National Forest Aurora District; Rydell and Sherburne National Wildlife Refuges; 1854 Treaty Authority, White Earth, Red Lake, and Leech Lake Tribal Natural Resource Departments; Ryan Miller, Rita Koch, and Vermillion Community College; Peter Jacobson and Faribault High School; and Steven Hogg and the Three Rivers Park District. This project was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

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2020 SCENT STATION SPECIFICS

Zone	Routes Completed	Route Density	Station Nights
Farmland	37	1/1,840 km^2	352
Transition	48	1/1,369 km^2	437
Forest	97	1/855 km^2	875
Totals	182	1/1,211 km^2	1,664

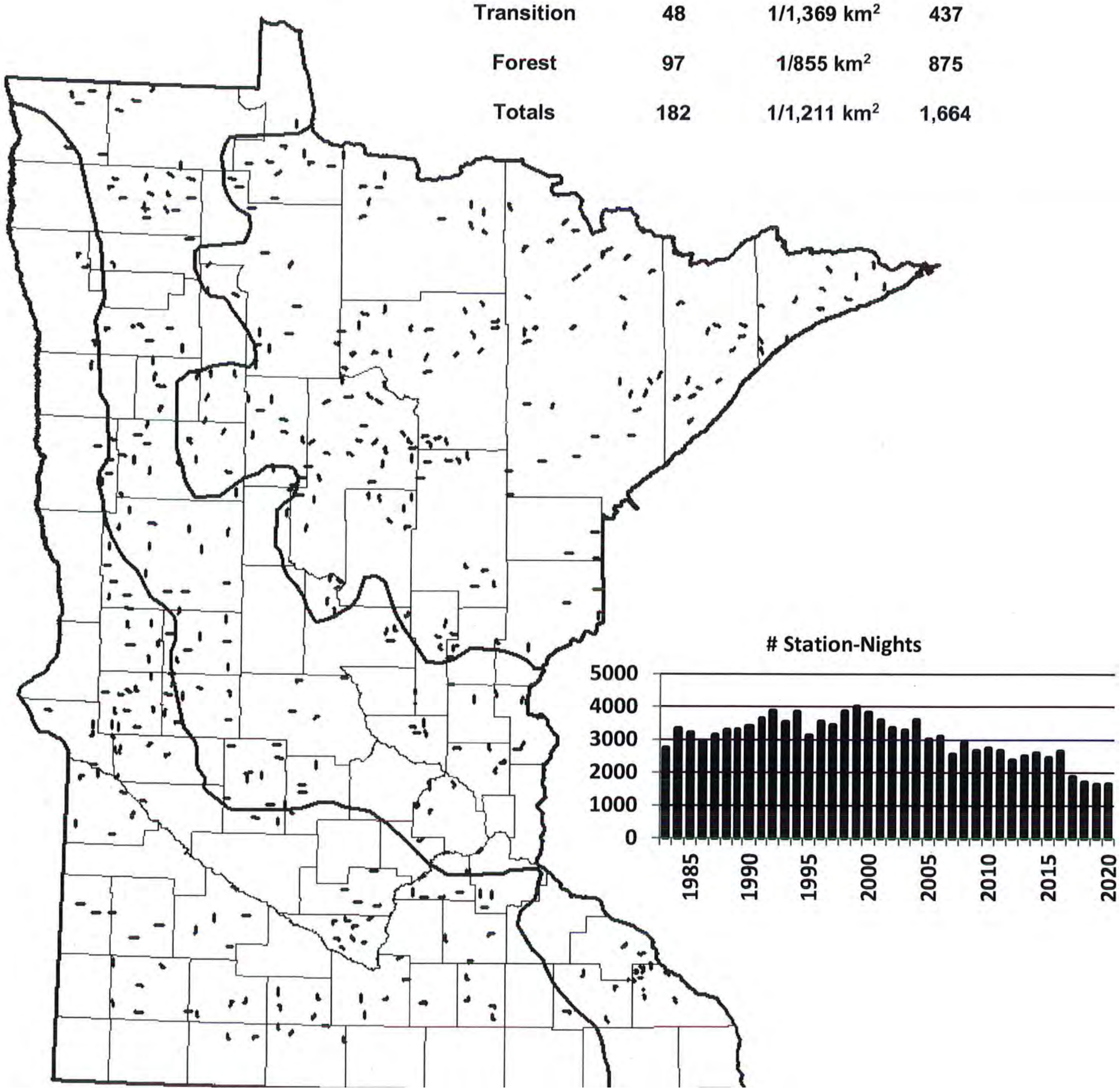

Figure 1. Locations of existing scent station routes (not all completed every year). Insets show 2020 route specifics and the number of station-nights per year since 1983.

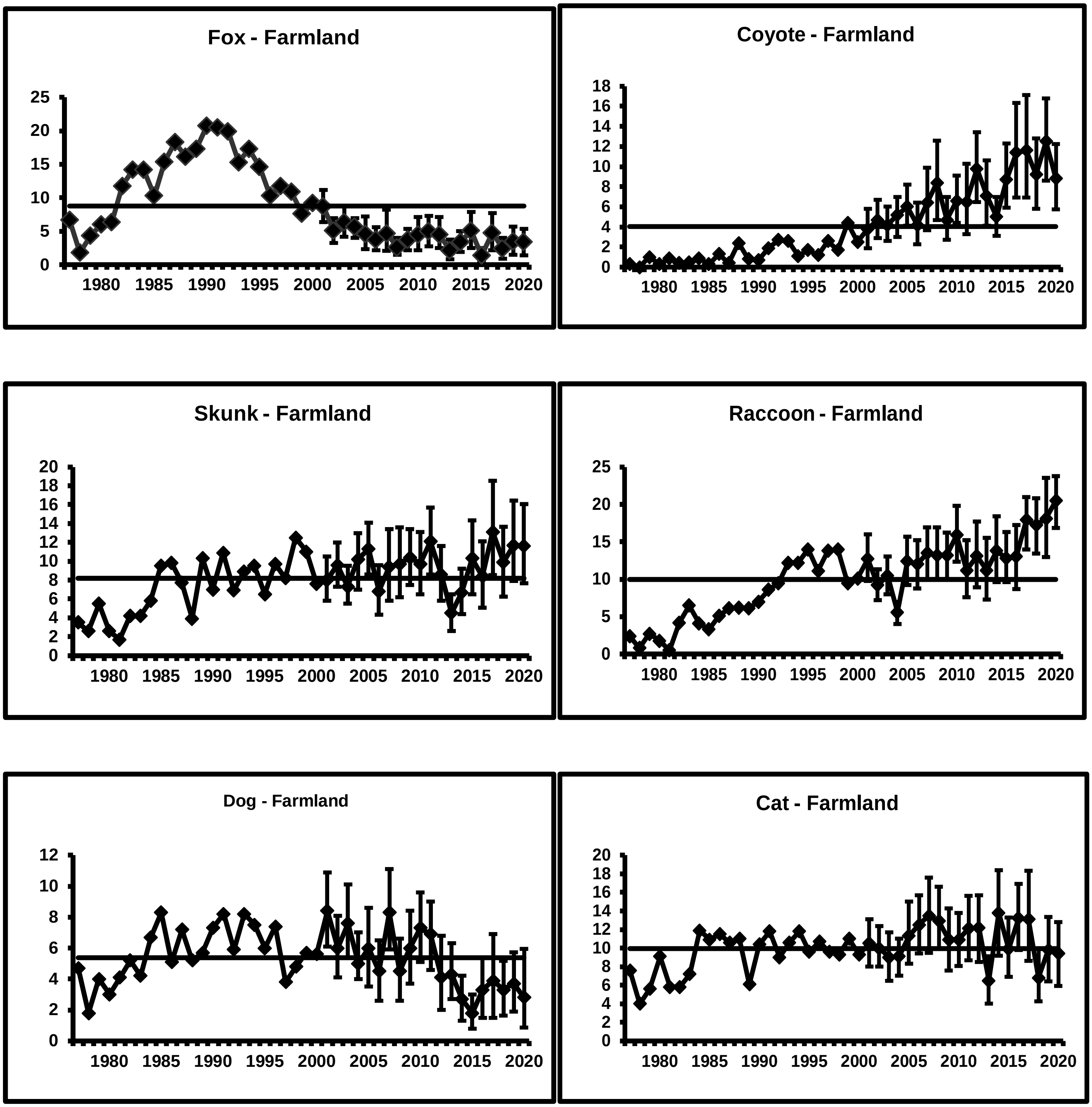

Figure 2. Percentage of scent stations visited by selected species in the Farmland Zone of Minnesota, 1977-2020. Horizontal line represents long-term mean.

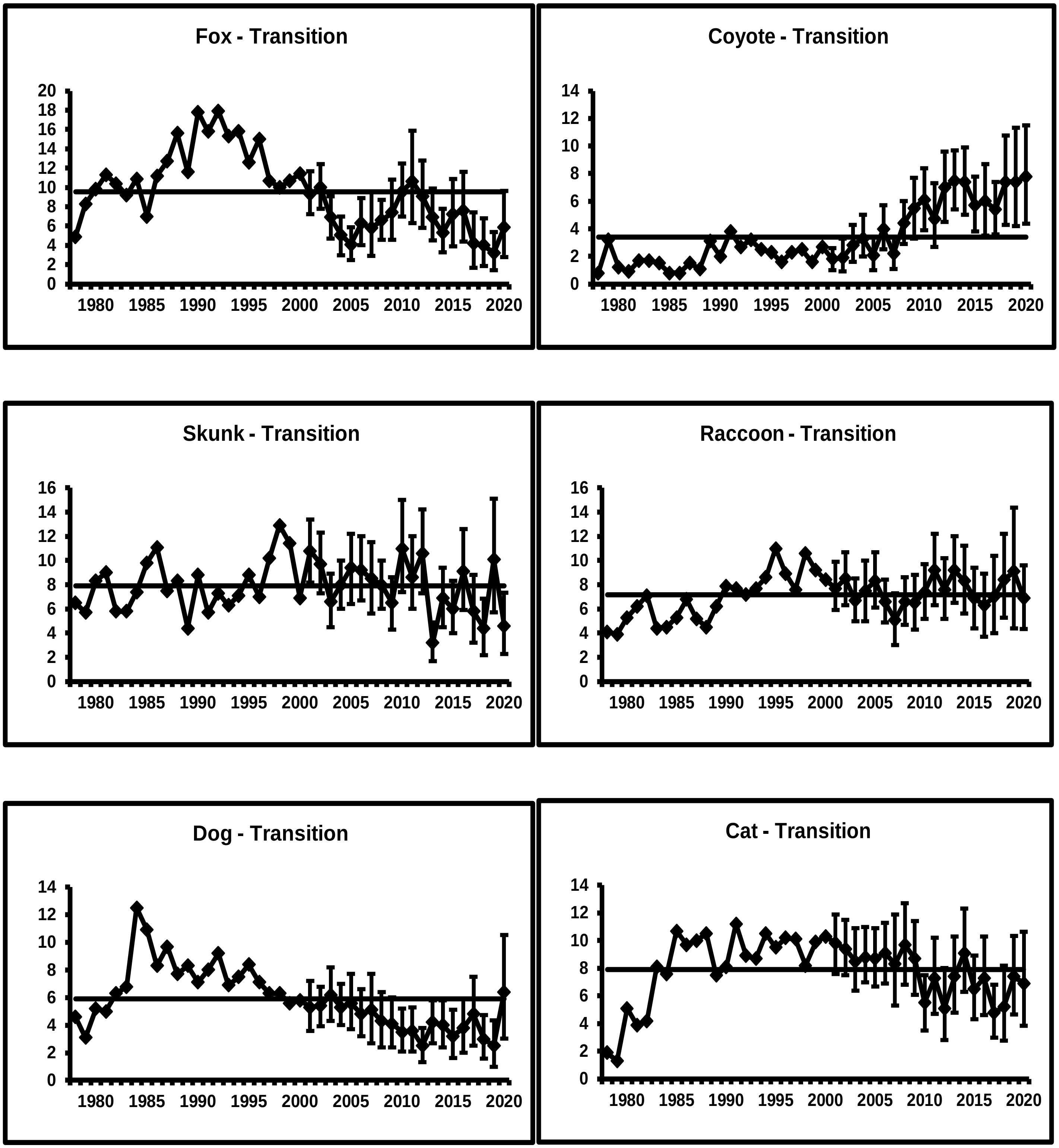

Figure 3. Percentage of scent stations visited by selected species in the Transition Zone of Minnesota, 1978-2020. Horizontal line represents long-term mean.

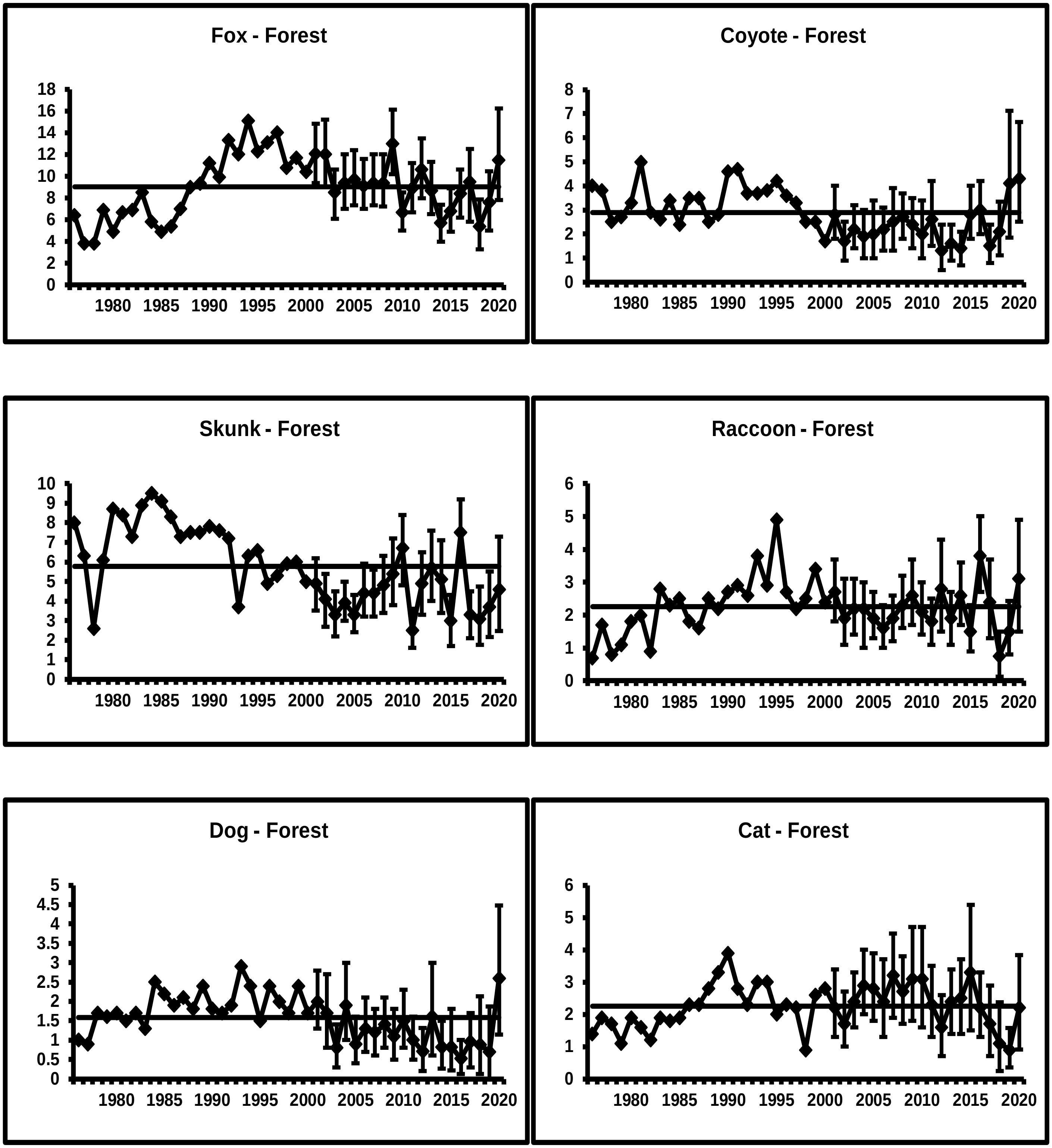

Figure 4. Percentage of scent stations visited by selected species in the Forest Zone of Minnesota, 1976-2020. Horizontal line represents long-term mean.

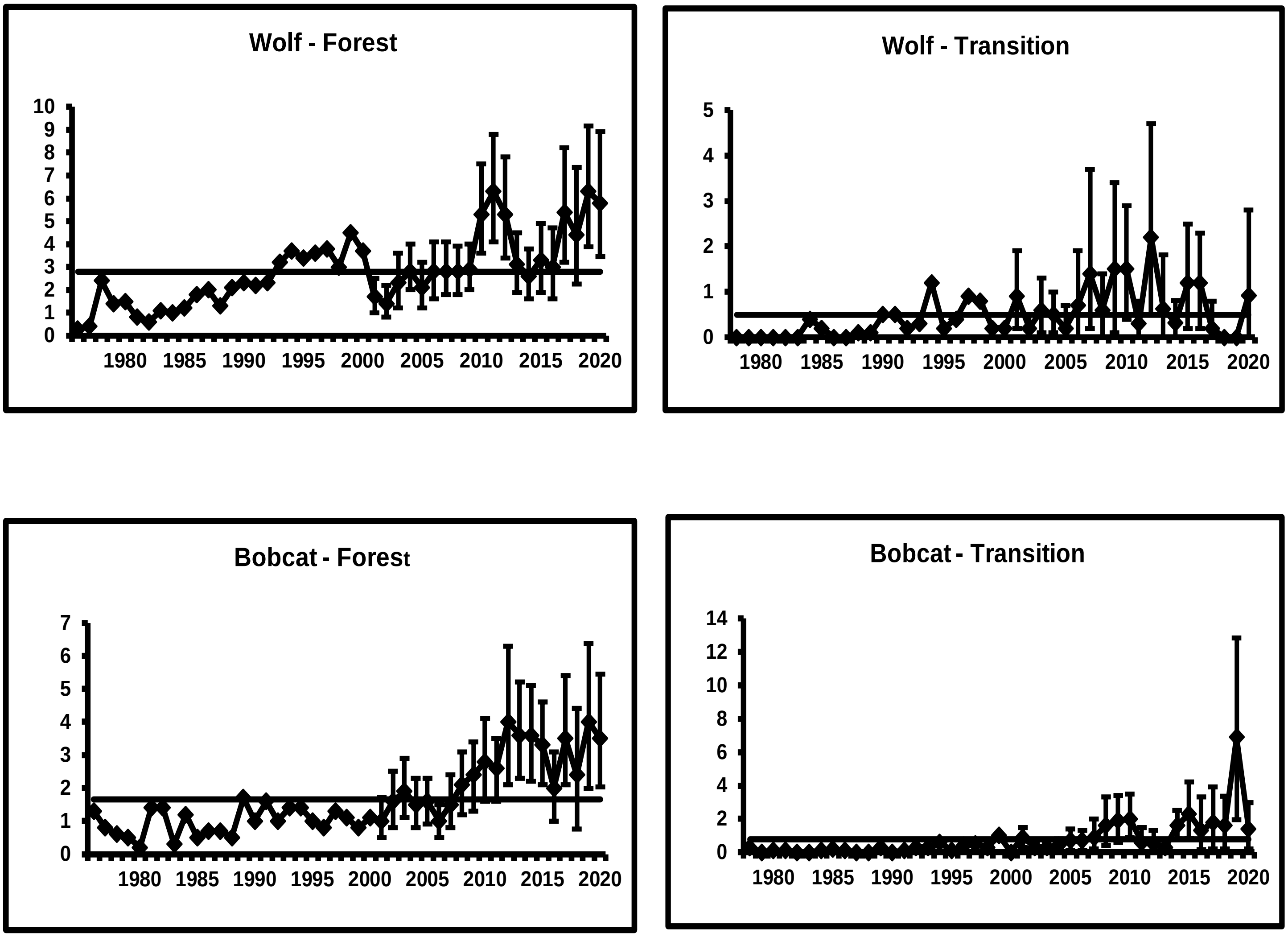

Figure 5. Percentage of scent stations visited by wolves and bobcat in the Forest and Transition Zones of Minnesota, 1976-2020. Horizontal lines represents long-term mean.

FURBEARER WINTER TRACK SURVEY SUMMARY, 2020

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

INTRODUCTION

Monitoring the distribution and abundance of carnivores can be important for documenting the effects of harvest, habitat change, and environmental variability on their 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 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 fishers (*Pekania pennanti*) and martens (*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. Formal recording of gray fox (*Urocyon cinereoargenteus*) detections did not commence until 2008.

METHODS

Presently, 57 track survey routes are operational across the northern portion of the state (Figure 1); for various reasons, not all are surveyed each year. Each route is 10 miles long and follows secondary roads or trails. Most routes are continuous 10-mile stretches of road or trail, but a few are composed of multiple discontinuous segments. Route locations were subjectively determined based on availability of suitable roads or trails, but were chosen when 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 recorded only 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. Though these '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. For standardization, routes are to be surveyed one day after the conclusion of a snowfall (ending by ~ 6:00 pm). However, in most years a few routes are completed two nights following snowfall; track counts on those routes are divided by the number of days post-snowfall.

Because most species of interest occur throughout the area where survey routes are located, calculated indices for all species prior to 2015 utilize data from all surveyed routes. Starting with the 2015 report, all past marten indices were re-calculated using only those routes that fall within a liberal delineation of marten range (hereafter, the 'marten zone'). However, in general there were minimal differences in temporal patterns observed in this subset versus the full sample of routes.

Currently, I present three summary statistics 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 red fox (*Vulpes vulpes*) clearly traverses two adjacent 0.5-mile segments of the road, and it was the only 'new' red fox 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 computed after removing any obvious duplicate tracks across segments. For wolves (*Canis lupus*) traveling through adjacent segments, I use the maximum number of pack members recorded in any one of those segments 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 (percent of segments occupied and number of 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 foxes 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, I include both indices on the same graph. Because snowshoe hares are tallied only as present or absent, the two 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'). I compute this measure to help assess whether any notable changes in the above-described track indices are a result of larger-scale changes in distribution (i.e., more or less routes with presence) or finer-scale changes in density along routes.

Using a bootstrapping approach (percentile method; Thompson et al. 1998), 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. Although the survey is intended to document long-term trends in populations, confidence intervals (CI) improve interpretation of the significance of any annual changes. However, I refrain from formal significance testing (e.g., determination of whether a CI on the difference between means overlaps 0) and instead use an informal approach (i.e., degree of CI overlap; Cumming and Finch 2005) to highlight changes from last year that likely represent significant differences.

RESULTS AND DISCUSSION

This winter, 28 of the 57 routes were completed (Figures 1 and 2), the fewest since 1995. Survey routes took an average of 2.3 hours to complete. Snow depths averaged 10" along completed routes, similar to the long-term mean (Figure 3). Mean overnight low temperature the night preceding the surveys was 6°F, also near the long-term average (Figure 3). Survey routes were completed between October 17th and March 12th, with the mean survey date of January 20th (Figure 3).

Reliable interpretation of changes in track survey results is dependent on the assumption that the probability of detecting animals remains relatively constant across years (Gibbs 2000, 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. Index point estimates increased for most species this winter. However, based on degree of confidence interval overlap, the only significant changes this winter were increases in the percentage of segments and routes where bobcats were detected, and an increase in the number of routes where red foxes were detected (Figure 4).

Fishers were detected on 5.3% of the route segments and along 75% of the routes (Figure 4), both similar to last winter. 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 indicative of population trends in only the northern 'core' of fisher range. Fisher indices have remained below their long-term average for the past 12 years, and far below the long-term peak around 2002; at their peak, fishers were detected on 14% of route segments.

Within the 'marten zone', martens were detected on 8.6% of the route segments and 56% of the survey routes (Figure 4), both non-significant increases from the previous winter. At their peak in 1999, martens were detected on 13% of the 'marten zone' route segments and 83% of the 'marten zone' survey routes. Similar to results for fishers, marten indices have declined over the long-term. Although low and without trend over the last 14 years, marten indices during this period do show indications of 3-5 year cycles, consistent in timing with cyclic fluctuations of some of their rodent prey species in Minnesota (e.g., Berg et al. 2017, Oestricher 2018).

Bobcat indices had increased for approximately 15 years through 2014, and then declined to their (now elevated) long-term average by 2016. Indices from 2016-18 then showed a rebound, followed by a significant decline again 2 winter's ago. However, the percentage of route segments with bobcat detection significantly increased this winter to the highest yet recorded, though not significantly higher than the previous peak in 2014. Bobcats were detected on 6.7% of the segments and 54% of the routes.

Wolves were detected on 11.6% of the route segments and 79% of the survey routes, both near peak levels since the survey began, but neither representing a significant change from the previous winter (Figure 4). The average number of wolves detected per route was 4.3, the second largest since the survey began. Coyotes were detected on 3.7% of the route segments and 36% of the routes. The long-term trend in coyote indices has been stable, but as with martens and weasels (see below), coyote winter indices appear to exhibit 3 - 5 year cycles consistent in timing with fluctuations in some rodent populations in MN. Long-term red fox indices display a 'stair-step' decline over time, being lowest and comparatively stable since 2013. Red foxes were detected on approximately 12% of the segments and 93% of the routes (Figure 4), the latter representing a significant increase from last winter. Although it is premature to characterize longer patterns in gray fox detections, data from the past 13 years suggests that, similar to coyotes, martens, and weasels, they may fluctuate in concert with cyclic rodent populations. Gray foxes were detected on 2% of the route segments and on 21% of the routes.

Following a significant increase the previous year, this winter's weasel (*Mustela* spp.) indices remained similar to last winter. However, fluctuations continue to be characterized by 4 to 5 year cycles or 'irruptions' superimposed on a long-term declining trend (Figure 4). Weasels were detected on 14% of the route segments (peak of 31% in 1995) and on 68% of the routes (peak of 88% in 1999).

There were no significant changes in the percentage of routes or route segments with snowshoe hare detections. Both spring and winter hare indices steadily increased from 1994 - 2010, then generally declined for five years and are near their post-1994 averages (Figure 4). The moderate albeit non-significant increase in the track index this winter may suggest a potential cyclic increase, though it is premature to conclude. Historic data (pre-1994; not presented here) for the spring snowshoe hare index clearly exhibited 10-year cycles. Since then, only subtle signs of a cycle are apparent in both surveys during the first few years of each decade.

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I wish to thank all those who participated in this year's survey, including staff with the Minnesota DNR, Superior National Forest (Cook and Ely offices), Fond-du-Lac Band of Ojibwe, and the 1854 Treaty Authority. This project was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

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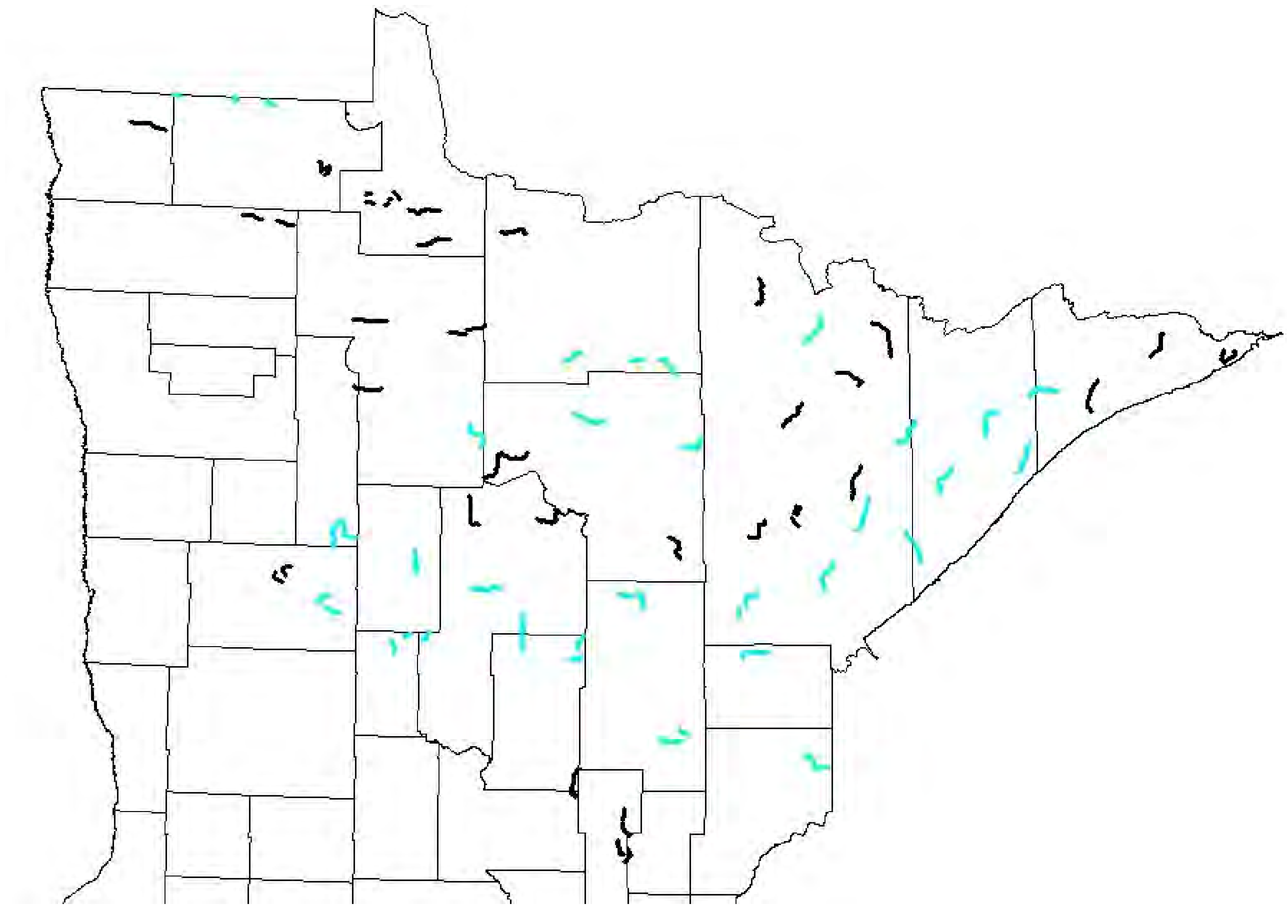


Figure 1. Locations of furbearer winter track survey routes in northern Minnesota. Blue routes are those completed during winter 2020-21.

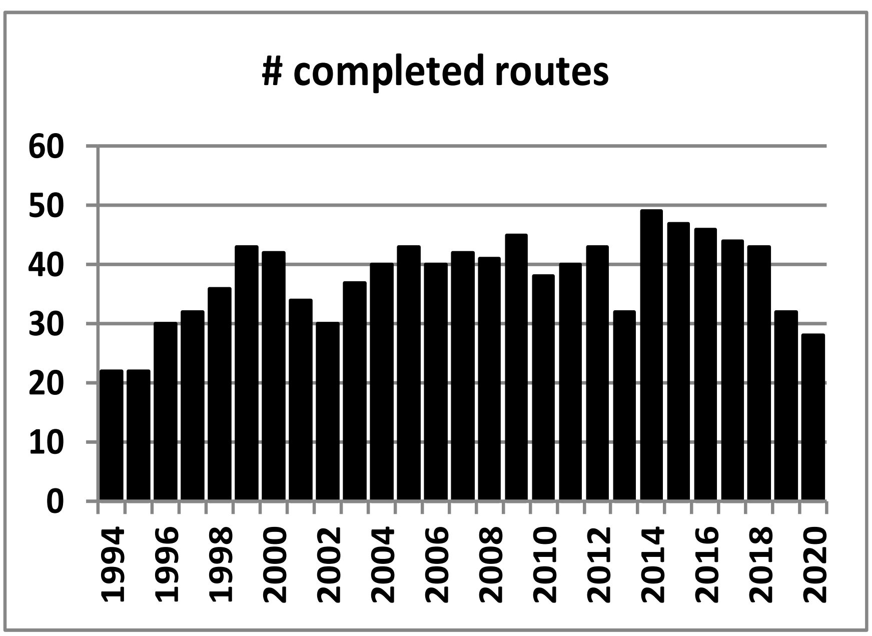
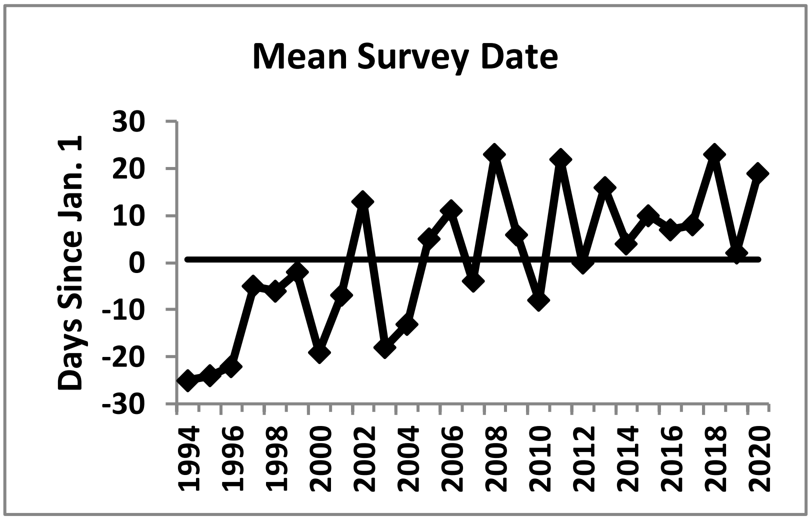
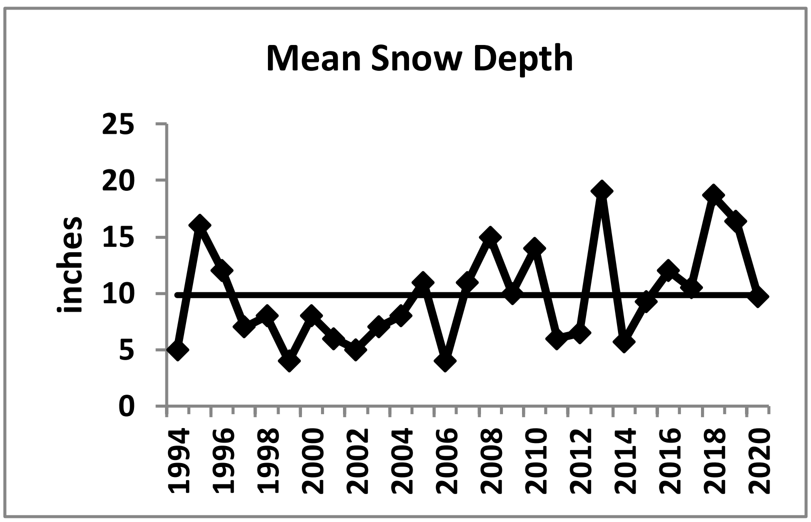


Figure 2. Number of snow track routes surveyed in Minnesota, 1994-2020.





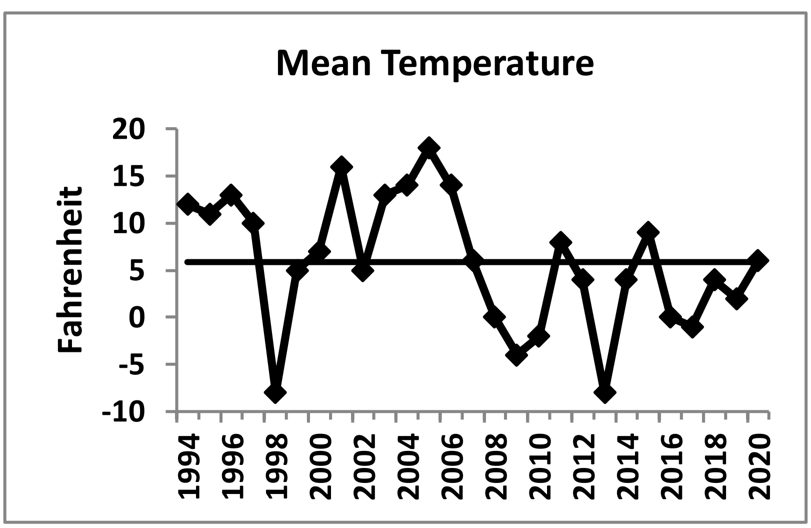


Figure 3. Average survey date, snow depth, and temperature for snow track routes completed in Minnesota, 1994-2020. Horizontal line represents long-term mean.

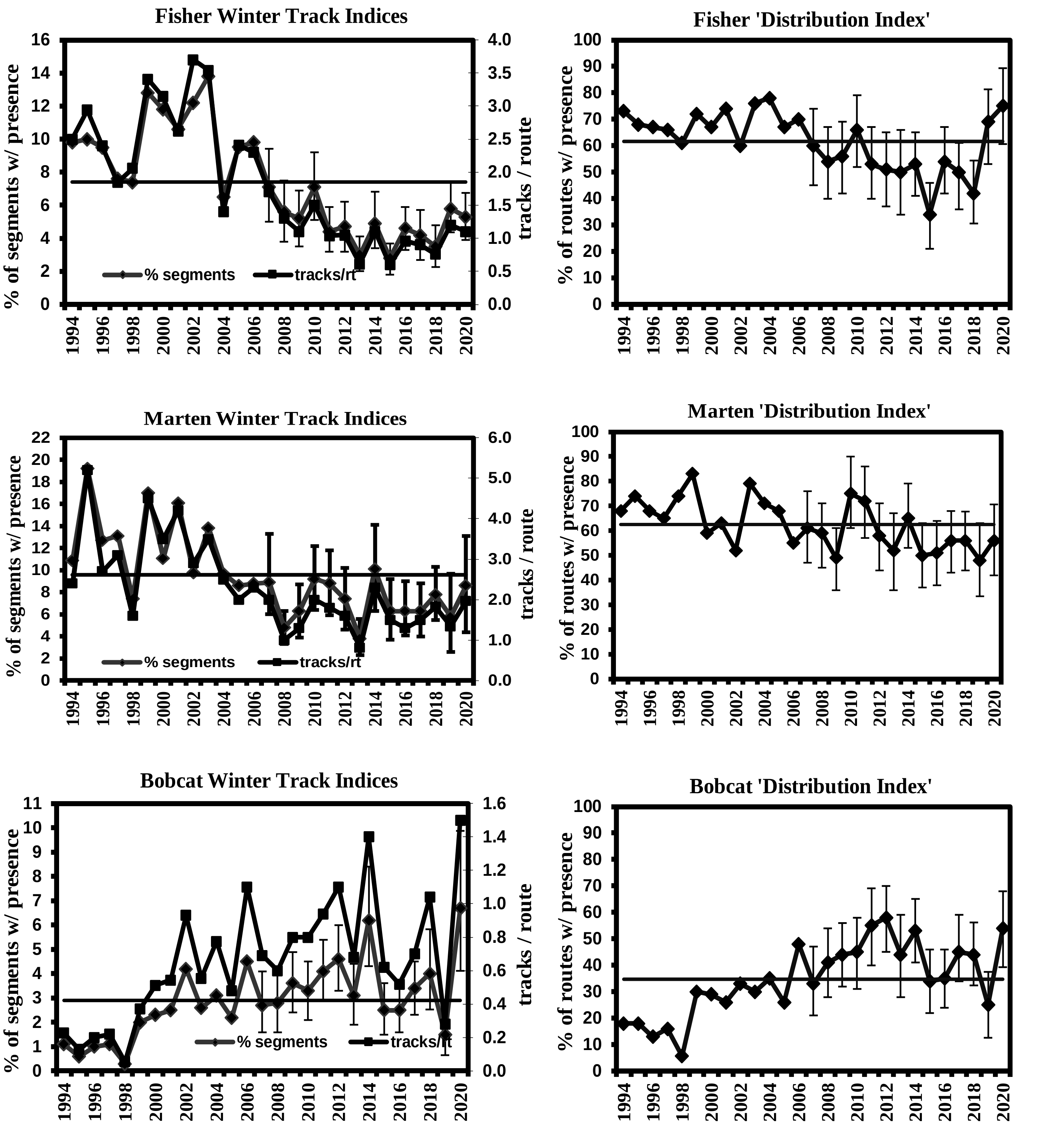
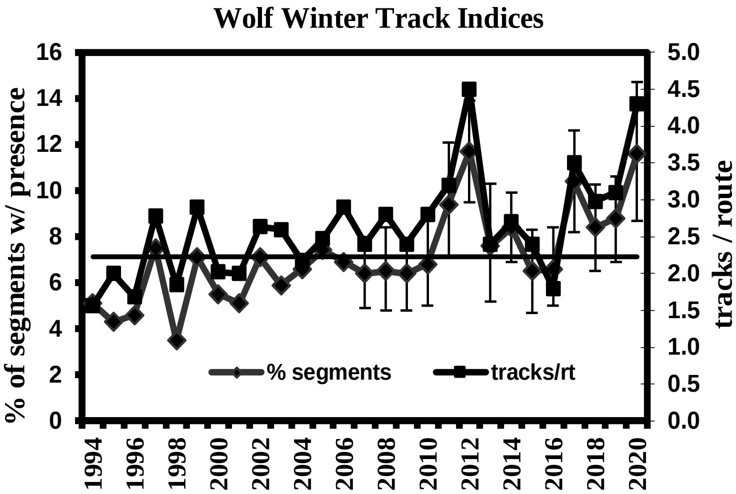
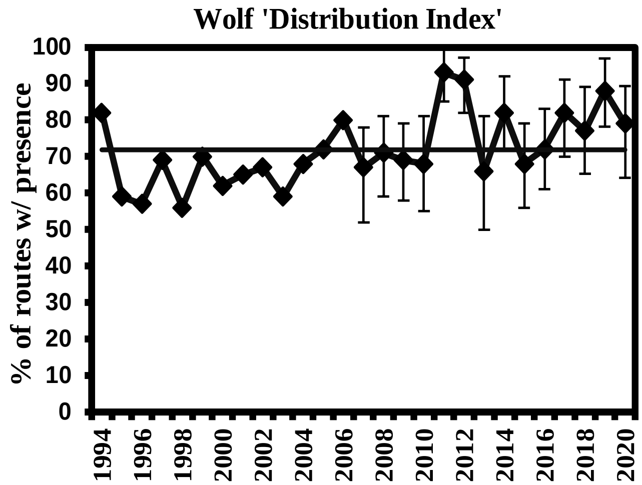
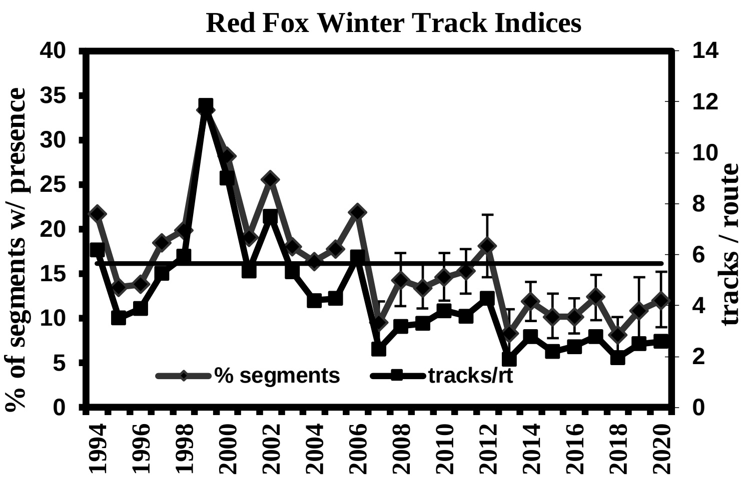
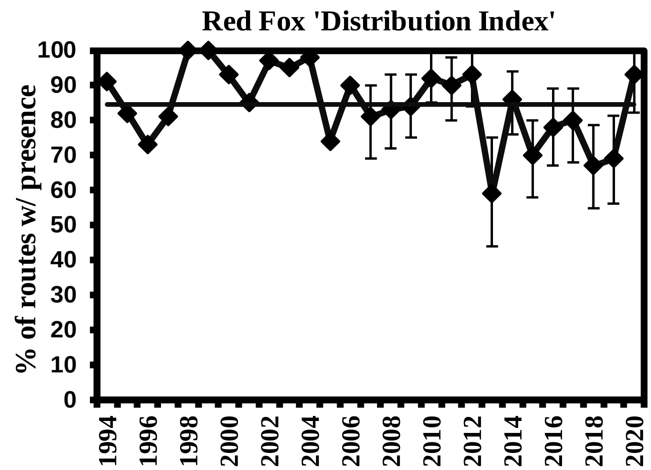


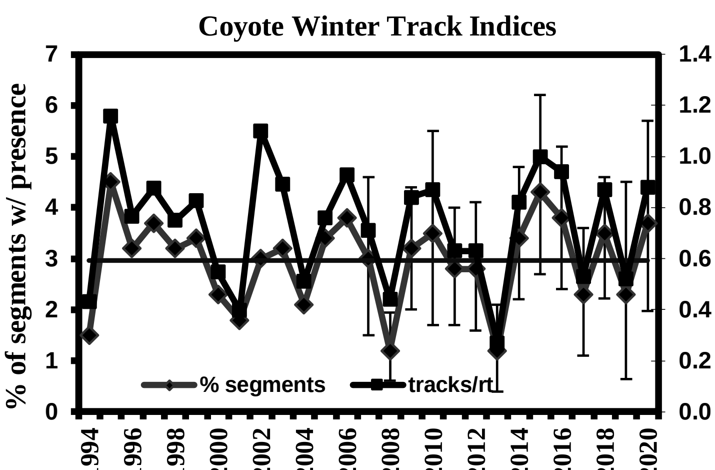
Figure 4. Winter track indices for selected species in Minnesota, 1994-2020. Confidence intervals are presented only for % segments and % routes with track presence; horizontal lines represent their long-term averages.











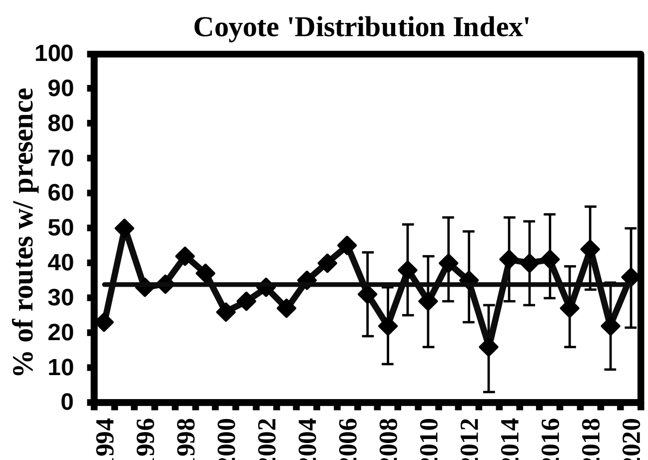
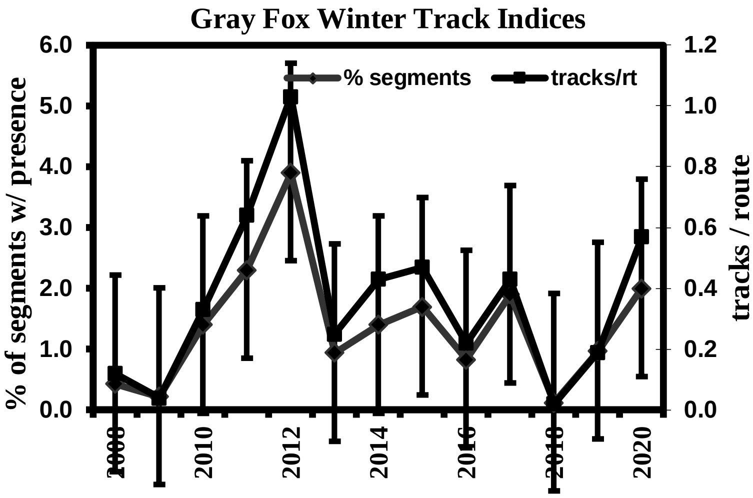
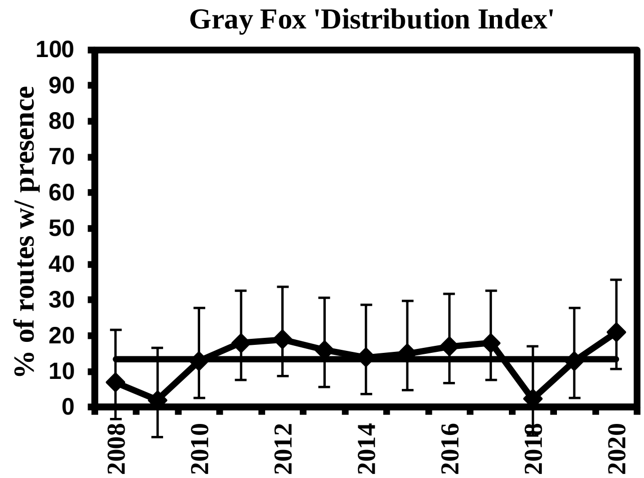
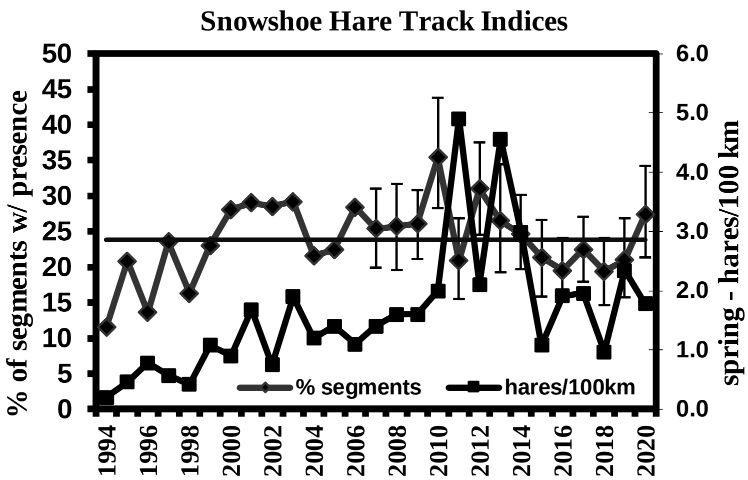
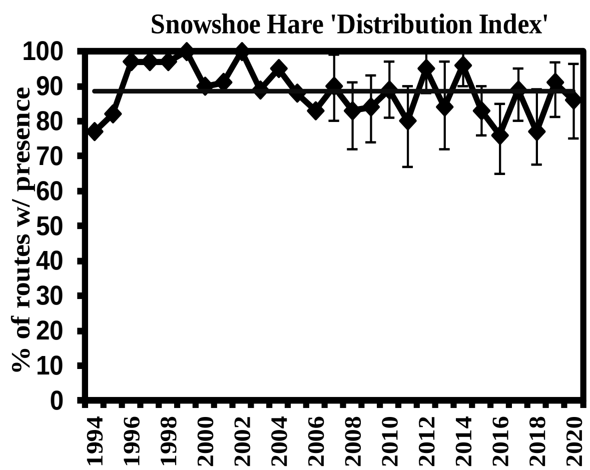


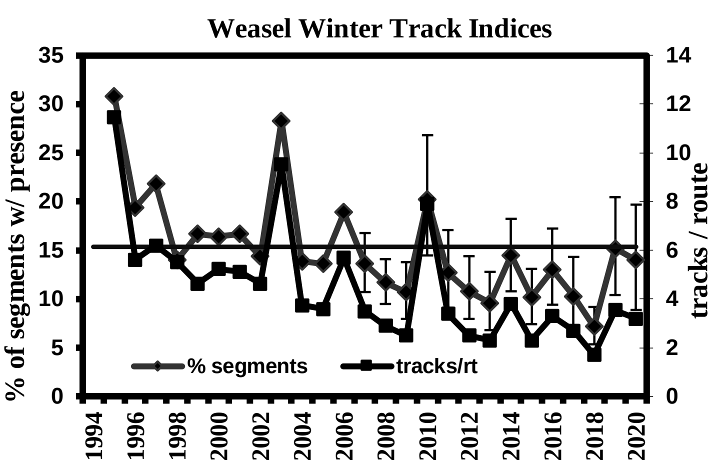
Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2020.











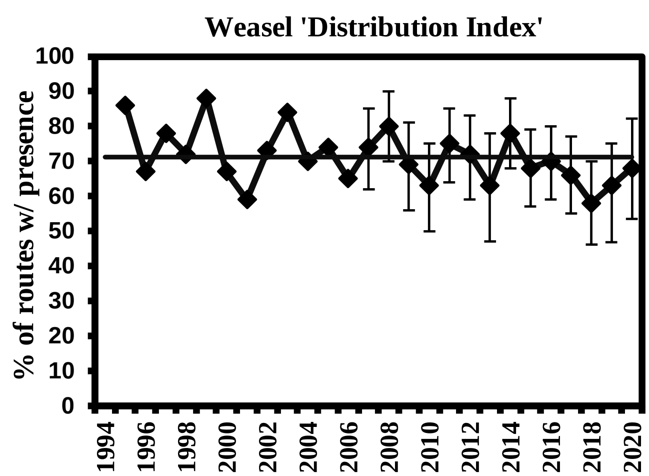


Figure 4 (continued). Winter track indices for selected species in Minnesota, 1994-2020.

DEPARTMENT OF NATURAL RESOURCES

STATUS OF MINNESOTA BLACK BEAR POPULATION, 2020

Andrew N. Tri, Forest Wildlife Research Group

INTRODUCTION

The size of the Minnesota bear population has been estimated in the past using a biomarker (tetracycline) and mark–recapture based on hunter-submitted samples (Garshelis and Visser 1997, Garshelis and Noyce (2006). The last estimate was produced in 2008, and the use of that biomarker may no longer be permitted. Since then, trends in the population have been assessed using various modelling approaches, based on composition (sex-age) of harvest data. Additionally, population information may be inferred by examination of nuisance bear complaints and the seasonal abundance of natural bear foods.

METHODS

Successful hunters must register their bears and submit a tooth sample, which is used to estimate age, and thus harvest age structure. Hunters also report the sex of their harvested bear; we adjust this for a known bias in hunter-reported sex (11% of female bears reported as males). Ages and sexes 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) using a technique formulated by Downing (1980): each sex was estimated separately, and then summed. Age groups were collapsed to 1, 2, and 3+ years in order to estimate population size 3 years in the past (no more recent estimates can be obtained using this technique). This technique only estimates the size of the population that eventually dies due to hunting; to account for bears that die of other causes, the trend lines are scaled upward to attempt to match tetracycline-based estimates.

A second, independent assessment of population trend is obtained by investigating harvest rates (% of living bears harvested each year). A relatively low harvest rate would signify a population with more potential growth. Harvest rate is estimated from the inverse of the age at which the number of males and females in the harvest is equal, based on methodology of Fraser (1984).

RESULTS

Population trend statewide

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) using a technique formulated by Downing (Figure 1). This was scaled upwards (to include bears that died of other causes), using 4 statewide tetracycline mark–recapture estimates as a guide. One trajectory, which assumed non-harvest mortality was 23% of total mortality (curves elevated x1.3) matched the 1991 tetracycline estimate but fell below the other tet-estimates. Another trajectory, which assumed non-harvest mortality was 44% of all mortality (curves elevated x1.8) matched the 1997, 2002, and 2008 tet-estimates. The curves show an increasing population from the early 1980s to mid-1990s, leveling off in the late 1990s, followed by a steep decline through the 2000s. Since 2013, quotas were maintained at a low and consistent level (Table 1) in an attempt to reverse the population decline (and also to allow the models to perform better, without the confounding issue of changing hunter effort). The reduced harvest pressure stabilized the population.

Population trend: quota vs no-quota zones

Downing population reconstruction indicated that the quota zone population declined by ~50% from 2000 to 2014 (Figure 2). With reduced quotas and lower harvests since then, the quota zone population increased over 10% from 2014 to 2016, according to this model, but then dipped following the higher than expected harvest in 2016. The Downing model does not produce population estimates for the most recent 3 years, so the effects of lower harvest in 2018 is not yet reflected. Bears taken in BMU 451 and on BMU 88 licenses are included in the Quota zone reconstruction.

A new Bayesian model developed by Allen et al. (2018) for bear monitoring in Wisconsin includes not only the sex-age composition of harvested bears (like the Downing), but also reproductive and survival parameters (obtained from data collected from long-term monitoring of radio-collared bears in different study sites across Minnesota). This model does not have a lag time (so projections are available to post-hunt 2020 and the estimation method provides a "dampening" effect on the year-to-year variation in population estimates because it looks at the long-term variation in the population trend. The trajectory of this model was remarkably similar to that of the Downing model for the quota zone, and indicated that the population there has stabilized and is slowly recovering.

Meanwhile, despite a surge in "overflow" hunters in the no-quota zone (Figure 3) prompted by the more restrictive quota zone permit allocations, harvests in the no-quota zone have not increased dramatically through 2018, however the harvest in the no-quota zone was a record high this year. Both the Downing and Allen models show a recent population increase.

Trends in harvest rates

The sex ratio of harvested bears varies by age (Figure 4). Male bears are more vulnerable to harvest than females, so males always predominate among harvested 1-year-olds (67–75%). Males also predominate, but less strongly among 2 and 3-year-old harvested bears. However, older-aged harvested bears (≥8 years) are nearly always dominated by females, because, although old females continue to be less vulnerable as individuals, there are far more of them than old males in the living population. 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 data into time blocks showed harvest rates increasing from 1980–1999, then declining with reductions in hunter numbers (Figure 5). Based on this method, harvest rates since 2015 have been significantly less than what they were in the early 1980s, when the bear population was increasing (Figure 6).

One problem in using this very simple method is that it assumes that the relative difference for males versus females in their vulnerability to harvest does not change systematically through time. This may not be true, given the steadily increasing male-skewed harvests since the late 1990s, and especially in recent years (Figure 7).

Nuisance complaints and kills

The total number of recorded bear complaints slowly increased over the past decade, reaching a peak in 2015 and 2016 (Table 2). Number of complaints declined in 2017, despite a higher number of DNR personnel recording complaints, and declined again in 2018, with abundant natural foods all summer (Figure 8, Tables ~~9~~ 3 & ~~10~~ 4). Below-average foods during the summer of 2020 led to higher numbers of complaints. A new recording system was instituted in 2017 whereby Wildlife Managers recorded all bear complaints online as they were received, instead of submitting reports at the end of each month (thus, unlike previous years, Managers who had no complaints were not counted in the number of personnel participating). Conservation Officers implemented a similar system beginning July 2019. This dramatically increased the number of officers reporting bear complaints. Also, a relatively high number of the reports from officers involved a bear being killed by a private party. In 2018 and 2019, a list was distributed of "area 88" hunters, who expressed interest in taking a nuisance bear in the quota area on a no-quota license. This year 96 hunters purchased an “88” license and 40 hunters were successful (42% success rate).

Spatial distribution of bear complaints

All bear complaints, whether handled by phone or at an on-site visit, are now recorded spatially (Figures 7, 9 & 10). These maps represent the complaints taken by Wildlife Managers because these have the most accurate GPS locations. Complaint calls most often occur on in the core of bear range, but there is a growing number of trash and birdfeeder complaints on the edge of bear range or in areas with low bear density. There also are a number of complaints where people feel threatened by bears. They are most common on the edge of bear range where people aren’t used to bears, in cities, and along the north shore of Lake Superior (a popular tourist destination).

Food abundance

The composite range-wide, all-season abundance of natural bear foods (fruits and nuts) in 2020 was the worst since 2012 (Tables 3-5). Abundance of many summer foods was below the long-term (35-year) average in all but the northwest region. In general, summer food conditions were poor across the state, but particularly poor in the north-central and northeast parts of the state due to drought. On the other hand, fall foods tended to be low across the state (6^{th} worst fall food year in our records). The statewide fall food index (Figure 11) (productivity of dogwood+oak+hazel), which helps predict annual harvest after accounting for hunter effort (Figure 12), was below average in all regions. Hazelnut production was poor across in much of the state. Dogwood production was generally poor across the range with above average production near Brainerd. Oak production was below average across the state with patches of above-average production near Brainerd and Hinckley. Note that due to the COVID-19 pandemic, DNR staff were not out as frequently as normal, and the data reported are a smaller sample of the landscape than normal.

Predictions of harvest from food abundance

The 2020 statewide harvest was 10% higher than expected (3203 actual vs. 2898 predicted), based on regression of harvest as a function of hunter numbers and the fall food productivity index (Figure 12). This regression is nearly as strong (and has accurately predicted previous harvests) when only the past 15 years are considered. For the quota zone, the actual harvest in 2020 was also nearly 20% higher (2037 actual vs.1666 predicted) than predicted by this regression. These discrepancies might be due to the changes in BMU 451 and the limited time staff spent in the field due to the COVID-19 pandemic.

Submission of bear teeth for aging

Ages of harvested bears are used as the principal means of monitoring population trends. Although hunters are required to submit a tooth from their harvested bear (Figures 13 & 14), historically >25% did not comply. Reminder notices were sent to non-compliant hunters each year during 2014–2017, which spurred a higher initial compliance the following years (>80%). Since 2018, with no reminder mailing, compliance has been 82–87%. Since 2013, hunters could register by phone or internet, and pick up a tooth submission envelope later: tooth submission compliance by these hunters has equalized across all registration types. A decreasing proportion of hunters are registering their bear at a registration station over the past years. Compliance with tooth submission was higher in the quota zones than in the no-quota area, but was especially low (<80%) in a number of units (BMUs 10, 11, 24, 41, 451, 46, 47, 52).

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 2001–2020.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Permit applications[a]	26824	21886	16431	16466	16153	15725	16345	17362	17571	18647	19184	18103	18107	18885	18422	19958	21034	21184	20632	22279
Permits available[b]	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050	6000	3750	3750	3700	3850	3350	3350	3400	3575
Licenses purchased (total)	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589	6620	6962	7177	6655	6550	6801	8882
Quota zone [c]	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188	3177	3257	3420	2954	2922	2988	3178
Quota surplus/military [c]	235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578	583	446	441	401	428	417	398
Quota-no limit area-451																				1038
No-quota zone [c]	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965	2823	2860	3259	3316	3300	3200	3396	4262[h]
% Licenses bought																				
Of permits available [d]	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6	100	100	100	100	100	100	100	100	100	100
Of permits issued [d]	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	87.9	88.7	88.2	87.2	87.8	80.8
Estimated no. hunters [e]	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9200	8600	6300	6300	6700	6900	6400	6300	6700	8700
Harvest	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866	1627	1971	2641	2040	1766	2340	3203
Harvest sex ratio (%M) [f]	56	61	58	57	59	58	57	62	59	59	61	59	62	62	66 [i]	61	63	66 [i]	61	56
Success rate (%)																				
Total harvest/hunters [g]	29	14	26	26	26	26	28	21	30	29	23	30	30	26	30	38	32	28	35	37
Quota harvest/licenses [k]	28	14	25	26	25	25	28	21	30	30	24	33	37	33	39 [j]	50 [j]	46	38	49 [j]	57 [j]

[a] From 2008 to 2019, 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; 2015=2455; 2016=2641; 2017=2803; 2018=3254, 2019=3450, 2020=3691(record high); additionally, area 88 nuisance-only bear license applications counted in this total in 2017=3, 2018=6, 2019=5, 2020=11 (people who selected area 88 as 1st preference).

[b] Beginning in 2011 a procedure was implemented that ensures that all available licenses are purchased (see Table 2).

[c] Quota zone established in 1982. No-quota zone 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 August 1. 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 2011–20, all unpurchased licenses were put up for sale and 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%), 2009 (95.3%), and 2018 (92.7%). Beginning in 2011 all unpurchased quota licenses were sold as “surplus” in August, and this process is quick and competitive; thus, for 2011–19 all Surplus and Military license-holders were considered to have hunted.

[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 both 2016 and 2017, 5 hunters legally killed 2 bears. In 2018, 3 hunters shot 2 bears. In 2019, 2 hunters shot 2 bears. In 2020, 5 hunters shot 2 bears.

[h] Record high number of no-quota zone licenses purchased in 2020; record high % of licenses in no-quota zone in 2017 (nearly 50%; see Fig. 4).

[I] Record high % males in statewide harvest.

[j] 2020: highest success rate in quota zone ever; 2016: second highest success rate; 2019: third-highest success rate.

[k] In 2020, BMU 451 was broken out of BMU 45 and was an area in the quota zone with an unlimited number of licenses. The quota success rate is calculated without BMU 451 in it to make hunting success estimates comparable across years. The 2020 success rate for BMU 451 is listed in Table 6 and the success rate for the quota area with Area 451 included is 48%.

Table 2. Number of nuisance bear complaints registered by Wildlife Managers and Conservation Officers during April–October during 2001–2020, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 [j]	2018 [j]	2019 [j]	2020 [j]
Number of personnel participating in survey [a]	54	50	39	34	42	46	46	37	51	40	34	56	63	64	61	55	86 (51,35)	78 (56,23)	126 (60,66)	112 (70,42)
Complaints examined on site	122	75	81	75	61	57	63	59	65	70	37	113	69	79	97	118	71 (22,49)	40 (21,19)	82 (37,45)	87 (84,3)
Complaints handled by phone [b]	660	550	424	507	451	426	380	452	535	514	396	722	623	570	840	780	644 (450,194)	438 (369,69)	736 (599,137)	784 (591,193)
Total complaints received [o]	782	625	505	582	512	483	443	511	600	584	433	835	692	649	937	898	715	478	818	871
• % Handled by phone	84	88	84	87	88	88	86	88	89	88	91	86	90	88	90	87	90	92	90	90
• Calls handled by the information center (not included in overall total)[n]																				281
Bears killed by:																				
• Private party or DNR	22	12	13	25	28	11	21	22	23	22	9 [k]	16	24	26	45	53	22 (4,18)	9 [k] (4,5)	45 (5,40)	42 (3, 39)
• Hunter before season [c]																				
– from nuisance survey	4	0	3	3	6	2	18	3	4	3	3	11	0	0	1	13	1	2	0	20
– from registration file	20	11	8	4	13	6	25	5	15	10	5	12	0	1	4	6	3	11	5	34
• Hunter during/after season [d]	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	3
• Hunter by Area 88 license [e]																	1		3 [m]	40 [m]
• Permittee [f]	6	4	6	1	5	4	5	1	3	5	0	0	1	0	3	0	0	1	2	5
Bears translocated [g]	6	3	1	3	3	3	1	3	2	2	2	0	3	2	0	0	0	0	0	3
Bears killed by cars [h]	43	26	25	16	22	18	20	27	18	28	15	33	32	28	47 [h]	27	9 (0,9) [h]	25 (15,10) [h]	16 (11,5) [h]	25 (23, 2)[h]

Table 2. (continued)

[a] Maximum number of people turning in a nuisance bear report each month. Monthly reports were required beginning in 1984, and included cases of zero complaints. In 2017, the recording system was changed, where Wildlife Managers only recorded actual complaints (not zero complaints), generally at the time the complaint was received. Since then, the number reflects the total number of people receiving and recording at least 1 complaint during that year. For consistency, the records from Conservation Officers were handled the same way. Beginning July 2019, COs recorded complaints electronically and individually (as they occurred), similar to Wildlife Managers (but using a different recording system).

[b] If a complaint was handled by phone, it means a site visit was not made.

[c] The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data. Similarity between the two values does not necessarily mean the same bears were reported. Of the 34 bears killed before the season, 5 were on normal quota licenses, 7 were on area 451 licenses, and the rest were on area 88 licenses.

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

[e] In 2017, hunters could choose Area 88 in the quota lottery, and if drawn, could hunt for a nuisance bear, if authorized (11 were authorized, 1 killed a bear). In 2020, Area 88 was only a designation for hunters willing to take a nuisance bear in the quota area on a no-quota license, if so authorized; 116 hunters were authorized to do this.

[f] A permit for non-landowners to take a nuisance bear before the bear season was officially implemented in 1992, but some COs individually implemented this program in 1991. Data are based on records from the nuisance survey, not directly from permit receipts. Only 12 bears have been killed by permittees since 2011. In 2020, 13 permits were issued but only 5 bears killed.

[g] According to DNR nuisance policy, trapped nuisance bears should not be translocated.

[h] Car kill data were reported on the monthly nuisance form beginning in 2005. In all previous years, car kill data were from Enforcement's confiscation records. In 2015, confiscation records had more car-kills than the nuisance survey (47 vs 33), so the higher number is shown here. In 2017, only 1 car-kill was in the confiscation records, and in 2018 there were just 2. In 2017, the electronic system used by managers did not allow for recording of car kills. In 2018, an effort was made to increase car-kill reporting by managers, which was further increased in 2019 by adding a distinct coding for non-confiscated car kills that were either observed or reported by the public.

[j] Beginning in 2017, Wildlife Managers recorded nuisance bear complaints on an all-species wildlife damage app, whereas Conservation Officers continued to submit monthly nuisance bear survey forms (April–Oct). Beginning in 2019, COs also used an electronic app to record bear complaints (but a different app than wildlife). Because the 2 survey tools are not exactly the same, data are presented separately for each in parenthesis (Wildlife Managers, COs). For consistency, only April–October data are included (in 2017 managers recorded 10 calls in other months, in 2018 14 calls were in other months, in 2019 16 calls were in other months, in 2020 21 calls were in other months). For the wildlife manager data, anytime a WCIL row was entered, it is considered an independent complaint, so there are some duplicates when there were repeat issues at the same property (in 2020, there were 27 duplicates in the database).

[k] Lowest number of nuisance bears were killed in 2011 and 2018, since recording began in 1982.

[m] 96 NQ hunters were authorized to take nuisance bears in the quota area in 2020, of which 40 were successful. Data are from the registration files only.

[n] Although it is unknown when this started, the information center at Central Office has been fielding bear nuisance calls. Some calls (~40%) are forwarded on to wildlife managers or conservation officers, but the rest are handled by the information center.

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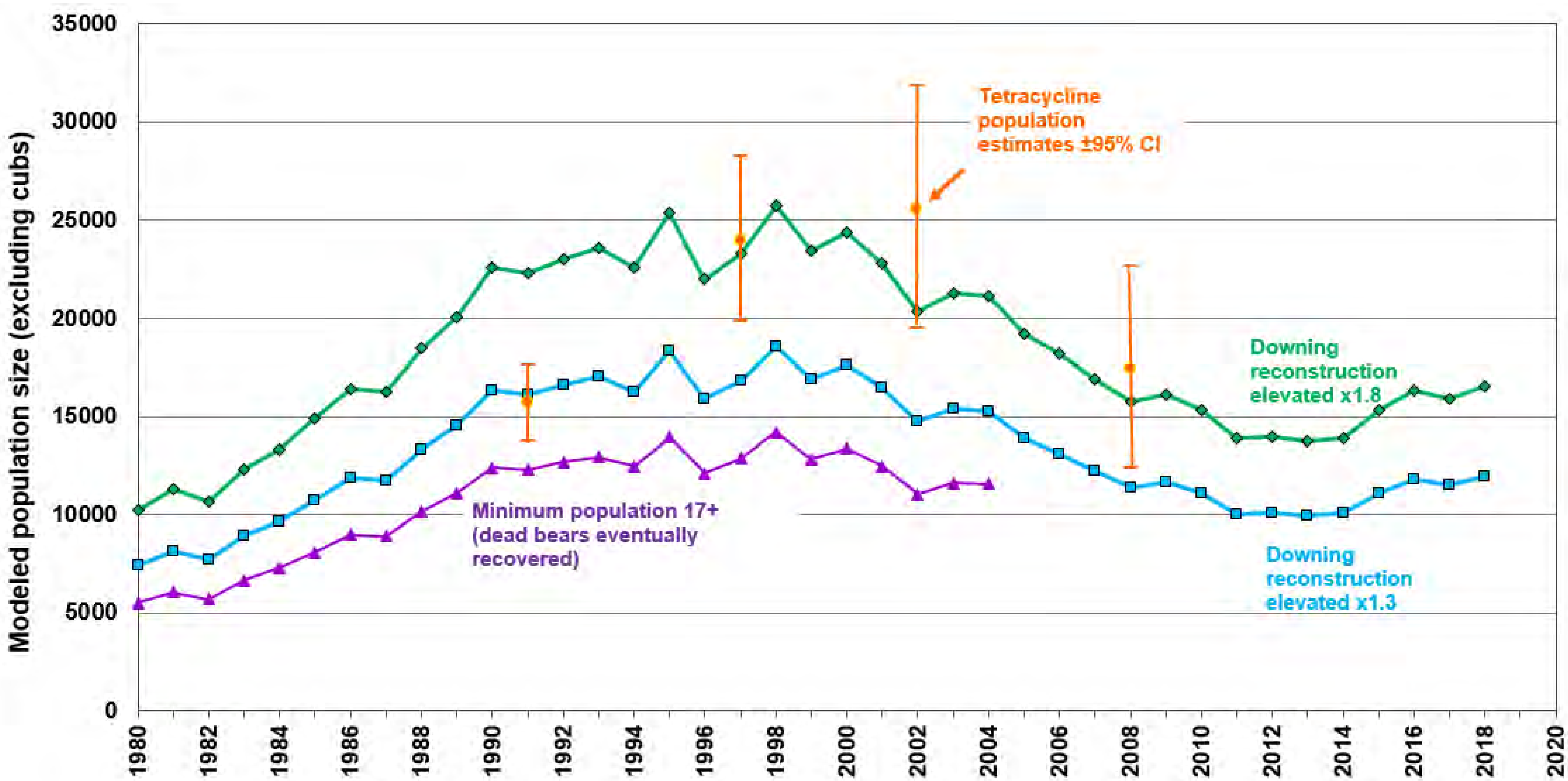


Figure 1. Statewide bear population trend (pre-hunt) derived from Downing reconstruction, scaled (elevated to account for non-harvest mortality) to various degrees to attempt to match the tetracycline-based mark–recapture estimates (2 such curves shown here; estimates beyond 2018 are unreliable).

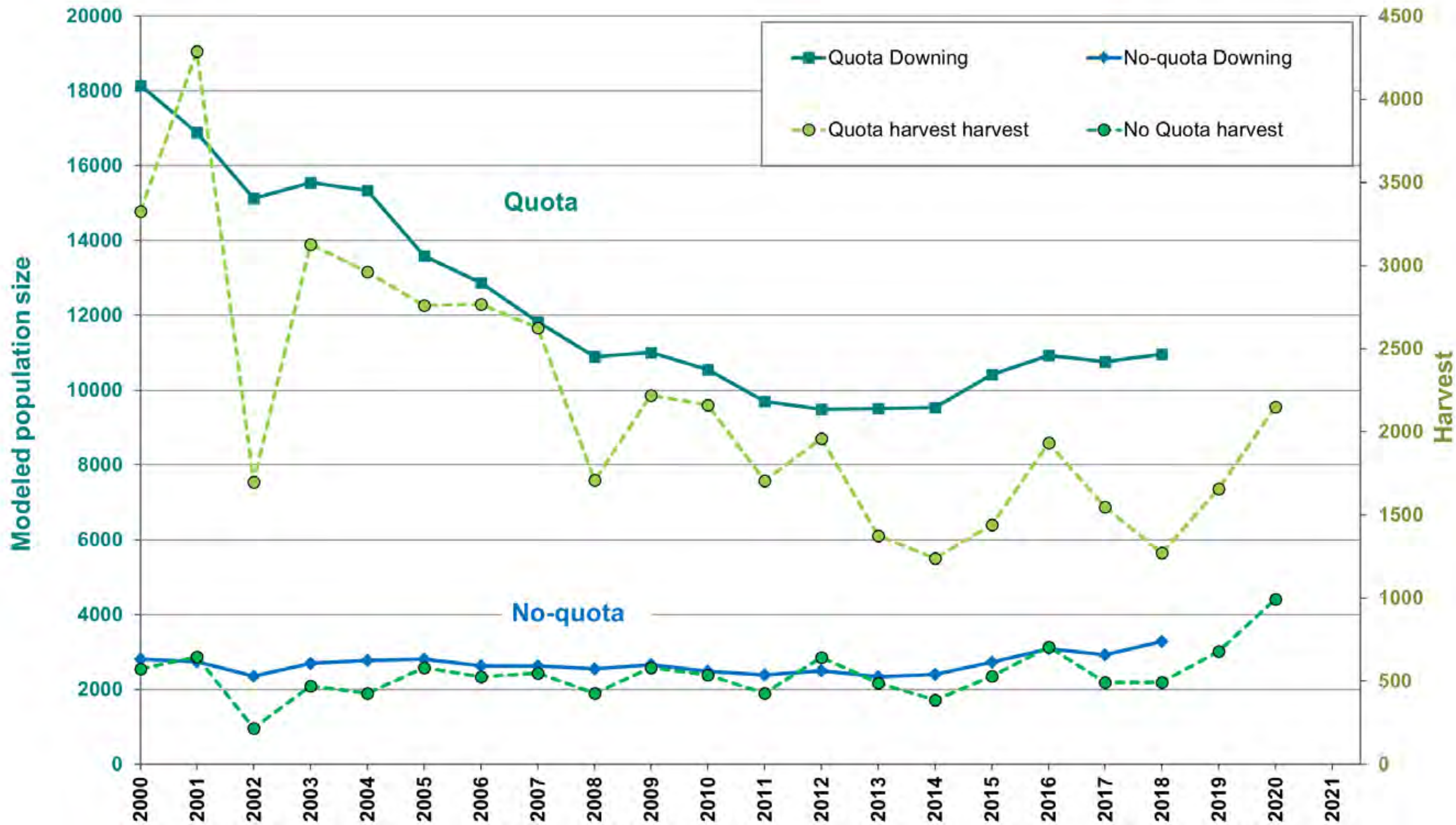


Figure 2. Population trends during 2000s derived from two independent population models (Downing [top panel] and Allen [bottom panel]) for quota and no-quota zones, compared to respective harvests. Downing reconstruction-based estimates <2 years from the most recent harvest age data are unreliable (hence these curves terminate 2018; top panel). Downing curves were scaled (elevated to account for non-harvest mortality) to fall between the two curves in Fig. 18 (i.e., the actual scale of the population estimates is not empirically-based, but happens to approximately match the magnitude of the Allen estimates).

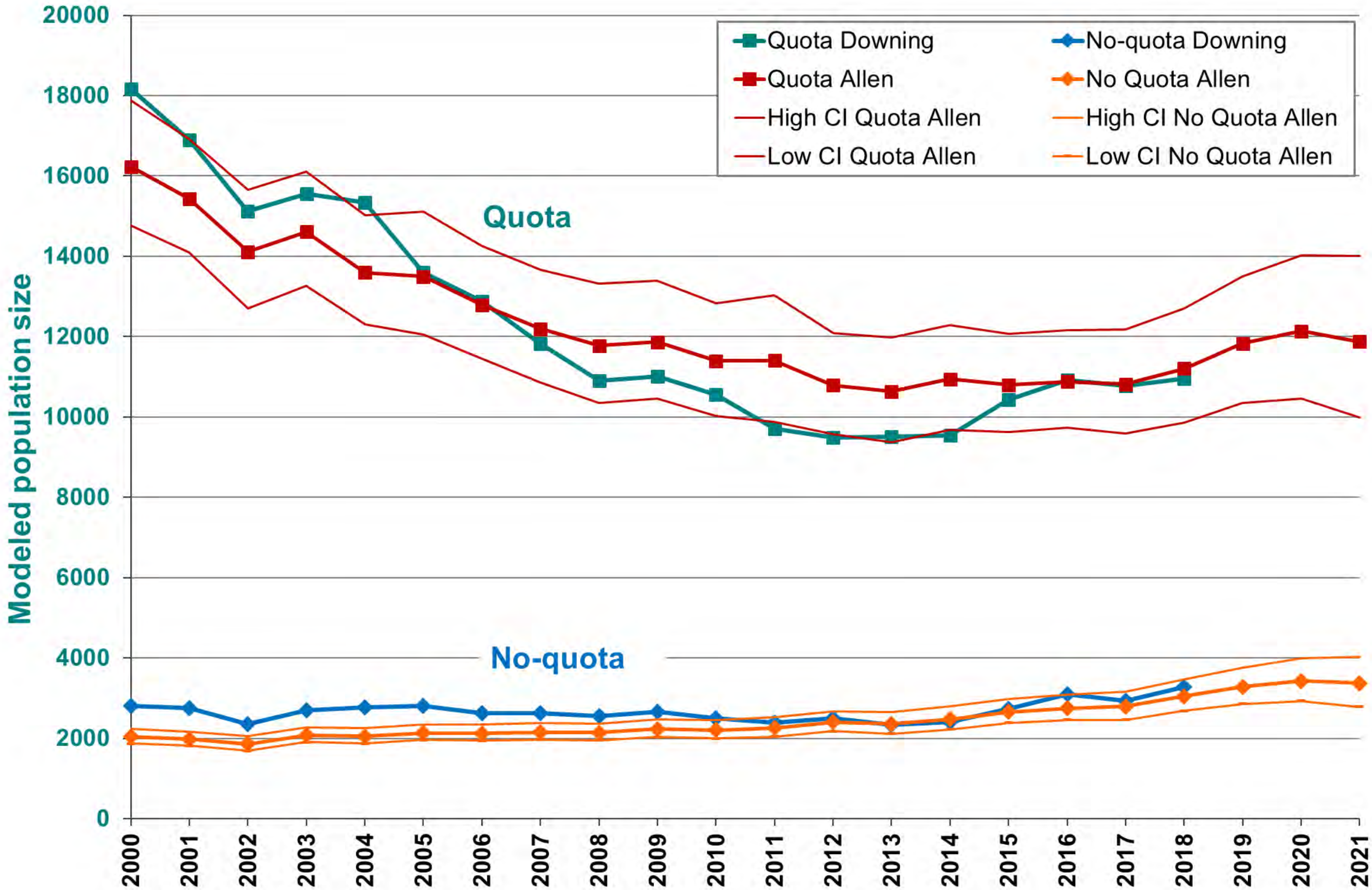


Figure 2. (continued)

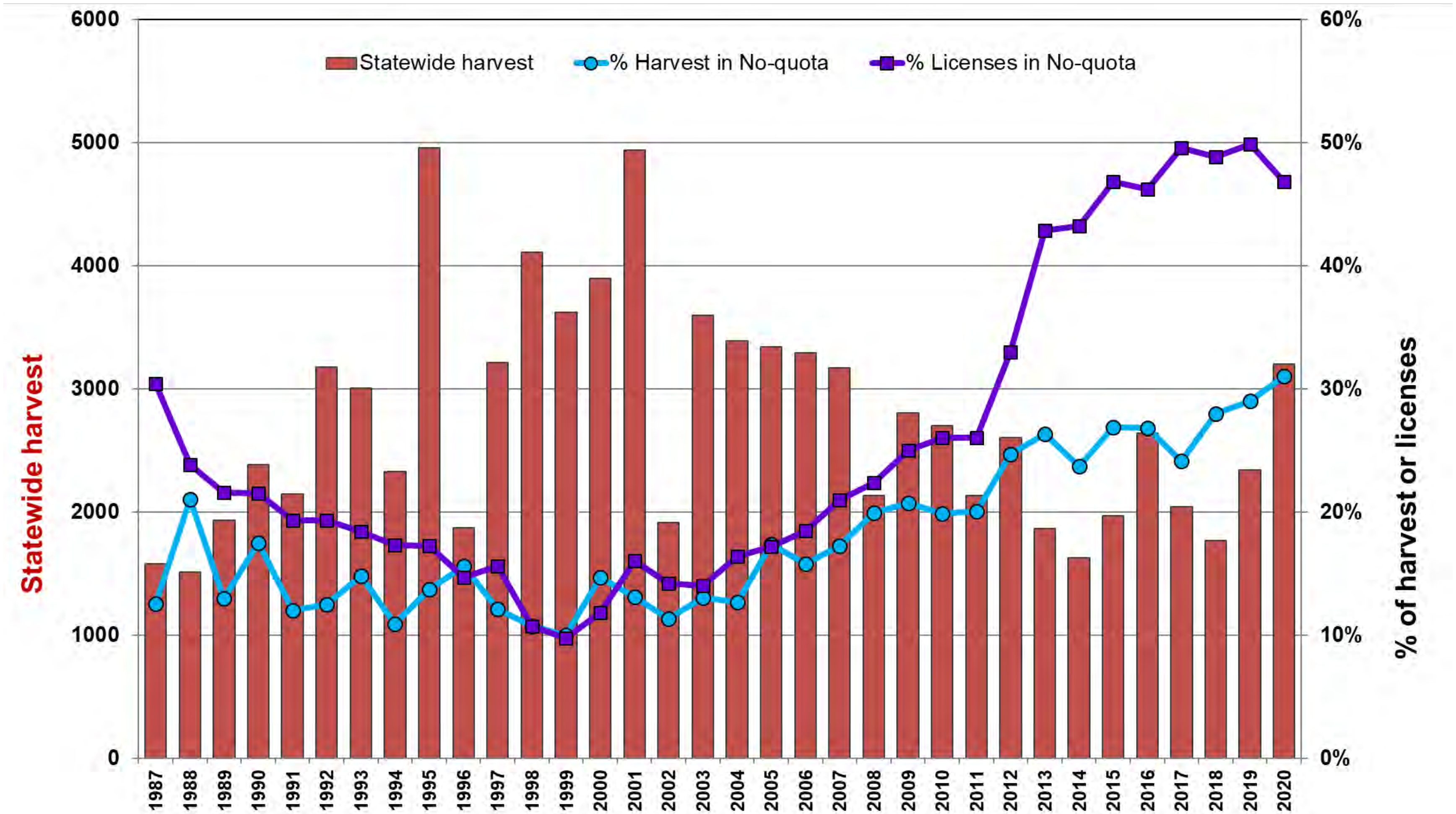


Figure 3. Trends in statewide bear harvest and proportions of harvest and licenses in the no-quota zones, 1987–2020.

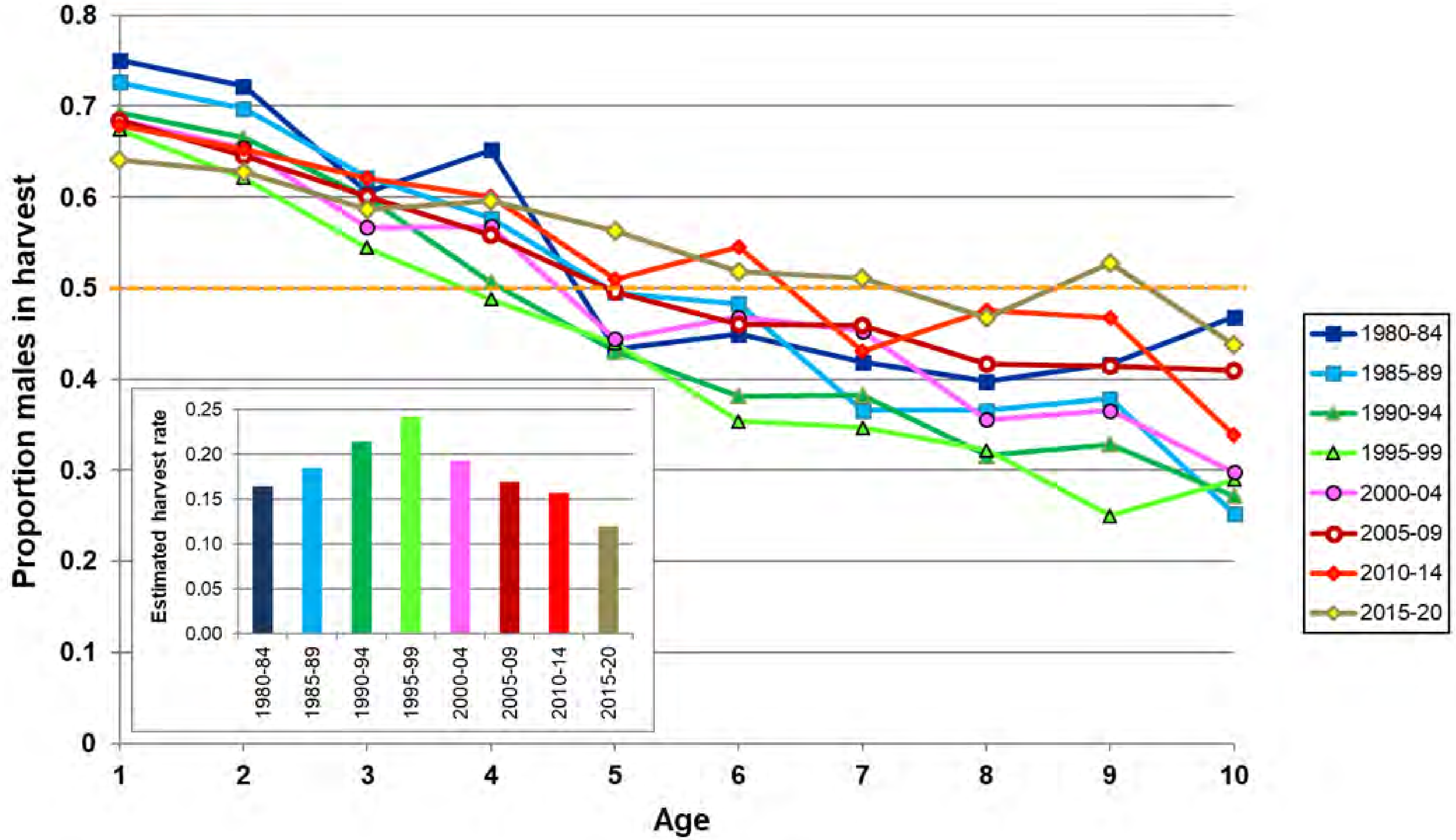


Figure 4. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1980–2020. Higher harvest rates result in steeper curves because males in the living population are reduced faster than females. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male (dashed tan horizontal line) yields approximately the inverse of the harvest rate (derived rates are shown in inset). Flatter curves in recent years indicate lower harvest rates (2015–20 lower than 1980–84).

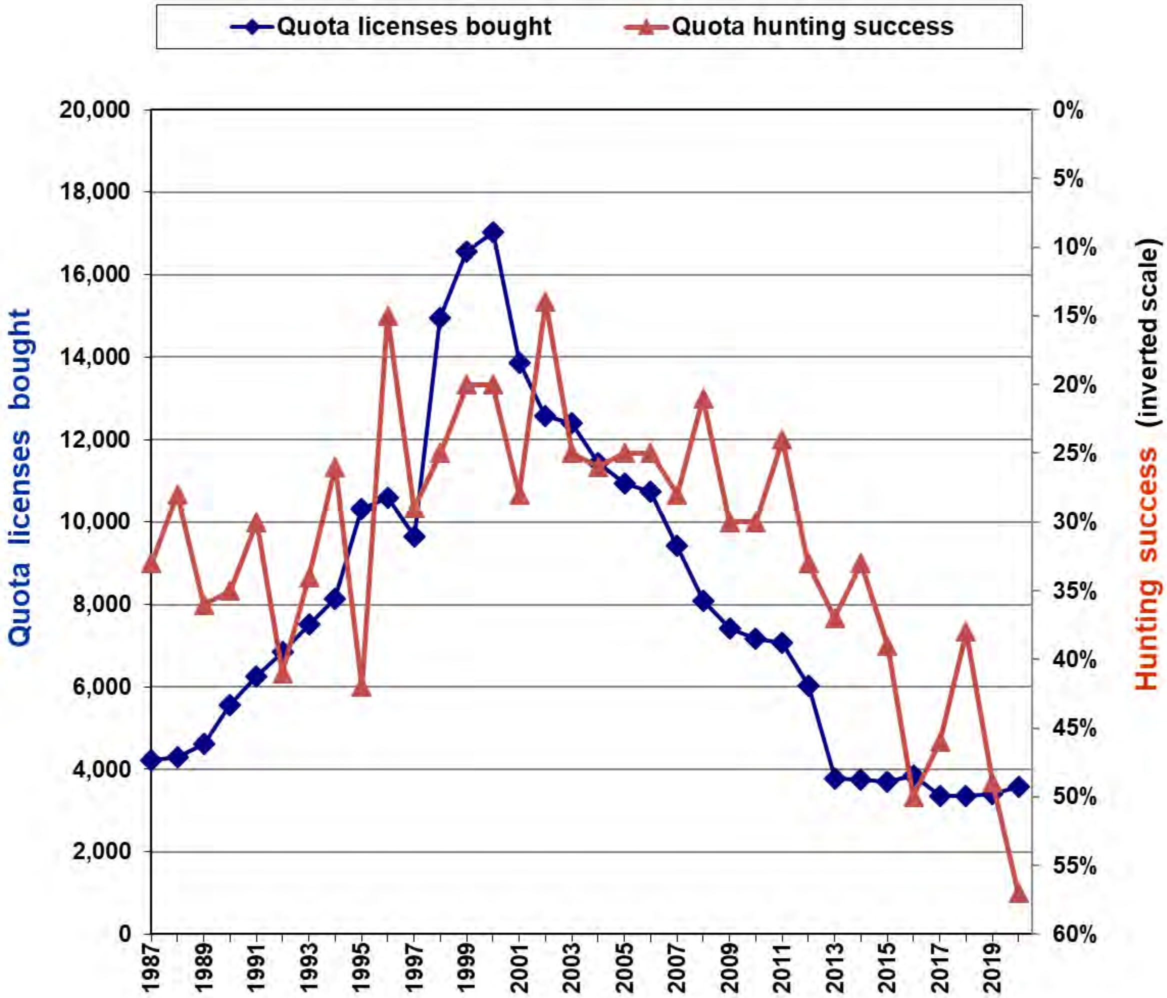
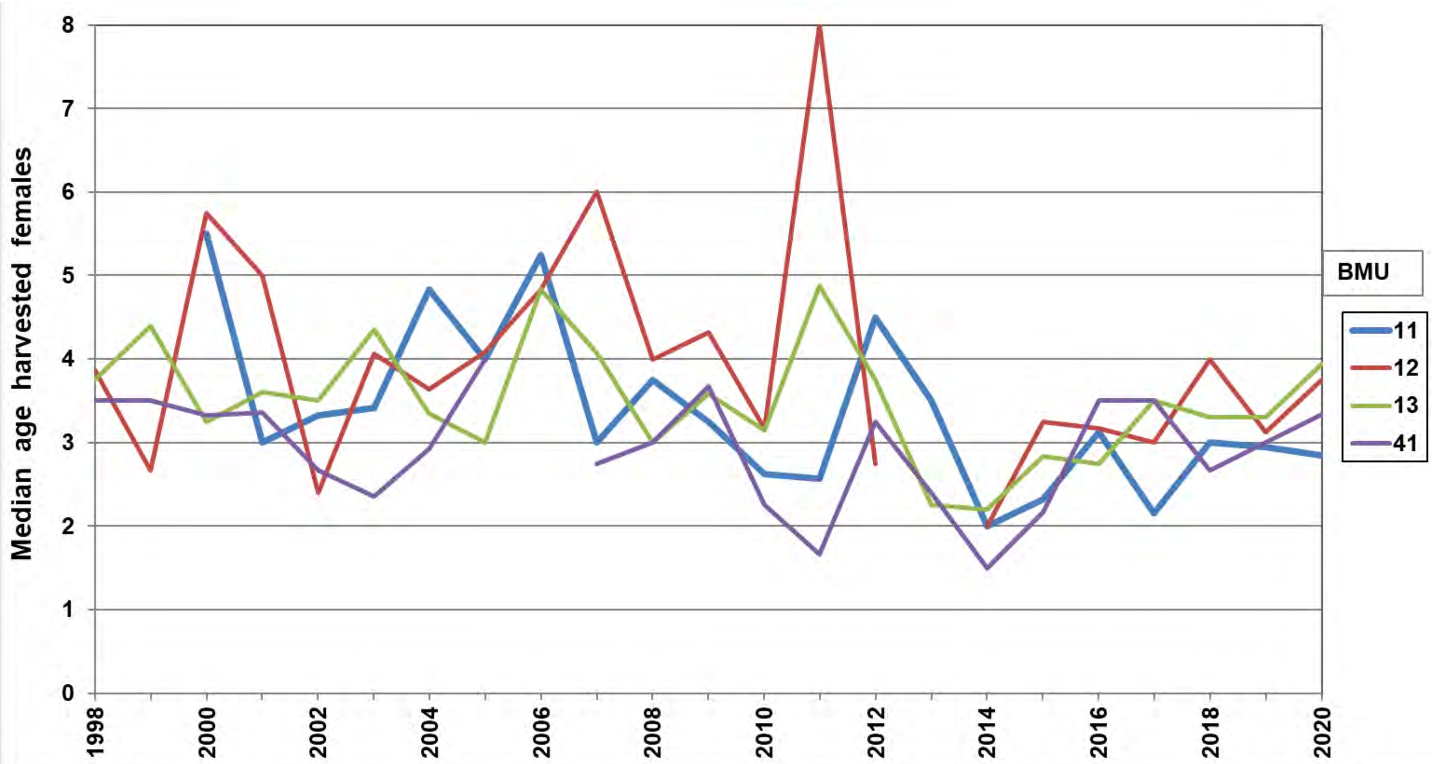


Figure 5. Relationship between licenses sold and hunting success (*note inverted scale*) in quota zone, 1987–2020 (quota and no-quota zones first partitioned in 1987). Number of licenses explains 54% of variation in hunting success during this period. Large variation in hunting success is also attributable to food conditions (e.g., during 2013–2020, when licenses were held relatively constant). Statistics from BMU 451 are not included in this graph to allow for quota zone comparisons with the past.



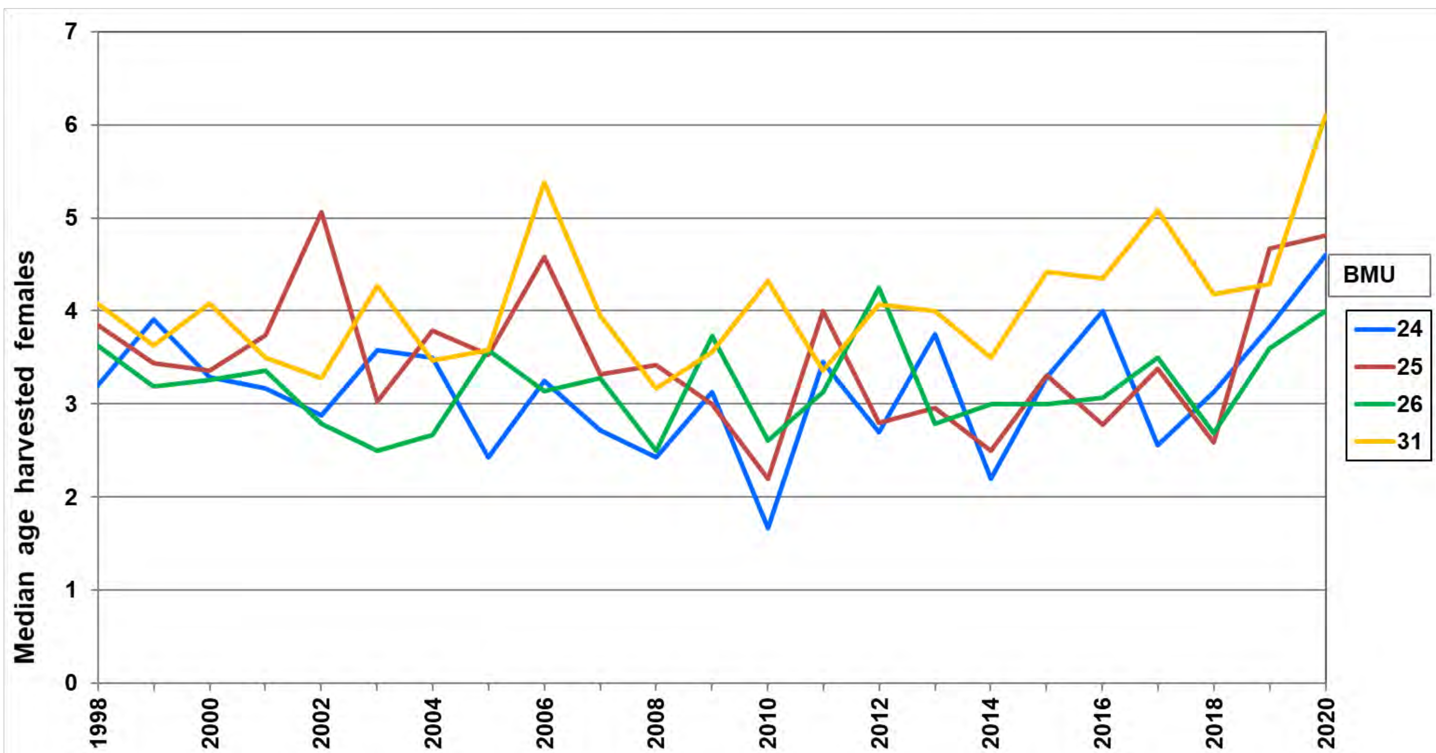


Figure 6. Median ages of harvested female bears by BMU, 1998–2020. Breaks in line occur when sample sizes were too small to calculate a meaningful median.

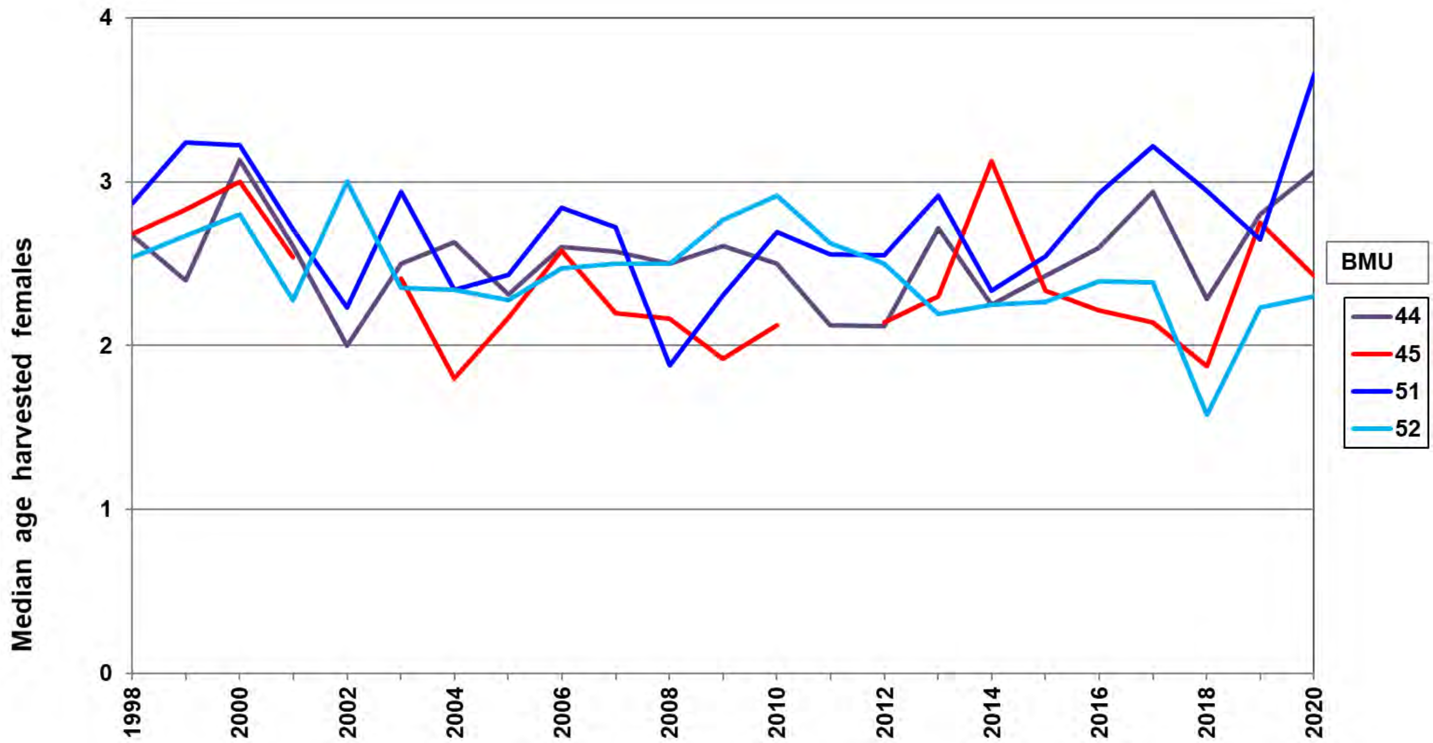


Figure 6. (continued)

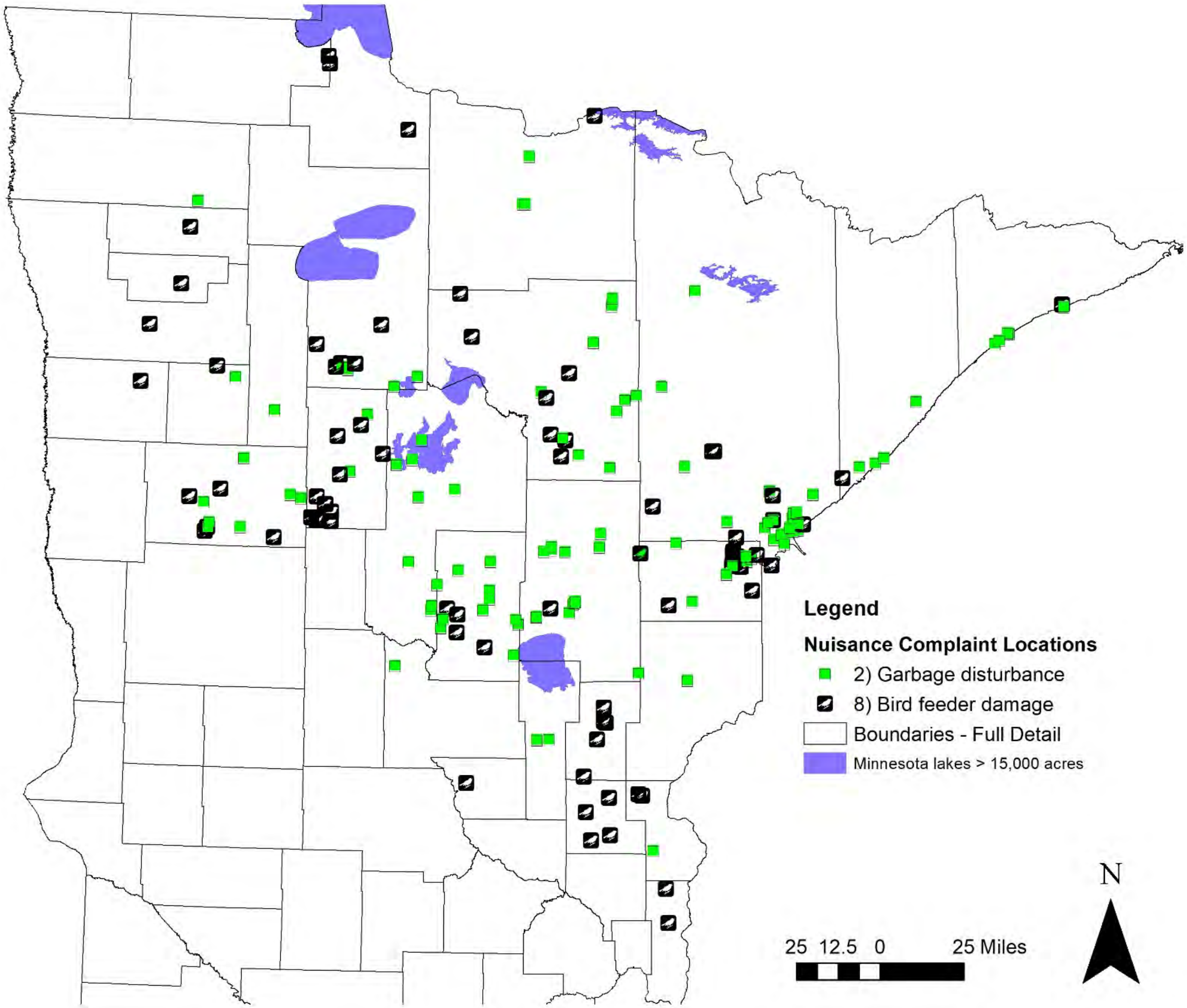


Figure. 7. Spatial distribution of nuisance bear complaints involving attraction to garbage or birdfeeders in 2020.

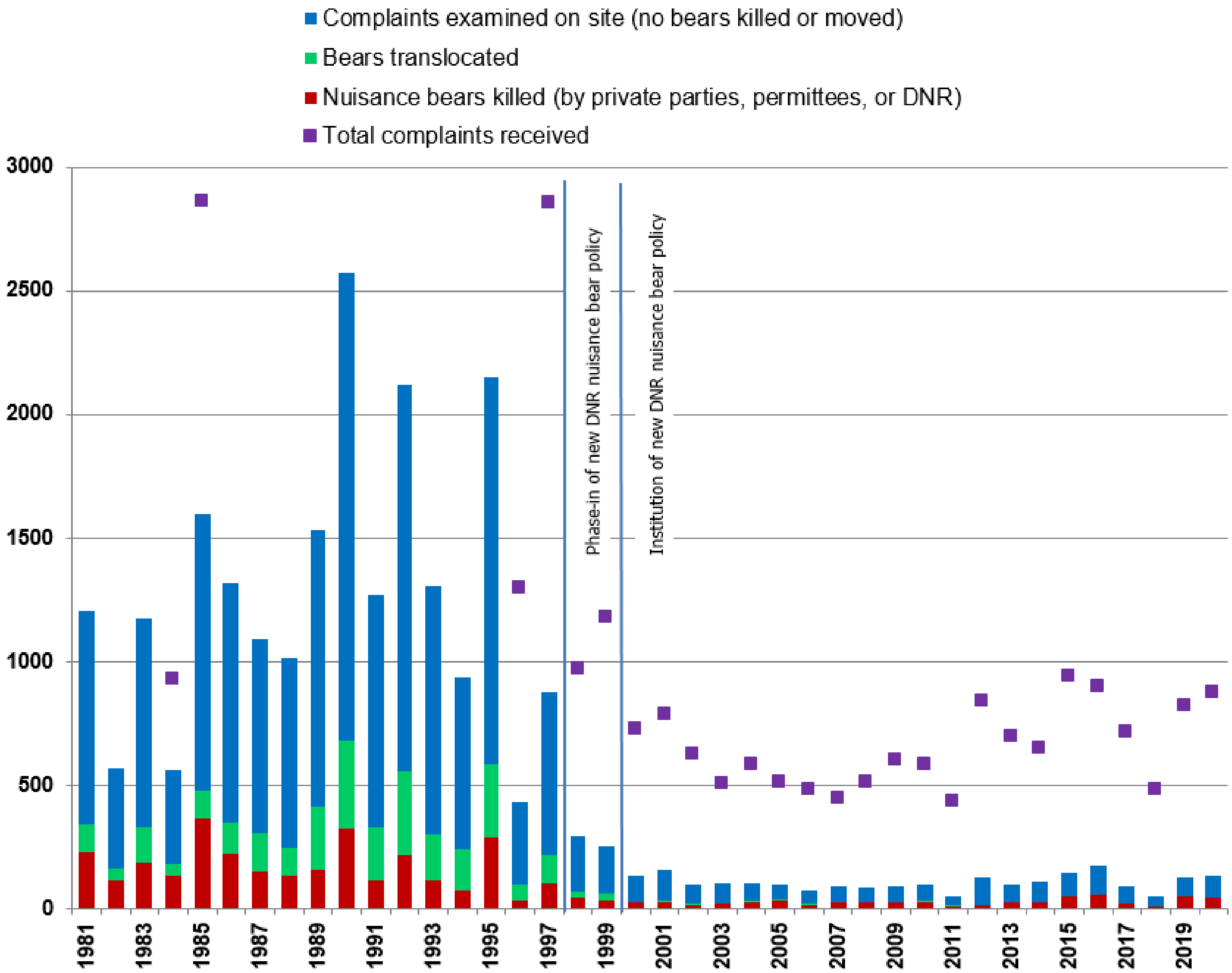


Figure 8. Trends in nuisance bear complaints, and nuisance bears killed and moved, 1981–2020, showing dramatic effect of change in nuisance bear policy, and slight increasing trend over past decade.

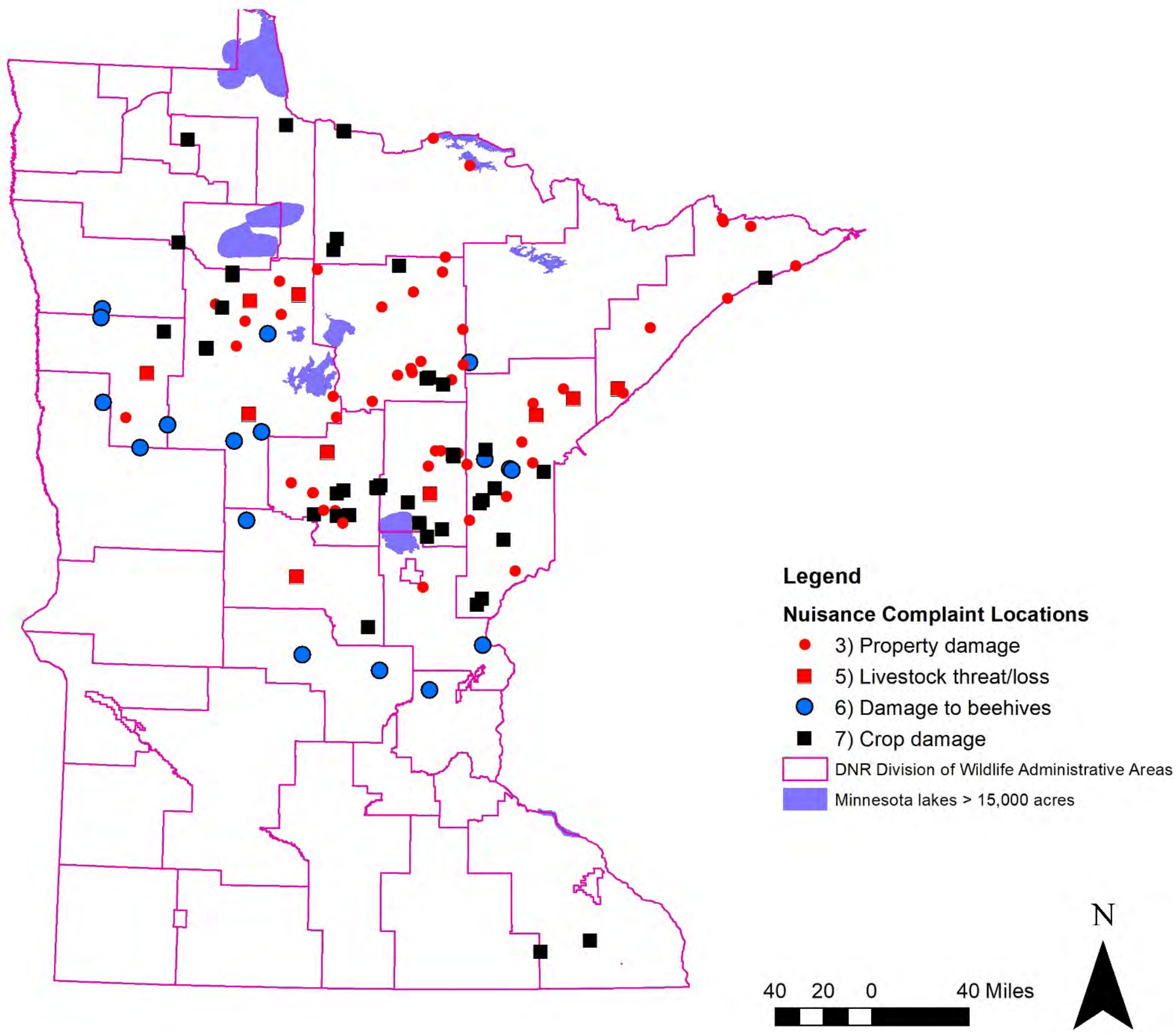


Figure 9. Spatial distribution of nuisance bear complaints to wildlife managers involving agriculture or property damage in 2020.

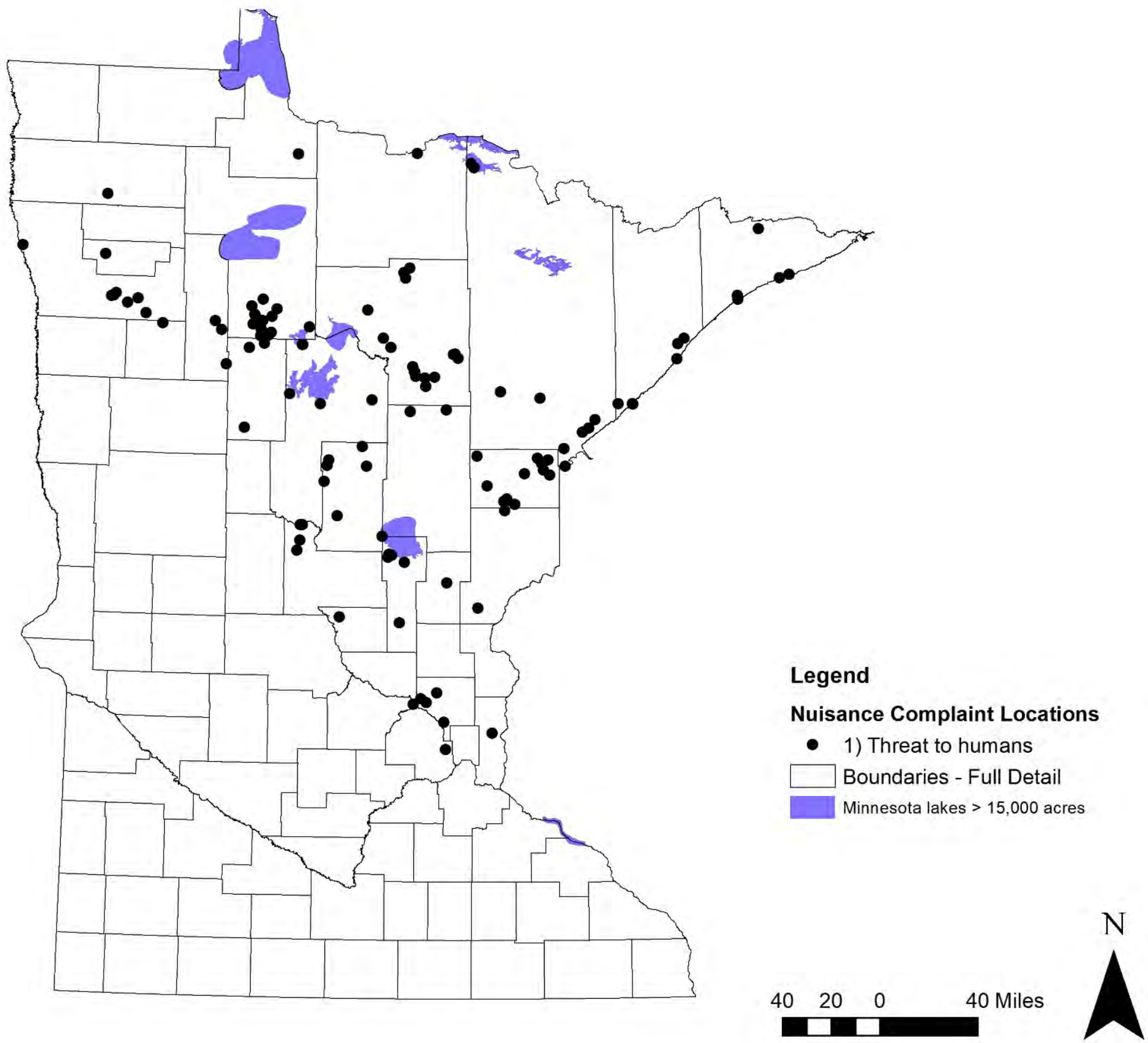


Figure 10. Spatial distribution of nuisance bear complaints where people felt threatened by bear presence in 2020.

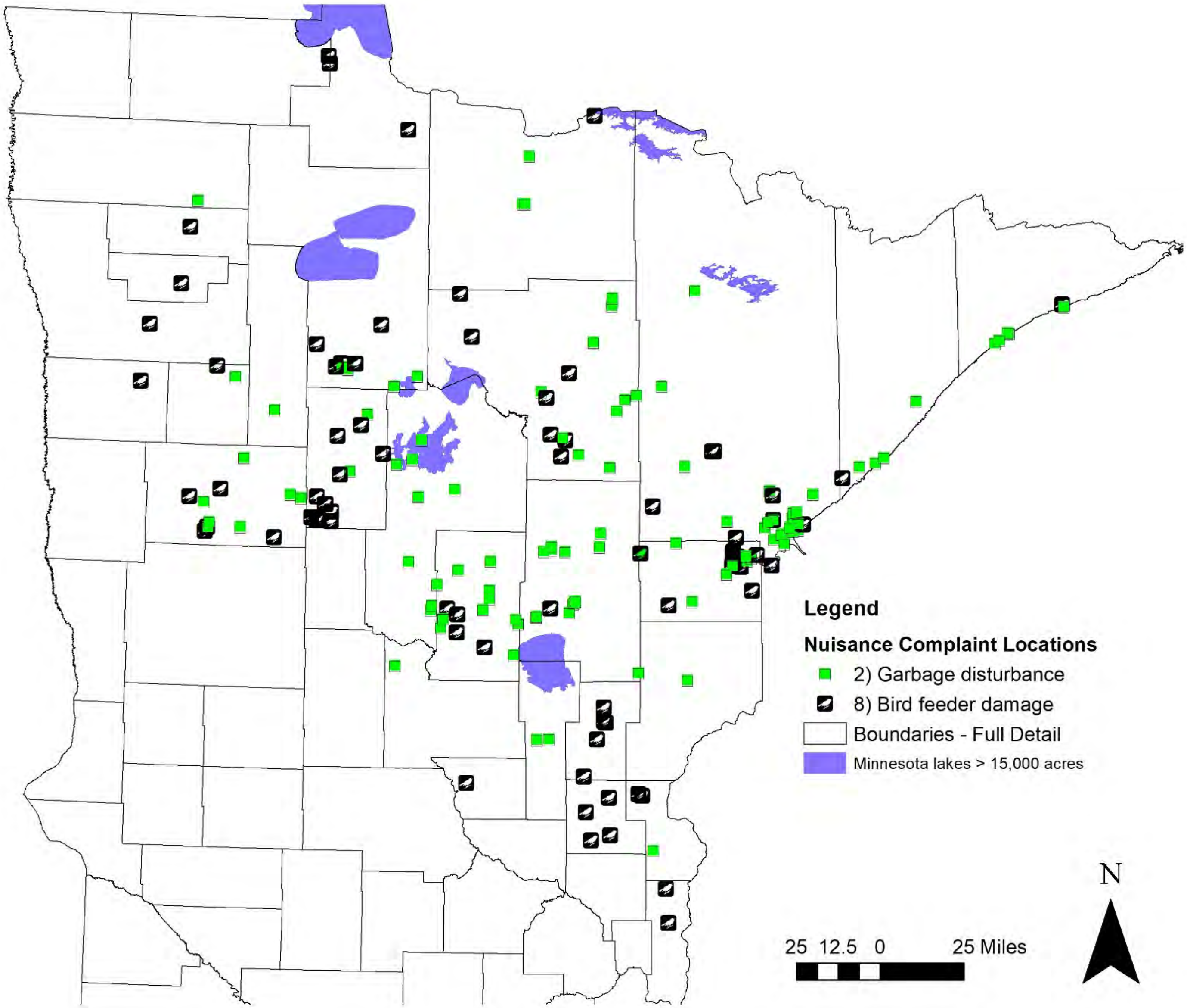
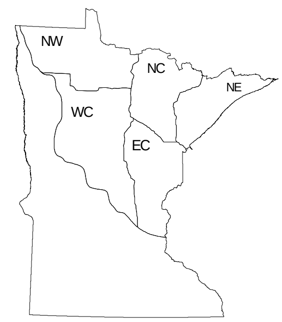


Figure 11. Spatial distribution of nuisance bear complaints involving attraction to garbage or birdfeeders in 2020.

Table 3. Regional bear food indices[a] in Minnesota's bear range, 1984–2020.

Shaded blocks indicate particularly low (<50; pink) or high (≥70; green) values.

	Survey Area					
Year	NW	NC	NE	WC	EC	Rangewide
1984	32.3	66.8	48.9	51.4	45.4	51.8
1985	43.0	37.5	35.3	43.5	55.5	42.7
1986	83.9	66.0	54.7	74.7	61.1	67.7
1987	62.7	57.3	46.8	67.4	69.0	61.8
1988	51.2	61.1	62.7	54.4	47.3	56.0
1989	55.4	58.8	48.1	47.8	52.9	51.6
1990	29.1	39.4	55.4	44.0	47.9	44.1
1991	59.7	71.2	64.8	72.1	78.9	68.4
1992	52.3	59.9	48.6	48.1	63.3	58.2
1993	59.8	87.8	75.0	73.9	76.8	74.3
1994	68.6	82.3	61.3	81.5	68.2	72.3
1995	33.8	46.5	43.9	42.0	50.9	44.4
1996	89.5	93.2	88.4	92.2	82.1	87.6
1997	58.2	55.5	58.8	62.0	70.1	63.9
1998	56.9	72.8	66.4	72.3	84.5	71.1
1999	63.7	59.9	61.1	63.2	60.6	62.0
2000	57.7	68.0	54.7	69.2	67.4	62.3
2001	40.6	48.7	55.6	62.2	66.0	55.8
2002	53.1	63.4	60.4	68.6	68.3	66.8
2003	59.1	57.5	55.2	58.6	49.7	58.8
2004	57.0	60.5	61.1	70.3	67.9	64.4
2005	53.4	65.9	61.4	59.9	72.6	62.3
2006	51.0	64.9	53.4	51.0	52.1	56.9
2007	68.4	79.0	67.3	67.6	70.0	69.4
2008	58.6	74.1	64.7	66.6	71.4	65.4
2009	59.9	67.8	63.2	69.2	69.5	66.5
2010	70.0	71.3	79.0	60.8	57.3	68.0
2011	61.4	59.6	57.9	66.7	63.5	62.5
2012	49.1	50.3	59.4	50.5	41.5	50.7
2013	71.9	77.1	76.0	59.1	63.2	71.8
2014	71.4	70.7	71.4	61.0	66.5	70.2
2015	47.2	56.3	44.8	57.2	46.5	50.7
2016	79.5	64.3	75.8	64.4	60.6	70.3
2017	67.1	57.5	56.2	70.6	73.9	61.3
2018	72.6	82.4	101.8[b]	71.5	88.3[b]	83.9[b]
2019	68.8	60.9	64.4	59.8	65.1	63.9
2020	65.3	42.1	47.5	51.7	51.9	53.0



[a] Each bear food index value represents the sum of the mean index values for 14 species, based on surveys conducted in that area. Range-wide mean is derived directly from all surveys conducted in the state (i.e., not by averaging survey area means).

[b] Record high food rating in NE and EC regions, and second-highest statewide.

Table 4. Regional mean index values[a] for bear food species in 2020 compared to the previous 35-year mean (1984-2019) in Minnesota's bear range. Shading indicates particularly high (green) or low (pink) fruit abundance relative to average (≥1 point difference for individual foods; ≥5 points difference for totals).

FRUIT	NW 35yr mean	NW 2020 (*n* = 9[b])	NC 35yr mean	NC 2020 (*n* = 10)	NE 35yr mean	NE 2020 (*n* = 7)	WC 35yr mean	WC 2020 (*n* = 10)	EC 35yr mean	EC 2020 (*n* = 9)	Rangewide 35yr mean	Rangewide 2020 (*n* = 39)
SUMMER												
Sarsaparilla	4.7	5.4	5.8	2.4	5.3	3.2	4.5	3.4	5.2	4.2	5.0	3.6
Pincherry	3.4	4.6	4.4	2.3	4.3	2.8	3.8	3.7	3.7	3.8	3.9	3.3
Chokecherry	5.9	7.8	5.4	3.4	4.6	4.0	5.4	4.1	4.7	3.4	5.3	4.7
Juneberry	5.2	5.7	4.8	2.8	5.0	2.3	3.7	2.7	4.0	2.7	4.5	3.5
Elderberry	1.6	1.0	2.9	1.0	3.6	4.6	3.0	2.2	3.2	3.5	2.9	2.2
Blueberry	5.2	7.0	5.4	3.2	5.0	2.6	3.7	3.3	3.9	4.0	4.5	3.9
Raspberry	6.5	5.1	7.8	3.4	7.9	3.9	7.1	6.7	7.0	5.4	7.2	5.0
Blackberry	1.3	1.0	2.3	1.7	1.2	1.0	3.6	3.4	4.4	3.3	2.9	2.9
FALL												
Wild Plum	2.4	6.9	1.9	2.2	1.4	5.4	2.7	3.4	2.4	3.3	2.3	4.2
HB Cranberry	5.2	2.3	4.4	2.2	3.9	1.7	3.7	2.1	3.8	2.0	4.1	2.2
Dogwood	6.2	6.9	5.6	3.2	4.9	4.0	5.9	6.1	5.8	4.7	5.7	5.3
Oak	3.5	3.0	3.2	3.2	2.0	3.3	5.9	6.2	5.7	5.7	4.5	4.5
Mountain Ash	1.6	1.3	2.6	3.5	4.7	3.8	1.8	1.6	2.4	2.7	2.7	2.3
Hazel	6.4	7.4	7.4	7.2	6.9	5.2	7.8	2.8	7.5	3.3	7.2	5.4
TOTAL[d]	59.1	65.3	63.9	42.1	60.9	47.5	62.5	51.7	63.8	51.9	62.7	53.0

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

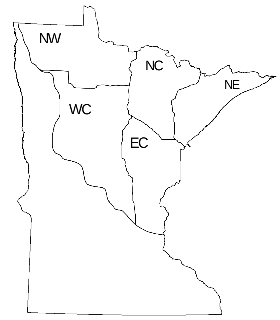
[b] *n* = Number of surveys used to calculate area-specific means

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

[d] Because of rounding error, these totals may be slightly different than the sum of adding down the columns.

Table 5. Regional productivity index[a] for important fall bear foods (oak + hazel + dogwood), 1984–2020. Particularly low (≤ 5.0; yellow) or high (≥8.0; tan) values are shaded.

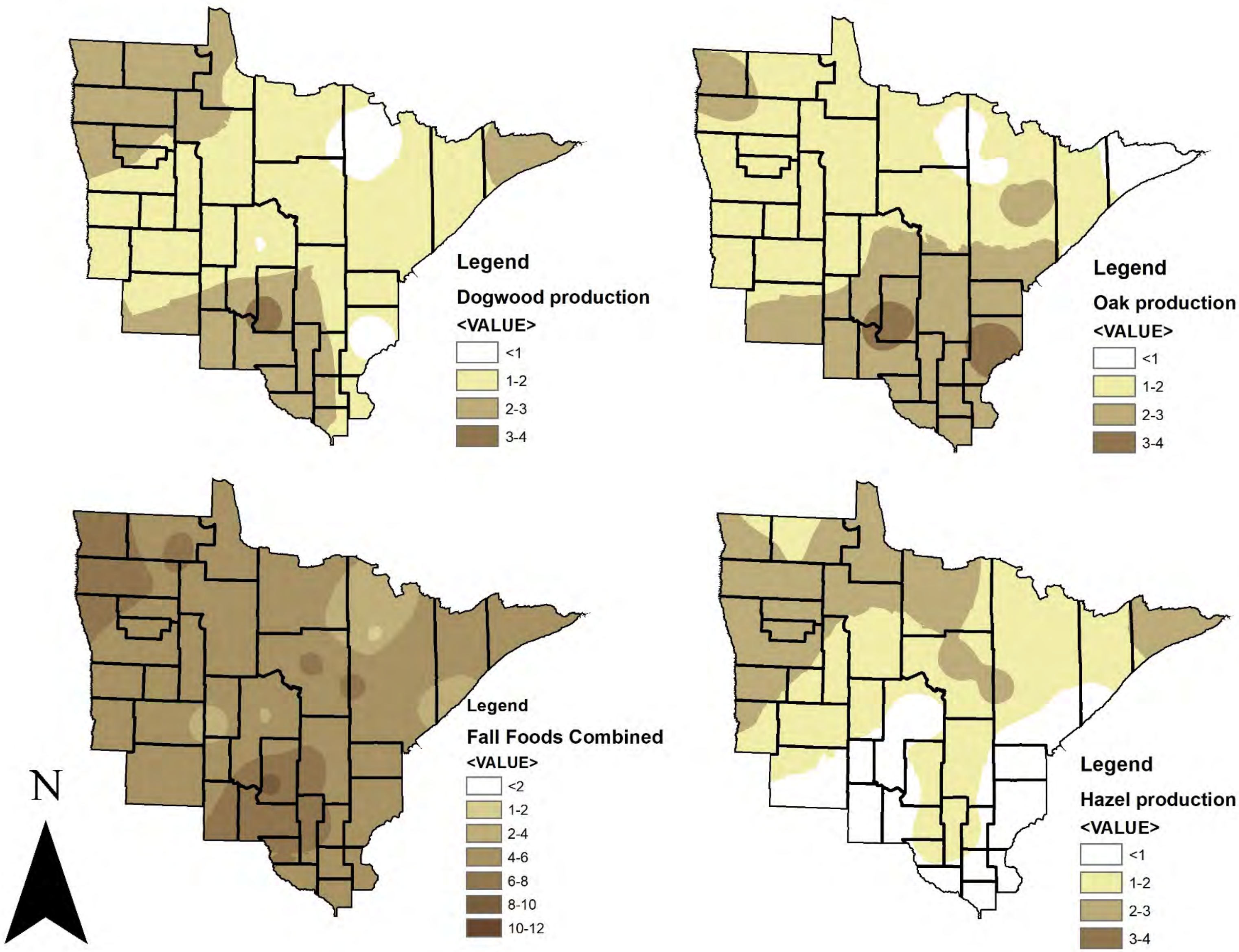
	Survey Area					
Year	NW	NC	NE	WC	EC	Entire Range
1984	4.2	7.6	7.0	6.2	7.0	6.5
1985	4.9	2.8[b]	4.2	4.7	5.3	4.4[b]
1986	7.2	5.0	4.0	7.0	6.2	6.2
1987	8.0	7.8	7.3	7.6	8.0	7.7
1988	5.5	7.2	7.3	6.8	6.1	6.7
1989	6.0	5.3	4.1	5.7	6.4	5.8
1990	3.3[b]	4.2	6.4	5.7	6.4	5.2
1991	6.2	6.2	5.4	7.2	7.7	6.7
1992	4.7	5.0	4.4	4.4[b]	6.8	5.1
1993	5.3	7.1	6.7	6.2	7.7	6.5
1994	7.1	7.8	5.8	7.8	7.1	7.2
1995	4.8	4.8	5.1	4.6	5.3	4.9
1996	8.7	8.6	8.1	9.2	8.5	8.6
1997	5.8	5.4	5.1	6.8	6.5	6.2
1998	5.8	6.0	6.3	7.1	7.8	6.7
1999	6.4	5.1	5.9	6.6	6.0	6.2
2000	5.8	7.7	7.2	7.5	8.5	7.0
2001	3.4	4.1	5.7	6.0	6.5	5.2
2002	8.7	7.1	6.6	8.8	8.2	8.1
2003	6.3	6.0	5.5	6.2	6.0	6.1
2004	6.1	5.4	5.4	6.4	6.1	5.9
2005	5.8	5.8	6.1	6.4	7.0	6.2
2006	6.7	6.1	6.0	6.7	5.8	6.3
2007	6.0	5.8	5.7	6.6	6.4	6.2
2008	6.6	7.3	6.2	7.0	8.9	7.1
2009	5.1	6.2	5.3	6.3	6.5	6.0
2010	7.7	6.4	6.5	6.2	5.4	6.6
2011	5.8	6.5	6.2	7.0	7.4	6.5
2012	6.2	6.3	6.3	6.5	4.8	6.1
2013	6.8	6.0	5.7	6.7	6.9	6.3
2014	7.0	5.6	5.4	7.7	6.1	6.7
2015	5.8	5.9	3.5[b]	8.2	3.7[b]	5.6
2016	5.7	5.2	6.0	5.4	5.2	5.3
2017	6.8	5.6	5.1	7.4	7.1	6.5
2018	5.8	6.1	7.7	8.3	8.4	7.2
2019	6.2	7.1	6.6	6.5	7.1	6.7
2020	5.8	5.4	5.1	5.4	5.4	5.5



[a] Values represent the sum of mean production scores for hazel, oak, and dogwood, derived from surveys conducted in each survey area. Range-wide mean is for all surveys conducted in the state (i.e. not an average of survey area means).

[b] Record low fall food score in survey area.

Figure 11. Production of fall bear foods (dogwood, oak, hazel) across Minnesota, 2020.



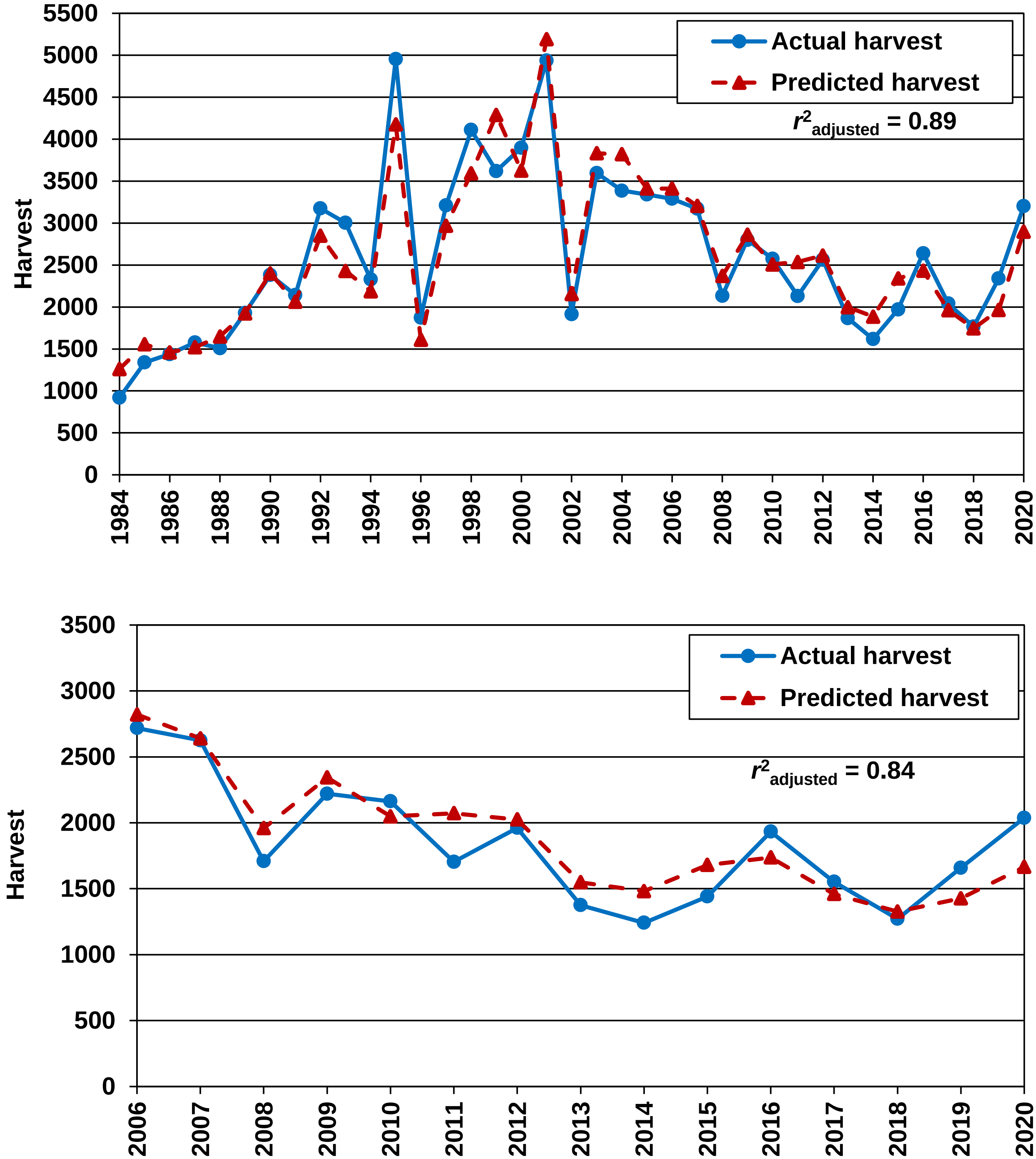


Figure 12. Number of bears harvested vs. number predicted to be harvested based on number of hunters and fall food production — top panel: statewide 1984–2020; bottom panel: quota zone only (including area 451 hunters and harvest), most recent 15 years. Regression for both datasets included an interaction term between food and hunters to better predict the drastic changes in harvest when fall foods were extremely high or low.

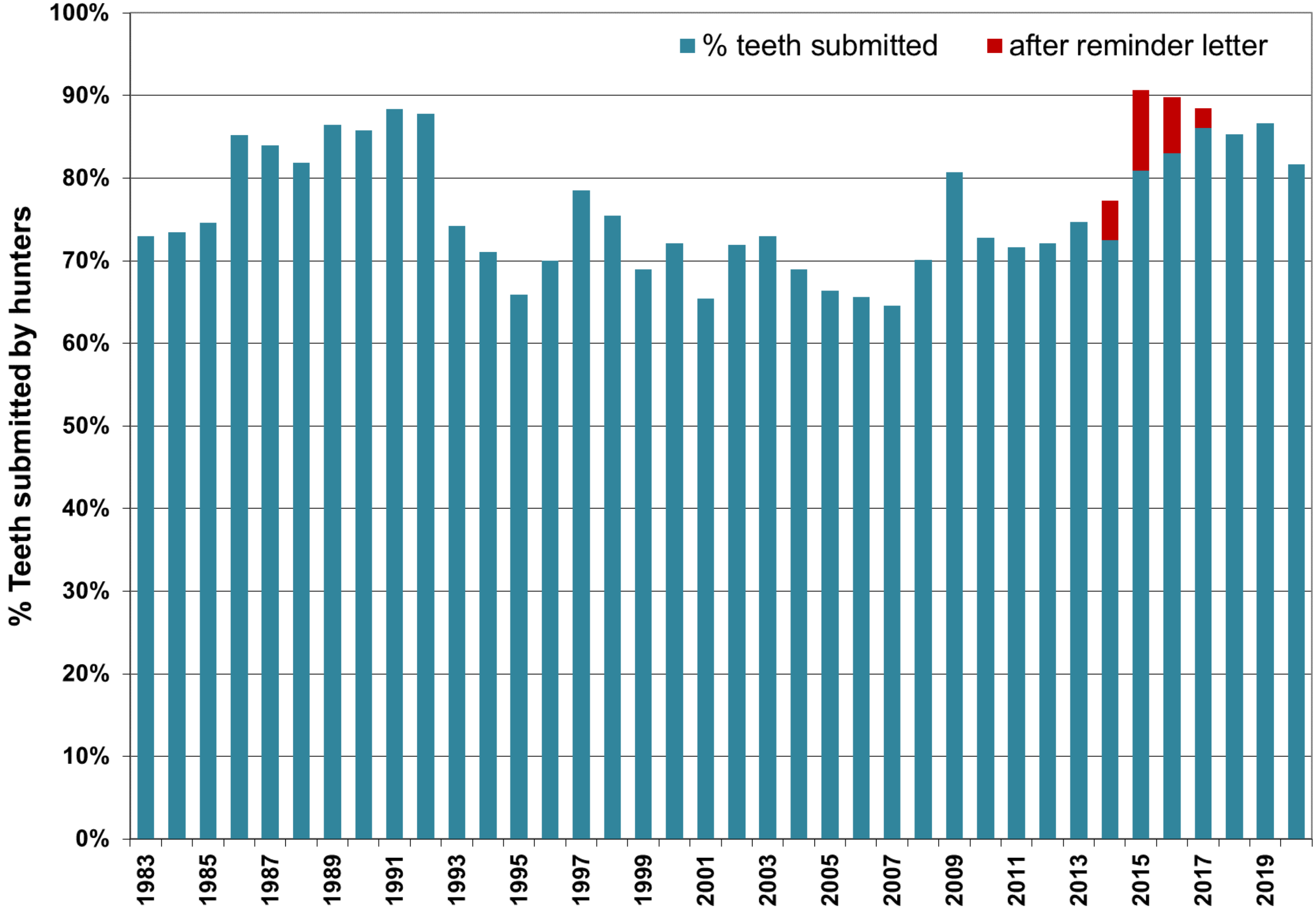
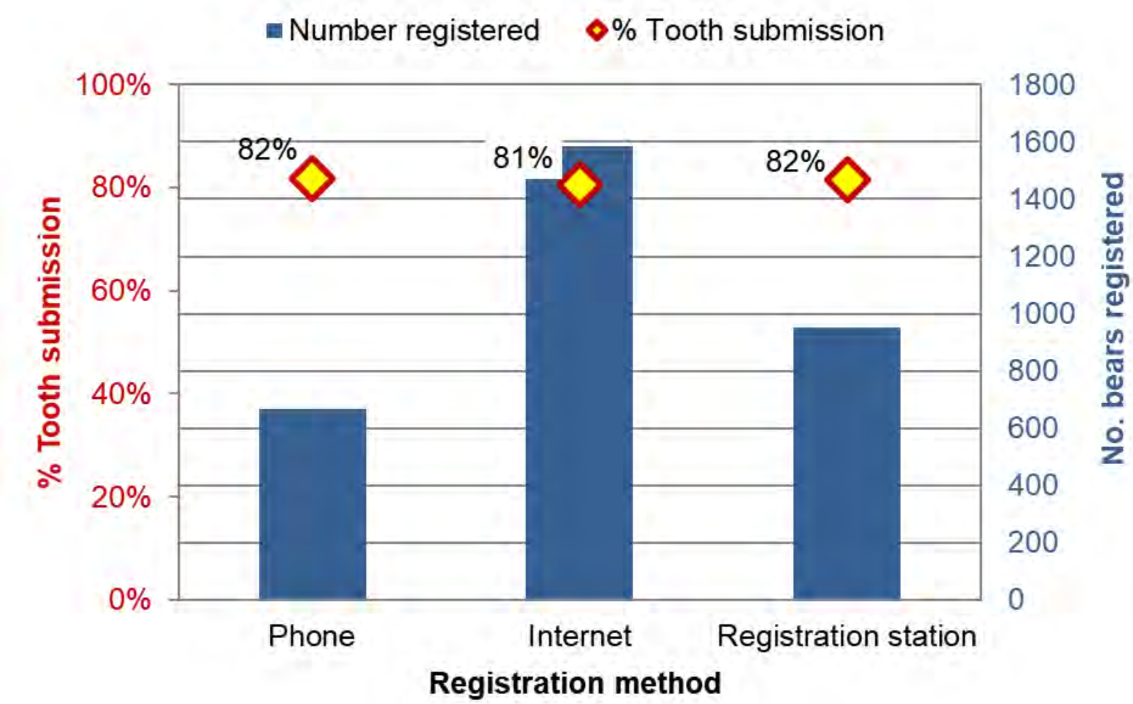


Figure 13. Percent of hunters submitting useable bear teeth for aging (vital for population monitoring, see Figures. 1,2 & 4). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993), and in recent years after a series of reminder letters (no letter was sent after 2017).



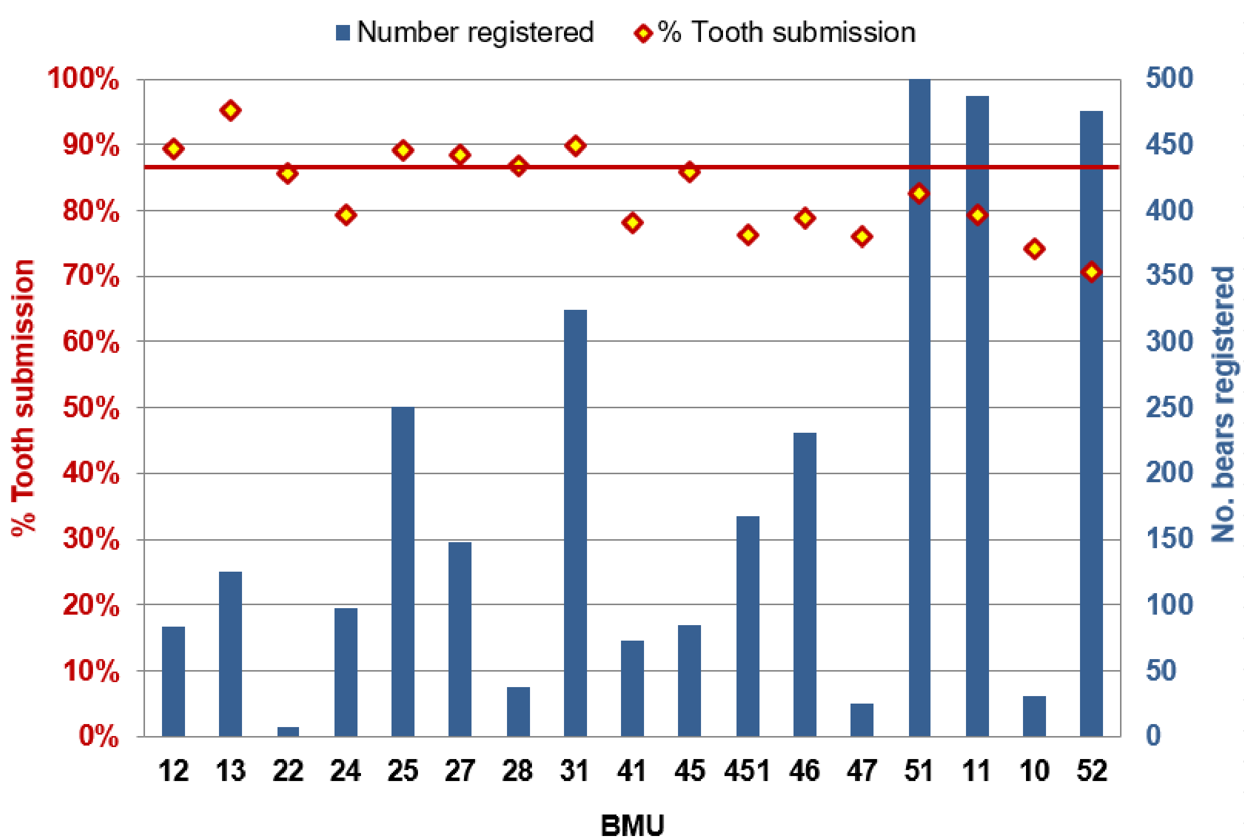


Figure 14. Percent of hunters who submitted a bear tooth in 2020 by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet, as well as in person at a station. The 2020 statewide submission average was 82%.

2021 MINNESOTA RUFFED GROUSE SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

The Minnesota DNR coordinates ruffed grouse (Bonasa umbellus) surveys each spring with the help of wildlife staff and cooperating federal, tribal, and county biologists. Mean ruffed grouse drums per stop (dps) were 1.3 statewide (95% confidence interval = 1.1 – 1.4), which is down from 1.6 dps last year. Lower dps are expected during the declining phase of the ruffed grouse population cycle. High points in the population cycle occur on average every 10 years, and surveys indicate that the last peak in the cycle occurred in 2017. However, lower dps compared to last year might also be due in part to a slight bias in 2020 due to restrictions on field surveys during the Governor's Stay at Home Order. Surveys could not be conducted during the appropriate survey window in the southern survey region, where counts are usually lower, possibly biasing data high last year.

INTRODUCTION

The ruffed grouse (*Bonasa umbellus*) is the most popular game bird in Minnesota, with an annual harvest of 200,000 – 500,000 birds. Ruffed grouse hunter numbers have been as high as 92,000 during the last decade, although hunter numbers did not peak with recent peaks in grouse numbers, as they have traditionally.

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 provide evidence that the ruffed grouse population cycles at approximately 10-year intervals. The spring survey data also correlated strongly with the fall harvest before the early 2000s, but in recent decades, this relationship has weakened.

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 then, staff and cooperators have conducted spring drumming counts 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.

METHODS

Observers conducted ruffed grouse surveys along 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.

I engaged survey observers from among state, federal, tribal, private, and student biologists that had a professional background in wildlife science. Most observers had previously participated in the survey. I provided each observer a set of instructions and route location information, but did not provide formal survey training. I asked participants to conduct surveys at sunrise during peak drumming activity (in April or May) on days that had little wind and no precipitation. I provided guidance about the timing of the usual peak in drumming but allowed flexibility in timing to match the peak if it occurred outside the usual survey windows. 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.

I used the number of drums heard per stop (dps) as the survey index value. I determined the mean dps for each route, for each survey region (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 each Ecological Classification Section (ECS). 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 ECS sections in the Northeast region and the 7 ECS sections in the state. I used the geographic area of the section 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). I reduced the area used to weight drum index means for the MIM and PP sections to reflect the portion of these areas within ruffed grouse range (~50%) using subsection boundaries. I calculated a 95% confidence interval (CI) 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. I defined confidence interval boundaries as the 2.5th and 97.5th percentiles of bootstrap frequency distributions.

RESULTS & DISCUSSION

Observers from 12 cooperating organizations surveyed routes between 6 April and 14 May 2021. Most routes (88%) were surveyed between 20 April and 10 May, with a median survey date of 28 April, which is earlier than most years when the median survey date is closer to May 3. However, many observers reported an earlier spring than usual and completed surveys when they believed the peak of drumming was occurring in their local area. Observers reported Excellent (61%), Good (36%), and Fair (3%) survey conditions for 122 routes that reported survey conditions.

Statewide counts of ruffed grouse drums averaged 1.3 dps (95% confidence interval = 1.1 – 1.4 dps) during 2021 (Figure 2). Drum counts were 1.4 (1.2 – 1.7) dps in the Northeast (n = 105 routes), 1.1 (0.8 – 1.4) dps in the Northwest (n = 8), 0.8 (0.4 – 1.2) dps in the Central Hardwoods (n = 15), and 0.9 (0.4 – 1.6) dps in the Southeast region (n = 8) (Figure 3a-d).

Statewide drum counts were down from last year as expected during the declining phase of the 10-year cycle. The most recent peak in the 10-year cycle occurred in 2017. Although peaks in the cycle occur on average approximately every 10 years, they vary from 8 to 11 years apart (Figure 2). However, ruffed grouse counts might have been biased high in 2020 because of constraints on the ruffed grouse survey during the COVID-19 pandemic. Surveys from the southern region, which tend to have lower dps, were not conducted during the survey window in 2020 and were excluded from the analysis. Thus, declines this year might appear to be larger than they would if data collection were more comparable between this year and last year.

ACKNOWLEDGMENTS

I would like to extend a special thanks to federal biologists from the Superior National Forest (USDA Forest Service), and tribal biologists with 1854 Treaty Authority and White Earth Reservation for surveying additional ruffed grouse routes last spring while exempted from the Governor's Stay at Home Order. The extra efforts of H. Becker, T. Brannock, D. Garrison, D. Grosshuesch, S. Malick-Wahls, D. McArthur, D. Ryan, S. Swanson, M. Swingen, and others ensured that surveys were conducted during the appropriate temporal window, and that survey data collected annually since 1949 and used by numerous natural resource agencies and cooperators to make decisions, could continue during the pandemic. The ruffed grouse survey was also accomplished this year through the combined efforts of staff and volunteers at Chippewa National Forest; Fond du Lac, Leech Lake, Red Lake, and White Earth Reservations; Blandin Paper; Beltrami County Land Department; and DNR staff at Aitkin, Baudette, Bemidji, Brainerd, Carlos Avery Wildlife Management Area (WMA), Cloquet, Crookston, Detroit Lakes, Fergus Falls, Grand Rapids, 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. Vermilion Community College, Tamarac National Wildlife Refuge and Agassiz National Wildlife Refuge also participated in surveys. Prior to 2013, 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. In 2020, Jackson Bates and Nicole Dotson entered ruffed grouse survey data for 1979 – 1981. In 2021, Lydia Spann helped enter ruffed grouse survey data for 1972 – 1978. A. Vinar ran routes near International Falls. I would also like to thank Lindsey Shartell for making helpful comments on this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

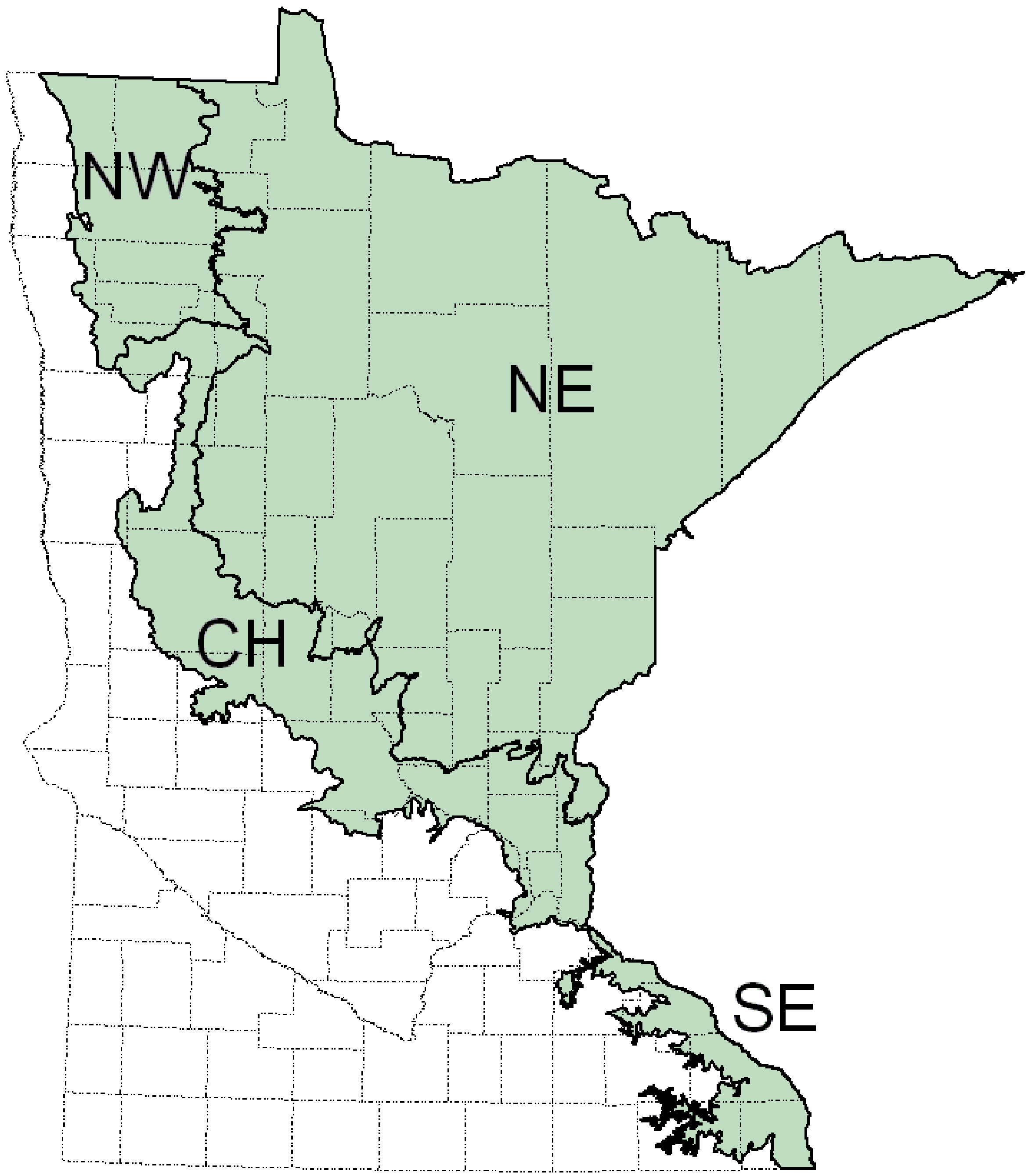


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

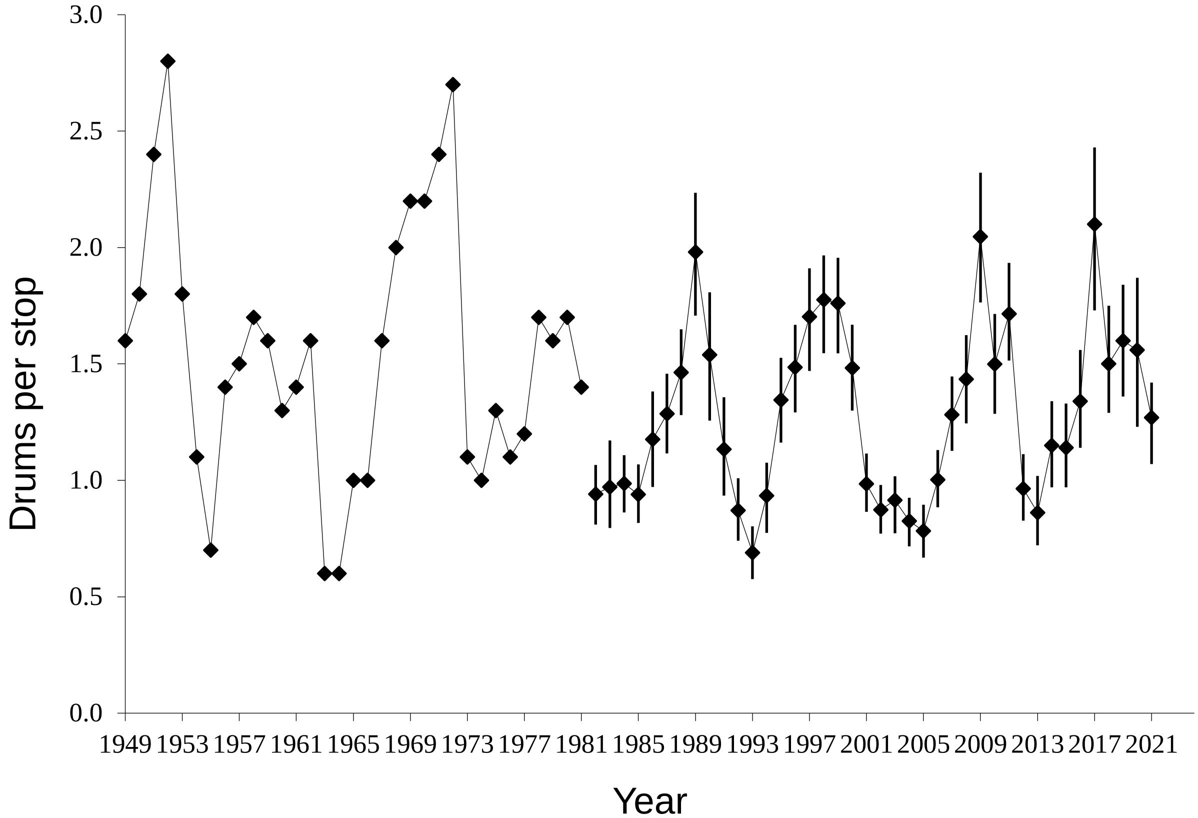
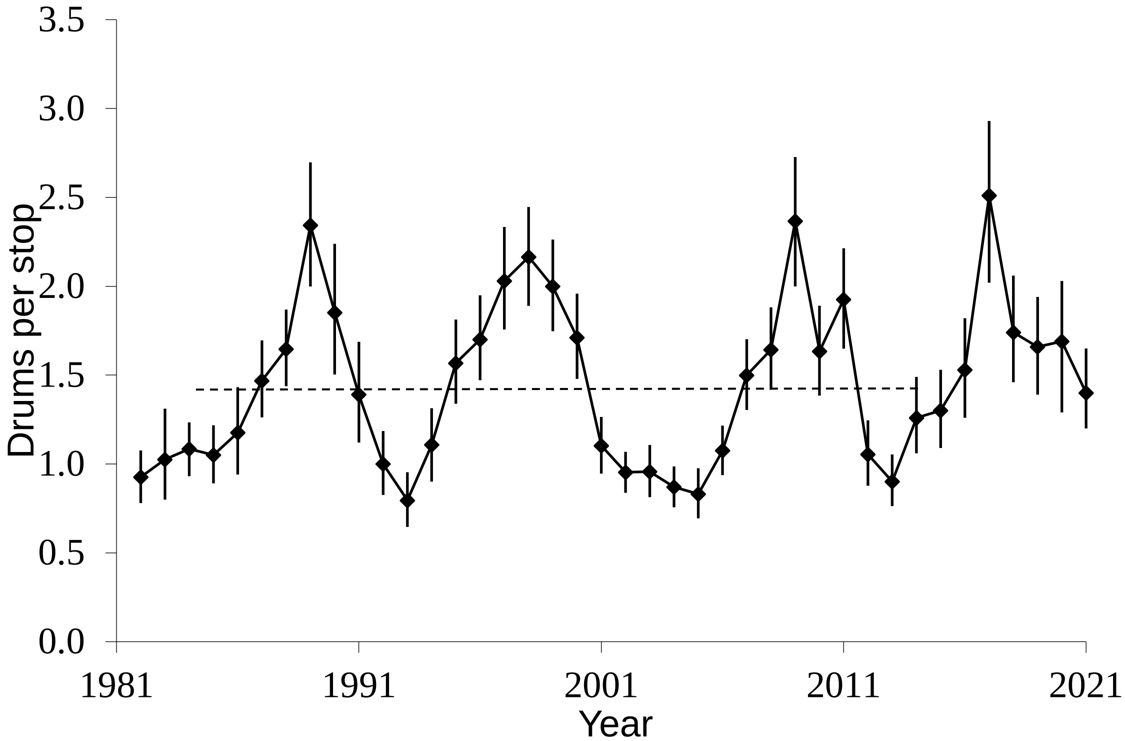
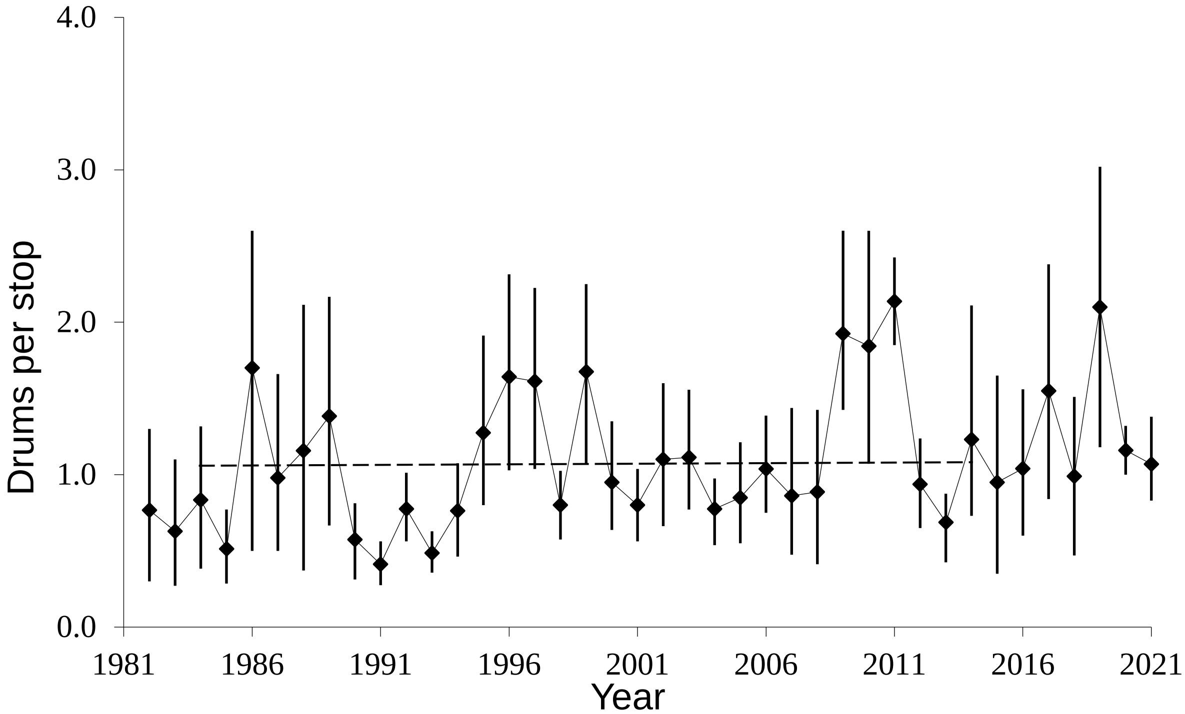


Figure 2. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not an artifact of the change in analysis methods.

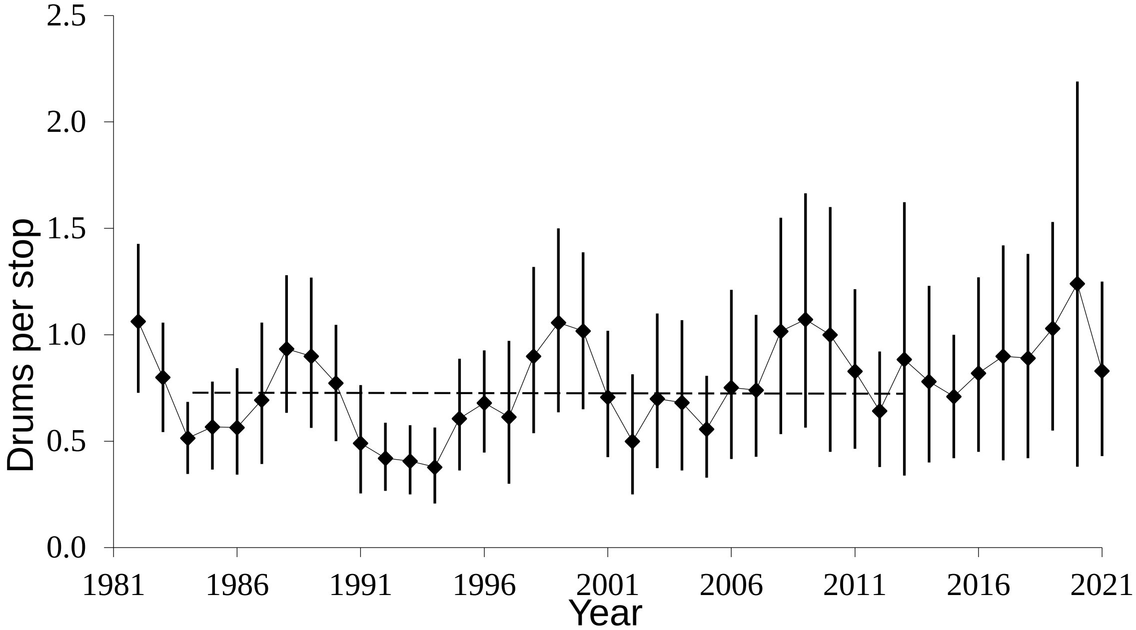
a.


3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1991
2001
2011
2021
Year

b.


4.0
3.0
2.0
1.0
0.0
Drums per stop
1981
1986
1991
1996
2001
2006
2011
2016
2021
Year

c.



d.

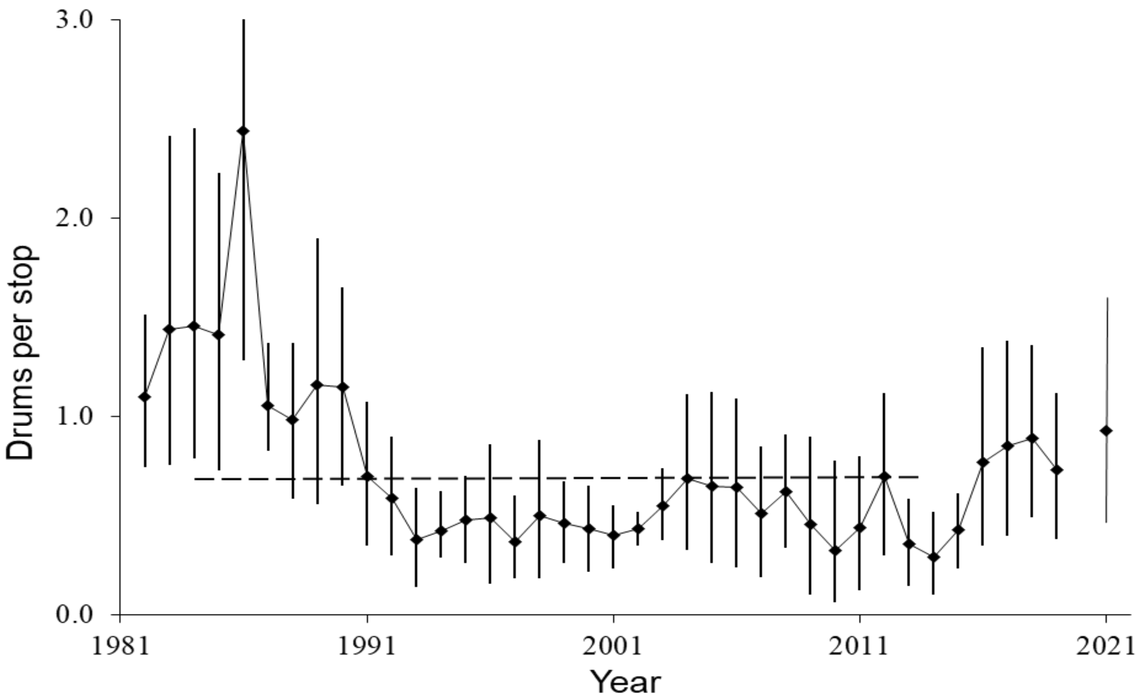


Figure 3a, b, c, d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2014 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In the bottom panel, the CI for 1986 extends beyond area depicted in the figure. Data were not collected during the survey window in the Southeast during the COVID-19 pandemic in 2020.

2021 MINNESOTA SHARP-TAILED GROUSE SURVEY

Charlotte Roy, Forest Wildlife Populations and Research Group

SUMMARY OF FINDINGS

The Minnesota DNR coordinates sharp-tailed grouse (*Tympanuchus phasianellus*) surveys each spring with the help of wildlife staff and cooperating biologists. DNR Wildlife Staff did not conduct sharp-tailed grouse surveys during 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic. Therefore, I compared survey data from 2021 to that from 2019. Sharp-tailed grouse surveys were conducted between 10 March and 19 May 2021, with 1,614 birds (males and birds of unknown sex) observed at 150 leks. The mean numbers of sharp-tailed grouse/lek were 7.3 (5.5 – 9.8) in the East Central (EC) survey region, 11.3 (10.1 – 12.5) in the Northwest (NW) region, and 10.8 (9.7 – 11.9) statewide. Comparisons between leks observed in both 2019 and 2021 indicated similar numbers of birds/lek statewide ($t = 1.0$, $P = 0.34$) and in the NW region ($t = 0.50$, $P = 0.62$, $n = 96$). However, in the EC region, birds/lek decreased 32% in 2021 ($t = 2.2$, $P = 0.04$, $n = 28$) and the number of leks with $\geq$2 birds dropped from 30 in 2019 to 18 in 2021. These changes in the EC region, in the absence of changes in survey effort in this region, are indicative of a population in steep decline.

INTRODUCTION

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.

The first surveys of sharp-tailed grouse in Minnesota occurred 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. Staff and cooperators conduct surveys in openland portions of the state where sharp-tailed grouse persist, although sharp-tailed grouse were formerly much more widely distributed in Minnesota at the early part of the 20th century. In recent years, sharp-tailed grouse have reportedly been expanding southward into the range of the Greater Prairie-chicken (*Tympanuchus cupido*) in western Minnesota but have been declining in the east-central part of the state.

Sharp-tailed grouse (*Tympanuchus phasianellus*) are popular among hunters. Annual harvest is 5,000 – 22,000 birds since the early-1990s, with 4,000 – 10,000 hunters in Minnesota.

METHODS

Wildlife staff and volunteers survey known sharp-tailed grouse lek locations in the Northwest (NW) and East Central (EC) portions of the state (Figure 1) during the peak in lek attendance, which usually occurs in the latter half of April and the first week of May. The NW region consists of Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley Ecological Classification Sections (ECS). The EC region consists of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior Uplands sections. In the EC region, and in eastern portions of the NW region where sharp-tailed grouse occur at low densities, most known leks are surveyed each year. Some leks may have been missed, but most managers in these regions believe that they include most of the leks in their work area, with the exception of Aitkin and Tower work areas where workloads do not permit exhaustive surveys. In the western part of the NW region, sharp-tailed grouse occur at higher densities, and thus surveying all leks is not feasible. Therefore, in the western portion of the NW region (e.g., Roseau, Thief River Falls), managers conduct surveys along 20-25 mile (32-40 km) routes. 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. Observed lek size can vary as a function of population changes, lek numbers, and the timing, effort, and conditions of surveys, so it is important to consider all these factors when collecting data.

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.

During the COVID-19 pandemic in spring 2020, DNR Wildlife Staff did not conduct any sharp-tailed grouse surveys during the peak in lek attendance. Unlike ruffed grouse surveys, few external cooperators participate in sharp-tailed grouse surveys. Thus, data were not reported for 2020. For this report, I made comparisons between the 2021 survey data and data collected in 2019.

RESULTS & DISCUSSION

A total of 1,614 male sharp-tailed grouse and grouse of unknown sex were counted statewide at 150 leks, including 1 lek outside the survey regions (Table 1), during 10 March to 19 May 2021. Leks with $\geq$2 grouse were observed an average of 1.8 times. The statewide index value of 10.8 (9.1 – 11.4) grouse/lek was centrally located among values observed since 1980 (Figure 2). In the NW survey region, 1,479 grouse were counted on 131 leks with 11.3 (10.1 – 12.5) grouse/lek, which is similar to 2019, despite staff vacancies preventing a complete survey in the International Falls area. Counts at leks that were observed during both 2019 and 2021 were similar statewide ($t = 1.0$, $P = 0.34$) and in the NW survey region ($t = 0.50$, $P = 0.62$). Thus, sharp-tailed grouse appear to be stable or possibly increasing in the NW region. Consistent with this, biologists in the Greater Prairie-chicken survey regions (the southern part of the NW survey region) are reporting more sharp-tailed grouse in areas that used to hold Greater Prairie-chickens.

In contrast to the NW survey region, in the EC survey region, counts at leks surveyed in both 2019 and 2021 declined by 32% ($t = 2.2$, $P = 0.04$; Table 2). Likewise, in the EC survey region, 132 grouse were counted on 18 leks, which is substantially lower than in 2019 when a similar survey effort resulted in 216 grouse being counted on 30 leks (Figure 3). Fourteen of the 18 leks reported were in the Aitkin work area, with no leks reported in the Tower or Cambridge work areas, despite surveys in these areas. This is the first year that Tower work area has reported no birds in the survey. Cambridge work area first reported no birds in the survey in 2018. Despite the loss of nearly half the leks, the grouse/lek index was similar 7.3 (5.1- 9.8) to 2019. When populations decline, small leks can disappear or they can combine with other leks, which can increase the grouse/lek index initially. Here, however, the number of birds counted also went down, and the grouse/lek index did not change. These data, in combination with studies indicating a genetic population bottleneck in this region (Roy and Gregory 2019) and reporting inconsistent lek attendance (Roy and Coy, in review), support the conclusion that this population is exhibiting traits of a population in steep decline.

ACKNOWLEDGMENTS

I would like to thank Lindsey Shartell for making helpful comments on this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

LITERATURE CITED

Roy, C. L., and A. J. Gregory. 2019. Landscape and population genetics reveal long-distance Sharp-tailed Grouse (*Tympanuchus phasianellus*) movements and a recent bottleneck in Minnesota. Conservation Genetics 20:259-273 https://doi.org/10.1007/s10592-018-1128-x

Roy, C. L., and P. Coy. In review. Lek attendance and disturbance at viewing blinds in a small, declining Sharp-tailed Grouse population.

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
2016	9.5	8.6 – 10.5	182	10.2	9.2 – 11.4	152	6.0	4.9 – 7.3	30
2017	9.7	8.7 – 10.8	181	10.4	9.2 – 11.8	141	7.2	5.8 – 8.6	40
2018	9.3	8.4 – 10.3	161[d]	9.8	8.8 – 10.9	130	7.3	5.4 – 9.6	30
2019	10.2	9.1 – 11.4	152	11.0	9.7 – 12.3	122	7.2	5.4 – 9.5	30
2020	NA[e]	NA	NA	NA	NA	NA	NA	NA	NA
2021	10.8	9.7 – 11.9	150[d]	11.3	10.1 – 12.5	131	7.3	5.1 – 9.8	18

[a] Survey regions; see Figure 1.

[b] 95% CI = 95% confidence interval

[c] *n* = number of leks in the sample.

[d]One lek was located just south of the NW region in Clearwater County.

[e]No data were collected in 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic.

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	-1.4 – 0.9	141	-0.3	-1.9 – 1.3	102	-0.1	-1.1 – 1.1	39
2015 – 2016	-1.3	-2.3 – -0.2	167	-1.6	-2.9 – -0.2	129	-0.2	-1.3 – 0.9	38
2016 – 2017	-0.3	-1.5 – 0.9	166	-0.3	-1.8 – 1.2	128	-0.2	-1.2 – 0.8	38
2017 – 2018	-2.2	-3.3 – -1.1	159[e]	-2.4	-3.9 – -0.4	123	-1.4	-2.8 – 0.2	36
2018 – 2019	-0.3	-1.5 – 1.0	132	0.0	-1.5 – 1.6	101	-1.4	-3.0 – 0.1	31
2019 – 2020[f]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2019 – 2021[g]	-0.7	-2.2 – 0.7	124	-0.5	-2.3 – 1.3	96	-1.6	-2.9 – -0.3	28

[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.

[e] One lek was located just south of the NW region in Clearwater County.

[f] No data were collected in 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic.

[g] Comparisons were made between 2019 and 2021 because the survey was not conducted in 2020.

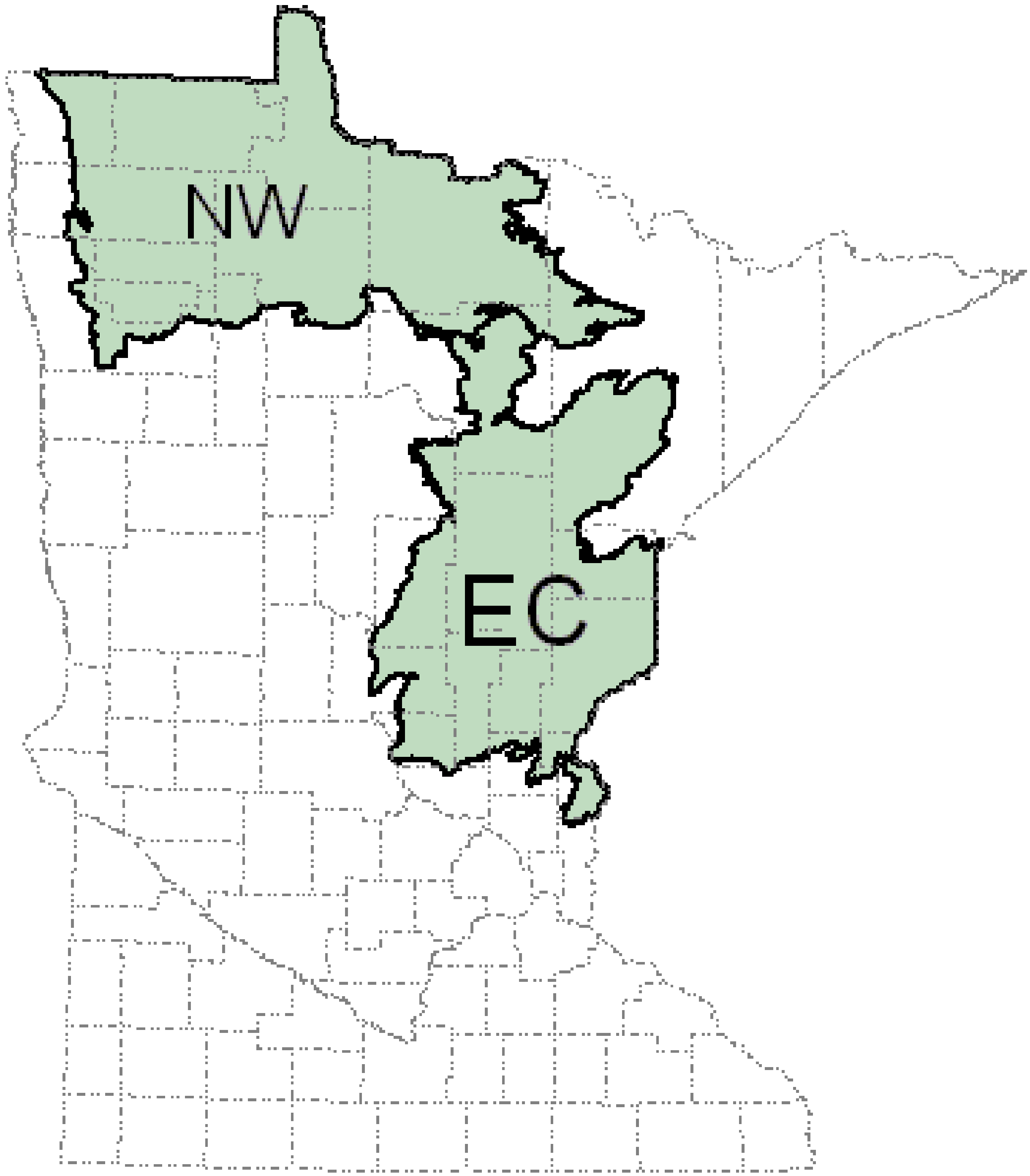


Figure 1. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

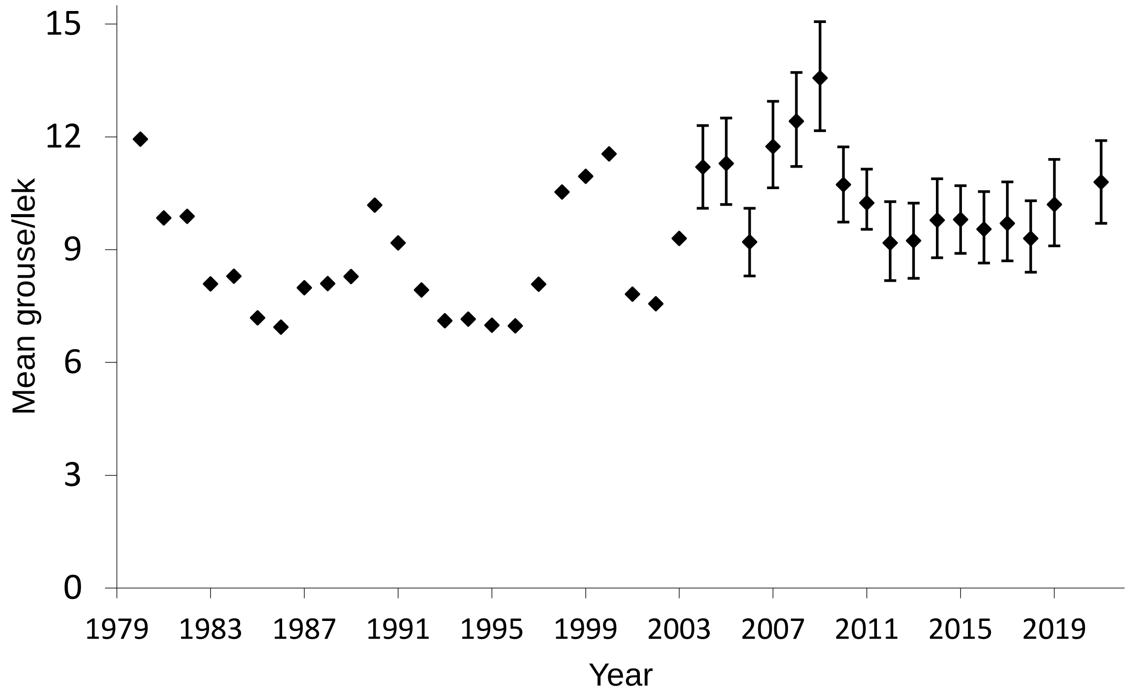


Figure 2. **Sharp-tailed grouse** counted in spring lek surveys statewide in Minnesota during 1980–2021. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year. No data were collected in 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic.

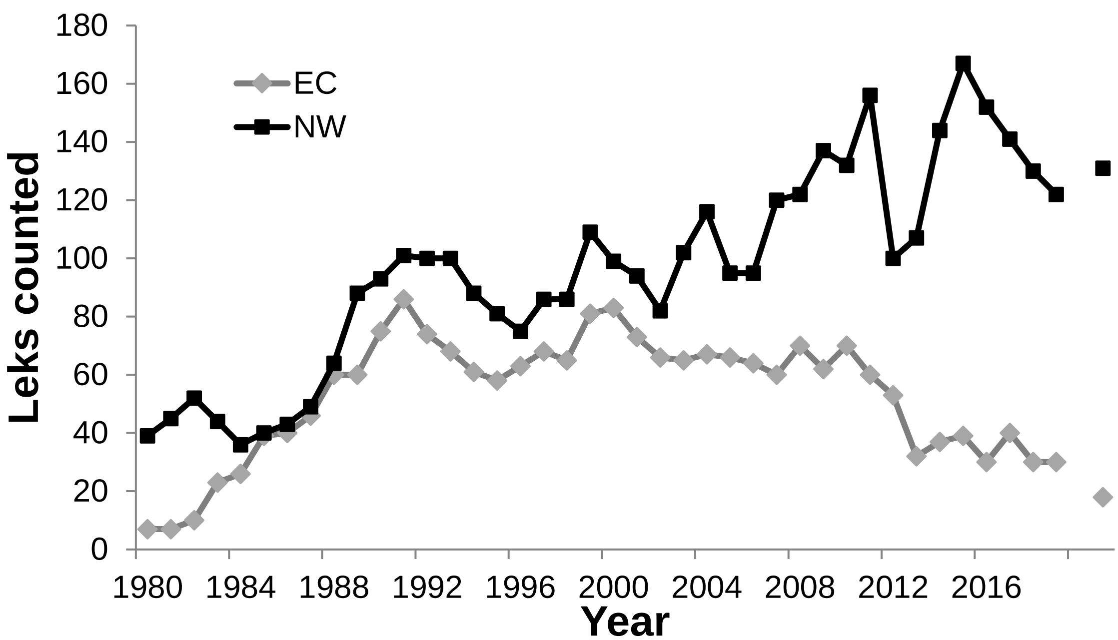


Figure 3. The number of **sharp-tailed grouse** leks with 2 or more birds counted in spring lek surveys in the Northwest (NW) and East Central (EC) survey regions of Minnesota during 1980 – 2021. Survey data were not collected in 2020 due to the Governor's Stay at Home Order during the COVID-19 pandemic.

2021 MINNESOTA PRAIRIE-CHICKEN POPULATION 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 2021. Observers located 53 booming grounds and counted 703 males and birds of unknown sex in the survey blocks. Including areas outside the survey blocks, observers located 124 booming grounds, 1,359 male prairie-chickens, and 110 birds of unknown sex throughout the prairie-chicken range. Estimated densities of 0.08 (0.05–0.10) booming grounds/km^2 and 13.3 (10.5–16.0) males/booming ground within the survey blocks were similar to densities during recent years and during the 10 years preceding modern hunting seasons (i.e., 1993–2002).

INTRODUCTION

Historically, greater prairie-chicken (*Tympanuchus cupido pinnatus*) range in Minnesota was restricted to the southeastern portion of the state. However, dramatic changes in their range occurred in the 19th century as settlers expanded and modified the landscape with farming and forest removal, providing abundant food sources and access to new areas. As grass was lost from the landscape, prairie-chicken populations began to decline, their range contracted, and hunting seasons closed after 1942. In an attempt to bolster populations and expand prairie-chicken range, the Minnesota Department of Natural Resources (MNDNR) 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 <100 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 on 17 designated survey blocks in western Minnesota (Figure 2) during March, April, and 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 observer attempted to find and survey each booming ground repeatedly in his/her assigned block, which comprised 4 sections of the Public Land Survey (approximately 4,144 ha). Observers 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 blocks 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 observers to submit surveys 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.

In 2021, MPCS requested that sharp-tailed grouse (*Tympanuchus phasianellus*) observed during prairie-chicken surveys be included in this report because of concerns that sharp-tailed grouse are expanding into range previously occupied primarily by the prairie-chicken. Prior to the survey season, I asked observers to include observations of sharp-tailed grouse with their data.

RESULTS & DISCUSSION

Observers from MNDNR Section of Wildlife, the U.S. Fish & Wildlife Service, and The Nature Conservancy, as well as many unaffiliated volunteers counted prairie-chickens between 14 March and 30 April 2021. Observers located 124 booming grounds and observed 1,359 male prairie-chickens and 110 birds of unknown sex within and outside the survey blocks (Table 1). These counts represent a minimum number of prairie-chickens in Minnesota during 2021, but because survey effort outside of survey blocks is not standardized among years, these counts should not be compared among years or permit areas.

Within the standardized survey blocks, 703 males and birds of unknown sex were counted on 53 booming grounds during 2021 (Table 2). This contrasts with the high count of 1,618 males and 114 booming grounds in 2007. Each lek was observed an average of 2.5 times (median = 2), with 38% of booming grounds observed just once. These counts should not be regarded as estimates of abundance because detection probabilities of leks and birds were not estimated.

However, if detection probabilities and effort are similar among years in the survey blocks, then population indices based on survey block data can be used to monitor changes in abundance among years.

Densities of prairie-chickens in the 10 core survey blocks were 0.10 (0.05–0.14) booming grounds/km^2 and 14.0 (10.6–17.4) males/booming ground (Figure 3). In the peripheral survey blocks, densities were 0.04 (0.03–0.06) booming grounds/km^2 and 10.9 (6.8–15.1) males/booming ground. For all survey blocks, the density of 0.08 (0.05–0.10) booming grounds/km^2 during 2021 was similar to densities during recent years (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 13.3 (10.5–16.0) males/booming ground in all surveyed blocks during 2021 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 (Figure 3).

The observed densities are lower than the years preceding 2008 when CRP enrollments in the counties containing the survey blocks were highest. These changes in the population indices coincide with gains and losses in enrollments in the Conservation Reserve Program. Changes in the quantity of grassland on the landscape impacts prairie-chicken populations. More explicit examination of these patterns can be found in the recent publication, *Adkins, K., C. L. Roy, D. E. Anderson, R. Wright. 2019. Landscape-scale Greater Prairie-chicken Habitat Relations and the Conservation Reserve Program. The Journal of Wildlife Management DOI: 10.002/jwmg.21724.*

Prairie-chicken survey cooperators submitted a few reports of sharp-tailed grouse observed during prairie-chicken surveys in 2021. In Norman County, 2 male prairie-chickens were displaying at a sharp-tailed grouse lek with 11 male and 6 female sharp-tailed grouse. In Clay County, 1 and 2 sharp-tailed grouse were displaying at 2 prairie-chicken booming grounds. In Polk County, 1 and 2 sharp-tailed grouse and also a hybrid were displaying at 3 prairie-chicken grounds. In Mahnomen County, 2 sharp-tailed grouse were at a booming ground, and in Becker County, 3 hybrids were observed at a prairie-chicken ground. Most (75%) of these observations were recorded outside of the survey blocks, which were selected for having abundant prairie-chicken habitat relative to areas outside the blocks.

ACKNOWLEDGMENTS

I would like to thank cooperators who conducted and helped coordinate the prairie-chicken survey, with a special thanks to those that stepped up to complete extra surveys last year when many staff were restricted from fieldwork during the pandemic. Cooperators with The Nature Conservancy included Brian Winter, Travis Issendorf, and volunteers Pat Beauzay, Matt Mecklenburg, Matt Jacobson, Derek Savage, Carl Altenbernd, and Eric Hoff; cooperators within MNDNR included Emily Hutchins, Rob Baden, Greg Henderson, Mark Palm, Michael Oehler, and Matt Morin; cooperators with the US Fish and Wildlife Service including Shawn Papon, Chad Raitz, Ben Walker, Hannah Kruenegel, and Stacy Salvevold; and numerous additional volunteers, including Dan Svedarsky, Doug Wells, Jon Voz, Ross Hier, Phil Doll, and Doug Hedtke. This survey was funded in part by the Wildlife Restoration (Pittman-Robertson) Program W-69-S-13 Project #16. Lindsey Shartell provided assistance and comments which improved this report.

Table 1. Minimum abundance of prairie-chickens within and outside hunting permit areas in Minnesota during spring 2021. Lek and bird counts are not comparable among permit areas or years.

Permit Area	Area (km^2)	Leks	Males	Unknown[a]
803A	1,411	11	86	0
804A	435	0	0	0
805A	267	12	91	24
806A	747	8	24	21
807A	440	25	266	10
808A	417	25	402	0
809A	744	11	165	0
810A	505	6	69	0
811A	706	4	13	21
812A	914	6	63	8
813A	925	4	69	0
PA subtotal	7,511	112	1248	84
Outside PAs[b]	NA[c]	12	111	26
Grand total	NA[c]	124	1359	110

[a] Unknown = 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.

Table 2. Prairie-chicken counts within survey blocks in Minnesota during spring 2021, and change in counts compared to 2020.

			2021		Change from 2020[a]	
Range[b]	Survey Block	Area (km^2)	Booming grounds	Males[c]	Booming grounds	Males[c]
Core	Polk 1	41.2	2	15	-2	-6
	Polk 2	42.0	4	50	1	15
	Norman 1	42.0	2	4	0	-11
	Norman 2	42.2	2	16	1	-1
	Norman 3	41.0	5	49	0	3
	Clay 1	46.0	12	199	4	74
	Clay 2	41.0	4	92	1	53
	Clay 3	42.0	5	81	-1	25
	Clay 4	39.0	1	6	1	6
	Wilkin 1	40.0	3	49	0	7
	Core subtotal	415.0	40	561	5	165
Periphery	Mahnomen	41.7	2	41	0	-1
	Becker 1	41.4	4	36	2	21
	Becker 2	41.7	1	6	0	0
	Wilkin 2	41.7	1	4	NA[d]	NA
	Wilkin 3	42.0	2	22	NA	NA
	Otter Tail 1	41.0	1	6	NA	NA
	Otter Tail 2	40.7	2	27	NA	NA
	Periphery subtotal	290.6	13	142	2	20
Grand total		705.5	53	703	7	185

[a] The 2020 count was subtracted from the 2021 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] NA = not applicable because 4 survey blocks were not completed in 2020 due to cooperator restrictions on nonessential field work during the COVID-19 pandemic.

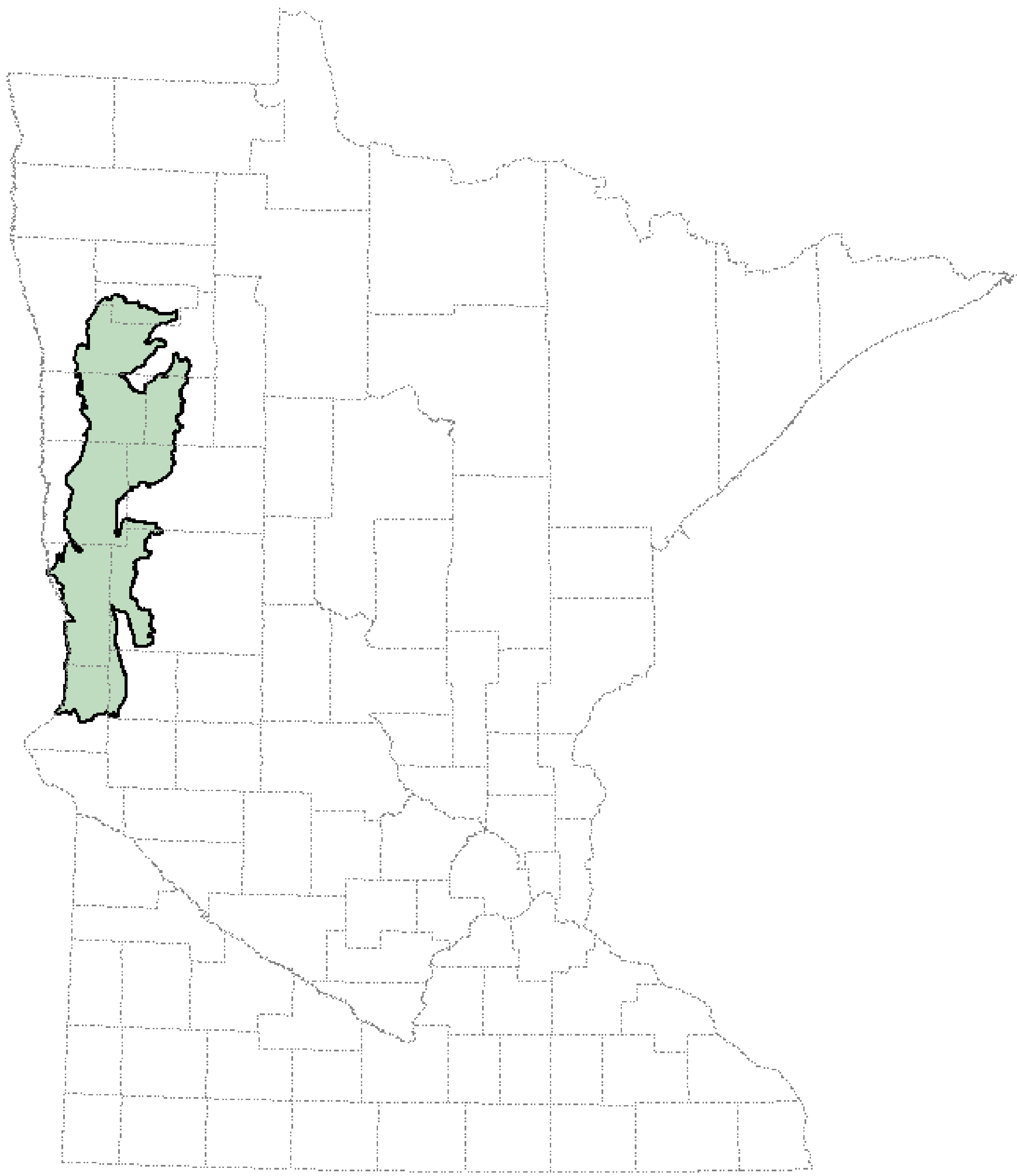


Figure 1. Primary greater prairie-chicken range in Minnesota (shaded area) relative to county boundaries. The range boundary was based on Ecological Classification System Land Type Associations and excludes some areas known to be occupied by prairie-chickens.

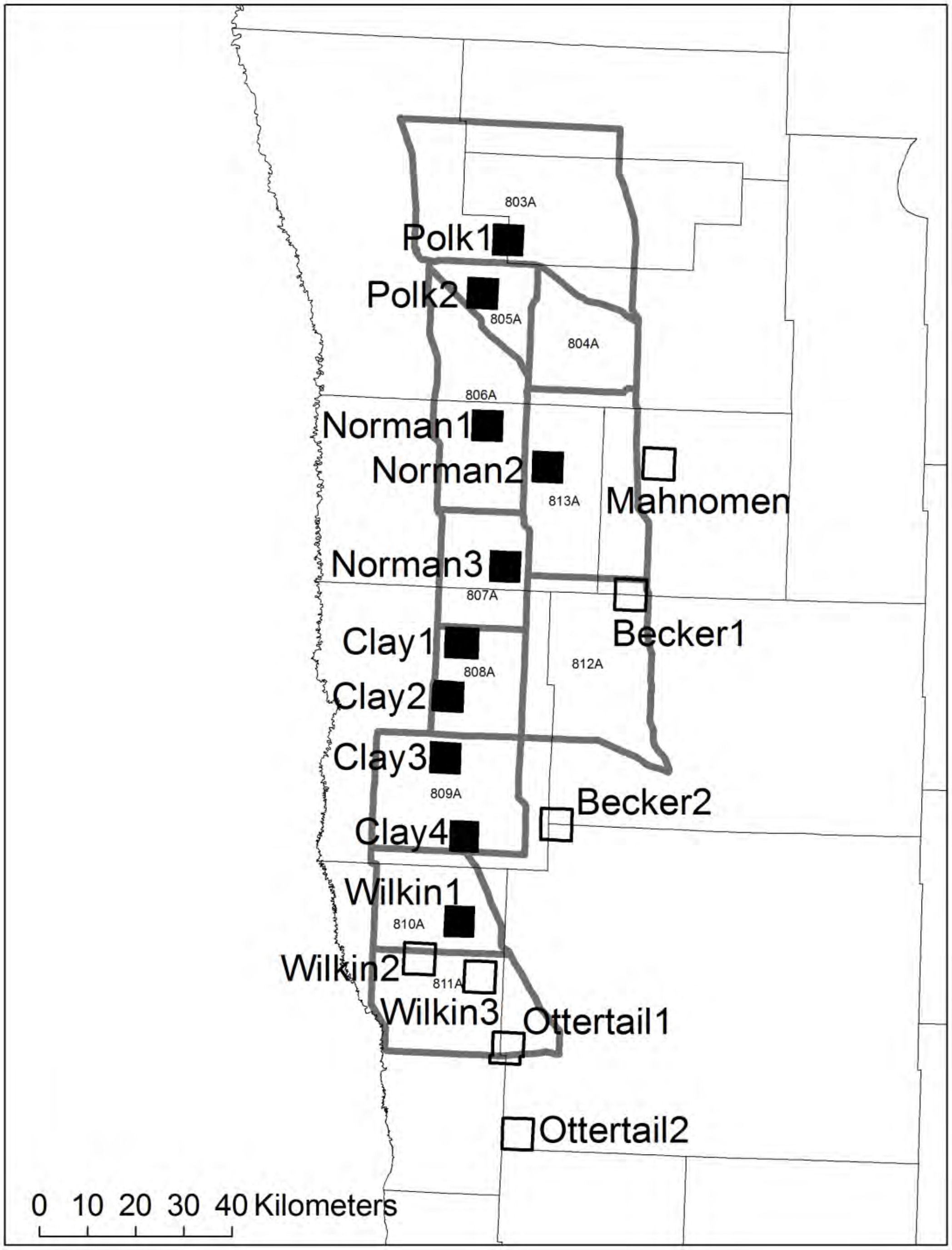


Figure 2. Prairie-chicken lek survey blocks (41 km^2, labeled squares) and hunting permit areas (thick grey lines) in western Minnesota. Survey blocks were either in the core (black) or periphery (white) of the range with a threshold of 1.0 male/km^2 in 2010, and were named after their respective counties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

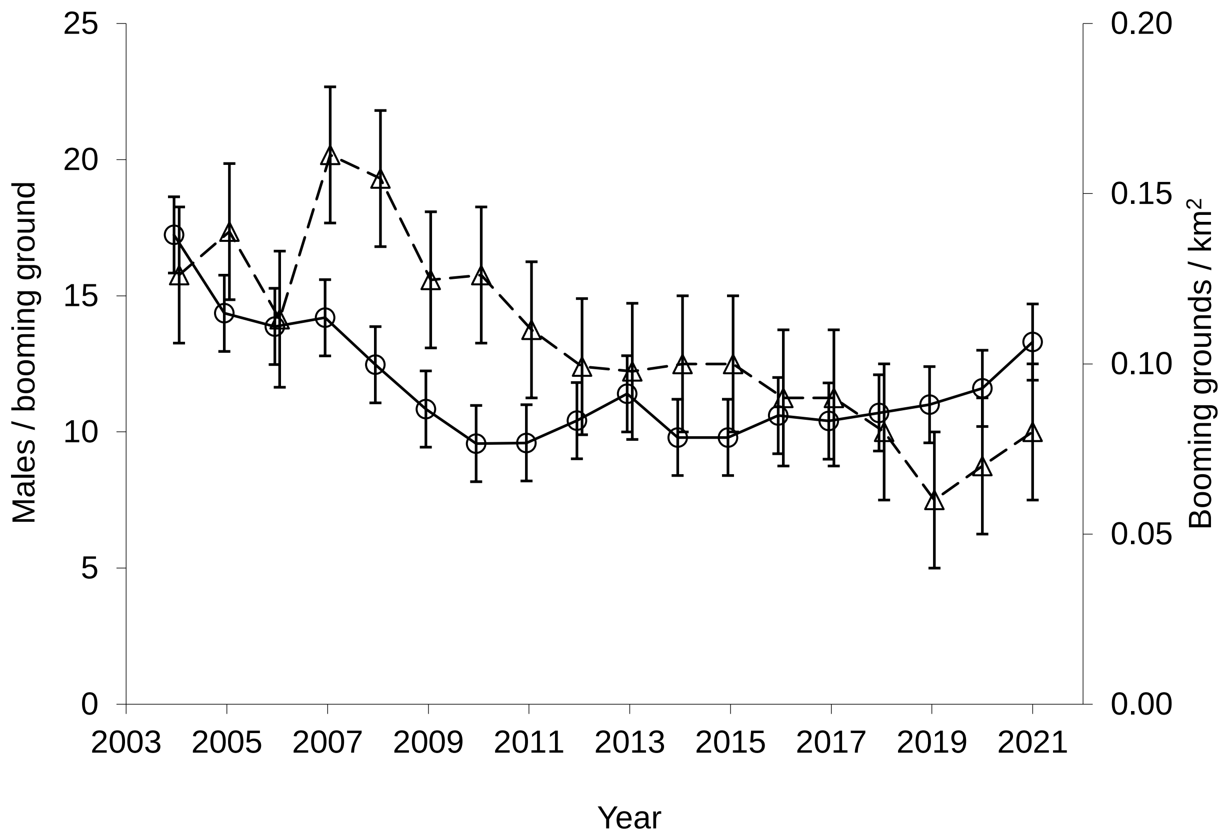


Figure 3. Mean prairie-chicken males/booming ground (circles connected by solid line) and booming grounds/km^2 (triangles connected by dashed line) in survey blocks in Minnesota with 95% confidence intervals.

2021 NW MN ELK SURVEYS

Doug Franke, Area Wildlife Manager, Thief River Falls

INTRODUCTION

Minnesota DNR Fish and Wildlife and Enforcement staff used a single fixed-wing aircraft (Cessna 185 Skywagon) to conduct aerial elk surveys for the Grygla and Lancaster elk herds during February of each year

Due to the coronavirus pandemic the 2021 aerial elk survey was cancelled for this year.

2021 AERIAL MOOSE SURVEY

Michael A Larson, Forest Wildlife Populations and Research Group

INTRODUCTION

Each year we conduct an aerial survey in northeastern Minnesota to estimate the moose (*Alces alces*) population and to monitor and assess changes in the overall status of the state's largest deer species. Specifically, the primary objectives of this annual survey are to estimate moose abundance, percent calves, and calf:cow and bull:cow ratios. This survey is usually conducted in January each year.

Due to the coronavirus pandemic the 2021 aerial moose survey was cancelled for this year.

MINNESOTA WOLF POPULATION UPDATE 2021

John Erb and Carolin Humpal, Forest Wildlife Populations and Research Group

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), thereafter at approximately 5-year intervals (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 only minor change in the total amount of land occupied by wolf packs; similar patterns were found 5 years later as part of the winter 2017-18 survey (Erb et al. 2018).

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 three winters after de-listing, wolf population point estimates varied from approximately 2,200 to 2,400 (Erb et al. 2014). In December 2014, following the third consecutive wolf harvest season, a court ruling returned wolves in Minnesota to the list of federally threatened species. Since that time, wolf surveys have continued on an annual basis. Herein we provide an update of population status from the 2020-21 winter survey.

METHODS

The methodology used to estimate wolf population size in Minnesota utilizes three primary pieces of information: 1) an estimate of the total area 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, occupied range is estimated only once every 5 years, with the last being during winter 2017-18; we assume that occupied range has remained unchanged (i.e., 73,972 km^2; Erb et al. 2018) and use that in our population calculations for winter 2020-21.

To track pack movements, 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. Some wolves are also captured with the use of live-restraining neck snares (Gese et al. 2019), 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, the antagonist Yohimbine and an antibiotic were typically administered to all animals prior to release.

Various models of tracking collars were deployed depending on study area and collar availability. Most GPS collars were programmed to take 3-6 locations per day, and wolves fitted with VHF-only 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 collared packs using minimum convex polygons (MCP) for consistency with previous surveys. Prior to delineating wolf pack territories, we removed 'outlier' locations using the following guidelines, though subjective deviations were made in some cases as deemed biologically appropriate: 1) for wolves with approximately weekly VHF locations only, locations > 5 km from other locations were excluded as extraterritorial forays (Fuller 1989); 2) for GPS collars that provided 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; and 3) for consistency with the way in which the data is used (i.e., to estimate number of packs), locations that result in notable overlap with adjacent territories are removed.

In past surveys where all or the majority of territories were delineated using comparatively few VHF locations, 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 VHF locations per pack typically averaged 30-60. Interstitial spaces are a combination of small voids created by landscape geometry and wolf behavior, but can also be an artifact of territory underestimation when there are fewer locations. Hence, for packs with < 100 locations (*n* = 9; mean number of locations = 23), we multiplied each estimated territory size by 1.37 as in the past. For packs with > 100 locations (*n* = 29; mean number of locations = 4,488), territories were assumed to be fully delineated and not re-scaled.

To estimate average mid-winter pack size, collared wolves were repeatedly located via aircraft during winter to obtain visual counts of pack size. In cases where visual observations were insufficient, we also rely on any estimates of pack size based on tracks observed in the snow and trail camera images from within the pack's territory. If any reported count 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. For purposes of discussion, we base our informal assessments of significant differences in results across years on visual comparison of the degree of confidence interval overlap (Cumming and Finch 2005).

RESULTS AND DISCUSSION

Pack and Territory Size

We obtained data on 38 packs that were monitored during all or part of the survey period (April 2020 to April 2021). Both territory and winter pack size data were available from 33 marked wolf packs (Figure 1). Five additional wolf packs had adequate location data to delineate territories, but we were unable to obtain mid-winter pack counts.

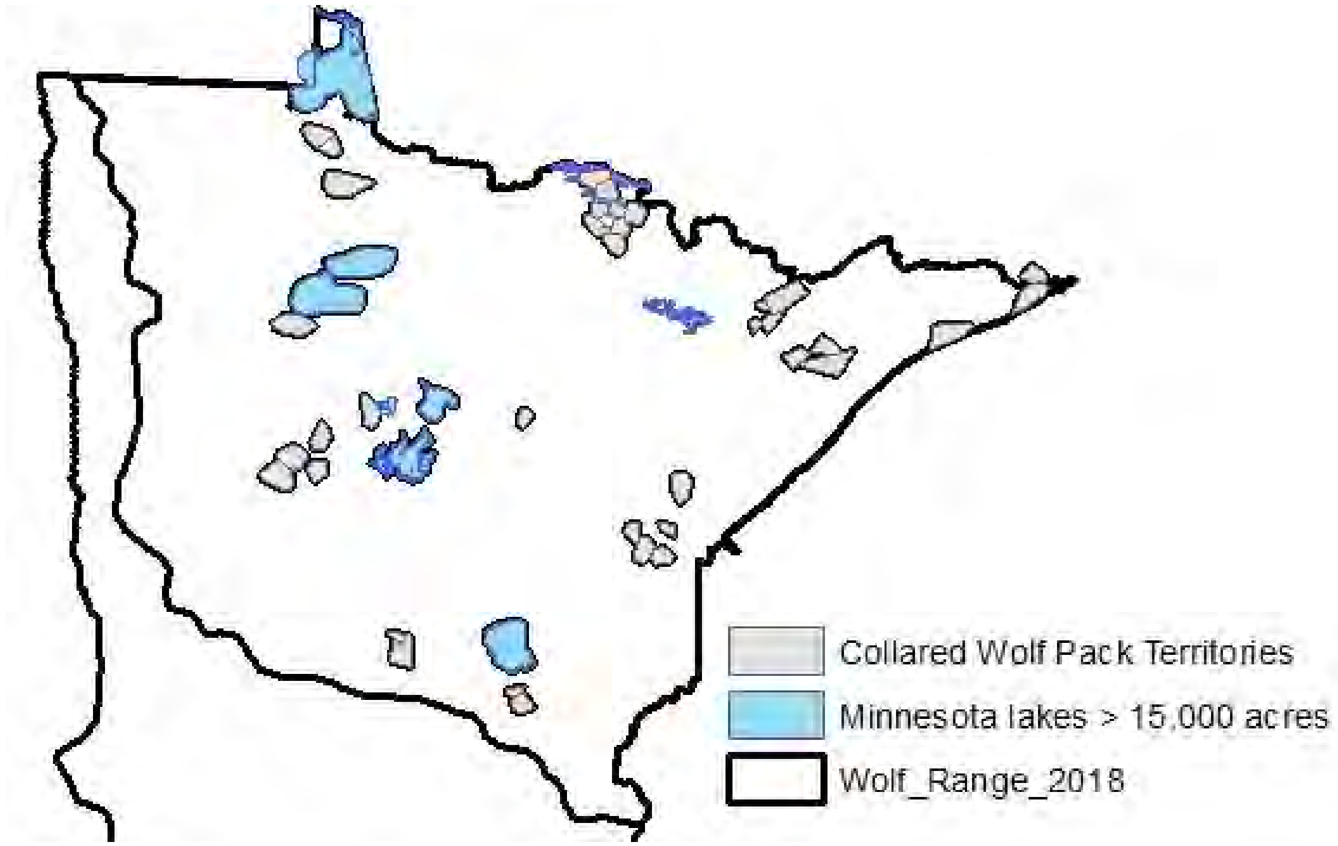


Figure 1. Location of territories for marked wolf packs during the 2020-21 survey.

A land cover comparison using the 2016 National Land Cover Database suggests that the most noteworthy discrepancies between land cover in overall occupied wolf range and in collared pack territories this winter were under-representation of cover types classified as woody wetlands and pasture-hay-grassland (Table 1). This is likely a result of under-sampling of packs in the Northern Minnesota and Ontario Peatlands Ecological Section and along the southern and western edge of wolf range with a predominance of private land. Using spring 2020 deer density data (MNDNR, unpublished data) for deer hunting permit areas, weighted by number of radio-collared wolf packs in a permit area, we estimate an average of approximately 10.7 deer/mi^2 (pre-fawn) in territories of radio-marked packs during spring 2020. In comparison, 2020 spring deer density for the entirety of occupied wolf range (weighted by permit area) in Minnesota was approximately 14.3 deer/mi^2.

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	37.6	32.6
Deciduous Forest	16.6	18.9
Emergent Herbaceous Wetlands	11.0	5.7
Mixed Forest	11.3	16.6
Evergreen Forest	5.5	10.5
Open Water	5.0	5.5
Shrub/Scrub	2.8	5.1
Pasture/Hay/Grassland/Crops	8.0	3.3
Developed, All	2.2	1.9

[a] Land cover data derived from the 2016 National Land Cover Database

The point estimate for average territory size in winter 2020-21 was nearly identical to the previous winter, the 2 smallest averages we've estimated since surveys began (Figure 2). After applying the territory scaling factors, average estimated territory size for radio-marked packs during the 2020-21 survey was 119.1 km^2 (range = 22 – 280 km^2).

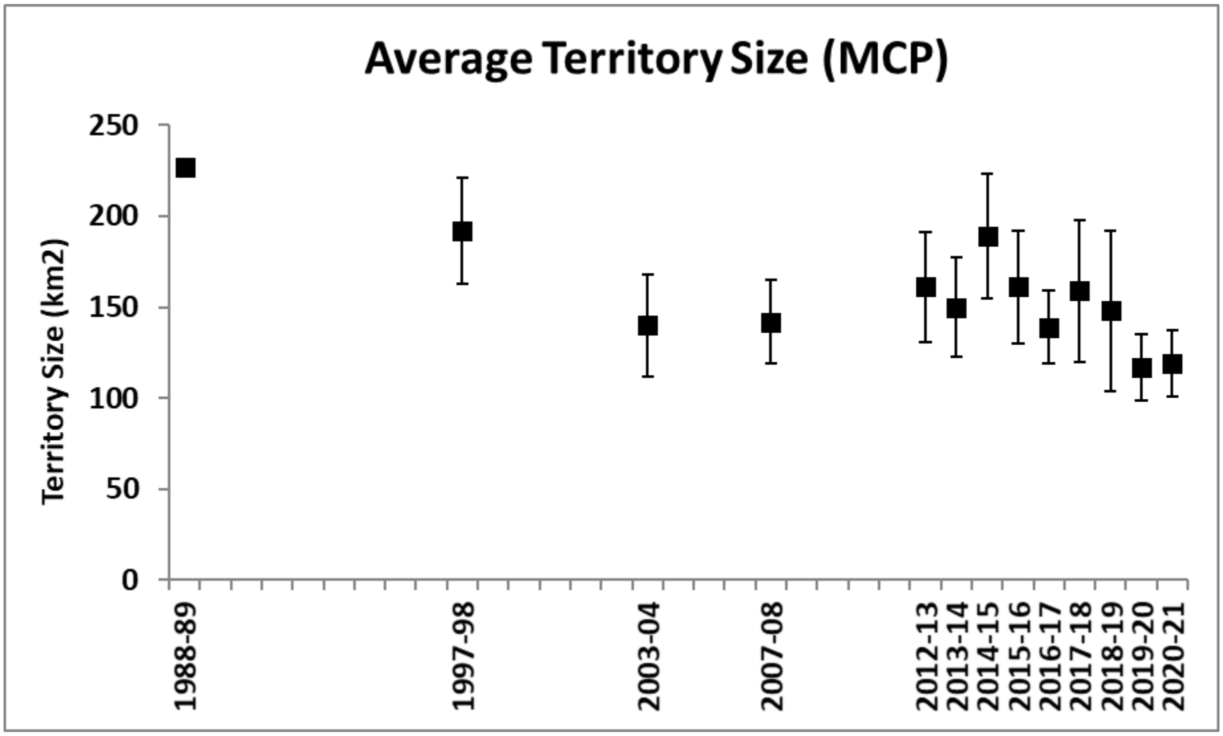


Figure 2. Average scaled territory size for marked wolf packs in Minnesota from winter 1988-89 to 2020-21.

The point estimate for average winter pack size increased by 4%, a non-significant change from the previous winter, but with the past 2 point estimates being lower than previous years (Figure 3). Average winter pack size in 2020-21 was estimated to be 3.79 (range = 2 – 7).

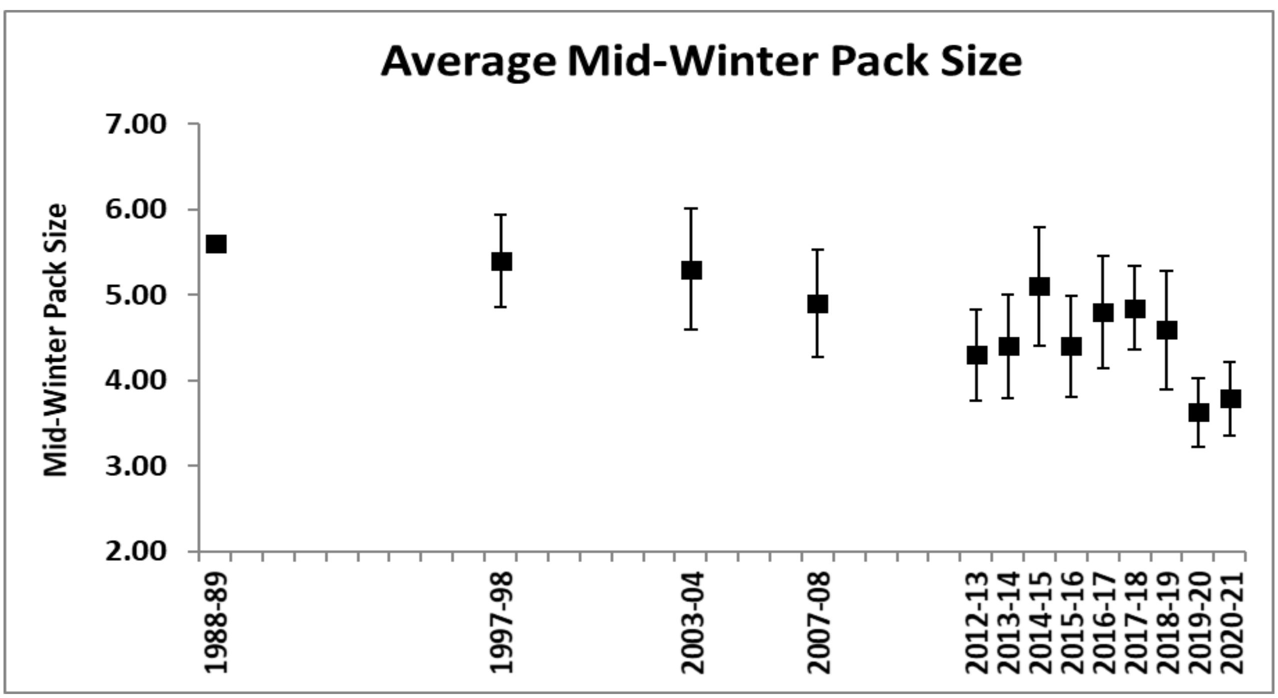


Figure 3. Average mid-winter pack size for marked wolf packs in Minnesota from winter 1988-89 to 2020-21.

Wolf Numbers

With an average territory size of 119 km^2 and assuming occupied range has not changed since the 2017-18 survey (73,972 km^2; Erb et al. 2018), we estimate a total of 621 wolf packs in Minnesota during winter 2020-21 (Figure 4). Although also influenced by the estimated amount of occupied range, trends in the estimated number of packs are inversely correlated with trends in estimated territory size (i.e., for a given amount of occupied range, increases in average territory size yield lower estimates of the number of packs within the state).

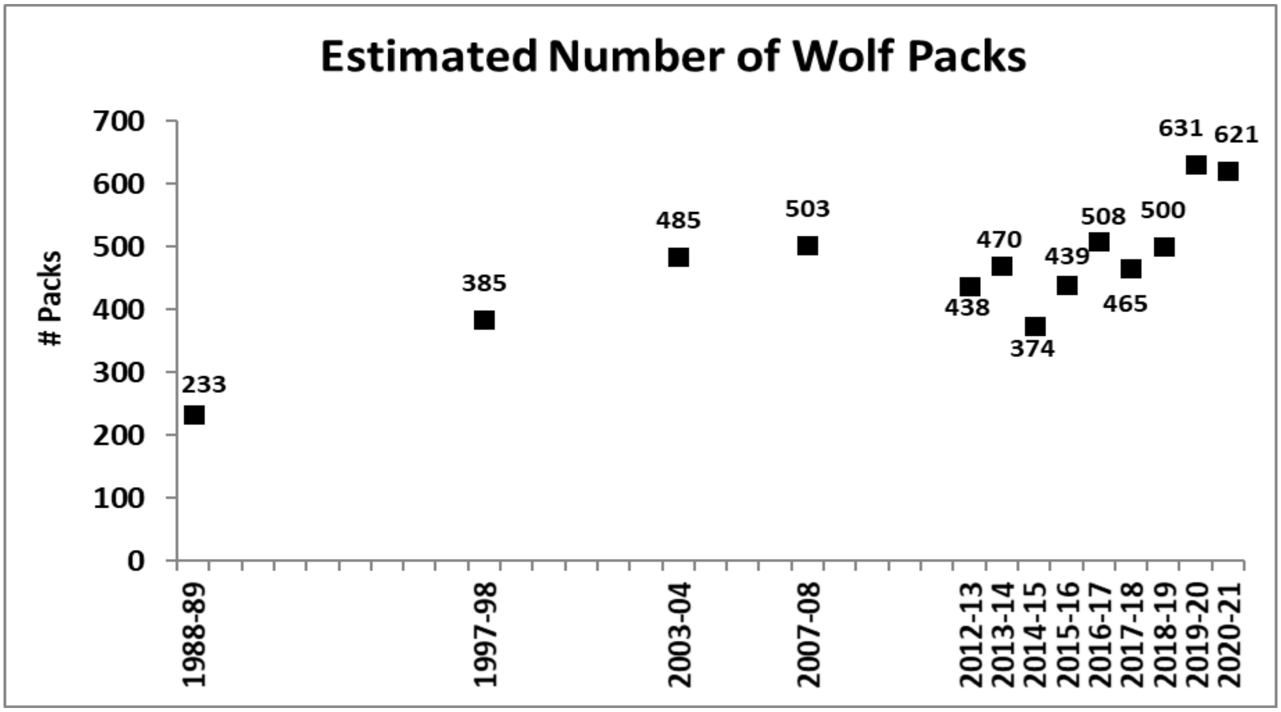


Figure 4. Estimated number of wolf packs in Minnesota at periodic intervals from winter 1988-89 to 2020-21.

After accounting for the assumed 15% lone wolves in the population, we estimated the 2020-21 mid-winter wolf population at 2,770 wolves, or 3.7 wolves per 100 km^2 of occupied range. The 90% confidence interval was approximately +/- 450 wolves, specifically 2,319 to 3,223. Given the nearly complete overlap with the 2019-20 confidence interval, we conclude that the 2020-21 statewide wolf population size was unchanged from the previous winter, but with results from the past 2 winters suggesting more but smaller packs.

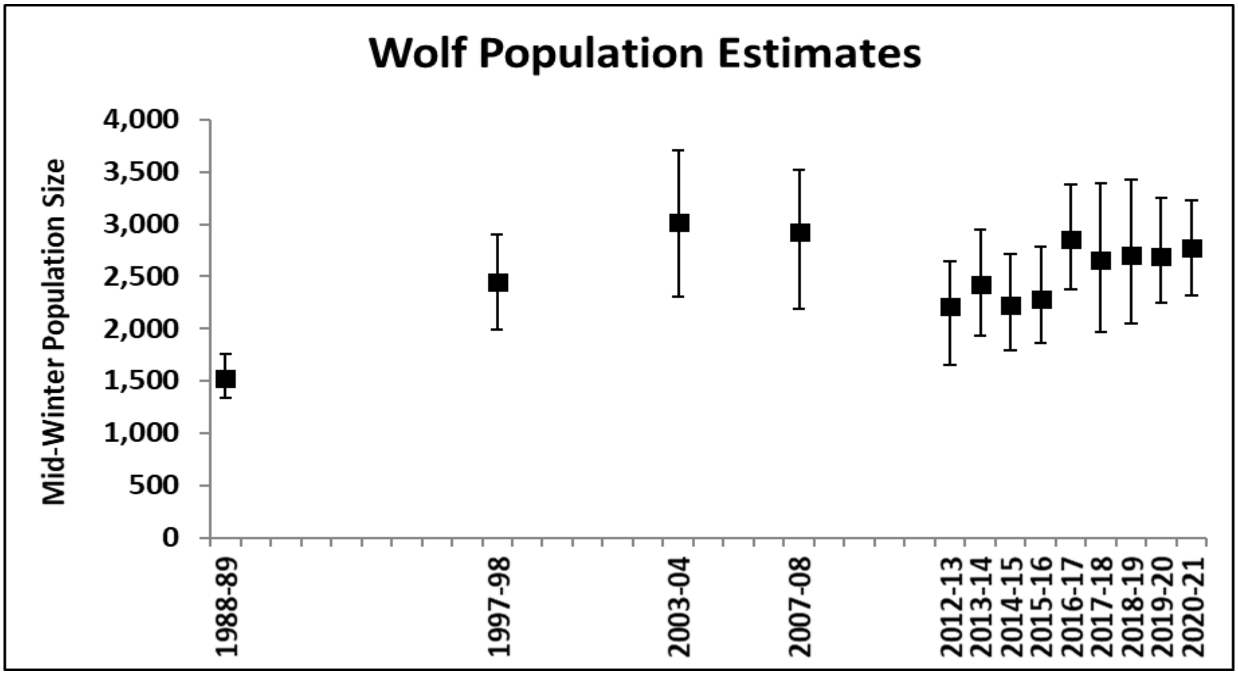


Figure 5. Wolf population estimates from periodic standardized surveys in Minnesota from winter 1988-89 to 2020-21.

From spring 2019 to spring 2020, overall average deer density within wolf range increased 9%. Over the past 9 years, the trend in wolf population size during winter has been positively correlated with average deer density within wolf range the preceding spring (Figure 6).

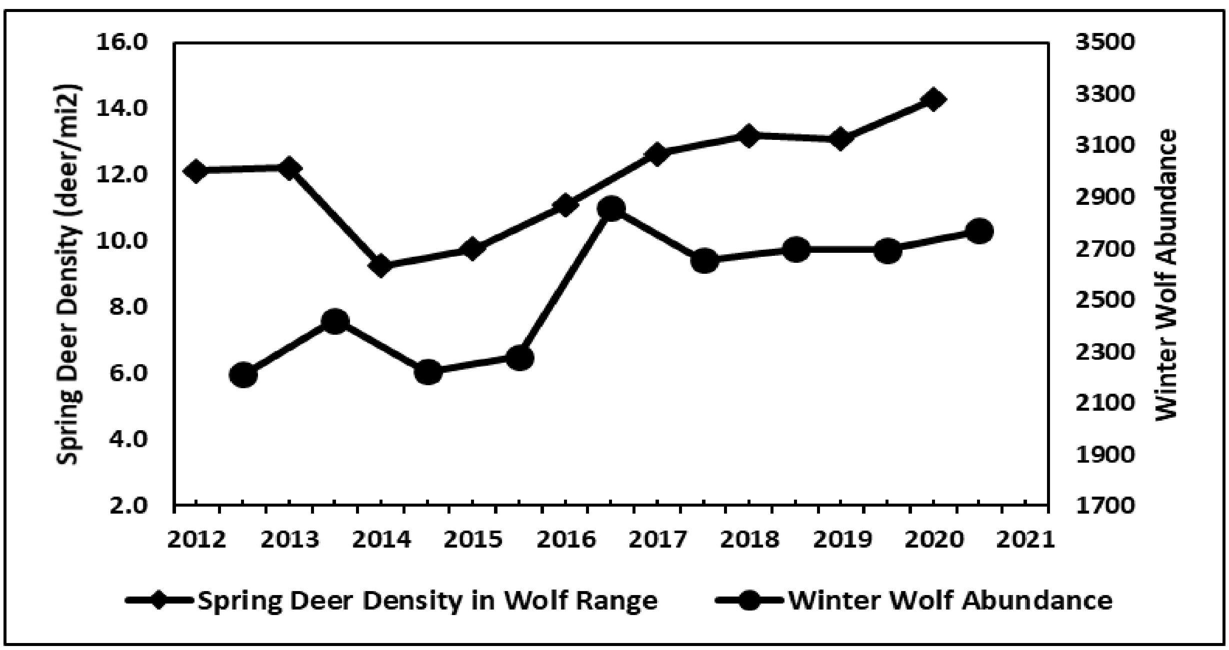


Figure 6. Comparison of estimated spring (pre-fawn) deer density and winter wolf abundance in Minnesota, 2012-2021.

ACKNOWLEDGMENTS

We thank the USDA Wildlife Services program (John Hart, Kevin Fuller, Jeff Grabarkewitz, Rick Olson, and Dave Hughley) and Barry Sampson for assistance with capturing and collaring wolves, and DNR pilots Jason Jensen, John Heineman, Chris Lofstuen, and Charles Scott for their critical monitoring contributions. Special thanks to numerous collaborators for their assistance or sharing of wolf monitoring data utilized in this survey, including Dave Mech and Shannon Barber-Meyer (USGS), Steve Windels (Voyageurs National Park), Tom Gable, Austin Homkes, and Joseph Bump (U. of Minnesota), Jay Huseby, Dave Price, and Sarah Ruffing (Red Lake Band of Chippewa), Seth Moore and EJ Isaac (Grand Portage Band of Chippewa), Mike Schrage, Lance Overland, Terry Perrault, John Goodreau, and Matt Weske (Fond du Lac Resource Management Division), Morgan Swingen (1854 Treaty Authority), and Brian Dirks and Nancy Dietz (Camp Ripley Military Reservation). This project was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

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WETLAND WILDLIFE POPULATIONS

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2021 WATERFOWL BREEDING POPULATION SURVEY MINNESOTA

Due to Covid-19 restrictions this survey was not conducted.

WATERFOWL POPULATION STATUS, 2021.

Waterfowl information is taken from the U.S. Fish and Wildlife Service report Waterfowl Population Status, 2021 by Joshua Dooley and Nathan Zimpfer. The entire report is available on the Division of Migratory Bird Management website Waterfowl Population Status, 2021 | FWS.gov

Due to the COVID-19 (SARS-CoV-2) pandemic, many migratory breeding surveys conducted by the U.S. Fish and Wildlife Service, Canadian Wildlife Service, U.S. Geological Survey, as well as state and provincial agencies were once again canceled in spring 2021, including the Waterfowl Breeding Population and Habitat Survey (WBPHS). However, several state and provincial agencies were able to conduct annual spring waterfowl surveys in 2021 (e.g., ND, WI, OR; Atlantic Flyway Plot Survey; state/provincial Canada goose surveys). In Alaska, biologists conducted the Yukon–Kuskokwim Delta Coastal Zone Survey, the Copper River Delta Breeding Pair Survey, and the WBPHS strata 1–11. Because spring waterfowl surveys were not conducted comprehensively across the range of many duck species in 2021, we do not present partial status information for any duck species in this report. We refer the reader to the 2019 Waterfowl Status report, which was the last complete survey, for more detailed historical data.

MOURNING DOVE POPULATION STATUS, 2021

Mourning dove information is taken from the U.S. Fish and Wildlife Service report by Seamans, M.E. 2021. Mourning dove population status, 2021. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 18 pp. The entire report is available on the Division of Migratory Bird Management web site

(Mourning Dove Population Status, 2021 | FWS.gov).

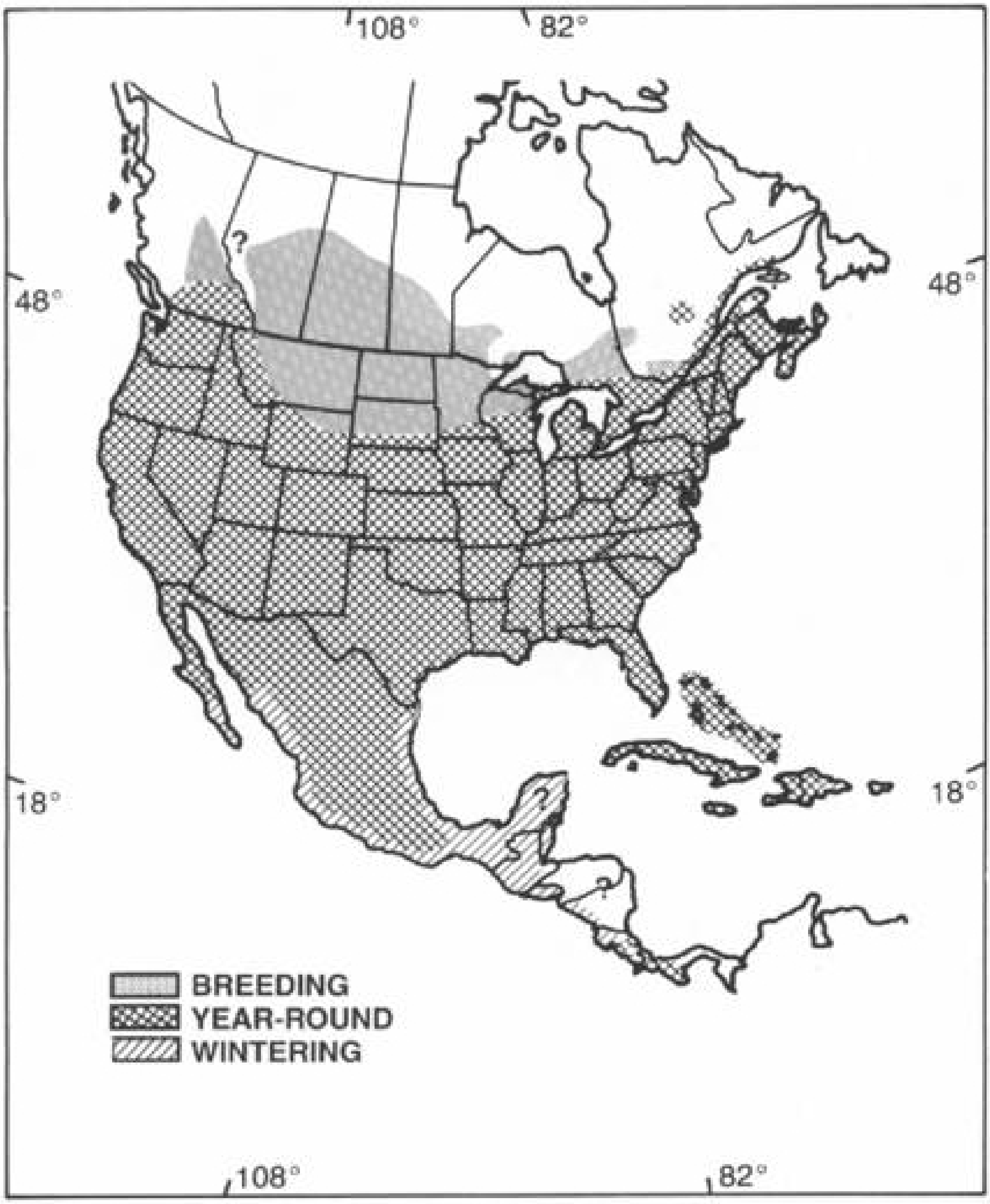

Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). (From: Seamans, M.E. 2021. Mourning dove population status, 2021. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 18 pp.)

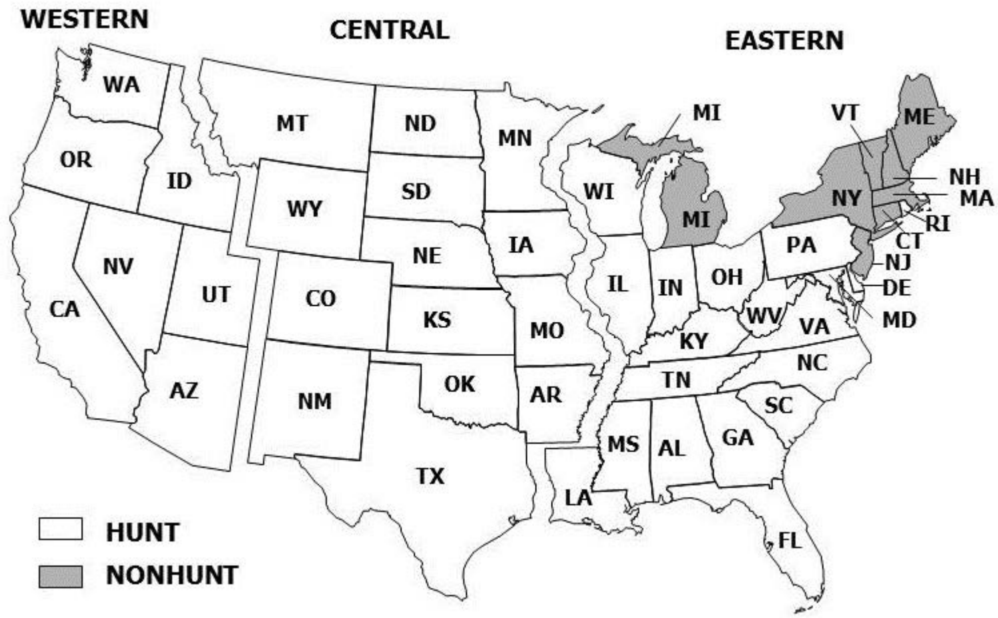

Figure 2. Mourning dove management units with 2019 -21 hunting and non-hunting states. (From: Seamans, M.E. 2021. Mourning dove population status, 2021. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 18 pp.)

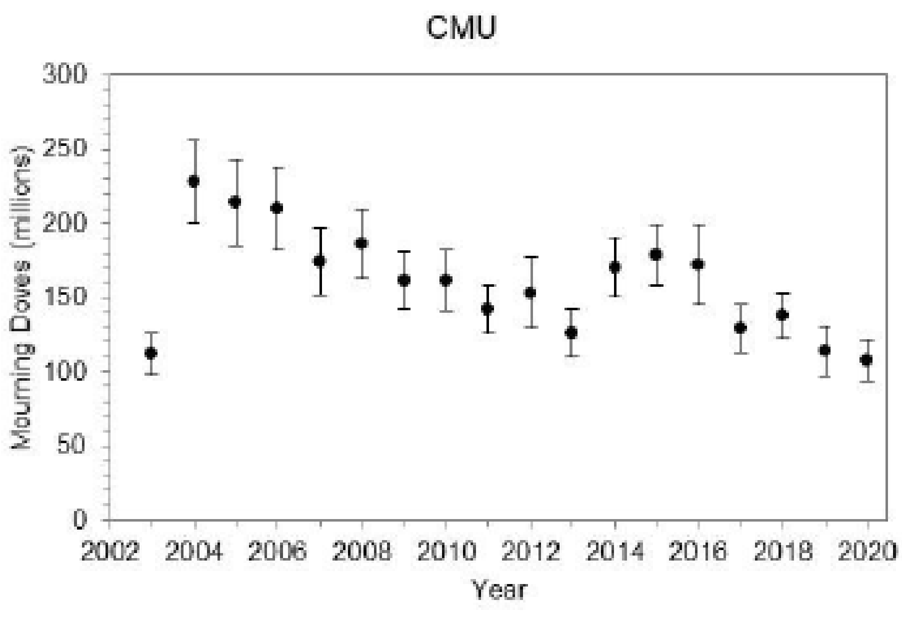

Figure 3. Estimates and 95% confidence intervals of mourning dove absolute abundance by in the Central Management Unit (CMU), 2003-19. Estimates based on band recovery and harvest data. (From: Seamans, M.E. 2020. Mourning dove population status, 2020. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 23 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 2018, 2019 and 2020 seasons [a]. (From: Seamans, M.E. 2021. Mourning dove population status, 2021. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. 18 pp.)

Management unit / State	Active Hunters			Hunter Days Afield			Total Harvest		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
CENTRAL	332,900	337,700[a] †[b]	368,200[a] †[b]	852,100 ±53,100	986,800 ±50,800	1,171,000 ±79,800	4,749,100 ±283,900	5,266,400 ±335,500	5,885,700 318,100
AR	12,400 ±2,700	14,200 ±2,200	20,000 ±2,300	24,500 ±5,200	37,500 ±7,100	47,600 ±7,300	170,600 ±44,700	328,100 ±74,800	320,300 ±44,600
CO	10,000 ±1,200	10,700 ±800	12,700 ±1,000	20,200 ±2,700	22,800 ±2,000	27,200 ±2,500	121,500 ±17,300	106,300 ±9,500	124,600 ±11,800
IA	9,000 ±1,000	3,600 ±400	9,700 ±700	23,500 ±3,100	11,000 ±1,800	25,000 ±2,400	107,800 ±12,300	29,900 ±4,700	104,600 ±9,000
KS	22,900 ±4,100	22,300 ±1,900	22,800 ±2,500	44,300 ±7,800	64,800 ±8,500	62,800 ±7,700	337,600 ±75,000	389,800 ±64,200	366,000 ±60,100
MN	7,100 ±2,500	3,900 ±1,400	7,000 ±2,200	16,900 ±5,500	9,400 ±2,300	23,800 ±7,700	55,300 ±14,000	40,200 ±11,800	63,100 ±28,400
MO	26,000 ±2,300	21,100 ±1,500	24,300 ±1,700	48,300 ±4,400	47,100 ±3,800	63,600 ±6,900	309,400 ±37,800	268,000 ±28,400	318,400 ±39,900
MT	1,200 ±400	1,600 ±400	2,200 ±500	3,500 ±1,100	3,600 ±800	6,600 ±1,900	9,800 ±2,200	16,600 ±4,600	32,900 ±13,100
NE	11,600 ±1,300	10,700 ±1,000	12,400 ±1,200	33,700 ±4,900	24,500 ±2,500	33,600 ±4,300	189,100 ±33,800	137,700 ±14,100	159,900 ±15,900
NM	9,900 ±1,000	8,300 ±700	10,600 ±700	28,200 ±3,400	28,800 ±4,100	37,000 ±3,400	126,900 ±20,100	125,400 ±22,000	147,400 ±16,600
ND	3,900 ±600	4,100 ±500	4,500 ±600	11,800 ±2,800	11,900 ±2,000	13,900 ±2,800	65,200 ±15,100	75,000 ±19,500	75,400 ±11,400
OK	13,600 ±2,100	14,800 ±1,200	19,000 ±1,800	29,200 ±4,600	38,000 ±4,200	58,200 ±8,800	181,300 ±30,500	247,900 ±26,700	339,600 ±39,300
SD	4,900 ±600	4,700 ±600	6,000 ±700	11,500 ±1,600	15,500 ±2,700	14,500 ±1,600	69,400 ±10,600	103,300 ±19,100	92,800 ±14,800
TX	199,100 ±18,100	216,300 ±13,100	216,100 ±14,000	553,200 ±51,000	669,000 ±48,800	754,800 ±77,400	2,990,400 ±260,900	3,385,000 ±315,600	3,729,300 ±300,600
WY	1,400 ±300	1,300 ±200	1,000 ±200	3,200 ±700	2,800 ±500	2,300 ±500	14,800 ±3,100	13,200 ±2,200	11,300 ±2,300

[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 POPULATION STATUS, 2021

American Woodcock information is taken from the U.S. Fish and Wildlife Service report American Woodcock Population Status, 2021. Seamans, M.E. and R.D. Rau. 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.

The entire report is available on the Division of Migratory Bird Management website [American Woodcock Population Status, 2021 | FWS.gov]

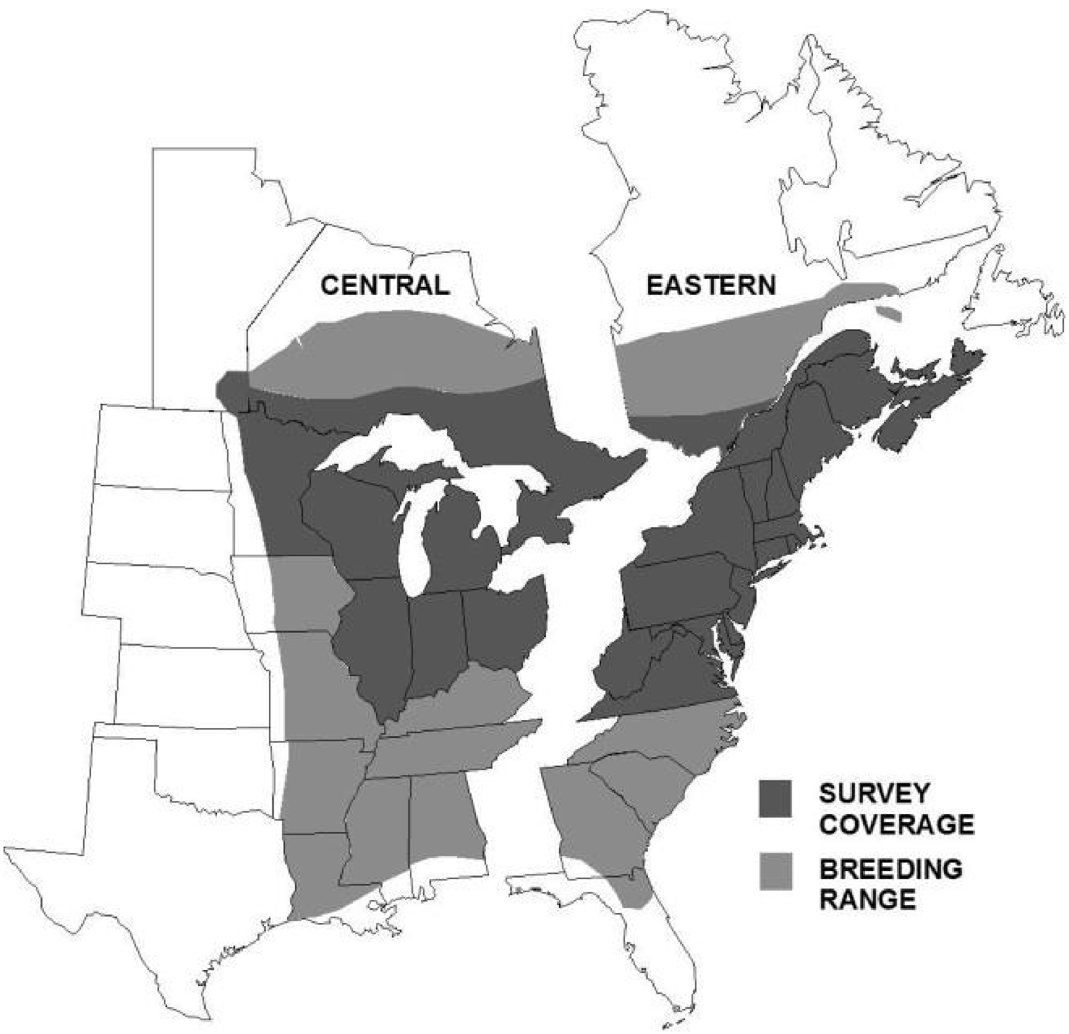

Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

Table 1. Short term (2020–21), 10 –year (2011-2021), and long-term (1968-2021) 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: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

Management Unit/State	Number of Routes[b]	n[c]	2020-21			2011-21			1968-21		
			% Change	95% CI[d]		% Change	95% CI[d]		% Change	95% CI[d]	
				lower	upper		lower	upper		lower	upper
CENTRAL	454	779	-9.94	-20.05	1.16	-2.06	-2.83	-1.28	-0.92	-1.13	-0.70
IL	19	49	-62.90	-86.46	-9.41	-2.54	-11.27	7.41	-1.24	-3.52	1.28
IN	12	63	-3.62	-40.26	52.88	-3.28	-7.75	1.43	-3.90	-4.97	-2.85
MB[e]	10	31	0.11	-32.29	48.66	-1.21	-4.78	1.98	-0.05	-1.42	1.30
MI	112	161	-9.08	-27.94	14.25	-2.31	-3.69	-0.94	-1.06	-1.39	-0.72
MN	92	126	-12.61	-30.16	8.46	-1.57	-3.18	0.04	0.36	-0.14	0.89
OH	35	74	-14.56	-41.47	18.04	-3.80	-7.03	-1.05	-2.03	-2.79	-1.33
ON	71	175	-6.70	-27.21	18.82	-2.38	-4.03	-0.74	-1.23	-1.65	-0.80
WI	103	131	-2.34	-24.87	26.04	-1.33	-3.09	0.46	-0.32	-0.76	0.13

[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 2021 for which data were received by 20 July, 2021.

[c] Number of routes with at least one year of non-zero data between 1968 and 2021.

[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.

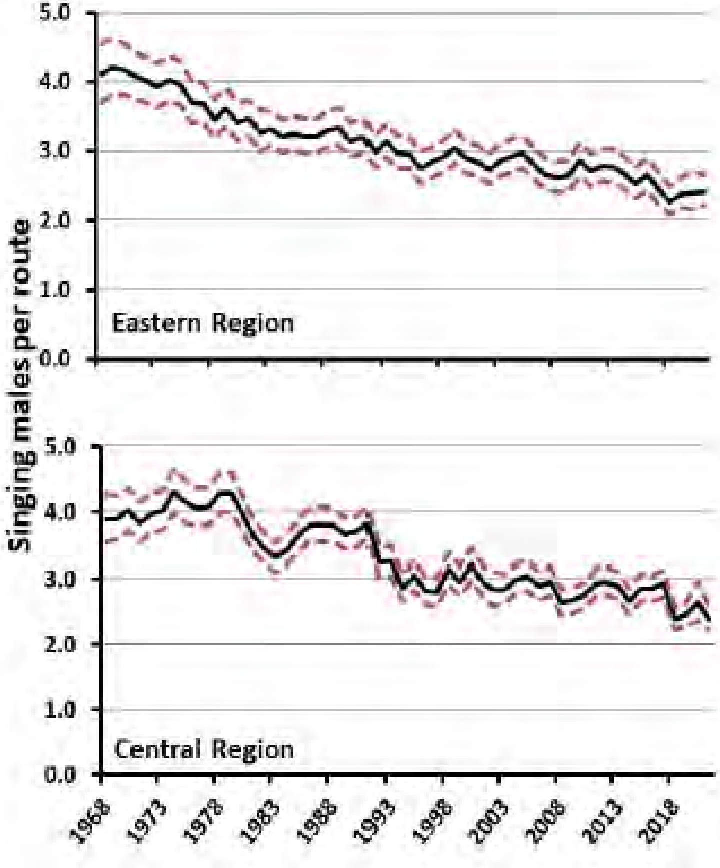

Figure 2. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2021. The dashed lines represent the 95 % credible interval. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

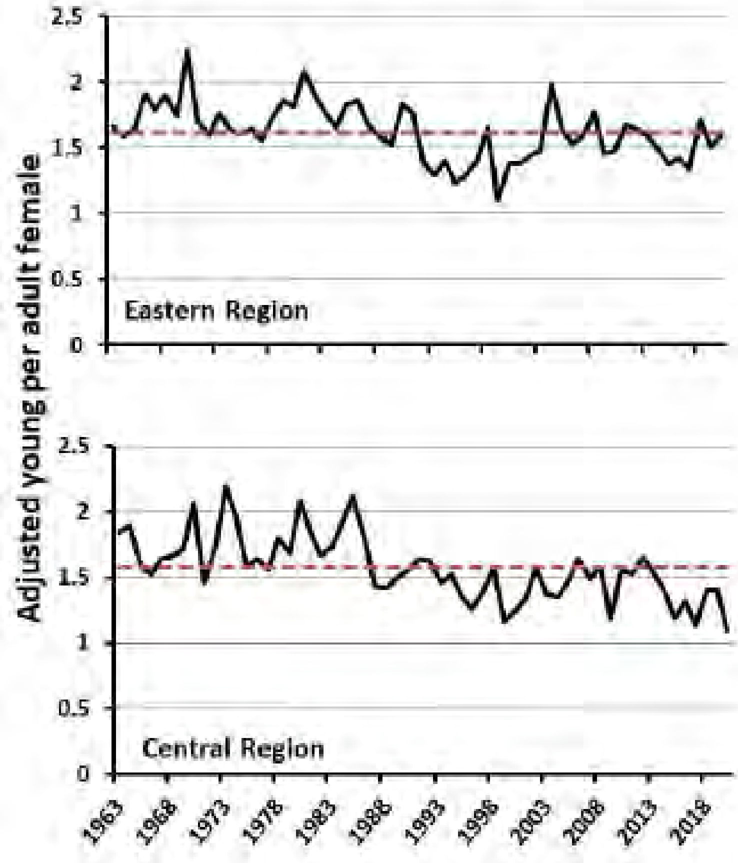

Figure 3. Annual indices of American woodcock recruitment, 1963-2020. Dashed line is the 1963-2019 average. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

Table 2. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2017-18, 2018-19, 2019-20 and 2020-21 Harvest Information Program surveys. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

Management Unit / State	Active woodcock hunters ([a])				Days afield ([a, c])				Harvest ([a, c])			
	2017-18	2018-19	2019-20	2020-21	2017-18	2018-19	2019-20	2020-21	2017-18	2018-19	2019-20	2020-21
Central Region	n.a. [b]	n.a. [b]	n.a. [b]	67,100[d] n.a.[d]	272,400 ±22,800	246,000 ±35,800	216,600 ±24,500	260,600 ±23,800	140,900 ±15,500	130,600 ±16,400	136,000 ±18,900	123,700 ±13,300
IL	100 <100	<100 <100	2,300 ±1,600	1,800 ±1,800	300 ±100	100 ±100	11,300 ±9,300	5,400 ±5,300	400 ±300	0 0	3,400 ±3,400	100 ±100
IN	1,100 ±400	100 <100	500 ±300	1,100 ±500	2,900 ±1,000	200 ±100	1,100 ±500	3,200 ±1,600	1,500 ±1,100	200 ±100	400 ±100	1,000 ±500
MI	24,100 ±2,300	29,300 ±3,700	19,100 ±2,400	18,500 ±2,100	122,800 ±15,200	135,800 ±31,900	86,100 ±12,600	82,900 ±10,000	66,100 ±10,300	59,600 ±10,400	64,500 ±15,200	37,400 ±5,600
MN	11,900 ±2,100	10,400 ±2,100	8,700 ±1,900	12,000 ±2,100	45,700 ±8,200	41,500 ±9,700	29,300 ±5,700	49,700 ±9,700	26,700 ±5,000	22,500 ±3,900	20,800 ±4,500	25,000 ±4,700
OH	1,900 ±800	500 ±100	1,100 ±900	2,000 ±800	5,000 ±1,800	800 ±300	2,400 ±1,000	5,200 ±2,200	400 ±200	600 ±400	700 ±300	2,900 ±1,300
WI	11,700 ±1,800	10,800 ±2,100	9,500 ±1,700	17,200 ±2,500	52,400 ±7,700	45,900 ±9,300	47,000 ±9,400	82,300 ±14,800	31,100 ±4,600	25,500 ±4,300	26,800 ±5,300	49,300 ±10,700

[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.

[d] Hunter number estimates at the regional and national levels may be biased high because the HIP sample frames are state specific; therefore, hunters were counted more than once if they hunted in >1 state. Variance was inestimable.

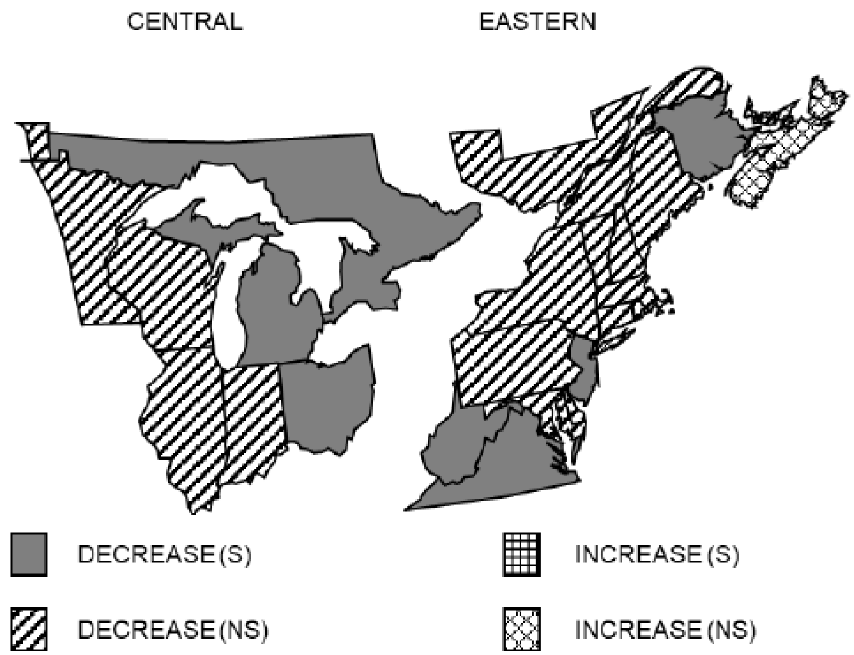

Figure 4. Ten-year trends in number of American woodcock heard on the Singing-ground Survey; 2011-21, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

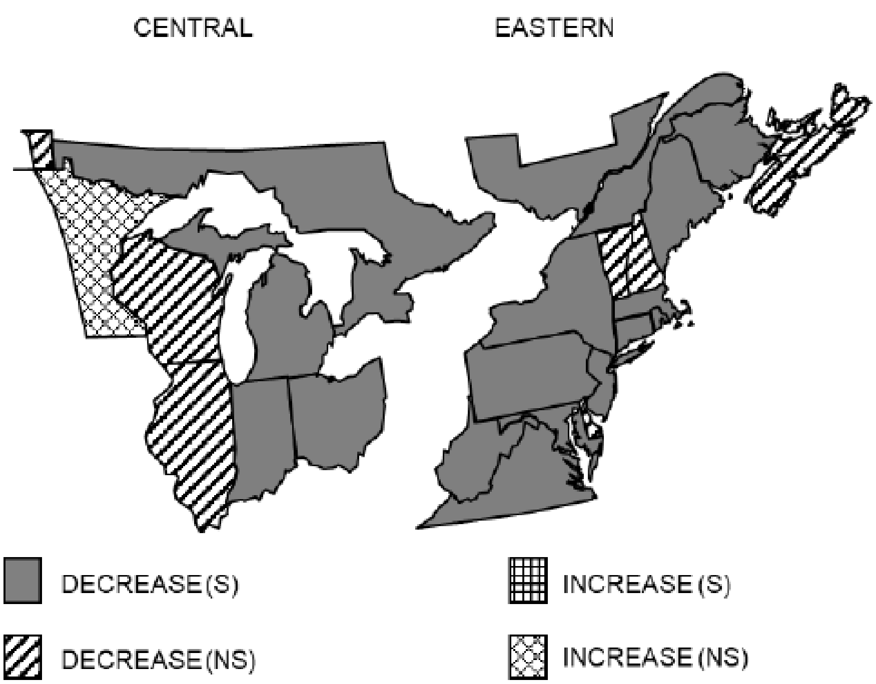

Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-2021, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. (from: Seamans, M.E. and R.D. Rau. 2021. American woodcock population status, 2021. U.S. Fish and Wildlife Service, Laurel, MD. 17 pp.).

HUNTING HARVEST STATISTICS

Division of Fish and Wildlife
500 Lafayette Road, Box 20
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2020 SMALL GAME HUNTER MAIL SURVEY

Nicole Davros and Margaret Dexter, Wildlife Research Unit

INTRODUCTION

The Minnesota Department of Natural Resources (MNDNR), 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 following the close of the small game hunting season. Hunters who returned it within three weeks were eliminated from a follow-up mailing to non-respondents. The sampling frame consisted of individuals who purchased a small game hunting license (any type) for the 2020-21 small game hunting season (N=244,100). A stratified random sample (n=7,000, 2.9%), allocated proportionally by license type, was drawn from the MNDNR electronic licensing system (ELS) database. Small game license types included: Resident Senior Citizen, Resident Youth, Resident Adult, Resident Individual Sport, Resident Combination Sport, Resident Lifetime, Resident Lifetime Sport, Non-resident Youth, and Non-resident Adult. For analysis, license types were pooled into “Resident” (N=235,725) and “Non-resident” (N=8,375) (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 harvest estimates and license sales are comparable among years. Also, beginning in 2017, license holders <18-years old at the time of the survey were excluded from the sampling frame but included in the overall expansion for sampling. This group comprised <3% of license holders and thus estimates should be comparable among years.

Recipients were asked if they hunted small game in 2020-21 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 were tabulated using Viking Data Entry VDE+ software and analyzed using R programming language (R version 4.1.0 [2021-05-18]; R Core Team 2020).

RESULTS

Survey Response and Overall License Sales Trends

Statewide (resident and non-resident) small game license sales and survey response rate are shown in Figure 2. Of the 7,000 mailed surveys, 255 surveys were returned as undeliverable; 2,413 surveys were completed and returned for an adjusted response rate of 36%. The percent of respondents who said they hunted or did not hunt is reported in Table 1. Overall, statewide license sales (244,100 small game licenses) increased nearly 9% from the previous year but was 4% below the 10-year average (253,879 licenses; Figure 2, Table 2). Non-resident small game license sales (8,375 licenses) increased 22% in 2020 and was 28% above the 10-year average (6,547 licenses; Table 3).

Estimates by Species

Harvest trends for the four most sought-after small game species (ducks – all species, Canada geese, ruffed grouse, and ring-necked pheasants) in Minnesota since 2002 are shown in Figure 3 and discussed separately below. For most other species, estimated harvest (Table 2) and number of statewide hunters (Table 4) showed a mix of increases and decreases compared to 2019 and the 10-year averages. Non-resident estimates are shown in Table 3. Tables 5 shows the estimated harvest per active hunter by species and Table 6 shows the mean harvest for successful hunters and hunter success rates (%).

Ducks – all species

The number of state duck stamps sold in 2020 (95,116 stamps) was 10% above the 10-year average (89,234 stamps; Table 2) but the 2020 harvest (555,985 ducks) was 22% lower than the 10-year average (709,114 ducks; Table 2). An estimated 56,347 hunters pursued ducks in 2020 compared to an average of 73,514 duck hunters in the previous 10 years (Table 4). The estimated harvest was 9.9 ducks/active hunter which was comparable to the 10-year average of 9.7 ducks/active hunter (Table 5). Duck hunter success rate (82%) was just below the 10-year average (85%), but successful hunters harvested slightly more ducks in 2020 than the 10-year average (12.1 vs. 11.4 ducks/successful hunter, respectively; Table 6).

Canada geese

The 2020 Canada goose harvest (182,194 geese) was well-below the 10-year average (259,325 geese; Table 2). An estimated 37,430 hunters pursued geese in 2020 compared to the 10-year average of 50,478 goose hunters (Table 4). The estimated harvest per active hunter was 4.9 geese/hunter which was comparable to the 10-year average (5.1 geese/hunter; Table 5). The hunter success rate (74%) and the mean harvest per successful hunter (6.5 geese) were also similar to their respective 10-year averages (76%; 6.6 geese/successful hunter; Table 6).

Ruffed grouse

For ruffed grouse, the estimated 2020 harvest and number of hunters (221,746 birds, 63,428 hunters) were 28% and 22% below the 10-year averages (306,250 birds, 80,795 hunters), respectively (Tables 2 and 4). Harvest per active hunter (3.5 grouse/hunter) was slightly below the 10-year average (3.8 grouse/hunter; Table 5), and the mean harvest for successful hunters (5.2 grouse/successful hunter) was similar to the 10-year average (5.3 grouse/successful hunter; Table 6). The 2020 ruffed grouse hunter success rate was 67%, slightly below the 10-year average (71%; Table 6).

Ring-necked pheasants

Pheasant stamp sales (88,803 stamps) increased nearly 19% from the previous year and was 10% higher than the 10-year average (80,730 stamps; Table 2). The 2020 harvest (190,185 roosters) was 13% lower than the 10-year average (217,317 roosters; Table 2), and the number of pheasant hunters (52,503) was 17% below the 10-year average (63,592 hunters; Table 4). The estimated harvest per active hunter was 3.6 pheasants/hunter which was comparable to the 10-year average (3.4 pheasants/hunter; Table 5). Mean harvest per successful hunter (5.3 roosters) and hunter success (69%) in 2020 were also similar to the 10-year averages (5.1 roosters, 67% success; Table 6).

ACKNOWLEDGMENTS

This project was funded in part by the Federal Aid in Wildlife Restoration Program. John Giudice analyzed the data and Tim Lyons provided comments on a previous draft of this report.

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 2020-2021 small game hunting season (**March 2020 - February 2021**). We need information to estimate the season's harvest and to help set future small game seasons. Answer only for your Minnesota 2020 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

Michelle Carstensen, Acting Wildlife Research Program Manager
Division of Fish and Wildlife
Department of Natural Resources

2020 Small Game Hunter Report

1. Did you hunt small game, listed below, in Minnesota this year (March 2020 - Feb 2021)? ☐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	______	______	______
Pheasant	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. Sample of Small Game Hunter survey card.

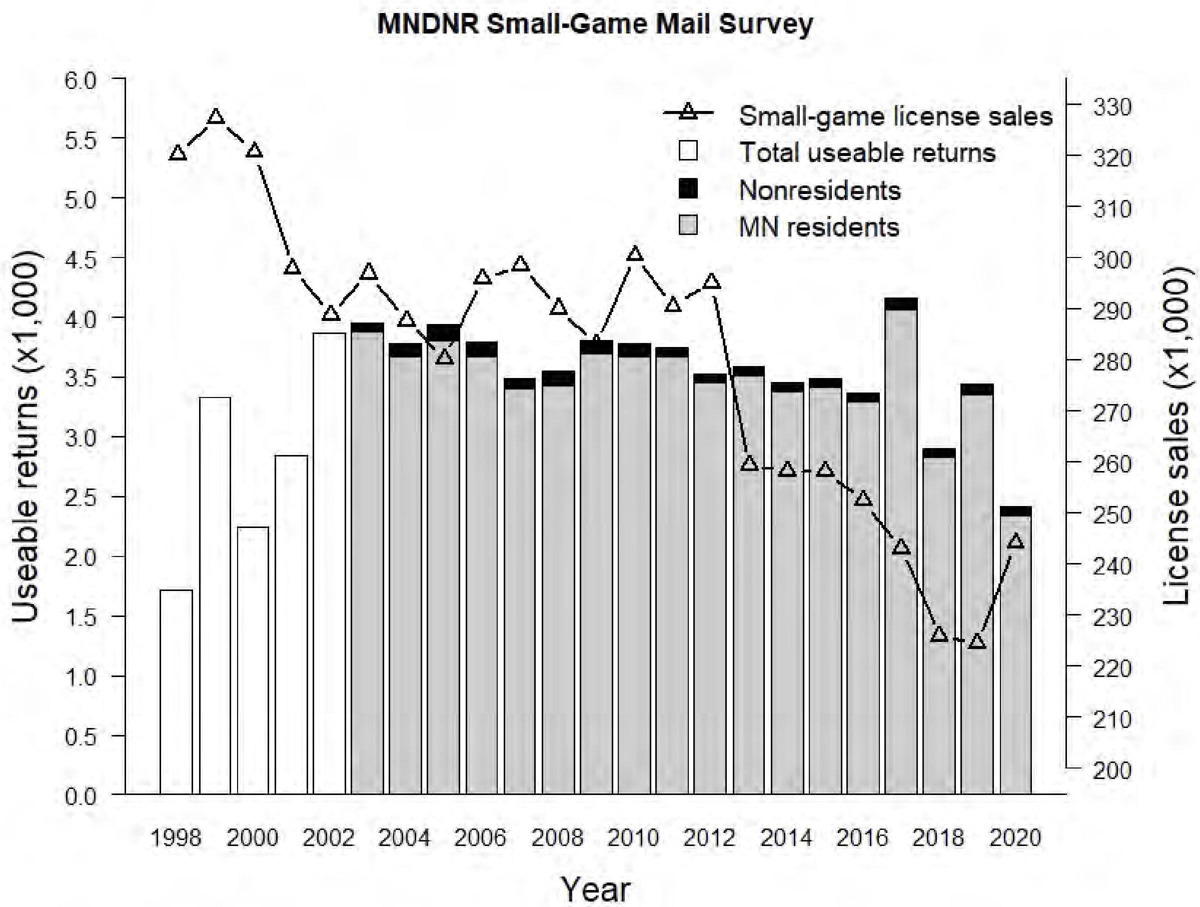

Figure 2. Number of Minnesota small game licenses sold and usable returned surveys, 1998-2020. Includes resident and non-resident licenses, and excludes duplicate and free licenses.

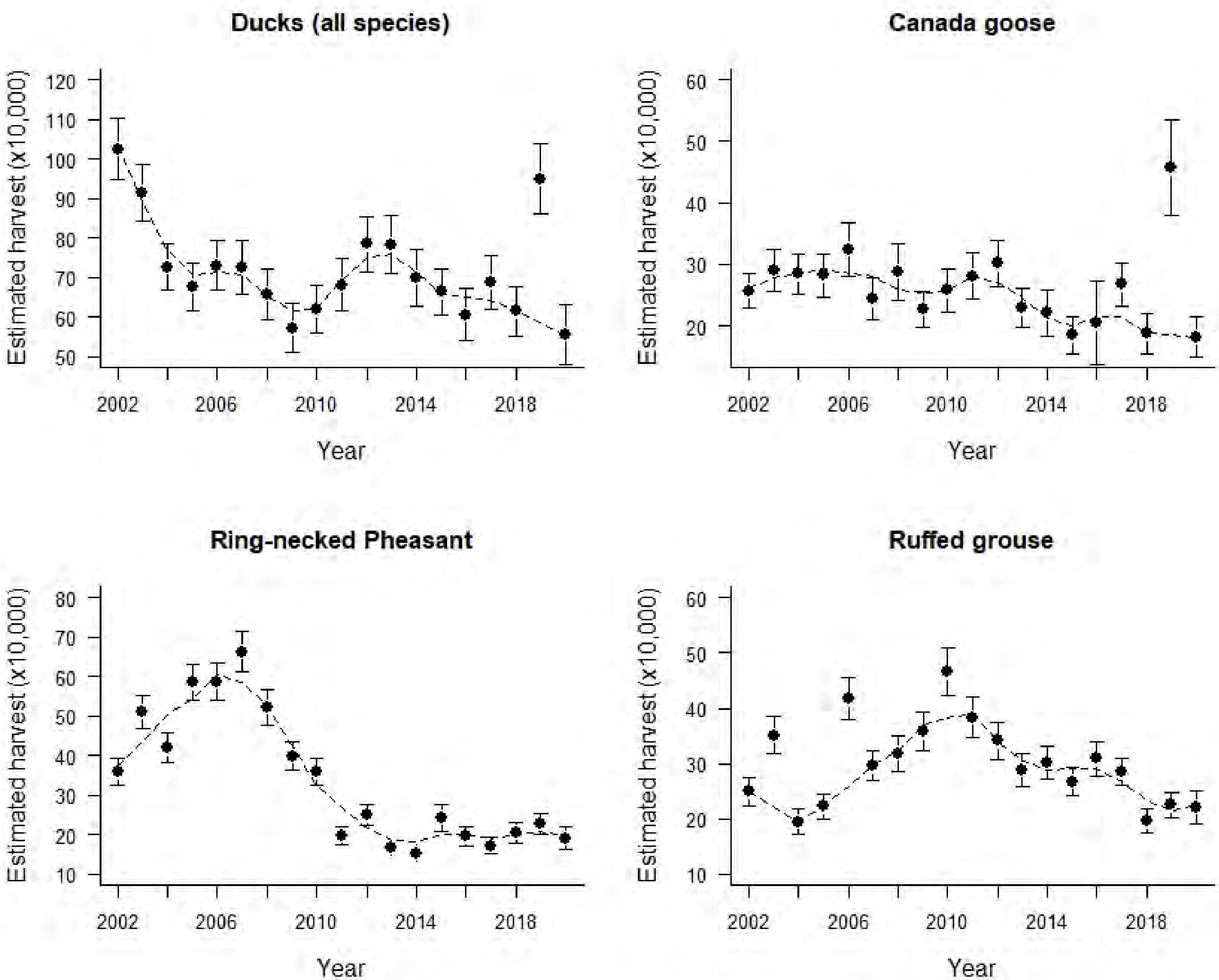

Figure 3. Harvest trends for top four small game species harvested in Minnesota, 2002-2020.

Table 1. Percent of respondents who hunted small game, 2010-11 through 2020-2021[a].

Year	Status	Returns from mail survey	Projections from license sales
2010-11	Hunted Did not hunt	2,824 (75%) 953 (25%) 3,777 (100.0%)	210,129 70,911 281,040
2011-12	Hunted Did not hunt	2,761 (74%) 987 (26%) 3,748 (100.0%)	214,137 76,549 290,686
2012-13	Hunted Did not hunt	2,669 (76%) 851 (24%) 3,520 (100%)	223,808 71,360 295,168
2013-14	Hunted Did not hunt	2,586 (72%) 1,003 (28%) 3,589 (100%)	186,317 72,264 258,581
2014-15	Hunted Did not hunt	2,476 (72%) 975 (28%) 3,451 (100%)	185,186 72,923 258,109
2015-16	Hunted Did not hunt	2,505 (72%) 980 (28%) 3,485 (100%)	185,604 72,612 258,216
2016-17	Hunted Did not hunt	2,426 (72%) 945 (28%) 3,371 (100%)	181,614 70,744 252,358
2017-18	Hunted Did not hunt	2,768 (66%) 1,395 (34%) 4,163 (100%)	161,658 81,472 243,130
2018-19	Hunted Did not hunt	2,000 (69%) 904 (31%) 2,904 (100%)	155,601 70,331 225,932
2019-20	Hunted Did not hunt	2,524 (73%) 911 (27%) 3,435 (100%)	164,896 59,517 224,413
2020-21	Hunted Did not hunt	1,487 (62%) 926 (38%) 2,413 (100%)	150,425 93,675 244,100

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

Table 2[a]. Statewide (resident and non-resident) small game hunting license sales and estimated hunter harvest, 2010-11 through 2020-21.

	2010-11	2011-12[b]	2012-13[b]	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Small game license sales[c]	282,227	271,768	264,063	258,581	258,109	258,208	252,358	243,130	225,932	224,413	244,100
State duck stamp sales	88,069	89,681	90,052	93,412	94,265	92,176	88,905	86,258	82,955	86,568	95,116
Pheasant stamp sales	104,286	86,868	90,541	77,597	74,295	77,750	76,920	71,925	72,192	74,921	88,803
Estimated harvest[d]											
Ducks	619,600	681,550	784,360	782,810	699,620	663,811	606,458	688,225	614,780	949,928	555,985
Canada geese	257,530	281,630	301,550	229,120	221,620	185,012	204,825	267,192	187,578	457,192	182,194
Other geese	3,940	4,800	8,820	7,130	6,510	4,448	7,188	8,062	1,557	11,566	2,024
American coot	26,340	10,520	16,720	15,130	17,050	15,861	21,564	19,976	10,663	15,680	7,792
Common snipe	1,940	1,390	1,420	2,310	520	223	1,948	1,928	1,401	1,764	1,620
Rails / gallinules	80	390	80	70	80	1,039	n.a.[e]	1,697	n.a.[f]	n.a.[g]	507
Crow	57,300	81,500	90,260	67,440	56,020	57,576	48,590	110,034	34,940	27,377	21,248
American woodcock	29,770	24,980	30,360	31,920	25,810	37,270	46,867	38,546	30,500	27,116	33,182
Mourning dove	100,230	74,000	92,760	80,480	103,370	96,552	58,618	88,021	54,623	89,834	41,883
Ring-necked pheasant	359,400	198,500	250,140	169,100	152,800	243,176	196,141	171,883	205,395	226,639	190,185
Ruffed grouse	465,580	383,150	341,320	288,410	301,190	267,997	308,955	285,180	195,515	225,200	221,746
Spruce grouse	14,960	18,640	11,980	13,110	14,590	9,856	15,348	12,032	7,081	7,319	14,467
Sharp-tailed grouse	16,820	11,600	10,650	7,130	8,530	7,929	8,610	11,097	5,681	6,273	15,883
Gray partridge	9,150	3,950	5,160	2,380	3,590	3,187	3,745	4,557	3,893	3,399	1,822
Gray squirrel	138,920	115,840	126,110	84,010	91,250	96,400	95,374	105,712	71,888	101,069	87,002
Fox squirrel	61,690	48,100	49,750	33,940	40,840	46,383	39,603	41,994	28,398	35,672	18,413
Eastern cottontail	53,870	34,640	64,140	40,710	38,820	41,716	49,187	47,135	32,057	33,647	27,923
White-tailed jack rabbit	7,220	5,180	1,910	1,870	1,050	742	1,124	585	623	393	4,657
Snowshoe hare	6,770	8,430	16,800	6,200	7,860	6,374	5,990	10,864	3,191	3,855	5,060
Raccoon	77,690	44,080	48,340	46,690	52,800	38,387	22,312	68,685	29,332	33,908	38,140
Red fox	8,780	7,120	7,990	5,190	3,220	3,780	2,247	9,229	1,868	5,358	3,947
Gray fox	2,380	1,160	250	430	600	816	225	3,798	78	1,438	304
Coyote	44,050	33,410	51,990	23,630	17,430	35,123	24,481	56,184	22,408	41,095	29,540
Badger	600	230	330	290	80	149	375	760	78	66	203

[a] Harvest estimates in this table, and the number of hunters and mean take per hunter in Table 4, 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 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.
[b] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.
[c] Includes all types of small game licenses. Duplicate and free licenses not included.
[d] Estimates based upon response of hunters to questionnaires.
[e] Only 1 respondent indicated they hunted rails and they reported 0 bagged.
[f] No respondents indicated they hunted rails.
[g] Only 3 respondents indicated they hunted rails and they reported 0 bagged.

Table 3. Mail survey results of non-resident small game hunters, 2010-11 through 2020-21.

Non-resident licenses issued [a]	2010-11 6,695	2011-12 6,312	2012-13 6,456	2013-14 6,031	2014-15 6,056	2015-16 6,755	2016-17 6,701	2017-18 6,854	2018-19 6,718	2019-20 6,887	2020-21 8,375
Questionnaires:											
Number mailed	163	169	166	162	165	169	190	200	200	213	214
Number not delivered	6	11	11	10	12	5	15	19	16	18	5
Number (percent) returned	107 (66)	91 (54)	71 (43)	81 (50)	70 (42)	73 (43)	78 (41)	99 (50)	80 (40)	86 (40)	75 (35)
Estimated non-residents and (percent) of all licensed non-residents hunting:											
Ducks	2,003 (29.9)	2,430 (38.5)	2,360 (36.6)	2,010 (33.3)	2,340 (38.6)	1,850 (27.4)	2,320 (34.6)	2,350 (34.3)	1,680 (25)	3,040 (44.2)	1,230 (14.7)
Canada goose	1,314 (19.6)	1,620 (25.6)	1,360 (21.1)	1,270 (21.0)	1,300 (21.4)	650 (9.6)	770 (11.5)	1,730 (25.3)	1,260 (18.8)	3,120 (45.3)	1,560 (18.7)
Ruffed grouse	2,503 (37.4)	1,460 (23.1)	2,820 (43.7)	2,010 (33.3)	2,600 (42.9)	2,870 (42.5)	3,520 (52.6)	2,280 (33.3)	2,270 (33.8)	1,760 (25.6)	3,800 (45.3)
Ring-necked pheasant	2,003 (29.9)	1,780 (28.2)	1,910 (29.6)	1,420 (23.5)	1,380 (22.9)	1,480 (21.9)	1,550 (23.1)	1,520 (22.2)	2,350 (35)	1,120 (16.3)	890 (10.7)
Raccoon[b,c]	63 (0.9)	0 (0)	0 (0)	80 (1.2)	0 (0)	0 (0)	170 (2.6)	70 (1.0)	0	0	0
Estimated non-resident take:											
Ducks	17,055	13,840	20,380	20,410	13,060	16,863	17,701	15,717	15,792	21,228	5,810
Canada goose	6,334	4,050	2,270	3,650	2,680	1,484	1,462	6,994	2,940	15,060	4,134
Ruffed grouse	12,600	8,980	10,090	4,990	9,090	13,805	11,772	6,994	2,856	4,325	24,793
Ring-necked pheasant	8,076	4,860	6,820	3,430	3,720	6,581	4,040	7,274	6,048	2,645	5,141
Raccoon [b, c]	593	0	0	1,280	0	0	172	770	0	0	0

[a] Excludes duplicate licenses and non-resident shooting preserve licenses.
[b] In 2009, 2011, 2012, 2014, 2015, 2018, 2019 and 2020 no non-residents reported hunting/harvesting raccoons.
[c] In 2013 and 2017 only one non-resident reported hunting/harvesting raccoons. The extrapolated estimate is not reliable.

Table 4. Estimated number of statewide hunters by species, 2010-11 through 2020-21.

	2010-11	2011-12[a]	2012-13[a]	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Ducks	72,770	76,090	80,770	76,950	75,170	76,243	67,301	63,426	61,618	84,801	56,347
Canada goose	53,430	57,220	58,900	51,160	48,240	45,938	40,950	44,678	38,278	65,985	37,430
Other geese	3,650	2,710	3,830	2,810	2,770	2,520	2,321	2,512	1,323	3,071	2,125
American coot	4,610	3,480	3,990	3,820	4,410	3,261	3,519	3,446	3,113	3,332	3,238
Common snipe	1,340	1,160	1,160	1,370	820	667	899	1,285	934	1,176	1,316
Rails / gallinules	220	230	500	140	300	445	75	234	n.a.[b]	196	304
Crow	9,380	10,360	11,480	8,570	7,400	7,410	7,412	11,564	4,669	5,227	3,946
American woodcock	10,790	9,430	13,310	12,030	9,650	12,596	12,877	12,615	10,737	9,866	10,622
Mourning dove	10,640	8,970	9,230	10,380	9,950	8,966	7,636	8,878	6,536	10,780	6,070
Ring-necked pheasant	89,140	72,840	76,950	62,110	57,590	63,350	59,965	45,263	55,861	52,854	52,503
Ruffed grouse	92,490	88,620	91,260	81,130	83,020	79,058	82,348	80,654	67,765	61,608	63,428
Spruce grouse	8,860	10,210	7,400	10,810	10,320	8,225	9,658	8,819	7,314	6,142	8,093
Sharp-tailed grouse	7,140	6,190	6,570	6,700	5,460	5,113	6,214	5,198	4,202	4,443	4,350
Gray partridge	3,720	2,400	3,080	2,450	2,540	2,075	2,097	2,103	1,479	2,614	1,923
Gray squirrel	23,740	23,280	24,710	21,690	21,240	22,303	23,806	20,967	17,972	18,097	16,591
Fox squirrel	15,630	12,060	14,220	12,030	12,790	13,411	13,625	11,798	9,803	10,192	7,284
Eastern cottontail	15,030	12,300	16,390	14,550	13,160	11,633	16,096	14,368	12,449	11,368	10,724
White-tailed jackrabbit	2,230	2,320	1,750	1,220	1,350	890	1,423	643	623	523	1,316
Snowshoe hare	3,800	3,250	4,820	3,750	4,560	4,076	3,369	4,439	2,101	1,960	2,125
Raccoon	8,260	8,040	8,570	7,640	6,880	5,632	5,840	8,936	4,746	5,880	6,677
Red fox	7,220	6,030	5,820	5,910	4,560	4,150	3,594	5,549	3,035	4,247	2732
Gray fox	1,640	1,390	1,580	1,730	1,050	1,186	899	2,103	623	1,176	607
Coyote	19,420	17,940	21,050	17,650	17,580	18,302	15,871	22,193	14,394	16,464	12,443
Badger	600	310	330	500	80	297	375	701	234	66	203

[a] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.
[b] No respondents indicated they hunted rails.

Table 5. Estimated harvest per active hunter by species, 2010-11 through 2020-21.

	2010-11	2011-12[a]	2012-13[a]	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Ducks	8.5	9.0	9.7	10.2	9.3	8.7	9.0	10.9	10.0	11.2	9.9
Canada geese	4.8	4.9	5.1	4.5	4.6	4.0	5.0	6.0	4.9	6.9	4.9
Other geese	1.1	1.8	2.3	2.5	2.4	1.8	3.1	3.2	1.2	3.8	1.0
American coot	5.7	3.0	4.2	4.0	3.9	4.9	6.1	5.8	3.4	4.7	2.4
Common snipe	1.4	1.2	1.2	1.7	0.6	0.3	2.2	1.5	1.5	1.5	1.2
Rails/gallinules	0.3	1.7	0.2	0.5	0.2	2.3	n.a.[b]	7.2	n.a.[c]	n.a.[d]	1.7
Crow	6.1	7.9	7.9	7.9	7.6	7.8	6.6	9.5	7.5	5.2	5.4
American woodcock	2.8	2.6	2.3	2.7	2.7	3.0	3.6	3.1	2.8	2.7	3.1
Mourning dove	9.4	8.2	10.0	7.8	10.4	10.8	7.7	9.9	8.4	8.3	6.9
Ring-necked pheasant	4.0	2.7	3.3	2.7	2.7	3.8	3.3	3.8	3.7	4.3	3.6
Ruffed grouse	5.0	4.3	3.7	3.6	3.6	3.4	3.8	3.5	2.9	3.7	3.5
Spruce grouse	1.7	1.8	1.6	1.2	1.4	1.2	1.6	1.4	1.0	1.2	1.8
Sharp-tailed grouse	2.4	1.9	1.6	1.1	1.6	1.6	1.4	2.1	1.4	1.4	3.7
Gray partridge	2.5	1.6	1.7	1.0	1.4	1.5	1.8	2.2	2.6	1.3	0.9
Gray squirrel	5.9	5.0	5.1	3.9	4.3	4.3	4.0	5.0	4.0	5.6	5.2
Fox squirrel	3.9	4.0	3.5	2.8	3.2	3.5	2.9	3.6	2.9	3.5	2.5
Eastern cottontail	3.6	2.8	3.9	2.8	2.9	3.6	3.1	3.3	2.6	3.0	2.6
White-tailed jackrabbit	3.2	2.2	1.1	1.5	0.8	0.8	0.8	0.9	1.0	0.8	3.5
Snowshoe hare	1.8	2.6	3.5	1.7	1.7	1.6	1.8	2.4	1.5	2.0	2.4
Raccoon	9.4	5.5	5.6	6.1	7.7	6.8	3.8	7.7	6.2	5.8	5.7
Red fox	1.2	1.2	1.4	0.9	0.7	0.9	0.6	1.7	0.6	1.3	1.4
Gray fox	1.5	0.8	0.2	0.2	0.6	0.7	0.2	1.8	0.1	1.2	0.5
Coyote	2.3	1.9	2.5	1.3	1.0	1.9	1.5	2.5	1.6	2.5	2.4
Badger	1.0	0.8	1.0	0.6	1.0	0.5	1.0	1.1	0.3	1.0	1.0

[a] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.
[b] Only 1 respondent indicated they hunted rails and they reported 0 bagged.
[c] No respondents indicated they hunted rails.
[d] Only 3 respondents indicated they hunted rails and they reported 0 bagged.

Table 6. Mean harvest for successful hunters and hunter success rates (%), 2010-11 through 2020-21.

	2010-11	2011-12 [a]	2012-13 [a]	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Ducks	10.3 (83)	10.5 (85)	11.1 (87)	11.7 (87)	11.0 (85)	10.6 (82)	10.9 (83)	12.5 (87)	11.3 (89)	13.1 (85)	12.1 (82)
Canada geese	6.1 (80)	6.3 (78)	6.5 (78)	5.8 (77)	6.6 (69)	5.7 (71)	7.1 (70)	7.4 (81)	6.3 (77)	8.5 (81)	6.5 (74)
Other geese	2.6 (41)	3.4 (51)	4.4 (52)	5.5 (46)	4.3 (54)	4.0 (44)	8.0 (39)	8.6 (37)	3.3 (35)	8.0 (47)	2.9 (33)
American coot	7.2 (79)	4.4 (69)	5.2 (81)	5.2 (75)	5.0 (78)	6.7 (73)	7.6 (81)	8.1 (71)	5.3 (65)	7.5 (63)	3.5 (69)
Common snipe	2.2 (67)	1.6 (73)	2.1 (57)	2.1 (79)	1.4 (45)	1.0 (33)	3.2 (67)	2.5 (59)	2.6 (58)	1.9 (78)	2.3 (54)
Rails / gallinules	1.0 (33)	5.0 (33)	1.0 (17)	1.0 (50)	1.0 (25)	3.5 (67)	n.a.[b]	14.5 (50)	n.a.[c]	n.a.[d]	2.5 (67)
Crow	6.7 (91)	8.9 (88)	8.8 (90)	9.4 (84)	8.7 (87)	8.3 (94)	7.6 (86)	11.0 (86)	9.4 (80)	6.1 (86)	6.6 (82)
American woodcock	3.6 (76)	3.8 (70)	3.4 (68)	3.8 (70)	4.2 (64)	4.4 (67)	5.4 (67)	4.5 (69)	4.4 (65)	3.8 (72)	4.4 (70)
Mourning dove	11.1 (85)	10.5 (78)	12.5 (80)	9.2 (85)	12.5 (83)	13.3 (81)	10.3 (75)	11.6 (86)	10.2 (82)	10.3 (81)	8.4 (82)
Ring-necked pheasant	5.6 (72)	4.4 (63)	4.9 (67)	4.2 (64)	4.3 (61)	5.4 (71)	5.0 (65)	5.5 (69)	5.4 (68)	6.0 (71)	5.3 (69)
Ruffed grouse	6.6 (76)	5.9 (74)	5.2 (71)	5.2 (68)	5.1 (71)	4.9 (69)	5.3 (70)	4.8 (73)	4.3 (67)	5.2 (71)	5.2 (67)
Spruce grouse	2.4 (71)	3.0 (61)	2.8 (57)	2.4 (51)	2.5 (56)	2.4 (50)	2.7 (58)	2.4 (57)	1.9 (50)	2.3 (51)	3.2 (56)
Sharp-tailed grouse	3.5 (68)	3.1 (61)	3.4 (48)	3.2 (33)	3.8 (41)	3.1 (51)	2.9 (47)	4.0 (53)	3.0 (44)	2.5 (56)	7.8 (47)
Gray partridge	4.2 (58)	3.2 (52)	3.1 (54)	2.5 (38)	4.4 (32)	2.7 (57)	3.3 (54)	4.3 (50)	4.5 (58)	3.7 (35)	3.0 (32)
Gray squirrel	7.0 (84)	6.3 (78)	6.3 (80)	5.0 (77)	5.5 (78)	5.3 (81)	5.1 (79)	5.7 (89)	4.8 (83)	6.2 (90)	6.3 (83)
Fox squirrel	4.6 (86)	5.4 (74)	4.4 (80)	3.7 (75)	4.3 (75)	4.9 (71)	3.8 (76)	4.3 (83)	3.6 (81)	4.4 (80)	3.3 (76)
Eastern cottontail	4.4 (81)	4.1 (69)	5.5 (71)	3.5 (79)	4.1 (73)	5.0 (72)	4.0 (77)	4.0 (83)	3.6 (71)	3.6 (83)	3.4 (76)
White-tailed jackrabbit	4.6 (70)	3.5 (63)	2.3 (48)	5.2 (29)	1.8 (44)	2.0 (42)	1.9 (42)	1.7 (55)	1.6 (62)	1.5 (50)	6.6 (54)
Snowshoe hare	2.6 (69)	3.8 (69)	5.0 (69)	2.9 (58)	3.0 (57)	3.0 (53)	3.2 (56)	3.9 (63)	2.7 (56)	2.8 (70)	3.3 (71)
Raccoon	10.0 (94)	6.1 (89)	6.1 (93)	6.9 (89)	8.5 (90)	7.7 (88)	4.1 (92)	8.2 (93)	7.4 (84)	6.2 (93)	6.0 (95)
Red fox	2.3 (54)	2.4 (49)	2.7 (50)	2.0 (44)	1.7 (41)	1.6 (57)	1.4 (44)	2.6 (63)	1.2 (51)	2.2 (58)	2.2 (67)
Gray fox	4.0 (36)	2.5 (33)	1.0 (16)	1.5 (17)	2.0 (29)	1.4 (50)	1.0 (25)	2.8 (64)	1.0 (12)	3.1 (39)	1.0 (50)
Coyote	4.0 (57)	4.0 (47)	5.1 (49)	2.7 (50)	2.4 (41)	3.4 (57)	3.1 (49)	4.3 (59)	2.9 (53)	4.3 (58)	4.4 (54)
Badger	1.0 (100)	1.5 (50)	1.0 (100)	1.0 (57)	1.0 (100)	1.0 (50)	1.2 (80)	1.6 (67)	1.0 (33)	1.0 (100)	1.0 (100)

[a] Estimates from these years were recomputed without license type 99- free youth license to be consistent with other years of data.
[b] Only 1 respondent indicated they hunted rails and they reported 0 bagged.
[c] No respondents indicated they hunted rails.
[d] Only 3 respondents indicated they hunted rails and they reported 0 bagged.

The following information has been excerpted from: U.S. Fish and Wildlife Service. Migratory bird hunting activity and harvest during the 2019 - 2020 and 2020-21 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, U.S.A. The entire report is available on-line at

Migratory Bird Hunting Activity and Harvest during the 2019–20 and 2020–21 Hunting Seasons (fws.gov)

Table 1. Species composition of the Minnesota waterfowl harvest, 2019 and 2020. (from: Raftovich, R.V., S.C. Chandler, and C.M. Cain. 2021. Migratory bird hunting activity and harvest during the 2019-20 and 2020-21 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA August, 2021. 75 pp).

	Minnesota Harvest					Mississippi Flyway Harvest		
Species	2019	% of Harvest	2020	% of Harvest	Percent change in Harvest 19-20	2019	2020	Percent change Harvest 19-20
Mallard	98,723	22.18	107,860	20.37	9	1,454,937	1,211,677	-20
Domestic mallard	0		0			839	2,162	61
American black duck	636	0.14	0	0.00	-100	20,357	16,746	-22
Black x mallard	0		0	0.00		982	471	-108
Gadwall	29,447	6.62	21,787	4.11	-26	537,060	549,477	2
American wigeon	11,652	2.62	12,911	2.44	11	69,814	72,343	3
Green-winged teal	22,668	5.09	42,498	8.02	87	435,290	475,539	8
Blue-winged /cinnamon teal	64,191	14.42	92,528	17.47	44	383,088	547,820	30
Northern shoveler	6,356	1.43	8,876	1.68	40	141,962	169,584	16
Northern pintail	5,084	1.14	11,297	2.13	122	74,589	100,111	25
Wood duck	80,716	18.13	101,136	19.10	25	488,166	610,197	20
Redhead	11,016	2.47	14,525	2.74	32	52,298	70,649	26
Canvasback	4,661	1.05	4,842	0.91	4	29,990	32,132	7
Greater scaup	1,271	0.29	1,076	0.20	-15	23,101	19,366	-19
Lesser scaup	6,356	1.43	8,607	1.63	35	75,001	102,147	27
Ring-necked duck	66,945	15.04	62,941	11.88	-6	174,603	161,580	-8
Goldeneye	5,508	1.24	7,800	1.47	42	27,855	27,892	0
Bufflehead	16,313	3.67	16,373	2.34	-24	83,493	119,634	30
Ruddy duck	847	0.19	1,345	0.25	59	15,506	9,392	-65
Scoters	0	0.00	269	0.05		3,125	6,746	54
Hooded merganser	11,228	2.52	15,601	2.95	39	46,569	50,080	7
Other mergansers	1,483	0.33	1,345	0.25	-9	7,916	9,599	18
Total Duck Harvest [a] (retrieved kill)	445,100 ±15%		529,600 ±14%		19	4,172,100 ±9%	4,408,800 ±5%	5

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

Table 2. Top 10 states in number of **adult duck hunters**, 2020, and number of hunter-days and retrieved duck kill (from: Raftovich, R.V., S.C. Chandler, and C.M. Cain. 2021. Migratory bird hunting activity and harvest during the 2019-20 and 2020-21 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA August, 2021. 75 pp).

State	Number of active duck hunters	Duck hunter days afield	Total duck harvest	Seasonal duck harvest per hunter
Texas	80,300 ± 20%	408,600 ± 20%	1,193,900± 26%	14.9 ± 33%
Arkansas	56,300 ± 8%	450,700 ± 11%	889,000 ± 10%	15.8 ± 13%
Minnesota	55,500 ± 12%	331,900 ± 15%	529,600 ± 14%	9.6 ± 18%
Wisconsin	54,800 ± 13%	374,100 ± 16%	495,600 ± 14%	9.0 ± 19%
California	48,900 ± 10%	419,100 ± 10%	1,090,400 ± 12%	22.3 ± 16%
Louisiana	38,200 ± 10%	286,900 ± 13%	752,200 ± 15%	19.7 ± 18%
North Dakota	31,200 ± 9%	153,800 ± 10%	446,600 ± 11%	14.3 ± 14%
North Carolina	29,500 ± 16%	184,100 ± 19%	323,400 ± 20%	11.0 ± 23%
Washington	28,200 ± 5%	203,500 ± 10%	439,300 ± 11%	15.5 ±12%
Michigan	28,200 ± 12%	182,000 ± 14%	252,800 ± 13%	9.0 ± 18%
Mississippi Flyway		2,717,500 ± 5%	4,408,800 ± 5%	
United States		5,841,200 ± 3%	11,139,100 ± 4%	

Table 3. Top 10 states in number of **adult goose hunters**, 2020, and number of hunter-days and retrieved goose kill. (from: Raftovich, R.V., S.C. Chandler, and C.M. Cain. 2021. Migratory bird hunting activity and harvest during the 2019-20 and 2020-21 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland. USA August, 2021. 75 pp).

State	Number of active goose hunters	Goose hunter days afield	Total goose harvest	Seasonal goose harvest per hunter
Minnesota	42,300 ± 13%	213,100 ± 16%	145,800 ± 19%	3.4 ± 23%
Wisconsin	37,900 ± 11%	262,500 ± 15%	164,400 ± 18%	4.3 ± 21%
California [b]	37,600 ± 9%	294,100 ± 12%	290,500 ± 13%	7.7 ± 16%
Texas	35,800 ± 21%	104,200 ± 28%	157,400 ± 34%	4.4 ± 40%
Michigan	26,700 ± 13%	172,700 ± 15%	171,000 ± 20%	6.4 ± 23%
North Dakota	24,700 ± 8%	113,200 ± 11%	142,500 ± 14%	5.8 ± 16%
Arkansas	21,400 ± 11%	123,800 ± 17%	132,100 ± 43%	6.2 ± 44%
Illinois	20,600 ± 19%	169,000 ± 39%	108,700 ± 26%	5.3 ± 35%
Pennsylvania	18,700 ± 19%	82,000 ± 21%	70,400 ± 36%	3.8 ± 41%
North Carolina [b]	17,400 ± 22%	81,900 ± 36%	31,300 ± 31%	1.7 ± 38%
Mississippi Flyway		1,531,000 ± 7%	1,058,700 ± 9%	
United States [b]		3,412,800 ± 4%	2,879,800 ± 5%	

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

2021 LIGHT GOOSE CONSERVATION ORDER HARVEST IN MINNESOTA

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INTRODUCTION

This report documents results of the 2021 Light Goose Conservation Order hunter mail questionnaire survey.

METHODS

Minnesota held a light goose Conservation Order harvest from 15 February - 30 April 2021. Participants were required to obtain a $2.50 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 (except for youth <18 years old) were sent a questionnaire after the season. Survey questions are listed in Figure 1.

RESULTS AND DISCUSSION

A total of 873 permits were issued and 326 responses (38%) to the questionnaire were obtained (Table 1, Figure 2). In calculating harvest estimates, we assume that the 534 non-respondents participated in the conservation action and took light geese in the same manner as respondents. An estimated 375 hunters attempted to take light geese during the conservation order period. Active participants pursued light geese for 1,481 days and 1,455 light geese were shot and retrieved. This was an average retrieved take of 4 geese per active participant. An estimated 150 light geese were wounded and not retrieved.

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0480

MINNESOTA 2021 LIGHT GOOSE HARVEST SURVEY

For the Period of February 15- April 30, 2021 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 February 15 - April 30, 2021. 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 2021 hunting experience.** THANK YOU! The Wildlife Research Program, Division of Fish and Wildlife, MN DNR.

1. Did you hunt light geese in Minnesota during February 15 - April 30, 2021? 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 February 15 - April 30, 2021? __________
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? __________

Figure 1. Light Goose Conservation Order hunter mail questionnaire, 2021.

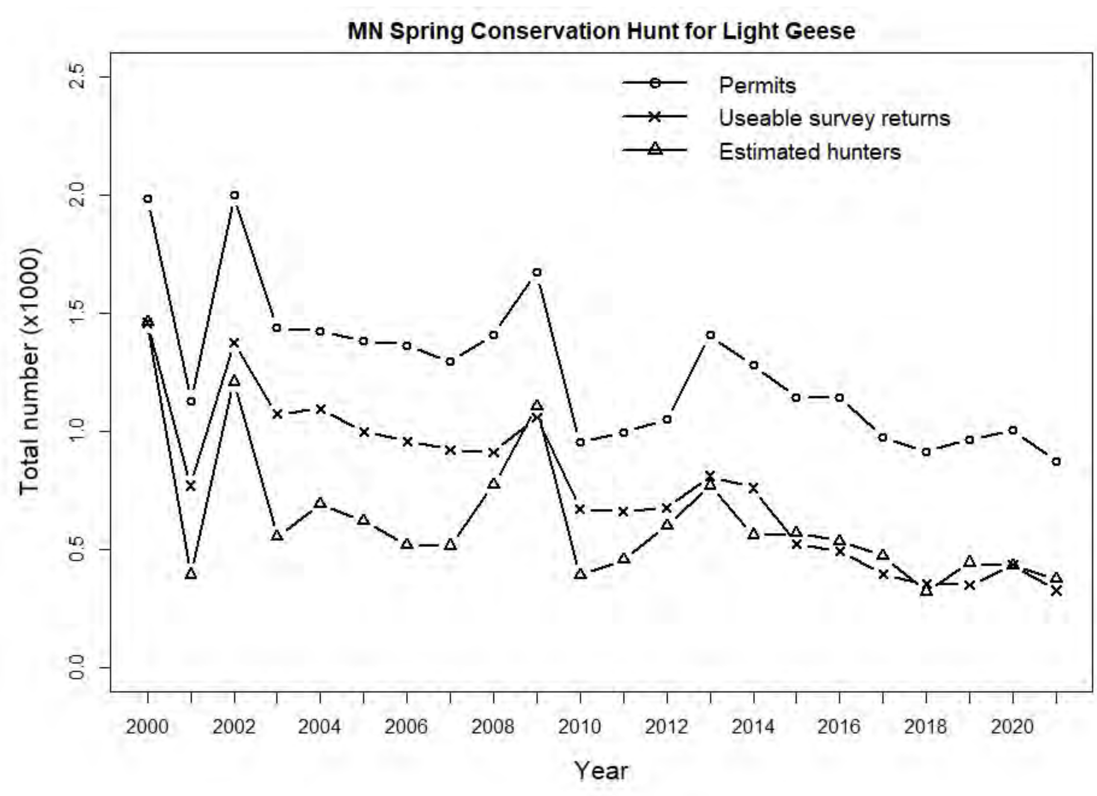


Figure 2. Light goose permits issued, survey response, and estimated hunters in Minnesota, 2000-2021.

Table 1. Summary of Light Goose Conservation Order harvest in Minnesota, 2009 – 2021.

	Year												
Statistic	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total permits sold	1,670	952	994	1,048	1,405	1,278	1,141	1,143	974	912	965	1,002	873
Useable returns	1,057	671	659	675	810	759	520	491	393	353	348	434	326
Response rate (%)	63.0	72.3	67.1	65.3	58.3	60.0	46	43	41	43	41	44	38
Active hunters (%)	66.0	40.8	45.7	56.9	54.9	44.0	50	47	48	35	46	43	43
Estimated total hunters	1,103	389	455	600	770	560	569	534	471	321	444	430	375
Estimated hunter days	4,647	1,475	1,830	2,270	3,070	2,580	2,434	2,605	1,966	1,204	1,537	1,529	1,481
Mean days/hunter	4.2	3.8	4.0	3.8	4.0	4.6	4	5	4	3.8	4	4	4
Estimated harvest (shot & retrieved)	4,366	559	1,554	2,620	2,430	2,880	3,266	2,121	1,713	1,021	1612	785	1,455
Mean harvest/hunter	4.0	1.4	3.4	4.4	3.2	5.1	6	4	4	3.2	4	2	4
Estimated crippling losses	640	70	145	210	370	210	349	215	298	78	206	54	150
Percent using unplugged guns	46.8	44.9	44.2	43.0	49.4	48.8	NA	NA	NA	NA	NA	NA	
Est. number hunters using unplugged guns	516	175	201	260	380	270	NA	NA	NA	NA	NA	NA	
Est. number geese **shot** with unplugged guns	2,413	348	742	1,510	1,670	2,060	NA	NA	NA	NA	NA	NA	
Est. harvest with shell 4-5-6	822	131	311	460	620	770	NA	NA	NA	NA	NA	NA	
Percent using electronic calls	23.5	25.9	21.3	22.2	24.5	27.8	NA	NA	NA	NA	NA	NA	
Est. number hunters using e-calls	260	101	97	130	190	160	NA	NA	NA	NA	NA	NA	
Est. harvest while using e-calls	1,171	192	531	460	620	1,710	NA	NA	NA	NA	NA	NA	
Percent hunting 1/2-hr after sunset	43.1	39.7	39.7	42.4	33.4	36.2	NA	NA	NA	NA	NA	NA	
Est. number hunting after 1/2-hr sunset	475	154	180	250	260	200	NA	NA	NA	NA	NA	NA	
Est. harvest 1/2-hr after sunset	713	87	238	240	260	550	NA	NA	NA	NA	NA	NA	

MINNESOTA'S WILD TURKEY HARVEST – FALL 2020, SPRING 2021

Tim Lyons, Farmland Wildlife Populations and Research Group

SUMMARY OF SEASON STRUCTURE

The fall 2020 turkey season opened on October 3, 2020 and closed November 1, 2020. Though an unlimited number of permits were available, regulations limited hunters to the harvest of a single turkey (any sex). Beginning in 2020, hunters were required to declare a permit area (TPA; Figure 1) at the time of purchase, but were able to harvest a bird anywhere throughout the state.

The spring 2020 hunting season was open April 14 through May 31, 2021. The season was comprised of 6 week-long time periods (A-F). General license hunters declared a TPA and were limited to a single time period during the first 5 weeks but unsuccessful hunters were able to hunt during the final (F) time period. Archery-only and youth licenses were valid during all time periods. All hunters were limited to a single bearded turkey (any sex). An unlimited number of general permits were available throughout all time periods, except for 3 TPA's (502, 511, 512) that maintained a lottery during the A-C time periods. All hunters had to declare a TPA at the time of purchase, but could harvest a bird within any TPA.

FALL 2020 SEASON

Permits Issued

The number of fall turkey hunters in 2020 (8,408) increased approximately 45% compared to 2019 (6,719; Table 1). The number of fall turkey hunters in 2020 exceeded the 10-year average (7,634; +10%). The proportion of youth licenses remained steady when compared to fall 2019 (23%).

Harvest

The fall 2020 turkey harvest (1,136; +33%) increased compared to 2019 while hunter success (13.5%) remained steady compared to the previous season (Table 1). Permit areas 501, 503, 507, 508, and 510 comprised 73% of the total fall harvest with total permit sales and harvest being greatest in areas 507 and 508 (Table 2). The fall 2020 total harvest and hunter success were only slightly below 10-year averages (1,150 and 15%; respectively).

Hunter participation increased substantially in fall 2020, potentially related to ongoing precautions associated with the COVID-19 pandemic. The proportional increase in general license holders from fall 2019 to fall 2020 was similar to the increase seen when comparing the number of spring turkey hunters in 2019 and 2020, when a "stay-at-home" Emergency Executive Order (Minnesota EO 20-20) was in place. Long term, the number of permits has fallen since the quota system was ended in 2012, but remains above the number issued following the permit area and quota increase enacted for the fall 2008 season (Figure 2). The total fall harvest has increased since the first fall season in 1990, but has fallen since its peak in 2012 (Figure 2).

SPRING 2021 SEASON

Permits Issued

The number of permits issued across all license types decreased in 2021 from 63,194 hunters in 2020 to 58,084 in 2021 (Tables 3 and 4). The number of general permits issued fell by nearly 1,700 to 32,520 in 2021 and was similar to the 10-year average (32,324; Table 4). Although the overall number of hunters declined from 2020, permit sales among youth and archery hunters remained near all time-highs (Table 4) with a similar total number of permits issued for youth and archery in 2021 (12,598 and 12,966, respectively; Table 3). The total number of permits issued in 2021 is second only to the record number of sales in 2020 (Figure 3). All hunters had to declare a permit area in 2021, but were not restricted to harvesting a bird in the declared area. Across all permit areas, all permits decreased or remained constant in all TPA's except for general permits, which increased in TPA 502 and 509. Permit areas 502, 511, and 512 still instituted a lottery during the A-C time periods (Table 5.)

Harvest

During the 2021 spring turkey season, 12,070 turkeys were harvested. The harvest total declined compared to 2020, but remains the third highest season harvest total for the modern turkey season (since 1978; Table 4, Figure 3). Permit areas 507 and 508 saw the greatest harvest but 501, 503, and 510 all reported near or more than 1,000 birds harvested (Table 5). Harvest success remained relatively constant compared to 2020 declining only 3.3% and 2.3% among youth and archery license holders (respectively), and by less than 1% among general license holders (Table 3).

Harvest during the A period remained nearly constant compared to 2020, and accounted for approximately 41% of the total spring 2021 harvest (Table 6) and was greater than 2019 (33.7%). Collectively, A-C periods account for slightly more than 75% of all spring turkey harvest. The F period had greater proportional harvest (11.2%) than either D or E (7.3 % and 4.7%, respectively) but ran for nearly twice as long as any other time period (Table 6). and F seasons but were offset by declines in both variables during C, D, and E (Table 6).

Table 1. Permits available, number of applicants, permits issued, registered harvest, and hunter success rates for the ten most recent fall wild turkey seasons in Minnesota, 2011-2020.

Year	Permits available	Applicants	Permits issued	Registered harvest	Hunter success (%)[a]
2011	10,430	3,538	5,382	953	17.7
2012[b]	Unlimited	N/A	10,628	1,752	16.5
2013[b]	Unlimited	N/A	8,060	1,137	14.1
2014[b]	Unlimited	N/A	8,236	1,216	14.8
2015[b]	Unlimited	N/A	8,109	1,213	15.0
2016[b]	Unlimited	N/A	8,469	1,176	13.9
2017	Unlimited	N/A	7,650	1,015	13.3
2018	Unlimited	N/A	6,719	834	12.4
2019	Unlimited	N/A	6,481	855	13.2
2020	Unlimited	N/A	8,408	1,136	13.5

[a] Total hunter success (all permits issued divided by registered harvest). Success rates not adjusted for non-participation or un-registered harvest.

[b] Permits issued, registered harvest, and derived hunter success (%) was reviewed and adjusted to address inconsistencies in data query and previous reporting.

Table 2. Permits issued, registered harvest and hunter success rates (non-youth licenses), total registered harvest, and registered harvest by sex during the 2020 fall wild turkey season in Minnesota.

Permit area	General permits issued[a]	Youth permits issued	Toms[a]	Jakes[a]	Hens[a]	Total registered harvest[a]
501	866	248	23	14	62	99
502	94	26	4	1	5	10
503	636	160	26	15	59	100
504	154	48	12	4	4	20
505	317	89	8	8	35	51
506	280	67	16	11	24	51
507	1,583	522	93	57	203	353
508	1,521	415	67	41	157	265
509	287	144	15	11	47	73
510	633	157	30	16	60	106
511	88	15	2	1	2	5
512	48	10	2	0	1	3
TOTAL	**6,507**	**1,901**	**298**	**179**	**659**	**1,136**

[a] Total harvest for all license types.

Table 3. Total permits issued, harvest, and success rate by permit type during the spring 2021 wild turkey season in Minnesota.

	Total permits issued	Harvest	Success (%)[a]
General	32,520	8,400	25.8
Youth	12,598	2,085	16.6
Archery	12,966	1,585	12.2
Total	58,084	12,070	20.8

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

Table 4. Permits issued, registered harvest, and hunter success rates for the ten most recent spring wild turkey hunting seasons in Minnesota, 2012-2021.

Year	General permits issued	Youth permits issued	Archery permits issued	Registered harvest[a]	Success (%)[b]
2012[c]	30,238	8,839	3,441	11,276	27.2
2013[c]	35,202	5,965	4,014	10,321	23.3
2014[c]	35,451	7,374	4,893	11,425	24.4
2015[c]	34,554	7,042	5,046	11,694	25.6
2016[c]	32,535	7,101	10,336	12,277	25.0
2017[c]	31,605	6,984	11,237	11,803	24.1
2018[c]	28,667	6,022	11,399	10,706	23.6
2019	28,295	6,169	11,794	10,699	23.0
2020	34,173	14,292	14,729	13,996	22.1
2021	32,520	12,598	12,966	12,070	20.8

[a] Includes all license types.

[b] Total hunter success (registered harvest divided by all permits issued). Success rates not adjusted for non-participation or un-registered harvest.

[c.] Permits issued, derived issued %, registered harvest, and derived hunter success (%) were reviewed and adjusted to address inconsistencies in data query and previous reporting.

Table 5. Permits issued by license type and registered harvest within each TPA during the 2021 spring wild turkey season in Minnesota[a].

Permit area	Archery permits declared	General permits declared	Youth permits declared	Total registered harvest
501	17,07	6,495	1,850	2,007
502	184	620	148	179
503	1,204	3,419	1,263	1,239
504	461	919	388	325
505	623	1,958	608	707
506	585	1,299	562	470
507	3,653	8,268	3,936	3,534
508	2,363	6034	2,289	2,053
509	448	942	531	475
510	1,496	2,245	860	993
511	147	198	94	54
512	95	123	69	34
Total	**12,966**	**32,520**	**12,598**	**12,070**

[a] Beginning in 2020, all hunters declared but were not restricted to harvesting a turkey in their declared TPA.

Table 6. Permits issued and harvest by license type and time period for the spring 2021 wild turkey season in Minnesota.

Time period	Archery permits issued[a]	Youth permits issued[a]	General permits issued	Registered harvest[b]	Percent of total harvest[b]
Any	12,966	12,598			
A			11,576	4,983	41.3%
B			8,813	2,561	21.2%
C			6,163	1,718	14.2%
D			2,994	887	7.3%
E			1,935	573	4.7%
F			1,039	1,348	11.2%

[a] Archery and youth permits were valid during any time period.

[b] Includes harvest from all license types.

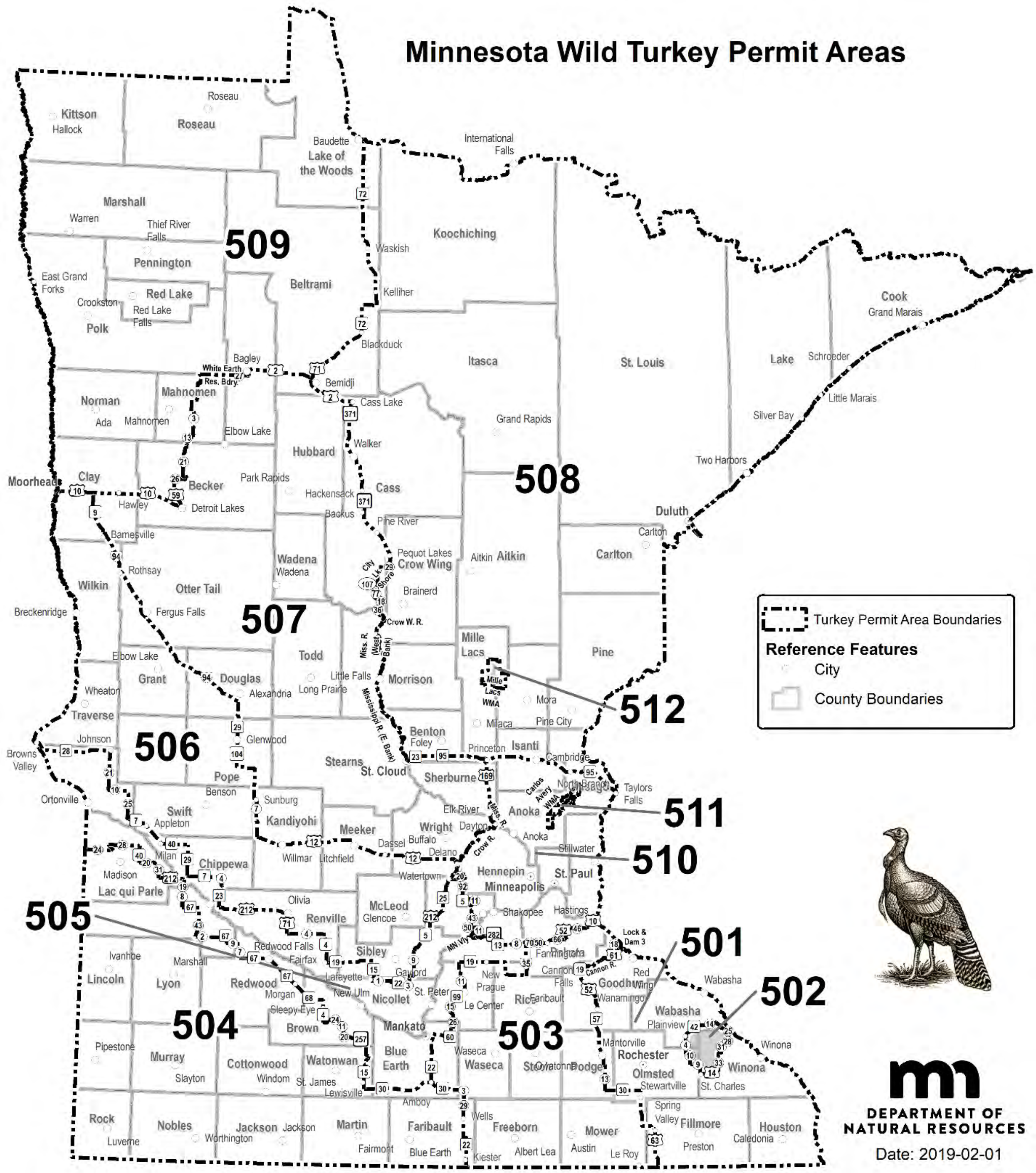


Figure 1. Permit areas open for hunting, fall 2020 and spring 2021 wild turkey seasons in Minnesota.

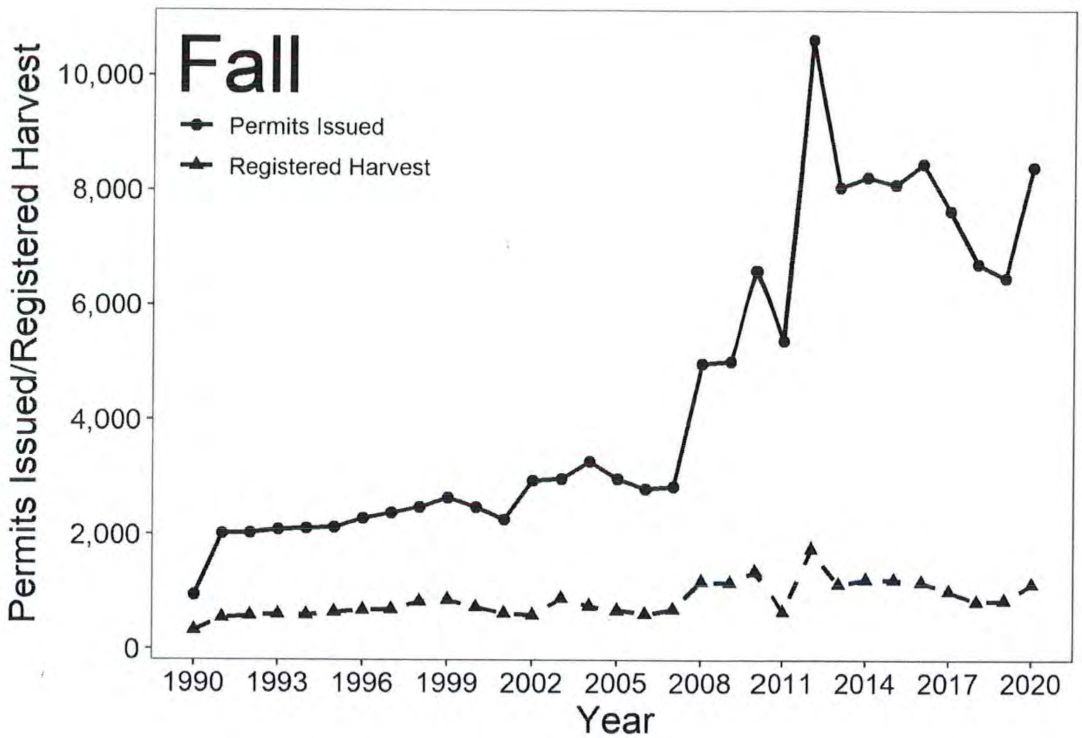


Figure 2. Permits issued and registered harvest for fall wild turkey seasons in Minnesota, 1990-2020.

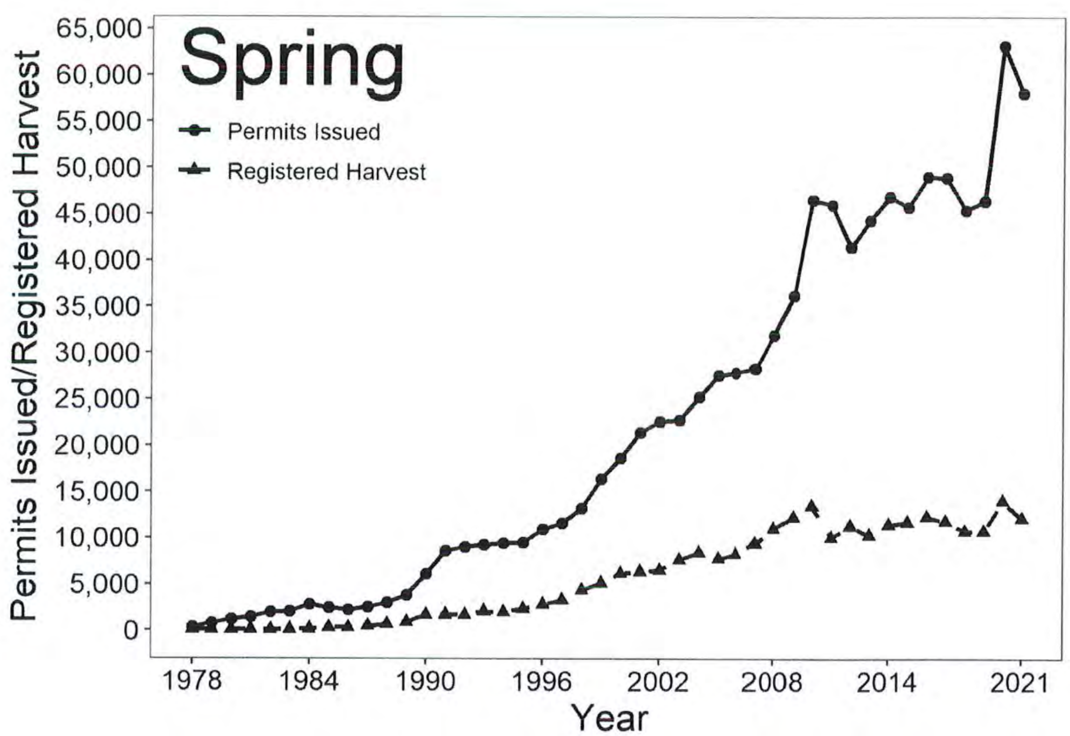


Figure 3. Permits issued and registered harvest for spring wild turkey seasons in Minnesota, 1978-2021.

2020 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. In 2020, 105 hunters were estimated to have gone afield and harvested 112 prairie-chickens and 41 sharp-tailed grouse (*Tympanuchus phasianellus*) during prairie-chicken hunts. Hunter success (0.62) was higher than last year and satisfaction (4.0 on a scale of 1-5) was similar to recent years and consistent with improvement following changes to the permit areas and season (i.e., longer length and earlier dates) in 2013.

INTRODUCTION

Greater Prairie-chicken (*Tympanuchus cupido pinnatus*) hunting in Minnesota 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 (Figures 1 and 2). 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. Responses of surveyed prairie-chicken hunters in 2015 provided additional evidence that the earlier season is preferred by most, although hunter preferences were clearly divided. In 2020, the prairie-chicken season opened 26 September and closed 4 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 up to 20% of the available permits in a permit area. Remaining 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 in the western part of the state (i.e., in 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 2003-2007, so I determined harvest through a postcard survey. I sent a postcard to each lottery winner the week before hunting season. Six 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 or reported hunting were considered in the analysis. I compared responses from the first mailing to responses from the second mailing to examine possible nonresponse bias and adjusted as necessary. I calculated the number of birds harvested, birds per harvester, and hunter success (i.e., proportion of estimated hunters harvesting ≥1 prairie-chicken) for each permit area. Each of these metrics was calculated by permit area and for all areas.

RESULTS & DISCUSSION

The combined quota for the 11 permit areas during 2020 was 125 permits, and 366 individuals applied in the lottery (Table 1). Of the 128 lottery winners, 107—including 1 landowner—later purchased a permit. All permit areas had more applicants than permits available, so surplus permits were not available.

Ninety-seven purchasers (91%, n = 107) responded to the survey; 92 (86%) responded to the first mailing and 5 (5%) to the second mailing. This response rate is similar to survey response rates since 2010 (mean: 87%; range: 83-95%). I detected a response bias in the number of days afield, but not the number of respondents that hunted, the number of prairie-chickens harvested, or the number of sharp-tailed grouse harvested. Respondents to the first mailing reported harvesting prairie-chickens at similar rates as respondents to the second mailing (64% vs. 40%), and reported harvesting a similar number of chickens (1.1 vs. 0.8 birds per hunter) and sharp-tailed grouse (0.4 vs. 0.8 birds per hunter), but hunted fewer days (2.2 vs. 4.0). Respondents to the first mailing were as likely as respondents to the second mailing to have hunted (97% vs. 100% of respondents), and reported similar satisfaction (mean 4.1 vs. 3.2, median 5.0 vs. 3.0), with 92% and 80% of respondents reporting satisfaction scores ≥3, respectively. However, statistical power to detect a difference between mailings was low because only 5 hunters returned surveys in the second mailing, and the magnitude of the differences between responses to the first and second mailing were similar to those in recent years in which a response-bias correction has been used. Therefore, I assumed that non-respondents to the survey had similar success as respondents to the second mailing (i.e., class method of correction). This assumption may not eliminate nonresponse bias if non-respondents were less successful than respondents to the second mailing, but should more closely approximate the actual harvest than assuming similar responses of non-respondents and all respondents.

Ninety-four respondents reported that they hunted prairie-chickens (Table 2). I estimated the total number of hunters to be 105 (i.e., purchasers who went afield) after accounting for hunting by non-respondents. Hunters reported harvesting 102 prairie-chickens and total harvest after accounting for non-respondents was estimated as 112 prairie-chickens. An estimated 64 hunters bagged ≥1 chicken. Prairie-chicken hunter success during 2020 was higher than last year and in recent years of the survey. Survey respondents also reported harvesting 41 sharp-tailed grouse while hunting prairie-chickens from permit areas 803A, 804A, 805A, 806A, 807A, 808A, and 809A (Figure 1). Successful hunters reported higher average satisfaction (4.5) than respondents that were not successful (3.4), but satisfaction of prairie-chicken hunters was high overall.

Prairie-chicken hunter satisfaction was similar to 2013-2019, which is consistent with improved satisfaction following changes to the season framework in 2013 to accomplish this goal (Table 3). Hunter survey responses in the 2013 Wildlife Public Input Survey and through this postcard survey in 2015 indicated that hunter preferences are split, but that the majority of hunters support the current season framework. Both the 2013 and 2015 surveys asked hunters about their preference for a season opening on the last Saturday in September or an opener on the Saturday nearest 20 October. The majority of respondents to the 2013 survey (64% of respondents who expressed an opinion) indicated a preference for the earlier season. Likewise, in the 2015 survey, 56% of respondents indicated a preference for the earlier season. Supporters of the early season indicated that the birds were less wary early in the season and pheasant hunting did not affect the hunt. Reasons provided in support of a later season included cooler weather for hunters and dogs, better plumage on birds, fewer standing crops, opportunity to harvest pheasants while hunting chickens, and no conflict with the waterfowl opener. Although a large minority still indicated a preference for a later season, the current season meets the timing preferences of the majority of responding prairie-chicken hunters.

ACKNOWLEDGMENTS

This survey was funded in part by the Wildlife Restoration (Pittman-Robertson) Program. I would like to thank Laura Gilbert for preparing and mailing the postcards and entering data. I would also like to thank Lindsey Shartell for commenting on the report.

Table 1. Prairie-chicken hunt lottery applicants, winners, and hunting permit purchasers in Minnesota during 2020.

Permit	Permits	No. of	Lottery winners		Permit purchasers[a]		Surplus
area	available	applicants	No.[b]	Proportion	No.	Proportion	purchasers[c]
803A	8	12	8	0.67	5	0.63	0
804A	10	11	10	0.91	10	1.00	0
805A	10	53	10	0.19	10	1.00	0
806A	12	33	13	0.39	9	0.69	0
807A	20	78	21	0.27	16	0.76	0
808A	20	57	21	0.37	17	0.81	0
809A	15	43	15	0.35	14	0.93	0
810A	15	38	15	0.39	12	0.80	0
811A	5	11	5	0.45	4	0.80	0
812A	5	20	5	0.25	5	1.00	0
813A	5	10	5	0.50	5	1.00	0
All	125	366	128	0.35	107	0.84	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 2020, because more people applied for permits in each area than there were permits available.

Table 2. Prairie-chicken harvest in Minnesota during 2020.

Permit area	No. of hunters[a]		Birds harvested		Birds per harvester[b]	Success rate[c]
	Self-reported	Estimated	Self-reported	Estimated		
803A	5	5	3	3	1.5	0.40
804A	6	10	3	6	1.7	0.30
805A	10	10	13	13	1.9	0.70
806A	9	9	9	9	1.8	0.56
807A	13	15	19	21	1.9	0.73
808A	16	17	21	22	1.6	0.82
809A	13	14	13	14	1.5	0.71
810A	10	11	4	5	2.0	0.18
811A	4	4	6	6	1.5	1.00
812A	3	5	4	6	2.0	0.60
813A	5	5	7	7	1.8	0.80
All	94	105[d]	102	112[d]	1.7[d]	0.62[d]

[a] Permit purchasers who hunted.

[b] Estimated number of birds harvested per successful hunter, assuming non-respondents had success similar to that of respondents to the second mailing.

[c] Proportion of estimated hunters harvesting ≥1 prairie-chicken.

[d] Assumed that non-respondents were represented by respondents in the second mailing.

Table 3. Summary of prairie-chicken hunting in Minnesota during 2003–2020.

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
2015	126	271	112	103	0.55	3.6
2016	126	304	111	102	0.58	3.8
2017	125	317	97	86[f]	0.55[f]	4.0[f]
2018	125	303	104	82[f]	0.51[f]	3.9[f]
2019	125	354	100	64[f]	0.37[f]	3.8[f]
2020	125	366	105	112[f]	0.62[f]	4.0[f]

[a] Estimated number who went hunting, not permit purchasers.

[b] Proportion of hunters harvesting ≥1 prairie-chicken.

[c] Mean on a scale of 1–5.

[d] A hunter survey was not conducted during 2007; results are from the Electronic Licensing System, which documented 150 permit purchasers.

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

[f] Assumed that non-respondents were represented by respondents in the second mailing in 2013, 2017, 2018, 2019, and 2020.

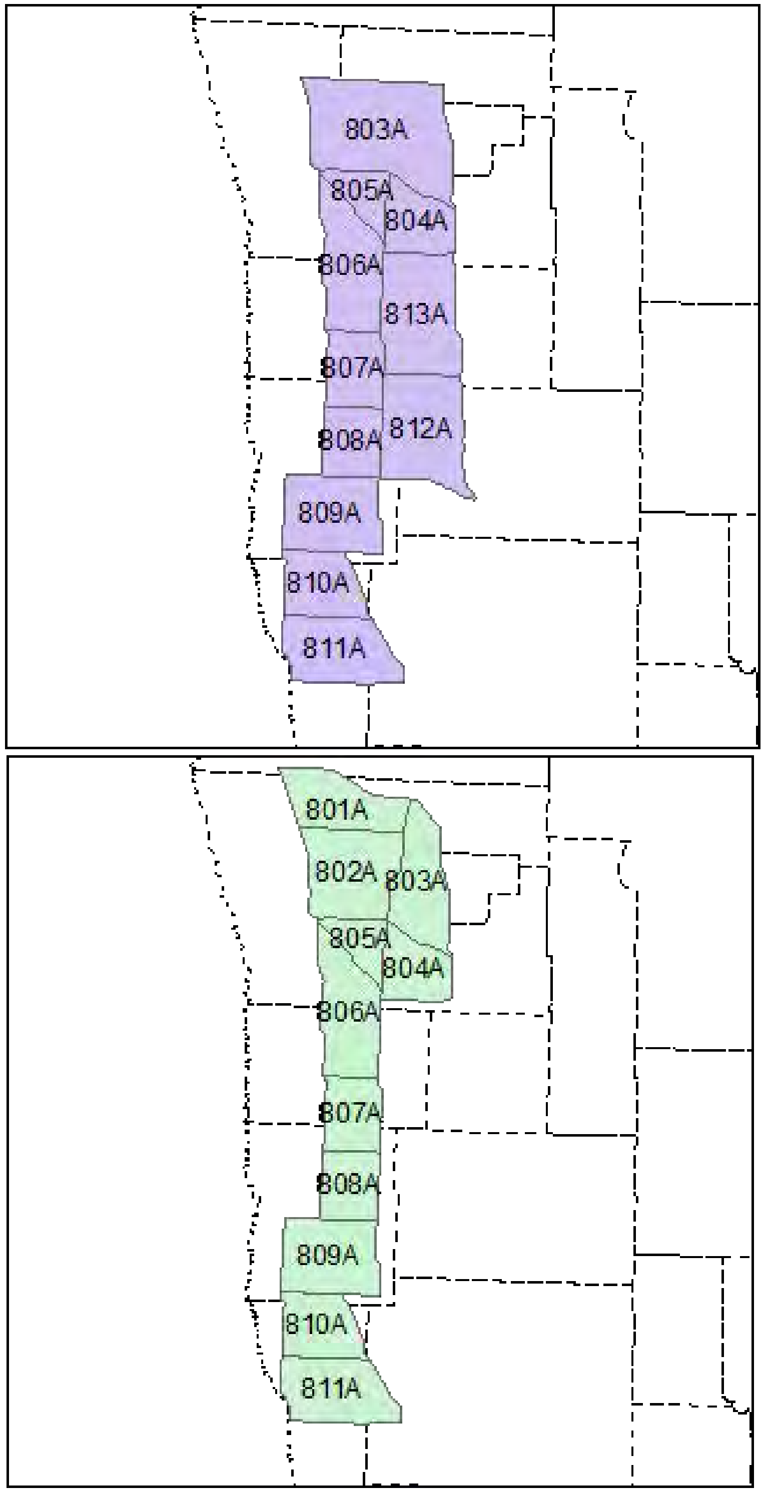


Figure 1. Prairie-chicken hunting permit area boundaries in northwestern Minnesota since 2013 (top) compared to during 2006–2012 (bottom). County boundaries are indicated by dashed lines. Permit areas 812A and 813A were added, 801A was eliminated, and 802A and portions of 803A were combined into a revised permit area 803A.

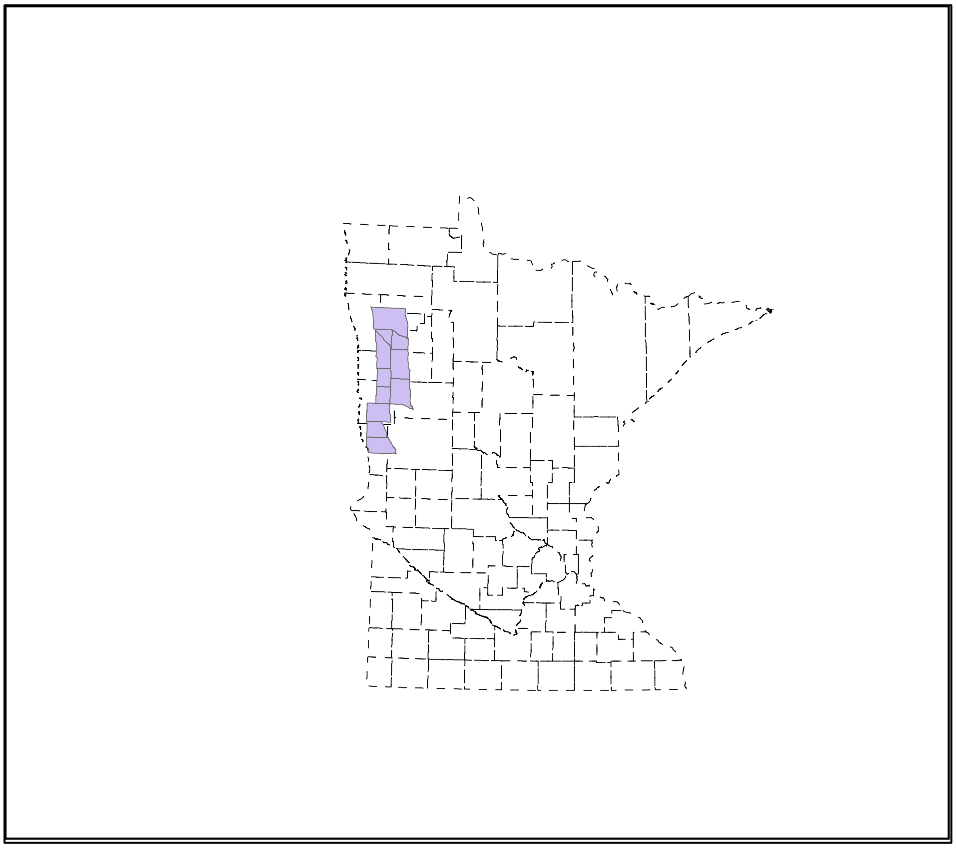


Figure 2. Northwestern location of prairie-chicken hunting permit areas within the state relative to county boundaries (dashed lines).

STATUS OF MINNESOTA BLACK BEAR HARVEST, 2020

Andrew N. Tri, Forest Wildlife Research Group

INTRODUCTION

The Minnesota bear range has historically been divided into 13 bear management units (BMU). Each has a separate quota on hunting licenses, and hunters must enter a lottery (based on preference points) to obtain a license. Outside the primary bear range, where bear depredation to crops is a primary concern, license sales are unlimited (no-quota area), and hunters can purchase licenses right up to and through the season, over the counter. 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 bear hunting and harvests.

METHODS

Successful hunters must register their bears, in person at designated registration stations or electronically by internet or phone. Stations are not staffed by DNR personnel. Harvest data is 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.

RESULTS

Permits, licenses, harvest, and success rates

Permit applications for bear licenses exceeded 20,000 for the fourth straight year (Table 1). Applications have not been this high since 2001. Of these, >3,600 (17%), a record high number, applied for area 99, meaning that they only sought to raise their preference level for the permit system, but not hunt this year. Permit availability was higher than 2020 (increased in BMUs 41 and 45). Hunting success (Figure 1) in the quota zone was the highest ever, and overall statewide harvest was the highest it has been since 2007. Hunting success is inversely related to the number of hunters but also strongly affected by fall foods. A record number of people bought no-quota licenses (4,249 hunters or 49% of the overall license sales). This is nearly a 30% increase over the 5-year average and is likely similar to increased hunter participation this year with other species.

Bear Management Units

There are currently 13 Bear Management Units (BMUs) (Figure 2) where license sales are limited by a quota, 1 where the number of permits are unlimited, and 4 BMUs with no quota at all. The BMU divisions in the no-quota zone are for internal data analysis purposes only: hunters do not have to choose a BMU in which to hunt within this zone. In the quota zone, hunters must apply for a certain BMU and are drawn through a preference lottery based on their number of previously unsuccessful applications (Table 4). The first digit in each BMU (1–5) refers to 5 larger BMUs in which each was previously a part (when numbering began in 1985). Since then several BMUs have been split, to better adjust hunting pressure. In 2016, BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). This split, along former BMU lines, allows current data to be regrouped into these former BMUs and thereby compared to older data (which is done in this report). BMU 451 was split from BMU 45 this year as an experimental unit to understand if we could reduce crop damage through hunting. The results the harvest statistics for this BMU are reported under the quota zone, but were not remerged with BMU 45 because there were an unlimited number of tags in BMU 451 and results are not comparable.

Quota zone permits and licenses

The number of quota zone permits available in 2020 was slightly higher than in 2019 (25 permit increase in BMU 41, and a 50 permit increase in BMUs 45 and 46). This is the 8th year (since 2013) that permits have been kept low (<3,900). This was the 10th year (since 2011) of a system whereby licenses for the quota zone that were not purchased by permittees selected in the lottery (>400) could be purchased later as surplus. BMU 451 (new in 2020) had an unlimited number of permits but was still part of the quota zone (1038 sold, all listed as surplus license sales). This experimental zone was created to test the hypothesis that hunters could reduce nuisance complaints and crop damage. This area will exist for at least 3 years to understand if there are any reductions in complaints.

Quota zone applicants

Statewide, quota zone applications increased have been relatively stable over the past 10 years, but much of that increase was for area 99 (preference level application). Among applications for specific BMUs, only BMU 45 showed a significant, steady increase over the past 10 years, but this too has leveled out since 2017 and decreased for the first time since 2011. This may be due, in part, to BMU 451 in which there was an unlimited number of surplus licenses and 1038 hunters participated).

Quota zone lottery

The low quota zone permit availability over the past 7 years has made it increasingly difficult to succeed in the lottery. This year, although quotas were about the same as last year, a higher level of preference was needed to secure a permit because a large number of hunters who had accumulated preference points by previously applying to area 99 entered the lottery for a BMU. First-time and second-time applicants were successful only in BMU 22 (wilderness area hunt). Seven BMUs required a preference level of at least 4 for a chance of success, and BMU 45 required a preference level of 5 or above. This high threshold for BMU 45 is due to the increasing number of applicants (Figure 3), not a reduced number of available permits (Table 2).

Harvest by BMU

The statewide harvest in 2020 was 37% higher than 2019. This was likely due to the rangewide drought that caused low natural berry production (although it had less of an effect on fall foods). The sex ratio of the harvest was ≥60% males in BMUs 13, 46, and 47. All others had sex ratios closer to 50% male, which is a large shift over the last few years. The statewide harvest sex ratio has exceeded 60% in all years except this one since 2013 (Table 1), when permits were reduced. However, these same highly male-biased sex ratios have also occurred in the no-quota area, suggesting that it is not just due to low hunter density. When natural foods are poor, reproductive females are far likelier to be shot than in average or good food years.

Harvest by quota vs no-quota zones

Permit availability continuously declined during the decade 2003–2013 (Table 1), and with that, total harvests declined and the percent of the harvest in the no-quota zone increased. The percent harvest in the no-quota zone has continues to increase (32%, a record high), split evenly between BMUs 11 and 52 (Table 5). Nearly half the bear hunters were hunting with a no-quota license since 2017, but this proportion decreased slightly this year.

Hunting success by BMU

In 2020, success was very high in the quota zone, reaching record or near-record levels in all but BMUs 22, 41, and 45 of the quota zone (>50% in BMUs 13, 24, 46, and 51; >60% in BMUs 12, 25, 27, 28, 31, and 47). Success rate in the no-quota zone as a whole (24%) was one-half that in the quota zone (48%). The distribution of hunters within the no-quota zone is gleaned from where they said they would hunt when they purchased their license: a growing proportion indicated that they planned to hunt in BMU 10 (although the hunting success rate in this area is lowest in the state).

Spatial distribution of hunters' baits

The bait registration system data has records for 7,832 baits placed on the landscape during the 2020 hunt. Highest hunter bait densities occurred on public land near the Chengwatana and Namadji forests in BMU 52 (no-quota), the Paul Bunyan State Forest in BMU 46, the Chippewa National Forest in BMU 27, and on the edges of the no-quota zone where hunters may have attempted to lure bears from the quota zone. Of note, a few hunters set baits outside of primary bear range. One note of caution when interpreting this map is that this is an underestimate of bait density; based on hunter surveys >90% of hunters set 2.5 baits on average, which means that a complete dataset would include the registration locations of nearly 20,000 baits rather than the nearly 8,000 we have.

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 followed this normal pattern (whereas the harvest was delayed in 2018, due to more abundant foods).

Predictions of harvest from food abundance

The 2020 statewide harvest was 10% higher than expected (3203 actual vs. 2898 predicted), based on regression of harvest as a function of hunter numbers and the fall food productivity index. This regression is nearly as strong (and has accurately predicted previous harvests) when only the past 15 years are considered. For the quota zone, the actual harvest in 2020 was also nearly 20% higher (2037 actual vs.1666 predicted) than predicted by this regression. These discrepancies might be due to the changes in BMU 451 and the limited time staff spent in the field due to the COVID-19 pandemic.

Harvest sex ratios

Harvest sex ratios within BMUs varied considerably year-to-year over the past 2 decades. In 2019, four BMUs in the northwestern part of the state (BMU 11, 12, 13, 41) all had harvest sex ratios very skewed to males (68–73%). Four BMUs farther east (BMU 24, 25, 26 [now 27, 28]), 31) had consistently lower sex ratios (62–63%), yet still much higher than a decade ago, when it rarely exceeded 60% male. The southern tier of BMUs (BMU 44 [now 46, 47], 45, 51, 52) all had much lower harvest sex ratios in 2019 than in 2018. Statewide, the percent males in the harvest has been climbing since the late 1990s; it has exceeded 60% in all years since 2013. 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, hunter selectivity, and possibly density of baits).

Harvest ages

On a BMU-basis, median ages of harvested females has not shown an obvious temporal trend over the past 20 years. In 2019, median ages of females harvested in northwestern BMUs (BMU 11, 12, 13, 41) was only about 3 years old, whereas those farther east (BMU 24, 25, 26 [now 27, 28], 31) were 0.5–1.5 years older, and those in the southern tier of BMUs (BMU 44 [now 46, 47], 45, 51, 52) were about a half year younger (all <3 years old). Statewide, the median age of harvested females showed a steady drop until 2014. Since then, it has climbed to 3.0 years old. Likewise, the proportion of harvested females aged 4–10 years has risen since 2014, while the proportion 1–2 years old has declined. The median age of harvested males has been creeping upward since 2013 (2.3 years in 2019).

Submission of bear teeth for aging

Ages of harvested bears are used as the principal means of monitoring population trends. Although hunters are required to submit a tooth from their harvested bear, historically >25% did not comply. Reminder notices were sent to non-compliant hunters each year during 2014–2017, which spurred a higher initial compliance the following years (>80%). Since 2018, with no reminder mailing, compliance has been 82–87%. Since 2013, hunters could register by phone or internet, and pick up a tooth submission envelope later: tooth submission compliance by these hunters has equalized across all registration types. A decreasing proportion of hunters are registering their bear at a registration station over the past years. Compliance with tooth submission was higher in the quota zones than in the no-quota area but was especially low (<80%) in a number of units (BMUs 10, 11, 24, 41, 451, 46, 47, 52).

Trends in harvest rates

The sex ratio of harvested bears varies by age. Male bears are more vulnerable to harvest than females, so males always predominate among harvested 1-year-olds (67–75%). Males also predominate, but less strongly among 2 and 3-year-old harvested bears. However, older-aged harvested bears (≥8 years) are nearly always dominated by females, because, although old females continue to be less vulnerable as individuals, there are far more of them than old males in the living population. 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 data into time blocks showed harvest rates increasing from 1980–1999, then declining with reductions in hunter numbers (Figure 1). Based on this method, harvest rates since 2015 have been significantly less than what they were in the early 1980s, when the bear population was increasing (Figure 13).

One problem in using this very simple method is that it assumes that the relative difference for males versus females in their vulnerability to harvest does not change systematically through time. This may not be true, given the steadily increasing male-skewed harvests since the late 1990s, and especially in recent years (Figure 9).

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

Table 1. Bear permits, licenses, hunters, harvests, and success rates, 2001–2020.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Permit applications[a]	26824	21886	16431	16466	16153	15725	16345	17362	17571	18647	19184	18103	18107	18885	18422	19958	21034	21184	20632	22279
Permits available[b]	20710	20610	20110	16450	15950	14850	13200	11850	10000	9500	7050	6000	3750	3750	3700	3850	3350	3350	3400	3575
Licenses purchased (total)	16510	14639	14409	13669	13199	13164	11936	10404	9892	9689	9555	8986	6589	6620	6962	7177	6655	6550	6801	8882
Quota zone [c]	13632	12350	9833	10063	9340	9169	8905	7842	7342	7086	5684	4951	3188	3177	3257	3420	2954	2922	2988	3178
Quota surplus/military [c]	235	209	2554	1356	1591	1561	526	233	77	83	1385	1070	578	583	446	441	401	428	417	398
Quota-no limit area-451																				1038
No-quota zone [c]	2643	2080	2022	2238	2268	2434	2505	2329	2473	2520	2486	2965	2823	2860	3259	3316	3300	3200	3396	4262[h]
% Licenses bought																				
Of permits available [d]	67.0	60.9	61.6	69.4	68.5	72.3	71.4	67.7	73.4	74.6	100	100	100	100	100	100	100	100	100	100
Of permits issued [d]	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	87.9	88.7	88.2	87.2	87.8	80.8
Estimated no. hunters [e]	15500	13800	13600	12900	12500	12500	11300	9900	9400	9200	9200	8600	6300	6300	6700	6900	6400	6300	6700	8700
Harvest	4936	1915	3598	3391	3340	3290	3172	2135	2801	2699	2131	2604	1866	1627	1971	2641	2040	1766	2340	3203
Harvest sex ratio (%M) [f]	56	61	58	57	59	58	57	62	59	59	61	59	62	62	66 [i]	61	63	66 [i]	61	56
Success rate (%)																				
Total harvest/hunters [g]	29	14	26	26	26	26	28	21	30	29	23	30	30	26	30	38	32	28	35	37
Quota harvest/licenses [k]	28	14	25	26	25	25	28	21	30	30	24	33	37	33	39 [j]	50 [j]	46	38	49 [j]	57 [j]

[a] From 2008 to 2019, 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; 2015=2455; 2016=2641; 2017=2803; 2018=3254, 2019=3450, 2020=3691(record high); additionally, area 88 nuisance-only bear license applications counted in this total in 2017=3, 2018=6, 2019=5, 2020=11 (people who selected area 88 as 1st preference).

[b] Beginning in 2011 a procedure was implemented that ensures that all available licenses are purchased (see Table 2).

[c] Quota zone established in 1982. No-quota zone 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 August 1. 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 2011–20, all unpurchased licenses were put up for sale and 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%), 2009 (95.3%), and 2018 (92.7%). Beginning in 2011 all unpurchased quota licenses were sold as "surplus" in August, and this process is quick and competitive; thus, for 2011–19 all Surplus and Military license-holders were considered to have hunted.

[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 both 2016 and 2017, 5 hunters legally killed 2 bears. In 2018, 3 hunters shot 2 bears. In 2019, 2 hunters shot 2 bears. In 2020, 5 hunters shot 2 bears.

[h] Record high number of no-quota zone licenses purchased in 2020; record high % of licenses in no-quota zone in 2017 (nearly 50%; see Fig. 4).

[i] Record high % males in statewide harvest.

[j] 2020: highest success rate in quota zone ever; 2016: second highest success rate; 2019: third-highest success rate.

[k] In 2020, BMU 451 was broken out of BMU 45 and was an area in the quota zone with an unlimited number of licenses. The quota success rate is calculated without BMU 451 in it to make hunting success estimates comparable across years. The 2020 success rate for BMU 451 is listed in Table 6 and the success rate for the quota area with Area 451 included is 48%.

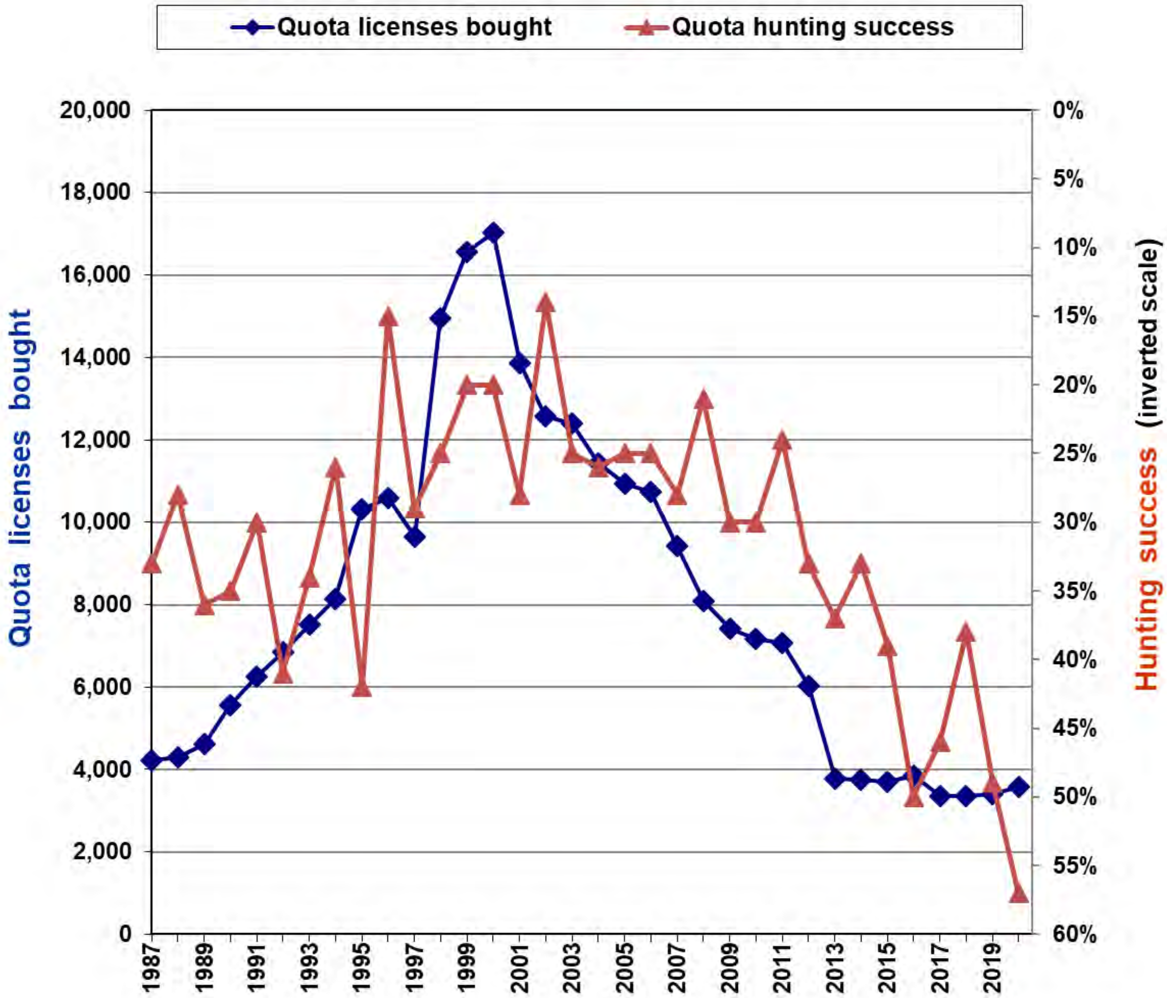


Figure 1. Relationship between licenses sold and hunting success (*note inverted scale*) in quota zone, 1987–2020 (quota and no-quota zones first partitioned in 1987). Number of licenses explains 54% of variation in hunting success during this period. Large variation in hunting success is also attributable to food conditions (e.g., during 2013–2020, when licenses were held relatively constant). Statistics from BMU 451 are not included in this graph to allow for quota zone comparisons with the past.

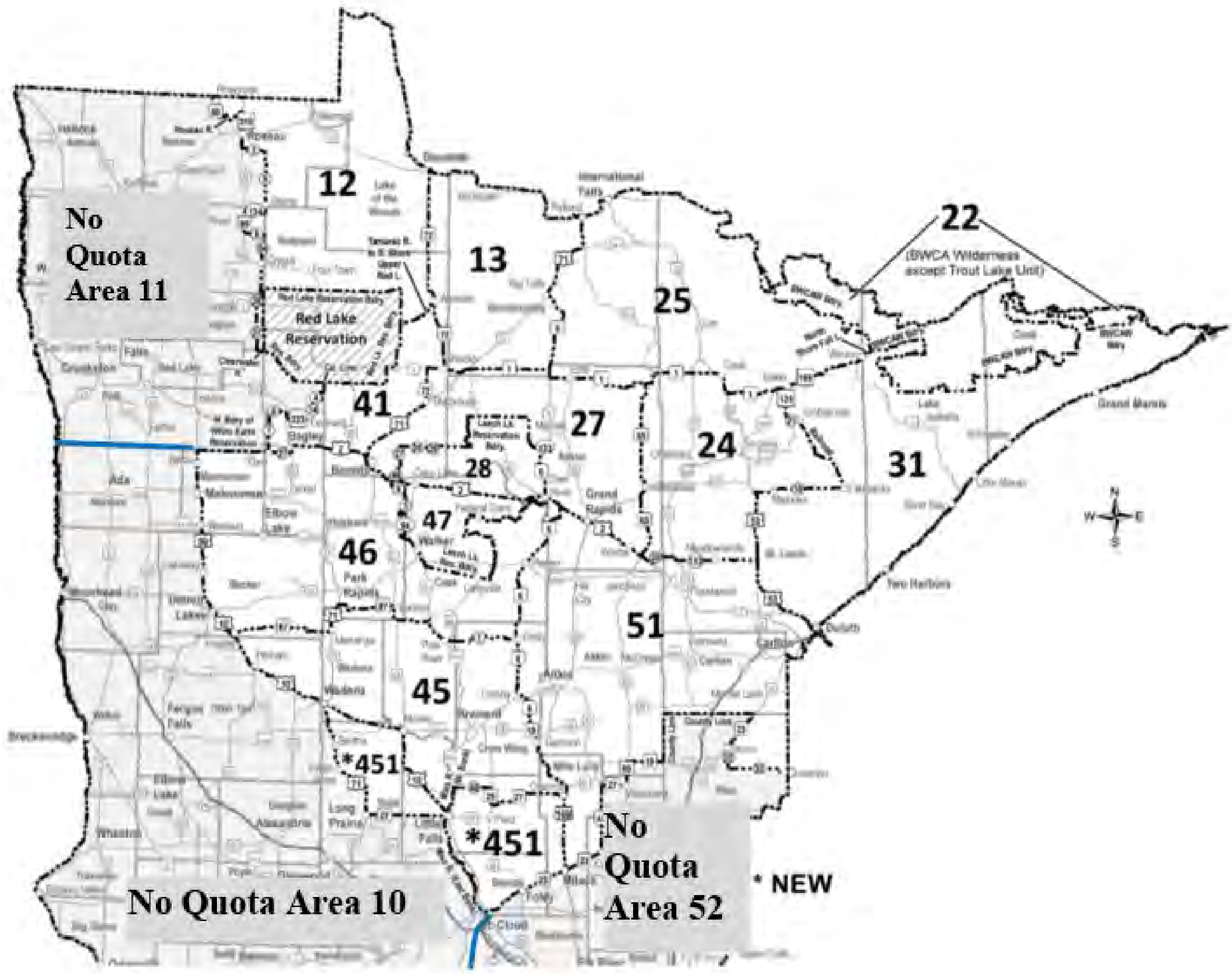


Figure 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU. In 2016, BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). No-quota hunters can hunt anywhere within the gray-colored zone, including the southeast corner of Minnesota (not shown; designated area 60). In 2020, zone 451 was split from 3 deer permit areas of 45 to relieve crop damage in the area. This area is in the quota-zone, but with an unlimited number of participants.

Table 2. Number of bear hunting quota area permits available, 2015–2020. Highlighted values show a change from the previous year. BMUs 26 and 44 were divided into 27/28 and 46/47, respectively, in 2016.

BMU	2015	2016	2017		2018	2019	2020
		Before BMU split [a]	After BMU split	After BMU split			
12	150	150	150	125	125	125	125
13	250	250	250	225	225	225	225
22	50	50	50	50	50	50	50
24	200	200	200	175	175	175	175
25	500	500	500	400	400	400	400
26	350	325					
27			250	225	225	225	225
28			75	60	60	60	60
31	550	550	550	500	500	500	500
41	150	125	125	125	125	150	175
44	450	450					
46			400	350	350	350	400
47			50	40	40	40	40
45	150	250	250	175	175	200	200
51	900	1000	1000	900	900	900	900
Total	3700	3850	3850	3350	3350	3400	3575

[a] In 2016, the Leech Lake Reservation was split from BMUs 26 and 44 to form BMUs 28 (north) and 47 (south), with the remaining area of BMU 26 renamed BMU 28 and remaining area of BMU 44 renamed BMU 46. The column shows permit allocation before the split in order to compare with previous years. Area 451 was created in 2020 to alleviate crop damage issues by having a permit area with an unlimited number of permit available (1046 in licenses sold in 451 during 2020).

Table 3. Number of quota BMU permit applicants (Apps), licenses bought (after permits drawn) and surplus licenses bought, 2015–2020[a]. Shaded values indicate undersubscribed (applications less than permits available).

BMU	2015			2016			2017			2018			2019			2020		
	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought	Apps	Bought license	Surplus bought
12	612	130	20	624	133	17	774	113	12	703	109	16	711	104	21	751	107	18
13	692	210	40	716	221	29	772	200	25	682	177	47	712	199	26	734	195	30
22	48	36	9[b]	52	37	13	47	34	16	76	36	14	61	35	14	69	32	18
24	771	171	29	884	173	27	945	158	17	928	155	20	840	153	22	909	155	20
25	1396	433	67	1443	440	60	1651	354	46	1561	355	44	1520	348	52	1627	367	33
26	1650	309	42															
27				1224	219	31	1297	197	28	1265	204	21	1280	200	25	1338	207	18
28				325	72	3	330	52	8	309	52	8	318	51	9	312	49	11
31	2021	488	62	2180	489	62	2076	441	59	2074	428	71	1907	432	67	2022	444	57
41	570	129	21	618	114	11	614	109	16	648	114	11	661	143	7	663	154	21
44	2626	402	48															
46				2690	370	30	2774	319	31	2769	317	33	2662	313	37	2853	364	36
47				194	45	5	214	33	7	182	35	5	198	34	6	216	33	7
45	1703	139	11	2046	227	23	2323	161	14	2383	160	15	2351	178	22	1978	186	14
451[d]																1038		1038
51	3878	810	90	4321	880	121	4411	783	117	4344	779	123	3956	798	102	4058	885	115
Total[c]	15967	3257	439	17317	3420	432	18228	2954	396	17924	2921	428	17177	2988	410	18577	3178	1454

[a] Beginning in 2011, all licenses not purchased by permittees were sold as "surplus". In all cases but three (see footnote b), all of the surplus licenses were purchased. Surplus = Permits available (Table 2) minus Bought licenses (±5 to account for groups applying together).

[b] Even after purchase of surplus licenses, this BMU remained undersubscribed.

[c] 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 the total number of applications (unlike Table 1, where they are included). This number also includes the permits sold in area 451 (1046 in 2020).

[d] Beginning in 2020, applicants could apply for area 451. This was an area in the quota zone with no limit on the quota and all licenses are considered surplus licenses.

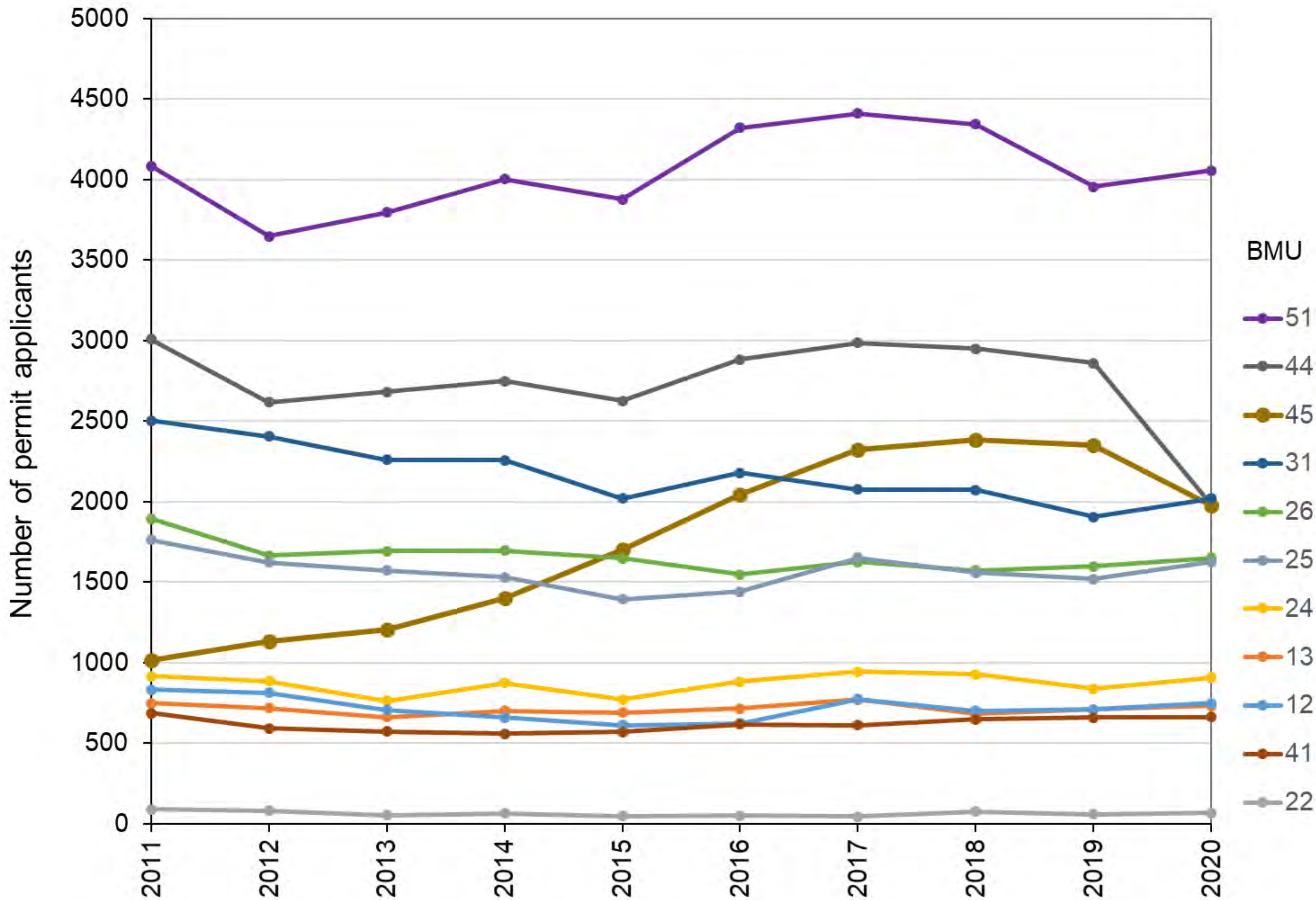


Figure 3. Trends in number of applicants for quota zone permits by BMU over past 10 years, 2011–2020. For 2016–2020, BMUs 27 and 28 were grouped into old BMU 26 and BMUs 46 and 47 were grouped into old BMU 44. BMU 45 is highlighted because applications there surged over this period. The number of applications for 45 dropped for the first time since 2011.

Table 4. Percent of quota BMU lottery applicants with preference levels 1 (1st-year applicants), 2, 3, 4, and 5 who were drawn for a bear permit during 2016–2020. Blank spaces indicate 100% of applicants were drawn. 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[a].

BMU	2016				2017				2018					2019					2020				
	Pref 1	Pref 2	Pref 3	Pref 4	Pref 1	Pref 2	Pref 3	Pref 4	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5	Pref 1	Pref 2	Pref 3	Pref 4	Pref 5
12	0	0	98		0	0	57		0	0	41			0	0	13			0	0	0	72	
13	0	38			0	16			0	11				0	0	92			0	0	93		
22	98				100				60					76					65				
24	0	0	86		0	0	57		0	0	26			0	0	11			0	0	0	93	
25	0	42			0	6			0	0	80			0	0	58			0	0	45		
26[b]																							
27	0	0	30		0	0	2		0	0	0	85		0	0	0	66		0	0	0	49	
28	0	0	0	99	0	0	0	76	0	0	0	46		0	0	0	5		0	0	0	2	
31	0	0	75		0	0	67		0	0	48			0	0	38			0	0	33		
41	0	0	77		0	0	56		0	0	27			0	0	6			0	0	26		
44[b]																							
46	0	0	0	85	0	0	0	51	0	0	0	24		0	0	0	1		0	0	0	0	83
47	0	0	10		0	0	0	49	0	0	0	26		0	0	0	50		0	0	0	18	
45	0	0	0	63	0	0	0	16	0	0	0	0	72	0	0	0	0	42	0	0	0	0	23
51	0	0	72		0	0	54		0	0	35			0	0	22			0	0	24		

[a] As an example, in 2019: BMU 12: 0% of preference level 1 and 2 applicants were drawn, 13% of preference level 3, and 100% of preference level 4 and above were drawn for a permit; BMU 22: 76% preference level 1 applicants were selected, 100% all higher preference levels; BMU 45: no preference level 1–4 applicants were drawn, 42% of hunters with preference 5 were drawn, and 100% of hunters with preference level 6 and above were drawn.

[b] BMU 26 was split into 27/28 and BMU 44 was split into 46/47 in 2016.

Table 5. Minnesota bear harvest tally for 2020 by Bear Management Unit (BMU)[a] and sex[b] compared to harvests during 2015–2019 and record high and low harvests (since establishment of each BMU, not counting current year).

BMU	2020 M	2020 (%M)	2020 F	2020 Total	2019	2018	2017	2016	2015	5-year mean	Record low harvest (yr)	Record high harvest (yr)
QUOTA												
12	49	58	35	84	62	66	54	78	60	64	38 (14)	263 (01)
13	85	67	41	126	105	119	100	147	72[e]	109	71 (88)	258 (95)
22	4	57	3	7	3[r]	4	8	5	7	5	3 (03)	41 (89)
24	56	58	41	97	86	60	81	96	97	84	50 (14)	288 (95)
25	127	51	124	251	224	223	212	287	227	235	149 (96)	584 (01)
26	105	56	81	186	[169]	[141]	[162]	[171]	121	153	117 (14)	513 (95)
27	86	58	62	148	128	105	120	131				
28	19	50	19	38	41	36	42	40				
31	169	52	156	325	212	211	262	312	307	261	157 (88)	697 (01)
41	38	52	36	74	76	58	61	57	35[j]	57	35 (15)	201 (01)
44	155	61	101	256	[203]	[154]	[158]	[215]	158	178	130 (11)	643 (95)
46	139	60	92	231	181	139	141	190				
47	16	64	9	25	22	15	17	25				
45	46	54	39	85	108	51	77	102[m]	55	79	32 (11)	178 (01)
451	98	58	70	168								
51	283	55	228	511	411	185[d]	372	463	302	347	185 (18)	895 (01)
88	22	55	18	40								
Total	1237	56	973	2210	1659	1272	1547	1933	1441	1570	1192 (88)	4288 (01)
No-Quota												
11	273	56	214	487[n]	269	287	179	291	195	1244	38 (87)	351 (05)
10	22	76	7	29[n]	26	21	18	15	11	18		26 (19)
52	251	53	225	476[n]	386	186[p]	295	402	324	318	105 (02)	405 (12)
60[c]	0	0	1	1	0	0	1	0	0	0		
Total	546	55	447	993[n]	681	494	493	708[n]	530	581	198 (87)	708 (16)
STATE	1783	56	1420	3203	2340	1766	2040	2641	1971	2151	1509 (88)	4956 (95)

[a] Some tooth envelopes were received from hunters who did not register their bear. These were added to the harvest tally:

2013:6; 2014:3; 2015:6; 2016:7; 2017:4; 2018:2; 2019:18

Some hunters with no-quota licenses hunted in the quota zone, and their kills were assigned to the BMU where they apparently hunted:

2013:11; 2014:4; 2015:12; 2016:9; 2017:2; 2018:4*; 2019:4

*None were authorized NQ license-holders hunting in quota zone.

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).

[b] Sex recorded on tooth envelopes may differ from the registered sex.

Sex shown on table is the registered sex.

[c] BMU 60 designates SE Minnesota, which is within No-quota zone. The only other hunter-harvested bear in this area was in 2017.

Notable harvests:

[d] Record low harvest since this area was established in 1987.

[e] Lowest harvest since 1988.

[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 harvest since 1988 (quota—no-quota split in 1987).

[k] Lowest harvest since 1999.

[m] Highest harvest since 2007.

[n] Record high harvest.

[p] Third lowest harvest since established as NQ area in 1987

[q] Record high % males (or tie for record).

[r] Tie for record low harvest

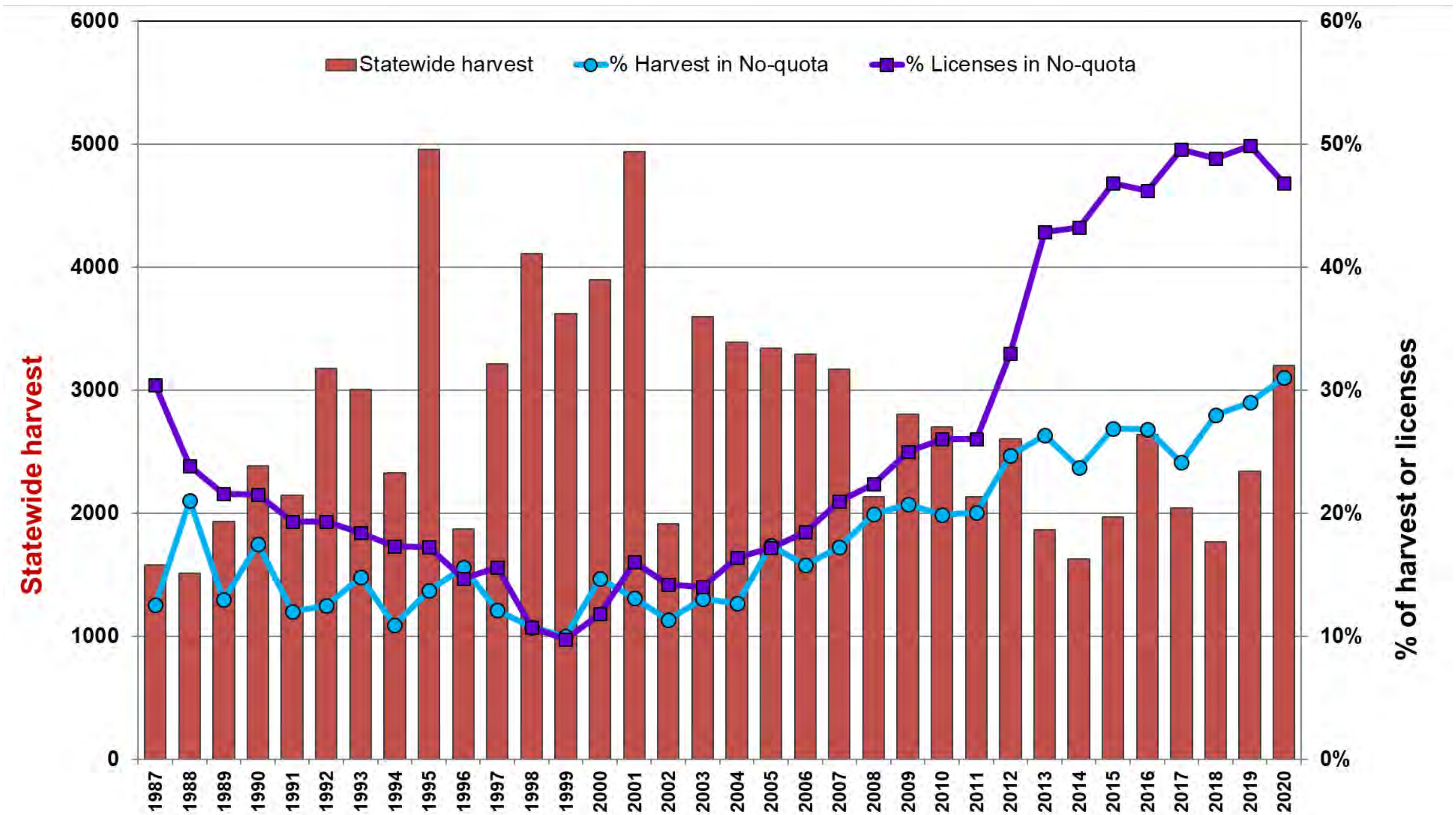


Figure 4. Trends in statewide bear harvest and proportions of harvest and licenses in the no-quota zones, 1987–2020.

Table 6. Bear hunting success (%) by BMU, measured as the registered harvest divided by the number of licenses sold[a], 2015–2020[a].

BMU	Max success (yr) before 2020		Mean success 2015–2019	2020	2019	2018	2017	2016	2015
12	53	(18)	47	67[b]	53[c]	43	52	40	19[e]
13	59	(95,16)	46	56[c]	53	45	59[b]	29	36
22	18	(92)	11	14	8	16	10	13	10
24	48	(15,16)	45	55[b]	34	46	48[c]	48	25
25	57	(16)	53	63[b]	56[c]	53	57[c]	45	34
26	59	(95)	50	65[b]	49	57	52	34	33
27	53	(18)	51	66[b]	47	53[c]	52		
28	70	(18)	61	63[c]	60	70[d]	53		
31	56	(16,17)	50	65[b]	42	52	56[c]	56[c]	40
41	50	(95)	43	42	46	49[c]	46	23	24
44	48	(16)	43	58[b]	39	41	48[c]	35	38
46	47	(17)	42	58[b]	39	40	47		
47	50	(17)	44	63[b]	38	43	50		
45	44	(17)	40	43[c]	29	44[b]	40	36	36
451				16					
51	46	(16)	37	51[b]	21	41	46[c]	33	32
QUOTA[F]	50	(16)	46	57[B]	38	46[C]	50	39	33
11[G]			34	23	25	17	28	20	9
10[G]			8	12	9	8	9	7	7
52[G]			20	19	10	14	19	15	16
NO QUOTA	32	(95)	24	24	15	15	21	16	13
STATEWIDE	40	(95)	33	38[C]	27	31	37	28	25

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

[b] Record high (or tied record high) success.

[c] Second highest (or tied second highest) success.

[d] Highest success ever for any BMU.

[e] Tied record lowest success.

[f] in 2020, BMU 451 was broken out of BMU 45 and was an area in the quota zone with an unlimited number of licenses. The quota success rate is calculated without BMU 451 in it to make hunting success estimates comparable across years. The success rate for BMU 451 is listed on it's own line in the table.

[g] Since 2013, an attempt was made to differentiate the number of no-quota (NQ) hunters by BMU in order to estimate success rates. When no-quota hunters bought licenses, they recorded the deer block where they anticipated hunting. A significant number chose blocks in the quota zone; those who did not harvest a bear in the quota zone were divided up into NQ-BMUs in proportion to those who chose blocks in or adjacent to NQ-BMUs. A few chose BMU 60 (SE Minnesota); the first bear was harvested there in 2017, 1 more was killed there in 2020. Table shows % indicating where they planned to hunt (number of hunters in parentheses for BMU 60 and Quota zone):

BMU	2020		2019		2018		2017		2016	
11	34.3		30.9		34.6		29.8		30.3	
10	8.6		14.3		7.4		6.6		4.9	
52	56.8		52.0		55.3		59.2		61.2	
60 (n)	0.3	(13)	0.3	(11)	0.1	(4)	0.1	(4)	0.4	(12)
Quota zone (n)	0.6	(27)	2.5	(94)	2.6	(83)	4.2	(137)	3.2	(105)

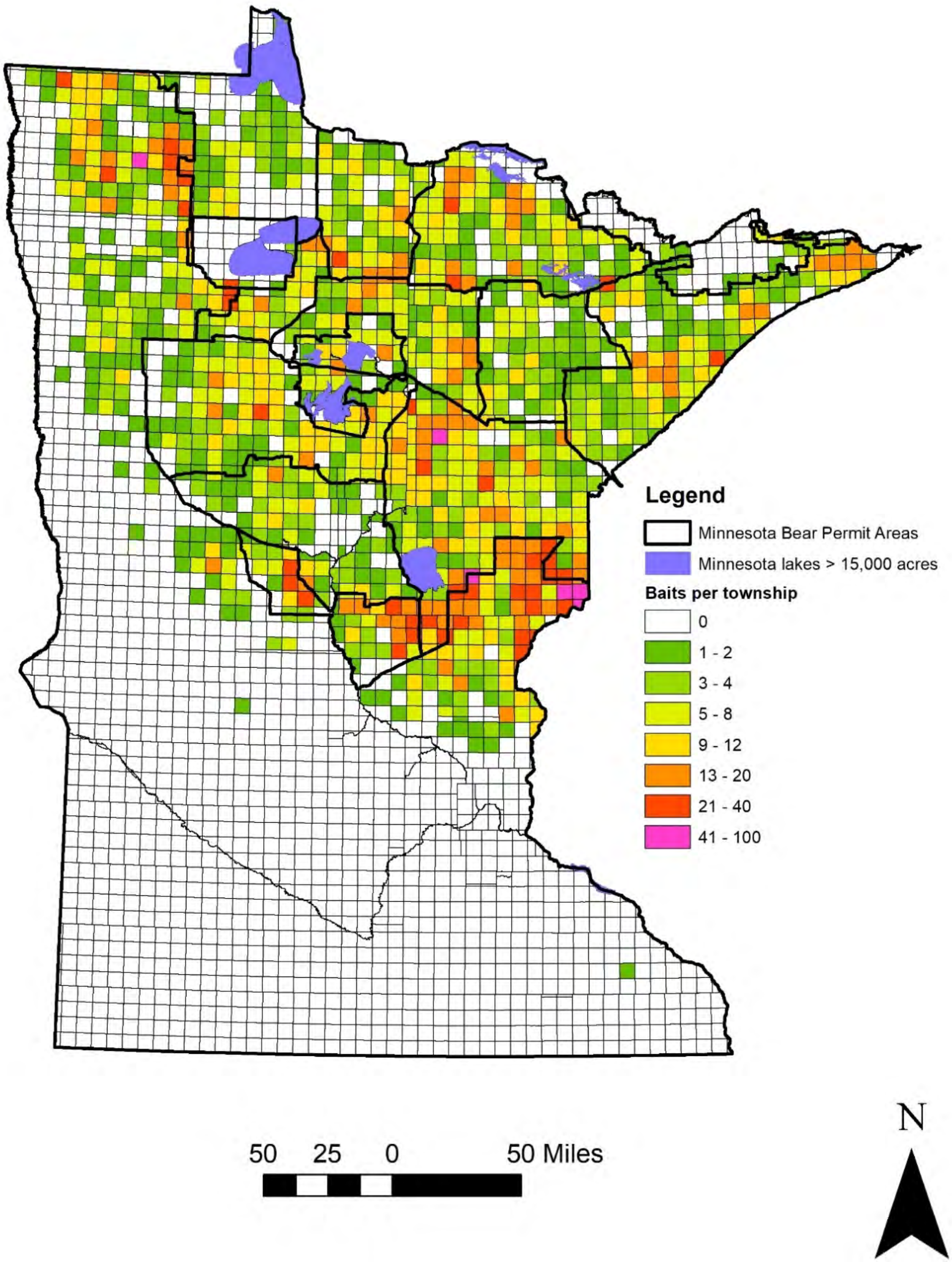


Figure 5. Number of hunters' baits per township within each BMU (7,382 total baits) in 2020. Nearly 37% of baits are registered on public land and 63% are on private land.

Table 7. Cumulative bear harvest (% of total harvest) by date, 1998–2020.

Year	Day of week for opener	Aug 22/23 – Aug 31	Sep 1 – Sep 7	Sep 1 – Sep 14	Sep 1 – Sep 30
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[a]	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[a]	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
2015	Tue		58[b]	75	91
2016	Thu		68	83	95
2017	Fri		69	83	93
2018	Sat		59[a]	75	91
2019	Sun		71	83	95
2020	Tues		70	83	94

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

[b] The slow start the first week was likely due to especially warm weather.

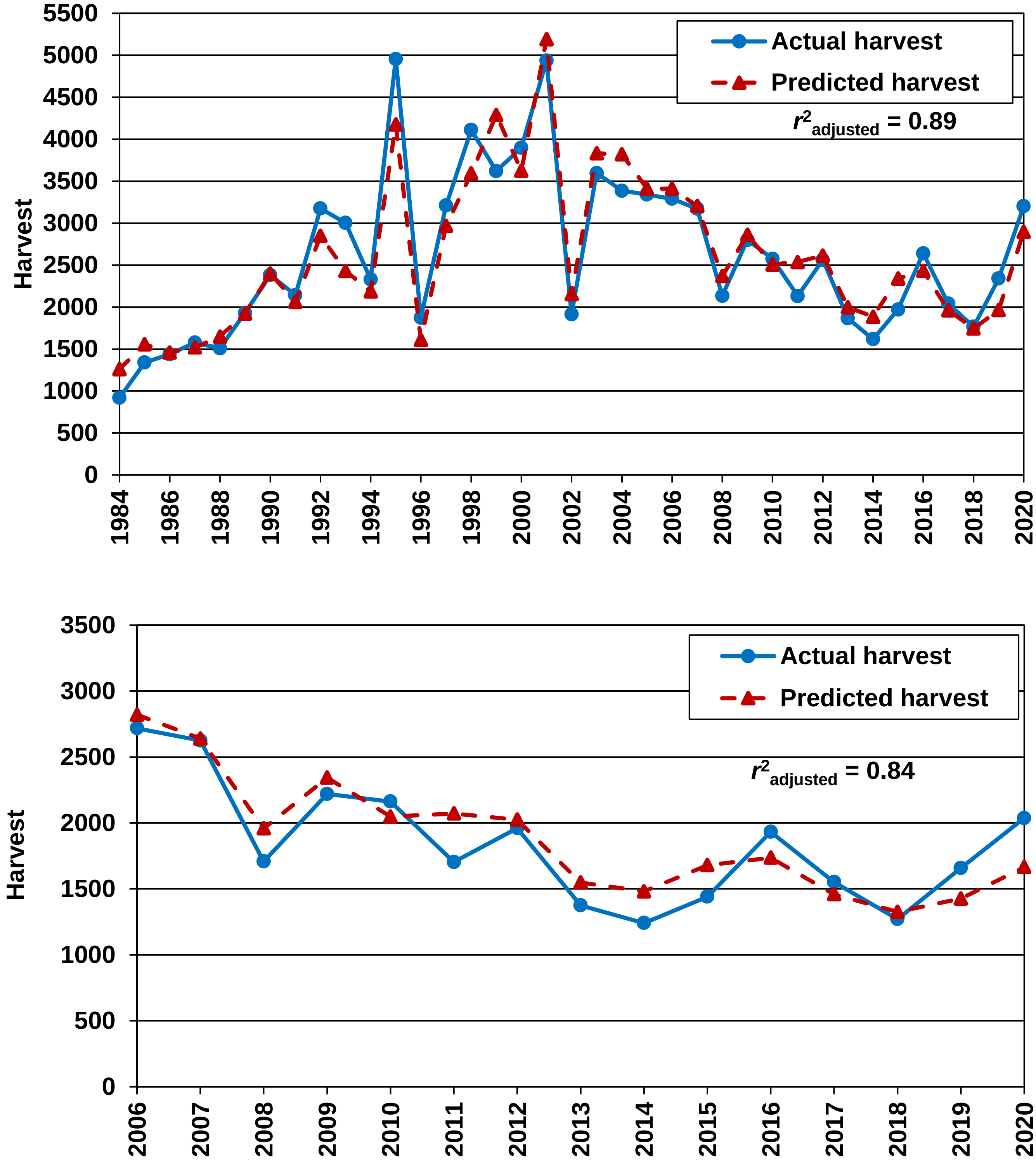
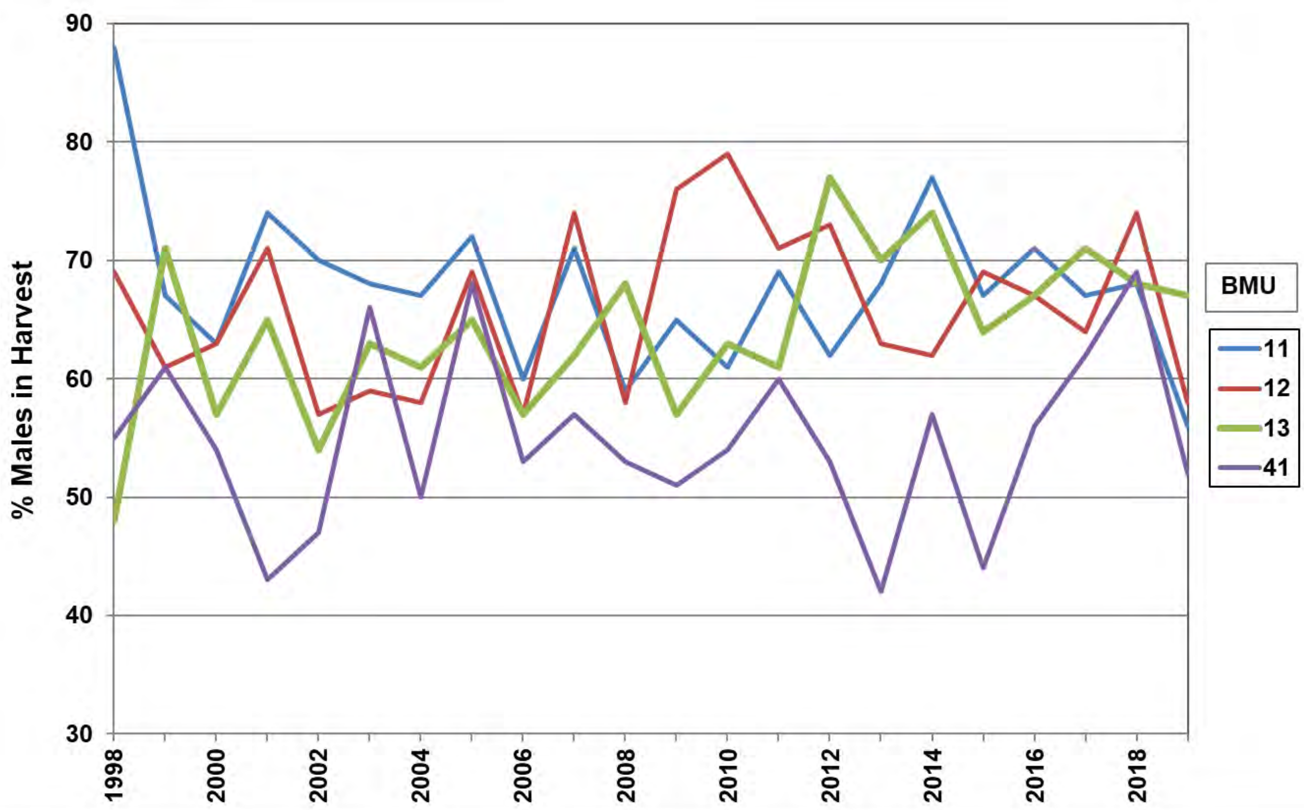


Figure 6. Number of bears harvested vs. number predicted to be harvested based on number of hunters and fall food production — top panel: statewide 1984–2020; bottom panel: quota zone only (including area 451 hunters and harvest), most recent 15 years. Regression for both datasets included an interaction term between food and hunters to better predict the drastic changes in harvest when fall foods were extremely high or low.



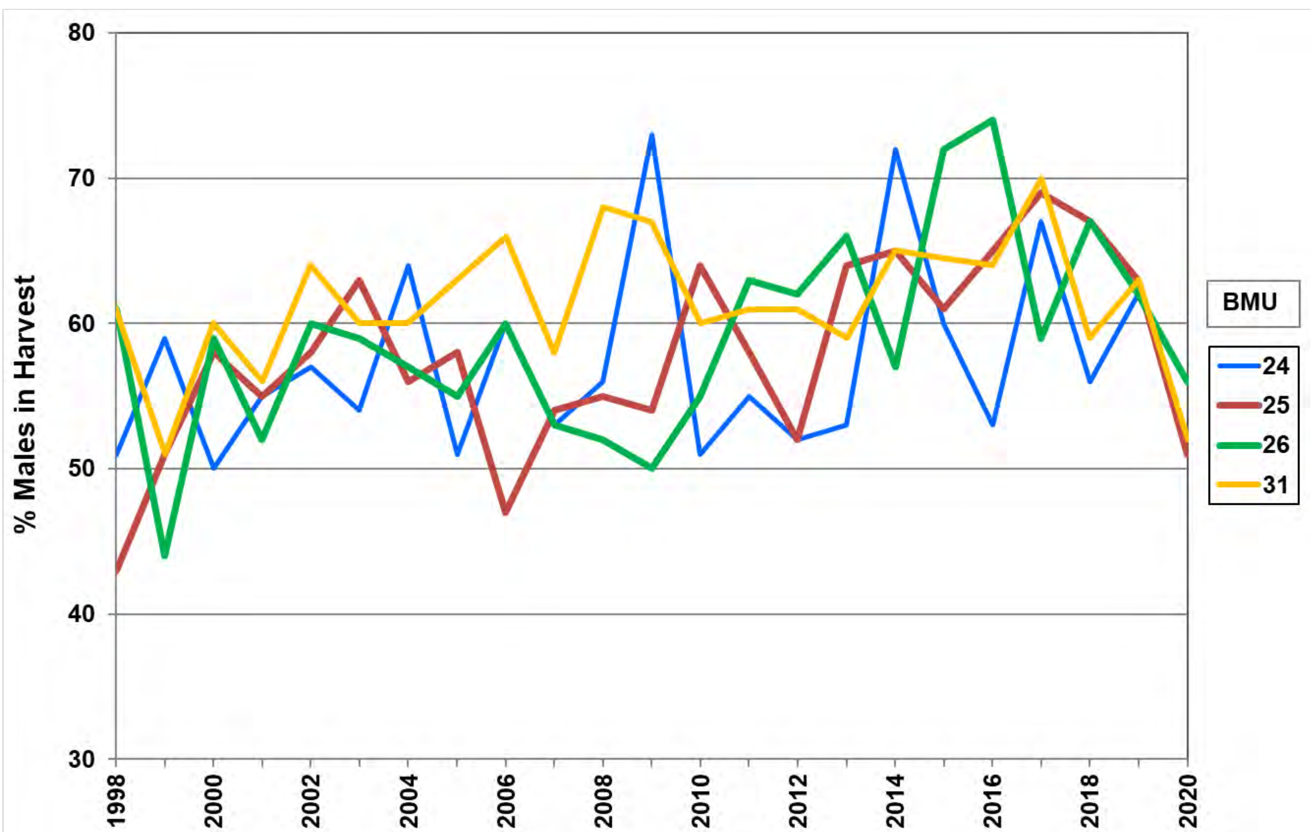


Figure 7. Sex ratios of harvested bears by BMU, 1998–2020. Thick lines show significant increasing trend across this period.

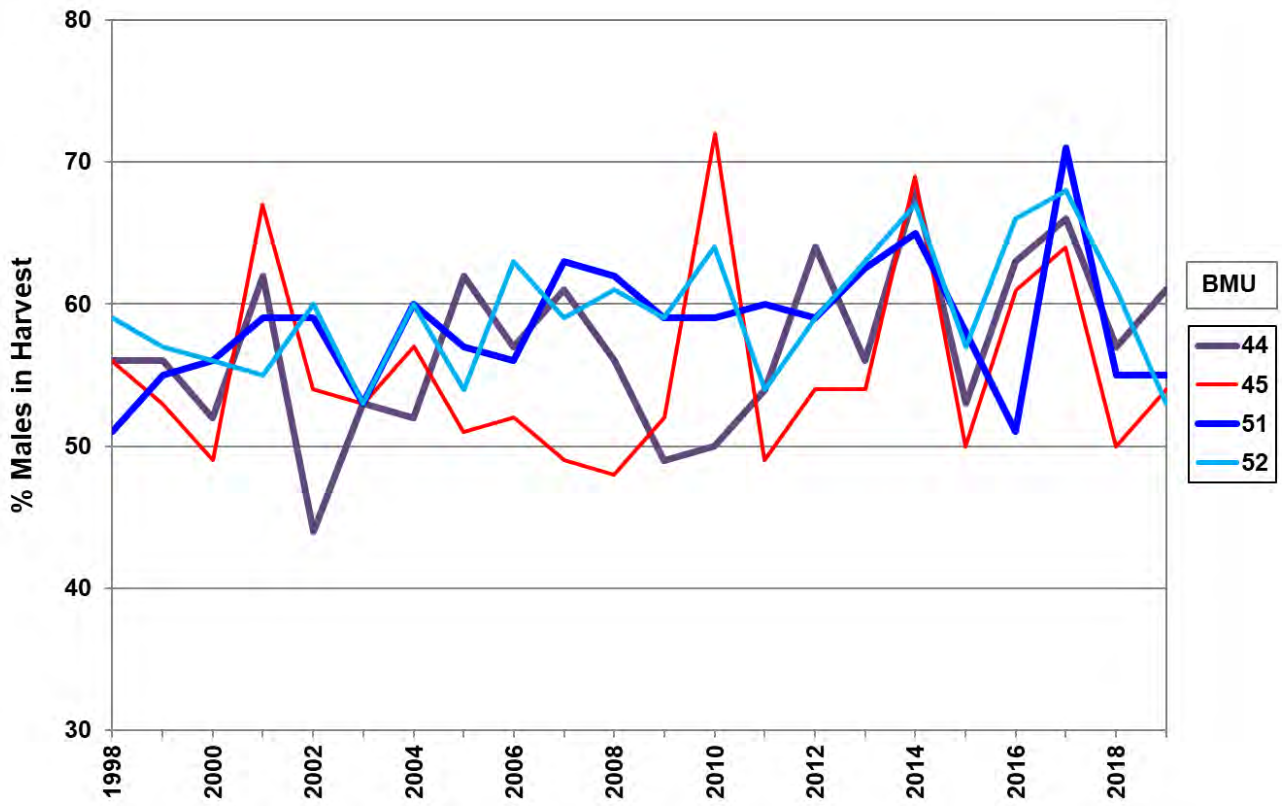
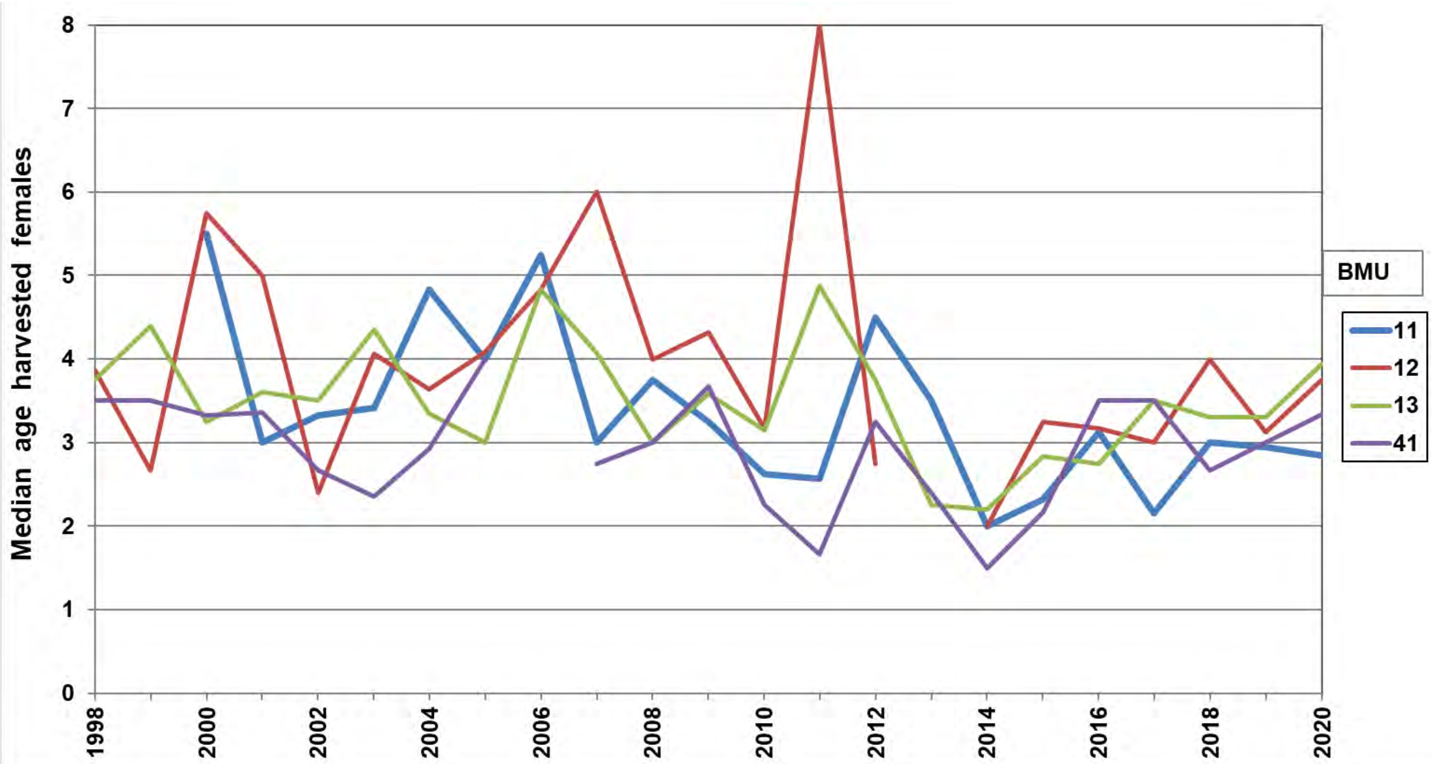


Figure 7. (continued)



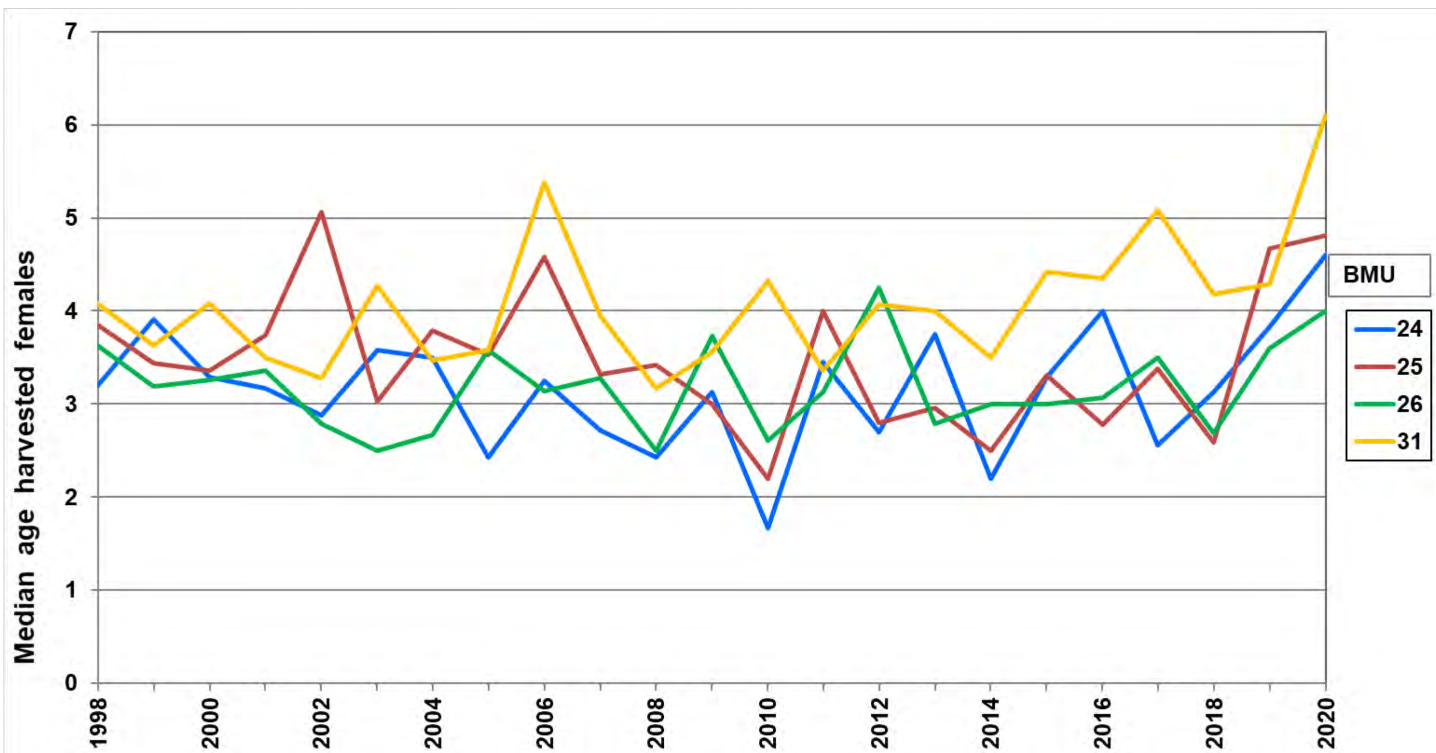
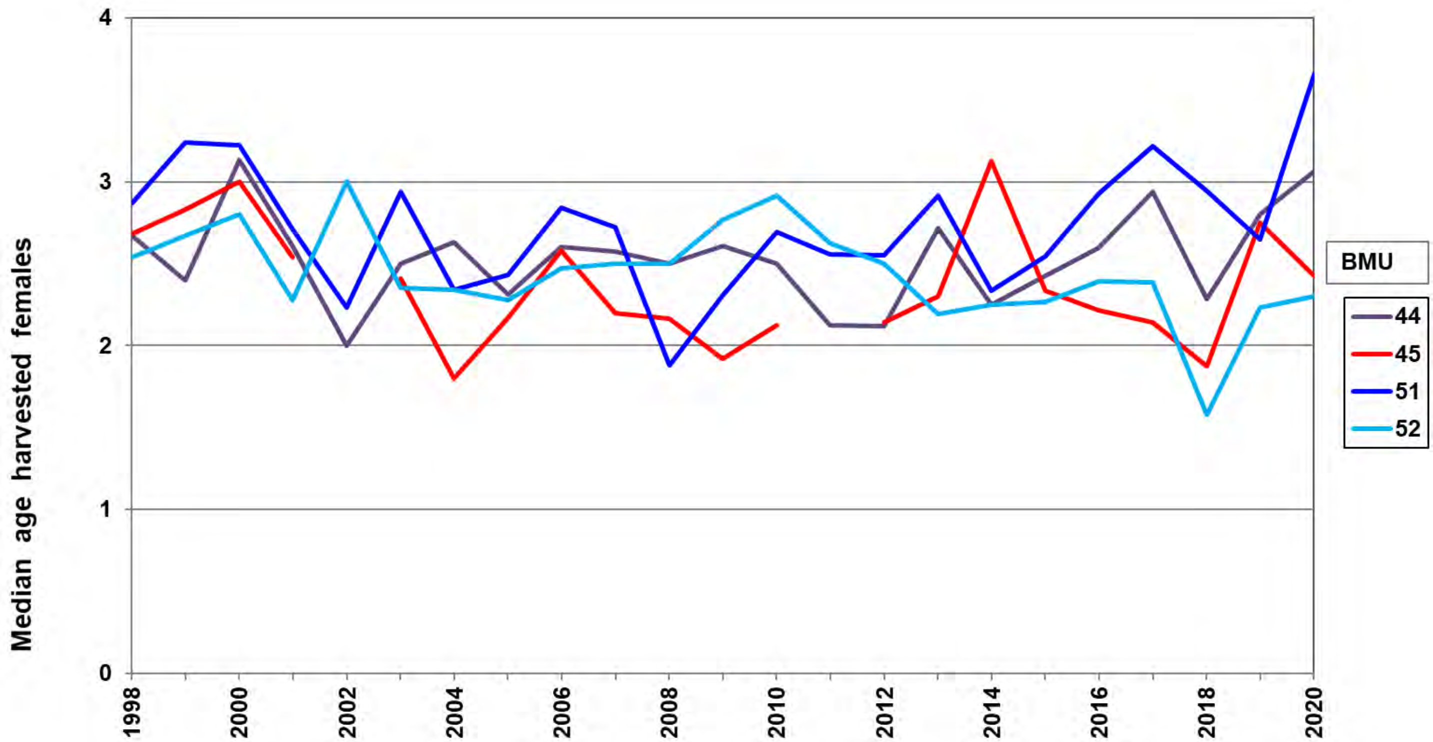


Figure 8. Median ages of harvested female bears by BMU, 1998–2020. Breaks in line occur when sample sizes were too small to calculate a meaningful median.



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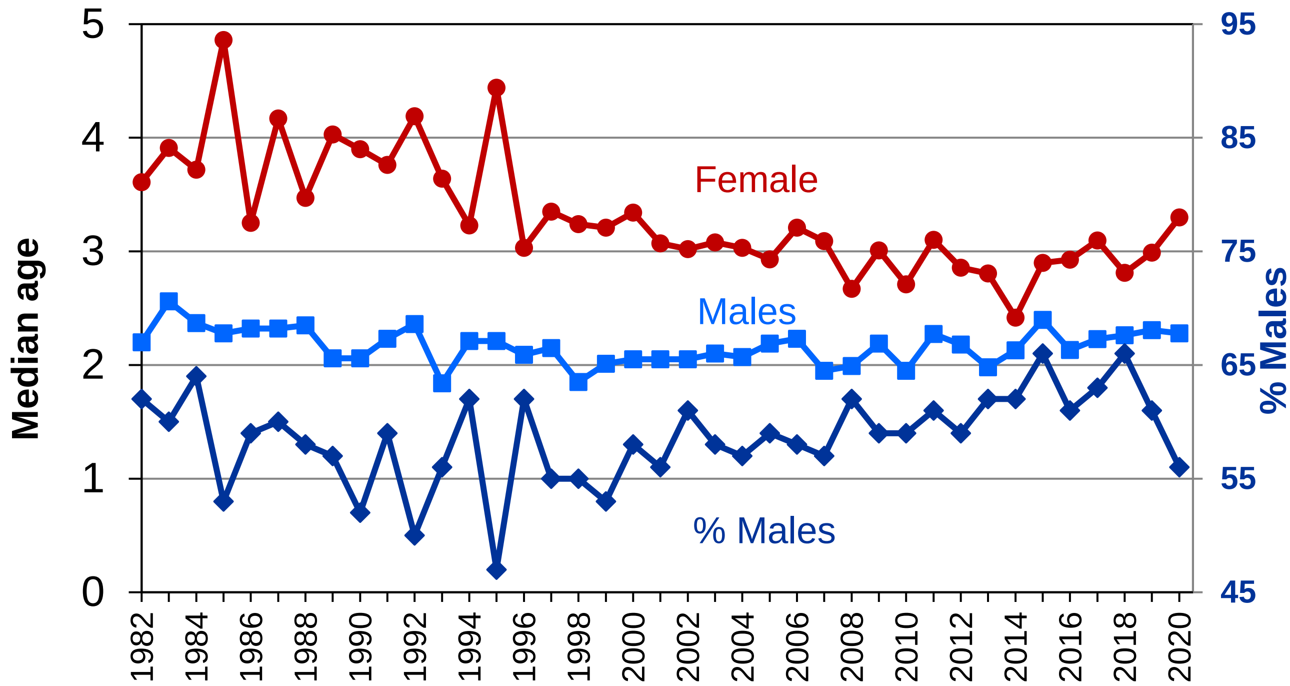

Figure 9. Statewide median ages (years) and sex ratio of harvested bears, 1982–2020.

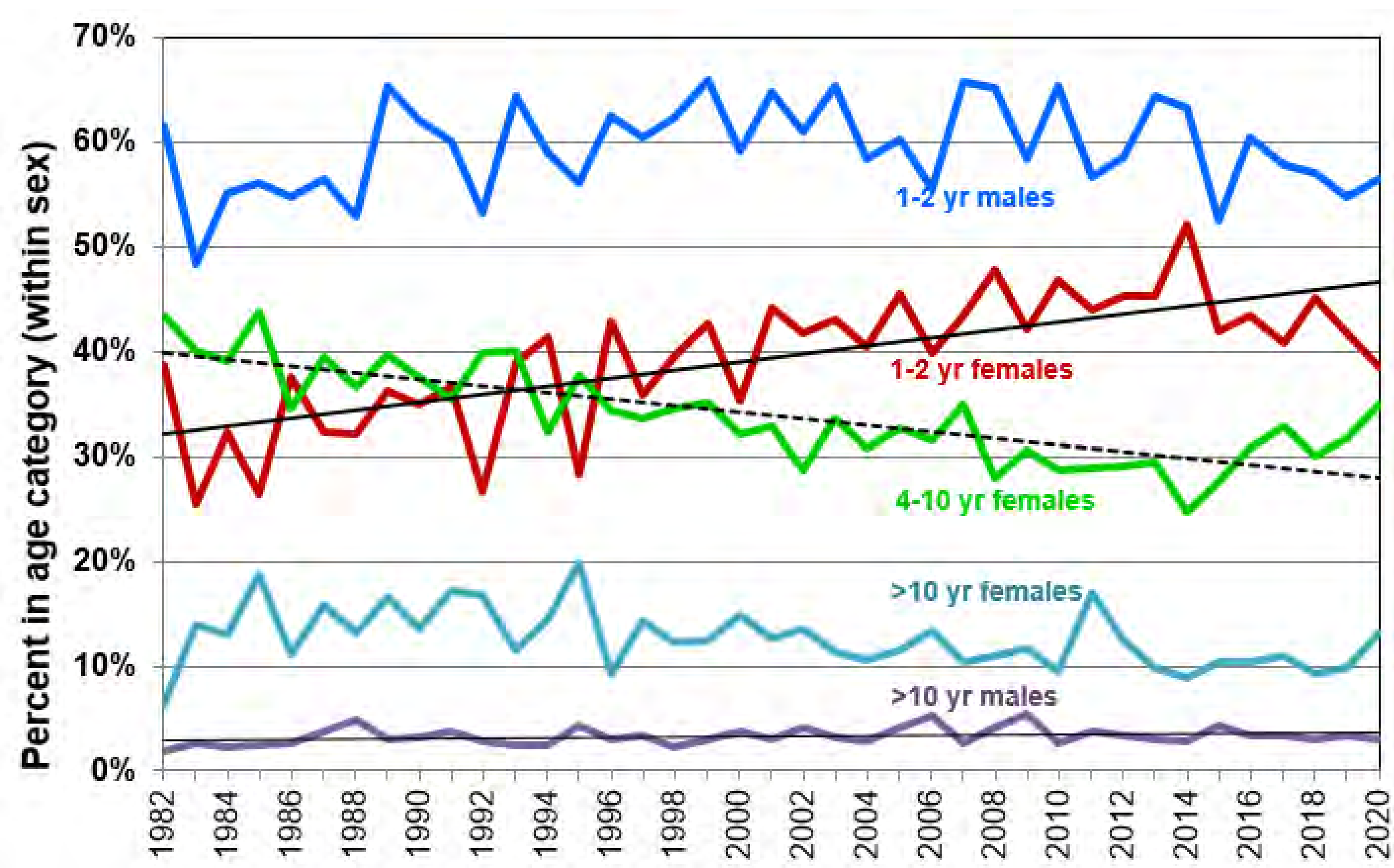

Figure 10. Statewide harvest structure: proportion of each sex in age category, 1982–2020.

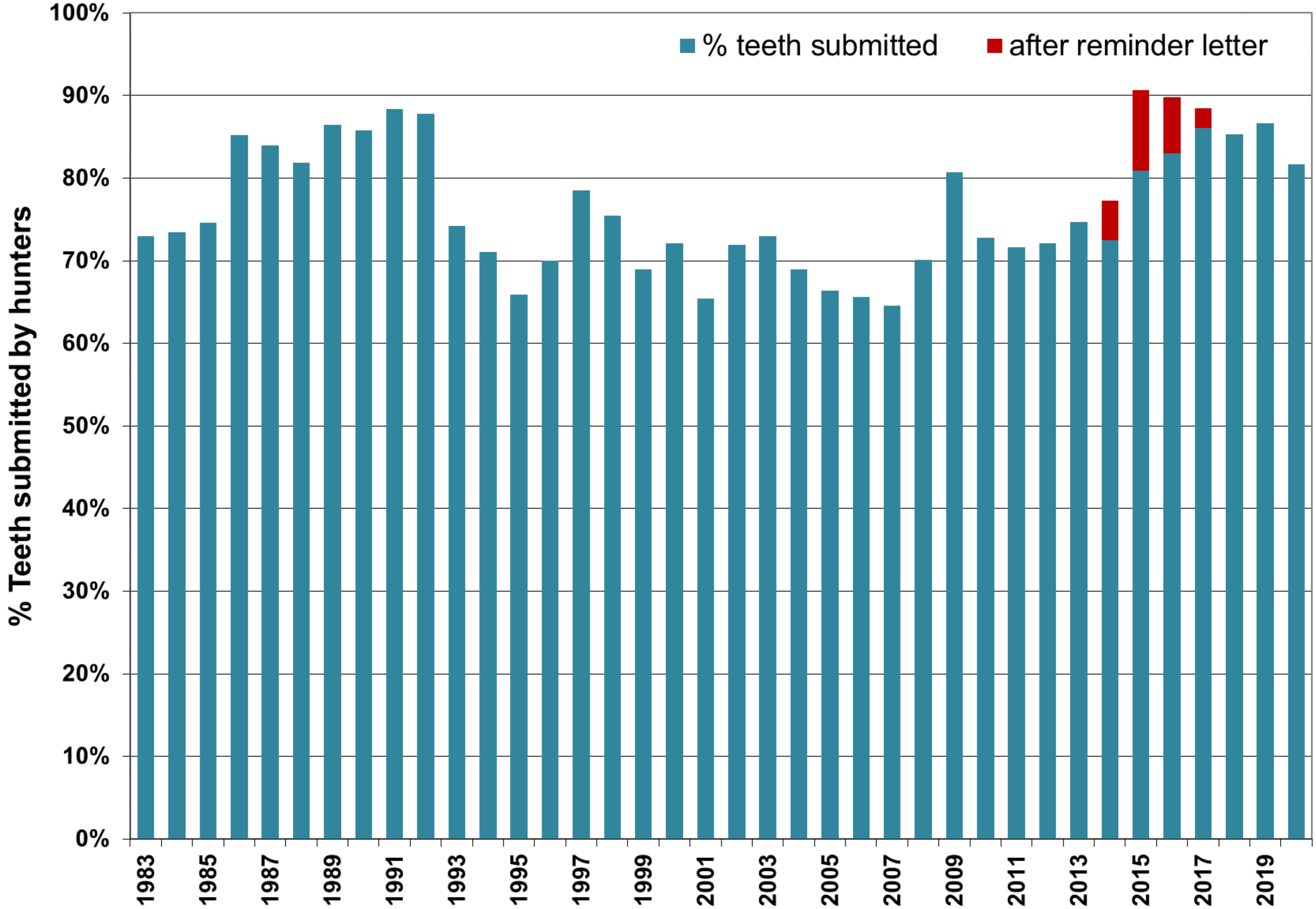

Figure 11. Percent of hunters submitting useable bear teeth for aging (vital for population monitoring, see Figs. 13–15). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993), and in recent years after a series of reminder letters (no letter was sent after 2017).

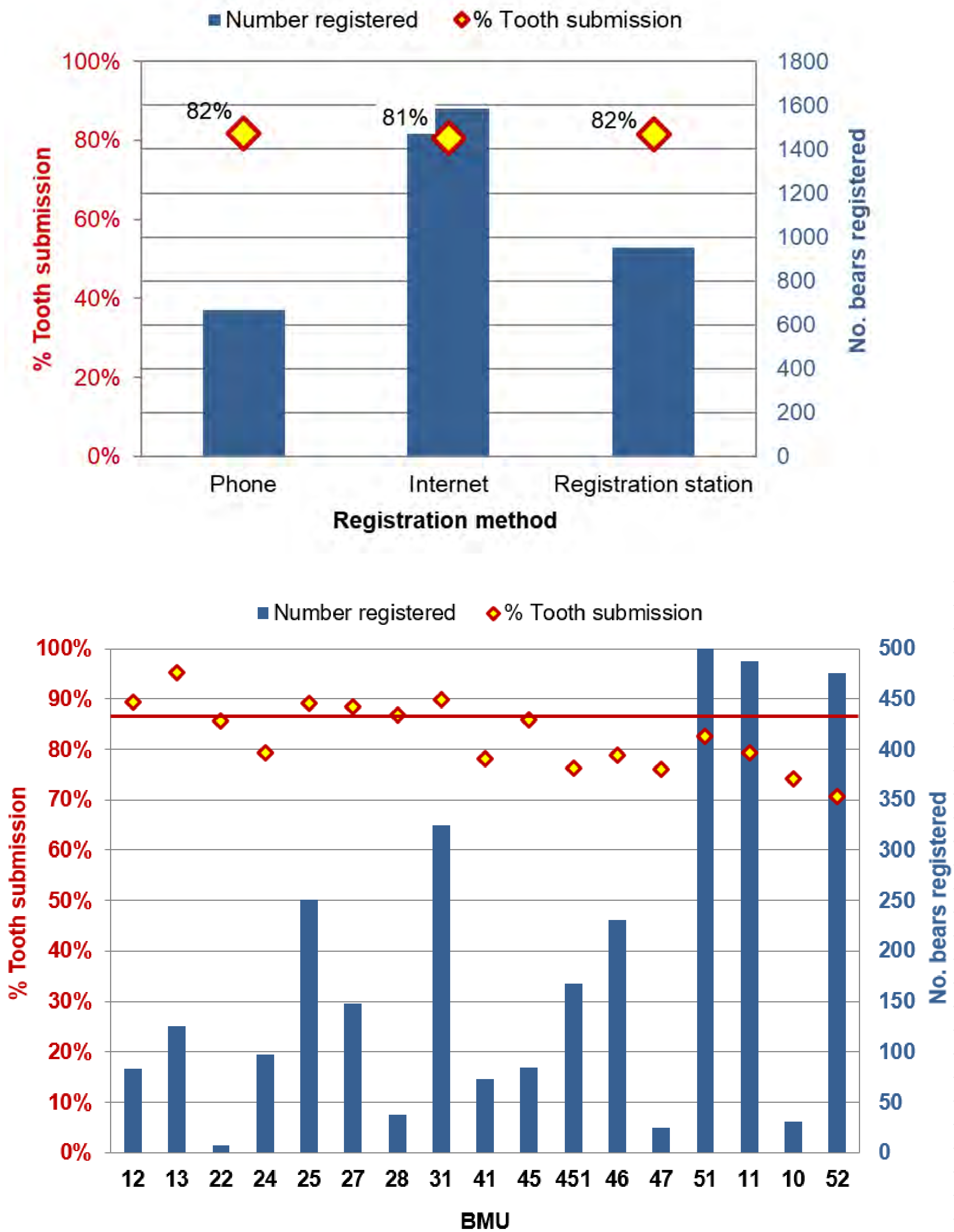

Figure 12. Percent of hunters who submitted a bear tooth in 2020 by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet, as well as in person at a station. The 2020 statewide submission average was 82%.

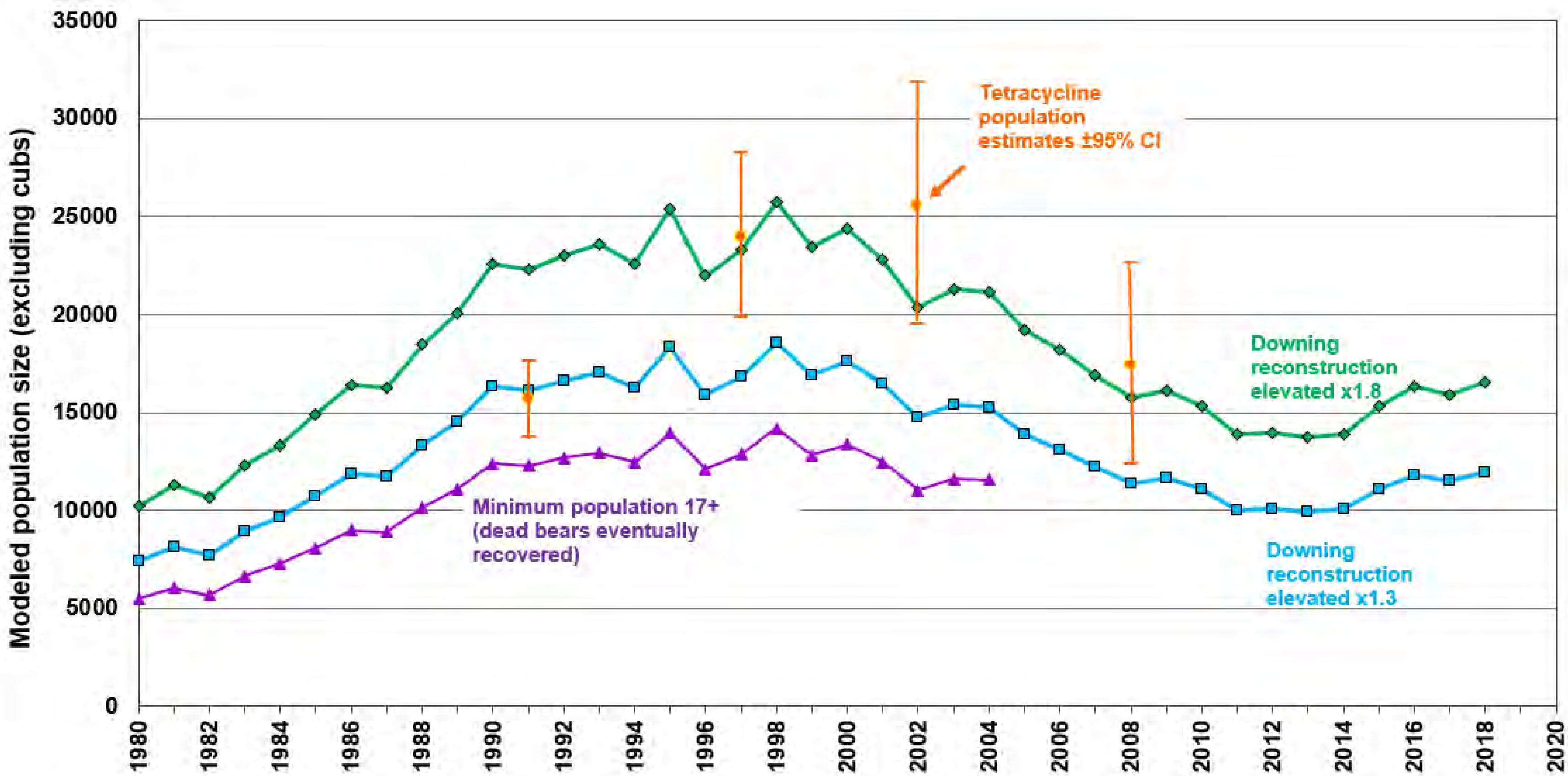

Figure 13. Statewide bear population trend (pre-hunt) derived from Downing reconstruction, scaled (elevated to account for non-harvest mortality) to various degrees to attempt to match the tetracycline-based mark–recapture estimates (2 such curves shown here; estimates beyond 2018 are unreliable).

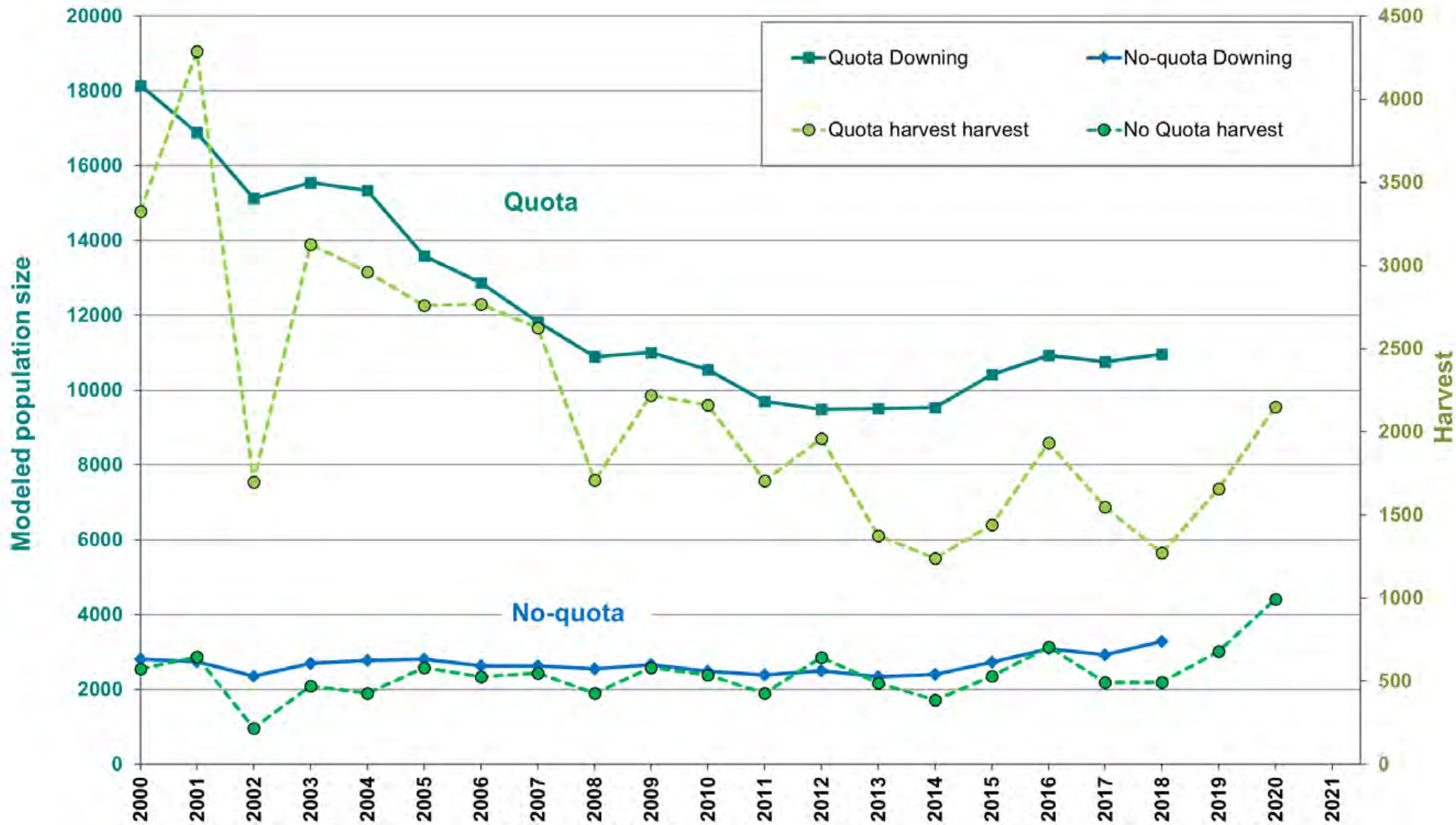

Figure 14. Population trends during 2000s derived from two independent population models (Downing [top panel] and Allen [bottom panel]) for quota and no-quota zones, compared to respective harvests. Downing reconstruction-based estimates <2 years from the most recent harvest age data are unreliable (hence these curves terminate 2018; top panel). Downing curves were scaled (elevated to account for non-harvest mortality) to fall between the two curves in Figure 13 (i.e., the actual scale of the population estimates is not empirically-based but happens to approximately match the magnitude of the Allen estimates).

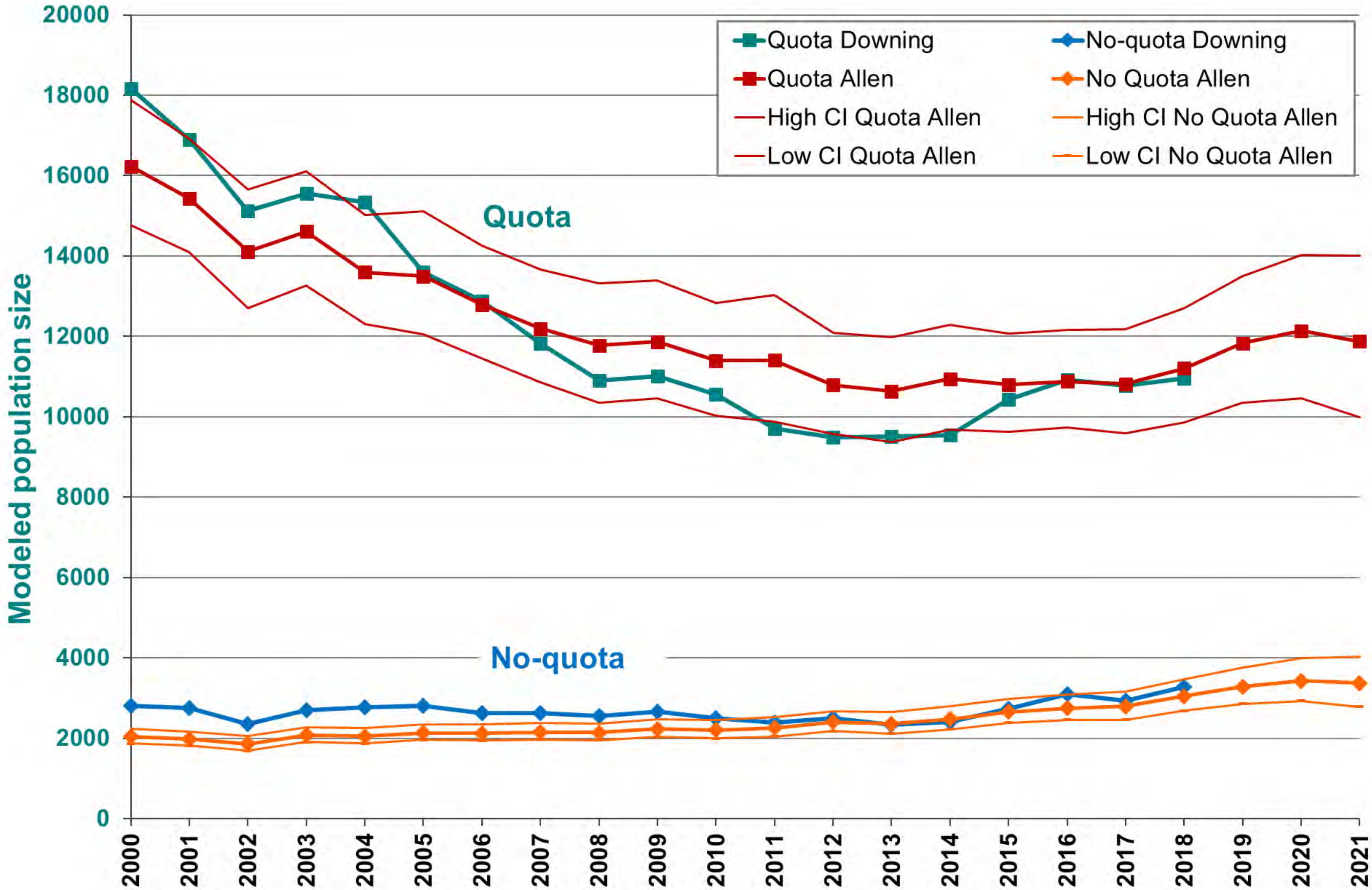

Figure 14. (continued)

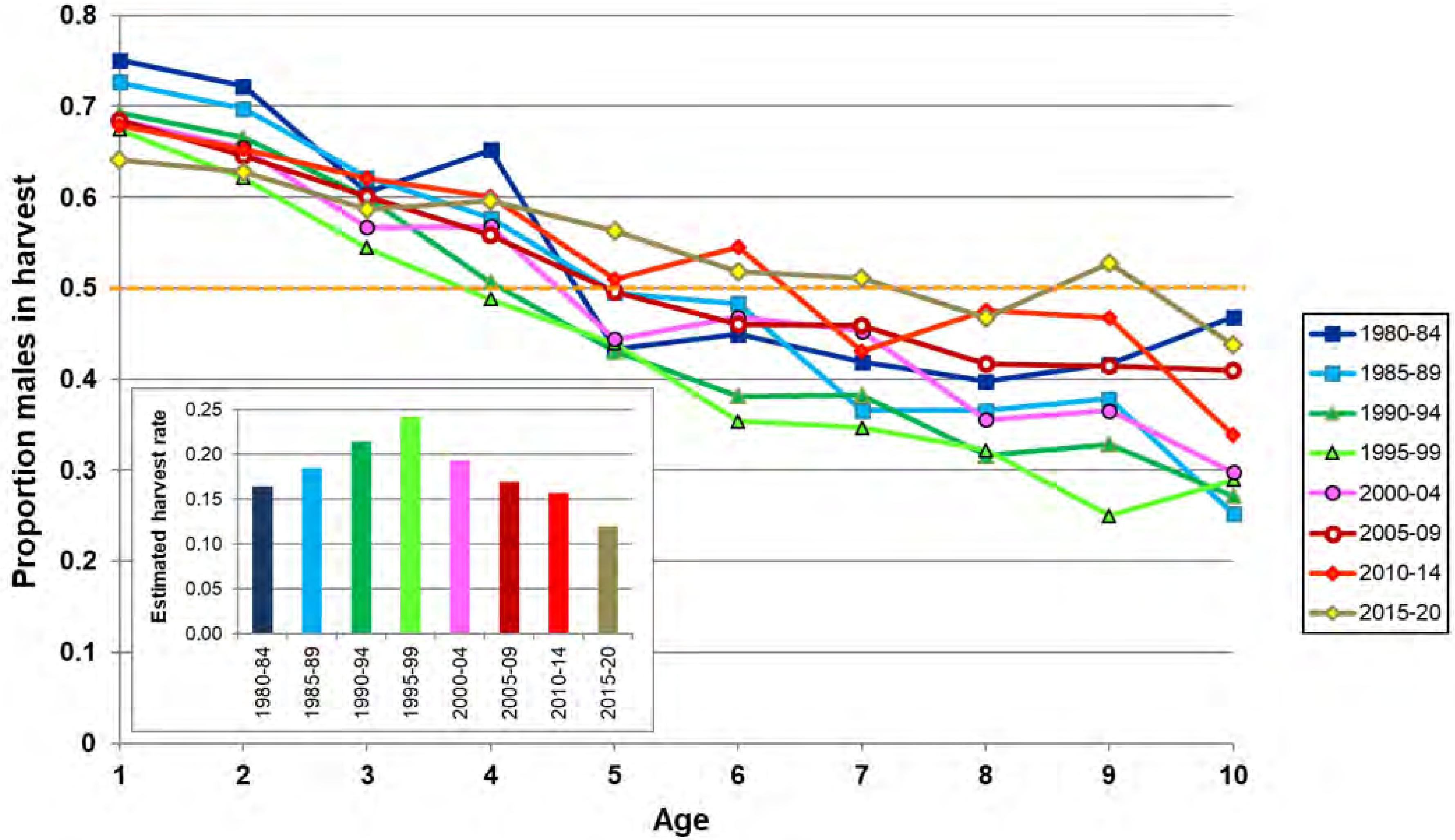

Figure 15. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1980–2020. Higher harvest rates result in steeper curves because males in the living population are reduced faster than females. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male (dashed tan horizontal line) yields approximately the inverse of the harvest rate (derived rates are shown in inset). Flatter curves in recent years indicate lower harvest rates (2015–20 lower than 1980–84).

2020 MINNESOTA DEER HARVEST REPORT

Barbara Keller, Big Game Program Leader, Division of Fish and Wildlife
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INTRODUCTION

The white-tailed deer may be considered Minnesota's most popular wildlife species. In 2020, more than 473,000 hunters participated in the season. 2020 was a generally liberal season designed to stabilize or reduce deer population growth across much of central Minnesota along the transition zone where there is exceptional deer habitat provided by deciduous forests interspersed with prairie and agriculture. The southeastern portion of the state, known as the driftless region, also provides exceptional deer habitat and ample hunting opportunities. Management of deer populations in the coniferous forests of the northcentral and northeastern portions of the state remained conservative, this an area where populations tend to have slower population growth rates. Likewise, the southwestern portion of the state, an area in an agriculturally dominated landscape had a conservative management strategy. During the archery, firearms and muzzleloader seasons, hunters registered 197,315 deer.

METHODS

Every deer taken by hunting in Minnesota must be registered. Deer may be registered at any of the 825 to nearly 900 "Big Game Registration" stations available throughout the state. Beginning in 2011, deer could also be registered using the internet and telephone. Implementation of electronic licensing (ELS) has improved the efficiency and accuracy of deer harvest estimates and provides a timelier release of harvest information. Registered deer are recorded as adult buck, fawn buck, adult doe, or fawn doe. Additional information gathered at the time of registration includes date of kill, deer permit area, and season. In 2016, carcass import restrictions were instituted to help prevent the spread of Chronic Wasting Disease (CWD). CWD was detected in three deer in Fillmore County during routine surveillance efforts. This prompted additional late season deer harvest opportunities for sample collection in southeast Minnesota. Due to the outward radial spread of CWD in southeast Minnesota and new detections of a wild deer near a positive deer farm in Crow Wing County, during the 2019 fall hunting seasons mandatory surveillance was implemented for the newly formed CWD Management Zones, known as 600-series DPAs. During the fall 2020 hunting season, CWD surveillance took place across 5 areas of the state. Three of the five areas were designated as management zones, as CWD had been found in wild deer in those areas; the remaining two surveillance zones were newly created in response to recent detections of disease on captive deer facilities. MNDNR's CWD management response within the management and control zones allowed for increased harvest through liberalized hunting opportunities to reduce deer densities, and control the movement of deer carcasses through carcass movement restrictions, which helps to prevent further spread of disease to new areas of the state.

RESULTS

Outcomes of the 2020 deer harvest are presented in the following tables.

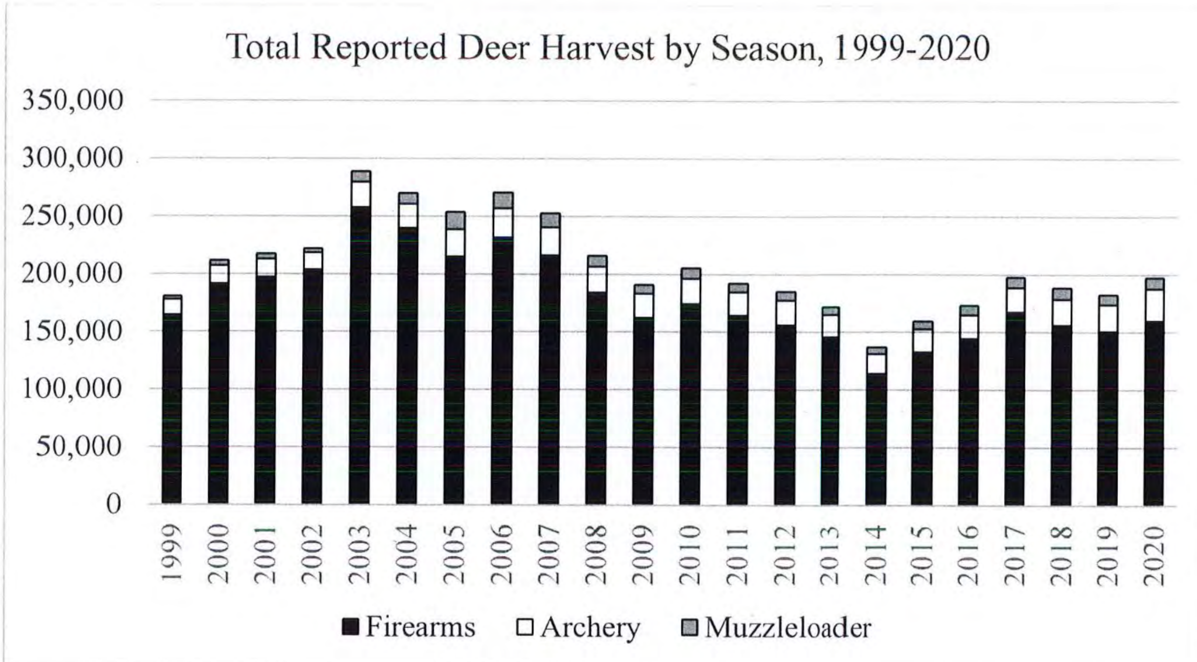


Figure 1. Total deer harvest by season, 1999-2020.

Table 1. Statewide firearms, archery, and muzzleloader harvest, license sales, and success rates, 2010 – 2020.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
REGULAR FIREARMS											
Resident License Sales	379,866	382,668	391,822	391,967	374,314	371,612	372,645	368,407	360,873	351,659	354,023
Non-Resident License Sales	11,908	11,955	12,483	12,496	11,674	13,501	12,540	12,923	12,928	12,239	12,576
Bonus Permit Sales[1]	143,763	142,049	89,750	97,402	29,642	31,065	44,365	93,309	117,640	131,804	168,814
Youth License Sales[2]	59,726	60,943	62,949	64,748	62,488	62333	61138	58779	56,989	57,575	58,601
Total License Sales[3]	595,263	597,615	557,004	566,613	478,118	478,511	490,688	533,418	548,430	553,277	594,014
Registered Buck Harvest	88,027	76,003	84,729	70,627	69,851	83,939	87,855	88,467	81,772	83,772	85,564
Antlerless Permits Offered	60,083	15,525	32,854	36,816	26,332	31,065	39,646	20,540	14,023	14,111	20,021
Antlerless Permits Issued	60,083	15,525	32,854	36,816	26,332	31,065	39,646	20,385	13,971	13,777	20,021
Antlerless Permits App.	86,783	21,071	67,308	68,811	96,580	95,656	97,056	45,001	29,302	33,191	39,821
Registered AL Harvest	86,077	88,197	71,140	67,885	44,038	48,758	52,338	79,033	74,203	66,971	74,198
Registered Total Harvest	174,104	164,200	155,869	145,449	113,889	132,697	144,470	167,500	155,975	150,743	159,762
Registered % Successful[4]	35.9	32.9	32.0	29.7	25.3	28.9	31.2	33.7	31.7	31.2	33.1
ARCHERY											
Resident License Sales	91,156	90,252	95,259	92,717	92,301	93,462	92,076	91,875	89,292	85,343	97,399
Non-Resident License Sales	1,638	1,718	1,814	1,952	1,946	2,032	2,062	2,016	2,020	2,129	2,592
Youth Archery Sales	9,577	10,306	11,276	12,212	11,965	11,905	10,846	9,961	9,052	8,267	9,312
Total License Sales	102,371	102,276	108,349	106,881	106,212	107399	104984	103852	100,364	95,739	109,303
Total Archery Harvest	22,057	20,444	21,605	19,388	17,119	20,074	20,360	21,058	22,665	24,250	27,803
Registered % Successful[4]	17.8	17.0	18.8	14.5	15.3	16.5	18.5	18.7	20.3	21.1	21.6
MUZZLELOADER											
Total Muzzleloader License Sales	55,640	59,384	58,363	51,092	43,946	50,176	53,097	51,961	48,589	43,126	55,523
Total Muzzleloader Harvest	9,023	7,416	7,779	7,045	5,847	6,572	8,383	9,210	10,066	8,644	9,750
Registered % Successful[4]	14.4	11.6	12.4	12.7	12.7	12.0	15.2	16.6	19	20.0	15.9
Antlerless Permits Offered	5,792	1,997	1,626	2,144	1,593	1,434	1,352	935	874	689	724
Antlerless Permits App.	7,260	2,615	3,743	3,544	4,588	3,393	2,930	1,902	1,592	1,485	1,281
TOTAL Registered Harvest	207,313	192,331	186,634	172,781	139,442	159,343	173,213	197,768	188,706	183,637	197,315

1 Bonus permits includes disease management and early antlerless permits.
2 Youth license sales include nonresident youth licenses.
3 Total license sales includes bonus permit sales, but does not include free landowner permits.
4 Percentage of unique hunters that harvested at least one deer, calculated by MNDNR number.

Table 2. Deer Harvest by Season, 2020.

Season	Total Hunters	Buck Harvest	Antlerless Harvest	Total Harvest	Successful Hunters[3]	Overall Success
Archery	109,234	11,779	16,024	27,803	23,582	21.6%
100 Series A	145,617	23,083	16,573	39,656	37,891	26.0%
200 Series A	226,066	49,582	40,135	89,717	79,311	35.1%
300-600 Series A[1]	40,619	6,963	4,667	11,630	10,032	24.7%
300-600 Series B[1]	7,640	1,647	3,526	5,173	4,285	56.1%
Metro Firearms (701)	1,899	489	327	816	715	37.7%
Muzzleloader	55,523	3,215	6,535	9,750	8,845	15.9%
Youth[2]	N/A	3,314	4,052	7,366	7,331	N/A
Early Antlerless	12,510	0	3,825	3,825	2,844	22.7%
Special Firearms Hunts	3,520	275	495	770	613	17.4%
Late CWD	N/A	211	598	809	702	N/A
Total	**473,346**	**100,558**	**96,757**	**197,315**	**166,244**	**35.1%**

[1] Does not include deer harvested in permit area 604; in 2019 a person could hunt either the A or B season in the 600 series regardless of license type and thus hunter numbers and success rates are only an estimate.

[2] Cannot estimate hunter numbers for youth and late CWD hunts because licenses are not exclusive to those seasons.

[3] Number of hunters that harvested at least one deer.

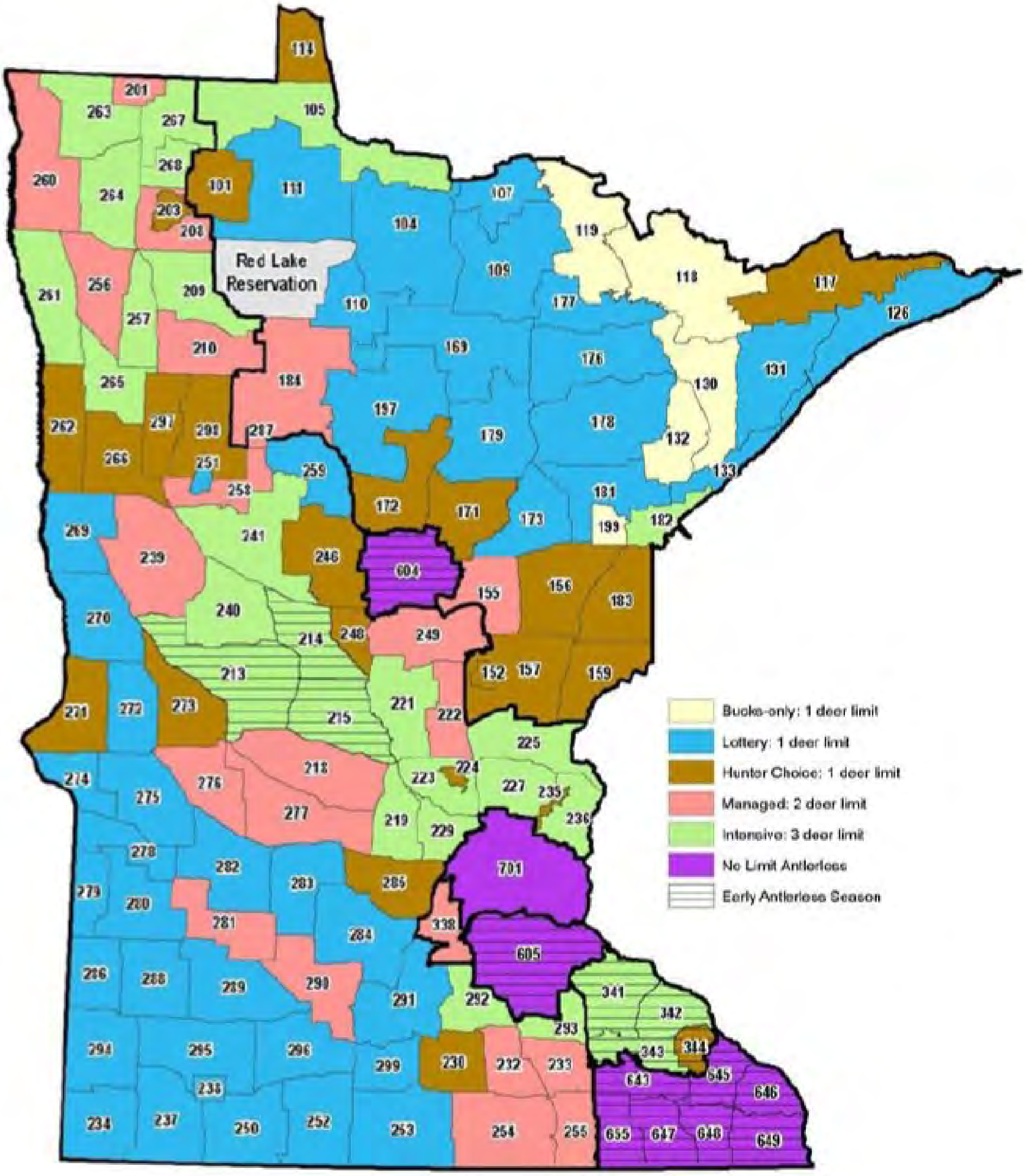


Figure 1. Bag limit designations for deer permit areas in Minnesota for the 2020 deer season.

Table 3. Total deer harvest in each deer permit area for the 2020 deer season.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Land Area (Sq. Mile)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile	Rank
101	401	27	148	15	591	496	0.81	0.38	1.19	92
104	318	11	34	4	367	1,414	0.22	0.03	0.26	125
105	1405	170	1162	156	2893	1,199	1.17	1.24	2.41	53
107	463	34	187	17	701	472	0.98	0.50	1.49	77
109	257	7	47	3	314	1,182	0.22	0.05	0.27	124
110	801	36	215	24	1076	529	1.52	0.52	2.04	59
111	299	3	40	5	347	1,384	0.22	0.03	0.25	126
114	12	0	7	1	20	116	0.10	0.07	0.17	129
117	15	3	8	0	26	927	0.02	0.01	0.03	131
118	520	0	2	2	524	1,220	0.43	0.00	0.43	120
119	296	2	3	0	301	770	0.38	0.01	0.39	122
126	207	3	40	3	253	942	0.22	0.05	0.27	123
130	148	1	4	1	154	746	0.20	0.01	0.21	128
131	37	1	13	2	53	899	0.04	0.02	0.06	130
132	195	1	3	2	201	482	0.40	0.01	0.42	121
133	343	15	72	8	438	352	0.97	0.27	1.24	88
152	80	16	48	6	150	61	1.31	1.15	2.45	52
155	768	157	745	124	1794	499	1.54	2.06	3.60	36
156	1207	169	925	125	2426	825	1.46	1.48	2.94	46
157	2671	381	1497	257	4806	888	3.01	2.41	5.42	20
159	1273	147	797	112	2329	571	2.23	1.85	4.08	33
169	1066	52	332	30	1480	1,124	0.95	0.37	1.32	86
171	460	85	454	65	1064	627	0.73	0.96	1.70	72
172	1155	207	967	160	2489	687	1.68	1.94	3.62	35
173	457	56	310	34	857	584	0.78	0.68	1.47	80
176	742	34	206	23	1005	921	0.81	0.29	1.09	95
177	508	32	219	32	791	480	1.06	0.59	1.65	73
178	1311	47	366	33	1757	1,195	1.10	0.37	1.47	79
179	1218	141	758	106	2223	862	1.41	1.17	2.58	51
181	765	60	404	50	1279	629	1.22	0.82	2.03	60
182	510	86	503	69	1168	278	1.84	2.37	4.20	30
183	1139	132	831	111	2213	663	1.72	1.62	3.34	38
184	2196	431	1776	336	4739	1,229	1.79	2.07	3.86	34
197	699	36	214	28	977	955	0.73	0.29	1.02	97

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Land Area (Sq. Mile)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile	Rank
199	91	1	7	0	99	153	0.60	0.05	0.65	110
201	115	16	83	17	231	161	0.71	0.72	1.43	82
203	67	3	14	2	86	118	0.57	0.16	0.73	107
208	328	30	175	35	568	379	0.87	0.63	1.50	76
209	716	94	482	77	1369	640	1.12	1.02	2.14	57
210	957	114	531	91	1693	615	1.56	1.20	2.75	49
213	3222	823	3062	704	7811	1,057	3.05	4.34	7.39	8
214	2238	657	2070	515	5480	554	4.04	5.85	9.89	1
215	2094	587	1967	516	5164	701	2.99	4.38	7.36	9
218	1462	283	1172	237	3154	884	1.65	1.91	3.57	37
219	927	232	788	162	2109	391	2.37	3.02	5.39	21
221	2066	475	1673	412	4626	642	3.22	3.99	7.21	11
222	1414	287	1054	252	3007	413	3.42	3.85	7.27	10
223	1153	276	926	195	2550	376	3.07	3.72	6.79	14
224	135	17	70	18	240	47	2.85	2.22	5.07	25
225	2313	514	1826	335	4988	618	3.74	4.33	8.07	4
227	1763	323	1374	267	3727	472	3.74	4.16	7.90	6
229	460	70	345	52	927	284	1.62	1.64	3.26	39
230	311	44	158	28	541	452	0.69	0.51	1.20	90
232	348	65	246	38	697	377	0.92	0.93	1.85	66
233	310	35	198	22	565	381	0.81	0.67	1.48	78
234	259	13	55	6	333	636	0.41	0.12	0.52	118
235	117	20	50	15	202	34	3.47	2.52	5.99	16
236	1111	173	718	101	2103	370	3.00	2.68	5.69	17
237	334	10	67	12	423	728	0.46	0.12	0.58	114
238	102	3	29	4	138	95	1.07	0.38	1.45	81
239	2083	351	1269	227	3930	919	2.27	2.01	4.28	29
240	2413	476	1842	358	5089	643	3.76	4.16	7.92	5
241	3620	806	3231	614	8271	996	3.64	4.67	8.31	3
246	1825	300	1198	208	3531	784	2.33	2.18	4.50	28
248	547	57	227	51	882	214	2.55	1.56	4.12	32
249	1610	347	1242	236	3435	496	3.25	3.68	6.93	12
250	413	16	102	6	537	713	0.58	0.17	0.75	104
251	60	11	32	10	113	55	1.09	0.96	2.05	58
252	397	24	152	20	593	715	0.56	0.27	0.83	100

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Land Area (Sq. Mile)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile	Rank
253	517	27	159	9	712	974	0.53	0.20	0.73	106
254	707	97	418	63	1285	924	0.77	0.63	1.39	84
255	310	40	220	38	608	392	0.79	0.76	1.55	75
256	611	59	328	64	1062	654	0.93	0.69	1.62	74
257	543	69	330	48	990	412	1.32	1.08	2.40	54
258	884	164	629	166	1843	343	2.58	2.80	5.38	23
259	899	108	414	72	1493	490	1.84	1.21	3.05	43
260	358	28	164	24	574	1,055	0.34	0.20	0.54	115
261	270	34	186	23	513	795	0.34	0.31	0.65	111
262	299	16	113	13	441	677	0.44	0.21	0.65	109
263	716	67	471	58	1312	706	1.01	0.84	1.86	65
264	925	130	707	116	1878	669	1.38	1.42	2.81	48
265	648	110	561	92	1411	494	1.31	1.54	2.86	47
266	511	48	177	23	759	617	0.83	0.40	1.23	89
267	409	56	302	51	818	472	0.87	0.87	1.73	69
268	378	43	254	44	719	228	1.66	1.49	3.15	41
269	372	13	81	13	479	650	0.57	0.16	0.74	105
270	307	16	73	9	405	748	0.41	0.13	0.54	116
271	337	30	158	13	538	632	0.53	0.32	0.85	99
272	242	11	58	12	323	531	0.46	0.15	0.61	112
273	619	48	279	50	996	571	1.08	0.66	1.74	67
274	330	12	102	7	451	354	0.93	0.34	1.27	87
275	453	21	107	15	596	764	0.59	0.19	0.78	103
276	729	109	547	77	1462	542	1.35	1.35	2.70	50
277	2051	298	1614	217	4180	812	2.53	2.62	5.15	24
278	493	50	219	20	782	402	1.23	0.72	1.95	63
279	207	30	136	21	394	344	0.60	0.54	1.15	93
280	266	10	76	12	364	675	0.39	0.15	0.54	117
281	686	86	530	54	1356	575	1.19	1.17	2.36	55
282	149	9	31	5	194	778	0.19	0.06	0.25	127
283	375	9	96	14	494	613	0.61	0.19	0.81	102
284	398	20	121	13	552	838	0.48	0.18	0.66	108
285	583	55	275	28	941	549	1.06	0.65	1.71	70
286	323	29	157	23	532	446	0.72	0.47	1.19	91
287	48	13	35	6	102	46	1.05	1.18	2.23	56

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Land Area (Sq. Mile)	Bucks/ Sq. Mile	Antlerless/ Sq. Mile	Total/ Sq. Mile	Rank
288	446	31	219	14	710	625	0.71	0.42	1.14	94
289	236	21	119	9	385	815	0.29	0.18	0.47	119
290	581	91	537	69	1278	662	0.88	1.05	1.93	64
291	883	69	378	41	1371	800	1.10	0.61	1.71	71
292	496	108	423	82	1109	362	1.37	1.69	3.06	42
293	428	75	282	46	831	278	1.54	1.45	2.99	45
294	354	28	171	15	568	686	0.52	0.31	0.83	101
295	621	21	213	19	874	839	0.74	0.30	1.04	96
296	396	28	138	10	572	667	0.59	0.26	0.86	98
297	154	20	78	13	265	438	0.35	0.25	0.60	113
298	526	60	244	39	869	618	0.85	0.56	1.41	83
299	411	36	203	21	671	386	1.06	0.67	1.74	68
338	337	56	212	33	638	316	1.07	0.95	2.02	61
341	1695	277	1085	243	3300	603	2.81	2.66	5.47	19
342	999	185	768	173	2125	350	2.85	3.22	6.07	15
343	766	116	578	83	1543	320	2.39	2.43	4.82	26
344	468	72	289	67	896	186	2.52	2.30	4.82	27
604	1787	556	1884	376	4603	673	2.66	4.18	6.84	13
605	1508	361	1462	247	3578	1192	1.27	1.74	3.00	44
643	624	141	558	133	1456	351	1.78	2.37	4.15	31
645	785	178	629	185	1777	330	2.38	3.01	5.38	22
646	1339	282	1008	286	2915	319	4.20	4.94	9.14	2
647	662	112	512	81	1367	434	1.53	1.62	3.15	40
648	831	185	682	141	1839	332	2.50	3.04	5.54	18
649	1783	375	1370	326	3854	492	3.62	4.21	7.83	7
655	255	53	170	41	519	387	0.66	0.68	1.34	85
701	1277	214	997	135	2623	1324	0.96	1.02	1.98	62
Total	99,924	15,852	67,109	12,228	195,113	78,870	1.27	1.21	2.47	

Table 4. Archery season harvest by DPA, excluding special hunts, 2020.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
101	9	0	7	1	17
104	7	0	3	0	10
105	59	6	89	10	164
107	28	4	19	0	51
109	7	1	8	0	16
110	21	4	15	2	42
111	6	0	3	0	9
114	1	0	1	0	2
117	2	0	1	0	3
118	28	0	0	0	28
119	4	0	0	0	4
126	10	0	9	0	19
130	8	0	1	0	9
131	4	0	3	1	8
132	11	0	1	1	13
133	35	3	17	2	57
152	1	2	3	1	7
155	42	12	83	7	144
156	60	7	57	5	129
157	163	16	137	6	322
159	83	5	53	8	149
169	33	2	51	0	86
171	28	3	19	2	52
172	73	10	70	7	160
173	22	2	25	5	54
176	27	4	37	3	71
177	23	2	19	4	48
178	76	13	53	3	145
179	95	14	81	9	199
181	58	4	35	1	98
182	146	27	206	27	406
183	64	6	52	6	128
184	158	34	237	27	456
197	27	1	27	5	60
199	4	0	2	0	6
201	2	1	6	1	10
203	3	0	1	0	4
208	15	2	9	0	26

Table 4., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
209	40	5	46	2	93
210	39	8	58	4	109
213	393	79	492	59	1023
214	157	54	274	38	523
215	283	69	366	62	780
218	180	44	269	27	520
219	151	50	244	41	486
221	206	53	307	49	615
222	116	21	139	17	293
223	265	80	349	54	748
224	29	2	20	2	53
225	270	70	408	50	798
227	377	99	504	77	1057
229	115	15	117	7	254
230	36	3	15	4	58
232	48	7	52	2	109
233	61	8	65	5	139
234	36	1	11	1	49
235	47	7	22	5	81
236	340	67	301	37	745
237	35	2	18	3	58
238	12	1	5	0	18
239	145	27	155	15	342
240	186	31	295	32	544
241	258	76	522	45	901
246	104	13	72	9	198
248	82	9	37	5	133
249	116	25	140	12	293
250	36	3	21	2	62
251	6	0	6	0	12
252	53	3	26	3	85
253	60	5	45	2	112
254	120	7	91	10	228
255	72	8	71	9	160
256	19	2	32	1	54
257	23	9	41	2	75
258	51	9	63	10	133

Table 4., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
259	46	5	42	2	95
260	31	1	15	1	48
261	37	2	37	6	82
262	43	2	21	1	67
263	32	3	43	2	80
264	39	9	60	2	110
265	39	5	73	6	123
266	27	1	13	1	42
267	17	3	24	1	45
268	16	2	29	2	49
269	41	1	13	2	57
270	35	2	12	1	50
271	31	3	23	1	58
272	23	0	2	2	27
273	64	0	32	6	102
274	34	5	20	4	63
275	50	3	24	1	78
276	81	9	102	10	202
277	252	30	338	28	648
278	51	10	33	2	96
279	10	1	17	1	29
280	29	1	16	0	46
281	90	5	104	6	205
282	22	1	5	1	29
283	55	0	17	2	74
284	46	3	29	3	81
285	90	4	49	2	145
286	22	2	11	1	36
287	1	0	3	1	5
288	52	4	37	2	95
289	32	0	21	2	55
290	67	8	90	9	174
291	133	14	77	4	228
292	70	17	93	16	196
293	82	15	86	10	193
294	30	2	14	1	47
295	61	3	57	4	125

Table 4., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
296	37	1	24	3	65
297	6	0	6	0	12
298	18	3	12	2	35
299	71	8	45	1	125
338	71	12	66	8	157
341	339	33	308	51	731
342	184	25	152	23	384
343	214	23	189	13	439
344	78	7	16	1	102
604	261	64	300	49	674
605	400	59	396	53	908
643	166	25	145	24	360
645	128	17	96	18	259
646	247	27	152	33	459
647	100	6	84	4	194
648	123	23	94	19	259
649	324	40	217	41	622
655	42	7	28	5	82
701	763	142	731	97	1733
Total	11,463	1,855	11,882	1,438	26,638

Table 5. Total 2020 firearms season harvest by DPA. Does not include youth, early antlerless, late CWD, or special firearms hunts.

Permit Area	Land Area (Sq. Mile)	Firearms Hunters	Hunters / sq. mile	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Bucks / sq. mile	Antlerless / sq. mile	Total / sq. mile
101	496	1786	3.6	367	26	126	12	531	0.74	0.33	1.07
104	1,414	1754	1.2	302	7	26	3	338	0.21	0.03	0.24
105	1,199	5578	4.7	1213	142	926	132	2413	1.01	1.00	2.01
107	472	2119	4.5	399	23	137	15	574	0.85	0.37	1.22
109	1,182	1941	1.6	246	5	31	3	285	0.21	0.03	0.24
110	529	3639	6.9	731	28	173	18	950	1.38	0.41	1.80
111	1,384	1499	1.1	276	2	23	3	304	0.20	0.02	0.22
114	116	67	0.6	11	0	6	1	18	0.09	0.06	0.16
117	927	132	0.1	13	2	6	0	21	0.01	0.01	0.02
118	1,220	2635	2.2	470	0	2	1	473	0.39	0.00	0.39
119	770	1975	2.6	286	2	3	0	291	0.37	0.01	0.38
126	942	1355	1.4	192	3	29	3	227	0.20	0.04	0.24
130	746	1336	1.8	139	1	2	1	143	0.19	0.01	0.19
131	899	773	0.9	32	1	8	1	42	0.04	0.01	0.05
132	482	1761	3.7	176	1	2	1	180	0.37	0.01	0.37
133	352	1994	5.7	293	8	47	6	354	0.83	0.17	1.01
152	61	621	10.2	78	14	43	5	140	1.28	1.01	2.29
155	499	5209	10.4	702	137	619	113	1571	1.41	1.74	3.15
156	825	7956	9.6	1108	151	803	108	2170	1.34	1.29	2.63
157	888	12354	13.9	2413	341	1247	232	4233	2.72	2.05	4.77
159	571	6383	11.2	1134	134	694	96	2058	1.99	1.62	3.60
169	1,124	7626	6.8	1009	43	239	26	1317	0.90	0.27	1.17
171	627	4745	7.6	423	82	391	58	954	0.67	0.85	1.52
172	687	8869	12.9	1052	187	847	147	2233	1.53	1.72	3.25
173	584	4245	7.3	423	51	258	26	758	0.72	0.57	1.30
176	921	5326	5.8	680	25	133	17	855	0.74	0.19	0.93
177	480	3571	7.4	467	28	174	23	692	0.97	0.47	1.44
178	1,195	8039	6.7	1168	28	255	25	1476	0.98	0.26	1.24
179	862	8129	9.4	1065	117	612	88	1882	1.24	0.95	2.18
181	629	5072	8.1	686	52	335	46	1119	1.09	0.69	1.78
182	278	2292	8.2	341	56	269	38	704	1.23	1.31	2.53
183	663	6863	10.4	1041	115	714	93	1963	1.57	1.39	2.96
184	1,229	12601	10.3	1951	373	1415	290	4029	1.59	1.69	3.28
197	955	4899	5.1	648	32	173	22	875	0.68	0.24	0.92
199	153	473	3.1	82	1	5	0	88	0.54	0.04	0.58
201	161	421	2.6	103	14	69	16	202	0.64	0.61	1.25

Table 5., continued.

Permit Area	Land Area (Sq. Mile)	Firearms Hunters	Hunters / sq. mile	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Bucks / sq. mile	Antlerless / sq. mile	Total / sq. mile
203	118	195	1.7	53	2	7	2	66	0.45	0.09	0.56
208	379	1081	2.9	278	26	135	30	472	0.73	0.50	1.25
209	640	2435	3.8	598	74	370	65	1111	0.94	0.80	1.74
210	615	3740	6.1	859	95	422	83	1465	1.40	0.98	2.38
213	1,057	10395	9.8	2599	443	1528	386	4966	2.46	2.23	4.70
214	554	7679	13.9	1934	410	1151	303	3812	3.49	3.36	6.88
215	701	7465	10.6	1628	356	1011	298	3304	2.32	2.37	4.71
218	884	5626	6.4	1166	199	738	174	2283	1.32	1.26	2.58
219	391	3787	9.7	714	156	438	98	1416	1.82	1.77	3.62
221	642	6173	9.6	1717	362	1124	312	3525	2.68	2.80	5.49
222	413	5262	12.7	1200	235	773	210	2431	2.90	2.95	5.88
223	376	3526	9.4	824	168	488	123	1612	2.19	2.07	4.29
224	47	556	11.8	102	15	46	16	191	2.16	1.63	4.03
225	618	7974	12.9	1955	401	1247	257	3873	3.16	3.08	6.27
227	472	4963	10.5	1292	195	724	163	2385	2.74	2.29	5.06
229	284	1555	5.5	308	52	180	36	581	1.08	0.94	2.05
230	452	1398	3.1	246	37	114	20	420	0.54	0.38	0.93
232	377	1461	3.9	267	44	140	27	482	0.71	0.56	1.28
233	381	882	2.3	215	15	80	14	326	0.56	0.29	0.86
234	636	745	1.2	192	12	30	5	240	0.30	0.07	0.38
235	34	419	12.5	62	13	25	9	121	1.84	1.39	3.60
236	370	3014	8.2	732	91	342	52	1225	1.98	1.31	3.31
237	728	1105	1.5	268	6	40	7	323	0.37	0.07	0.44
238	95	302	3.2	83	2	19	3	110	0.87	0.25	1.16
239	919	7914	8.6	1828	301	963	199	3300	1.99	1.59	3.59
240	643	7731	12.0	2063	407	1303	297	4082	3.21	3.12	6.35
241	996	13716	13.8	3122	630	2307	510	6583	3.14	3.46	6.61
246	784	9926	12.7	1642	269	1009	187	3120	2.09	1.87	3.98
248	214	1889	8.8	434	43	173	39	698	2.03	1.19	3.26
249	496	5769	11.6	1431	282	981	203	2909	2.89	2.96	5.86
250	713	1348	1.9	337	13	60	3	415	0.47	0.11	0.58
251	55	431	7.8	51	11	25	10	105	0.93	0.84	1.91
252	715	1360	1.9	306	17	102	17	444	0.43	0.19	0.62
253	974	1867	1.9	398	13	78	5	496	0.41	0.10	0.51
254	924	2395	2.6	516	66	262	46	893	0.56	0.40	0.97
255	392	1120	2.9	214	24	109	23	373	0.55	0.40	0.95

Table 5., continued.

Permit Area	Land Area (Sq. Mile)	Firearms Hunters	Hunters / sq. mile	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Bucks / sq. mile	Antlerless / sq. mile	Total / sq. mile
256	654	2102	3.2	535	49	242	61	890	0.82	0.54	1.36
257	412	1858	4.5	473	53	245	40	816	1.15	0.82	1.98
258	343	4213	12.3	789	143	514	147	1605	2.30	2.35	4.68
259	490	6340	12.9	816	99	325	61	1314	1.67	0.99	2.68
260	1,055	1235	1.2	278	22	119	19	439	0.26	0.15	0.42
261	795	857	1.1	204	26	123	14	368	0.26	0.21	0.46
262	677	883	1.3	227	13	80	10	331	0.34	0.15	0.49
263	706	2303	3.3	581	59	359	49	1051	0.82	0.66	1.49
264	669	3429	5.1	778	105	526	97	1511	1.16	1.09	2.26
265	494	2259	4.6	550	90	410	77	1132	1.11	1.17	2.29
266	617	1825	3.0	426	41	129	21	620	0.69	0.31	1.01
267	472	1324	2.8	326	46	237	46	658	0.69	0.70	1.39
268	228	1332	5.8	324	36	177	36	579	1.42	1.09	2.54
269	650	1267	2.0	282	10	58	11	363	0.43	0.12	0.56
270	748	1031	1.4	234	14	55	7	311	0.31	0.10	0.42
271	632	1145	1.8	272	25	113	12	424	0.43	0.24	0.67
272	531	1031	2.1	196	10	40	10	258	0.37	0.11	0.49
273	571	2549	4.5	508	40	206	39	797	0.89	0.50	1.40
274	354	1138	3.2	266	6	62	3	340	0.75	0.20	0.96
275	764	1808	2.4	362	10	62	10	446	0.47	0.11	0.58
276	542	3017	5.6	574	76	321	58	1035	1.06	0.84	1.91
277	812	7019	8.6	1626	224	982	154	2995	2.00	1.68	3.69
278	402	1862	4.6	402	35	144	15	601	1.00	0.48	1.49
279	344	1123	3.3	169	26	99	18	315	0.49	0.42	0.92
280	675	1301	1.9	220	6	50	12	290	0.33	0.10	0.43
281	575	2491	4.3	537	67	325	39	972	0.93	0.75	1.69
282	778	665	0.9	122	8	21	2	154	0.16	0.04	0.20
283	613	1360	2.2	294	9	57	8	370	0.48	0.12	0.60
284	838	1763	2.1	318	10	66	8	404	0.38	0.10	0.48
285	549	2322	4.2	448	46	187	22	707	0.82	0.46	1.29
286	446	1392	3.1	263	24	120	19	429	0.59	0.37	0.96
287	46	319	7.0	46	12	29	5	99	1.01	1.01	2.17
288	625	1913	3.1	345	23	155	10	536	0.55	0.30	0.86
289	815	1077	1.3	178	16	80	7	282	0.22	0.13	0.35
290	662	2459	3.7	463	69	349	54	939	0.70	0.71	1.42
291	800	3479	4.3	674	43	242	35	998	0.84	0.40	1.25

Table 5., continued.

Permit Area	Land Area (Sq. Mile)	Firearms Hunters	Hunters / sq. mile	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest	Bucks / sq. mile	Antlerless / sq. mile	Total / sq. mile
292	362	2596	7.2	383	80	259	54	783	1.06	1.09	2.16
293	278	1380	5.0	319	49	164	26	563	1.15	0.86	2.03
294	686	1298	1.9	303	23	135	11	474	0.44	0.25	0.69
295	839	2231	2.7	481	15	111	14	624	0.57	0.17	0.74
296	667	1573	2.4	317	20	88	5	432	0.48	0.17	0.65
297	438	1026	2.3	141	17	68	10	238	0.32	0.22	0.54
298	618	3223	5.2	483	56	213	35	792	0.78	0.49	1.28
299	386	1561	4.0	312	26	141	17	500	0.81	0.48	1.30
338	316	1407	4.5	246	36	118	19	423	0.78	0.55	1.34
341	603	5255	8.7	1214	202	604	157	2186	2.01	1.60	3.62
342	350	3408	9.7	720	114	448	96	1388	2.06	1.88	3.96
343	320	2241	7.0	476	60	261	53	857	1.49	1.17	2.68
344	186	2495	13.4	356	41	160	38	608	1.91	1.28	3.27
604	673	8435	12.5	1466	404	1272	251	3406	2.18	2.86	5.06
605	1192	5131	4.3	997	217	739	154	2111	0.84	0.93	1.77
643	351	2058	5.9	398	89	290	84	867	1.13	1.32	2.47
645	330	2800	8.5	587	126	404	128	1253	1.78	1.99	3.80
646	319	3420	10.7	976	186	600	197	1970	3.06	3.08	6.17
647	434	2360	5.4	502	70	305	59	941	1.16	1.00	2.17
648	332	3000	9.0	636	125	440	87	1297	1.92	1.96	3.91
649	492	5457	11.1	1311	257	867	210	2656	2.66	2.71	5.40
655	387	792	2.0	191	35	97	20	345	0.49	0.39	0.89
701	1324	1899	1.4	489	60	233	34	817	0.37	0.25	0.62
Total	78870	421845	5.3	81764	11616	44712	8896	146993	1.04	0.83	1.86

Table 6. Muzzleloader deer season harvest by DPA, excluding special hunts, 2020.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
101	11	0	3	0	14
104	4	0	0	0	4
105	30	8	51	4	93
107	8	0	6	1	15
109	2	0	3	0	5
110	7	0	2	0	9
111	4	0	0	0	4
114	0	0	0	0	0
118	14	0	0	0	14
119	4	0	0	0	4
126	3	0	1	0	4
131	1	0	1	0	2
132	5	0	0	0	5
133	6	2	1	0	9
152	0	0	0	0	0
155	4	2	26	1	33
156	9	4	36	2	51
157	18	11	49	7	85
159	21	2	17	3	43
169	8	1	7	2	18
171	2	0	19	2	23
172	9	3	25	2	39
173	4	1	3	0	8
176	12	0	3	0	15
177	3	0	5	1	9
178	23	2	5	0	30
179	17	1	19	0	37
181	5	2	13	1	21
182	9	1	13	2	25
183	7	6	37	4	54
184	32	9	51	6	98
197	5	1	4	0	10
199	2	0	0	0	2
201	4	1	5	0	10
203	10	1	6	0	17
208	12	1	15	3	31

Table 6., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
209	23	7	40	6	76
210	21	5	22	2	50
213	118	45	277	39	479
214	46	24	151	22	243
215	95	39	186	30	350
218	63	30	127	21	241
219	40	17	74	15	146
221	43	33	130	33	239
222	42	16	80	13	151
223	44	17	67	13	141
224	2	0	1	0	3
225	32	27	107	16	182
227	63	24	121	20	228
229	24	3	31	7	65
230	19	3	23	3	48
232	24	12	45	6	87
233	27	11	49	3	90
234	26	0	9	0	35
235	8	0	3	1	12
236	21	12	61	7	101
237	24	0	6	2	32
238	7	0	3	1	11
239	47	7	71	5	130
240	55	18	143	14	230
241	67	46	231	31	375
246	33	1	59	6	99
248	16	2	11	3	32
249	22	15	68	13	118
250	33	0	14	0	47
251	2	0	0	0	2
252	23	3	15	0	41
253	46	5	25	1	77
254	55	21	55	6	137
255	18	5	32	2	57
256	15	4	22	0	41
257	16	3	21	3	43

Table 6., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
258	17	3	28	3	51
259	9	1	18	2	30
260	18	4	13	3	38
261	15	4	23	2	44
262	13	1	10	2	26
263	41	2	35	2	80
264	41	8	65	5	119
265	32	14	58	6	110
266	38	2	18	0	58
267	19	2	21	2	44
268	14	2	24	2	42
269	40	1	5	0	46
270	33	0	5	0	38
271	26	2	20	0	48
272	18	0	6	0	24
273	34	3	27	4	68
274	25	1	13	0	39
275	27	3	10	2	42
276	52	15	104	8	179
277	105	30	225	25	385
278	33	4	35	2	74
279	23	3	14	1	41
280	13	1	5	0	19
281	48	11	89	7	155
282	2	0	3	0	5
283	17	0	6	2	25
284	27	2	9	1	39
285	24	3	22	1	50
286	30	3	22	3	58
287	1	1	1	0	3
288	35	4	21	2	62
289	21	2	15	0	38
290	34	11	77	5	127
291	42	9	35	2	88
292	32	8	57	5	102
293	21	6	22	8	57

Table 6., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
294	19	0	15	2	36
295	61	3	31	0	95
296	31	5	18	1	55
297	1	2	1	0	4
298	5	1	9	0	15
299	21	2	12	1	36
338	12	6	17	3	38
341	70	16	84	9	179
342	46	19	79	18	162
343	25	7	40	9	81
344	17	4	28	0	49
604	14	11	74	12	111
605	33	18	95	7	153
643	18	5	39	5	67
645	27	14	44	12	97
646	39	16	88	15	158
647	23	5	32	5	65
648	19	4	37	6	66
649	76	30	94	22	222
655	9	2	9	7	27
701	15	6	25	3	49
Total	3,176	856	4,838	629	9,499

Table 7. Youth deer season harvest by DPA, 2020. Special hunts excluded.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
101	14	1	12	2	29
104	5	4	5	1	15
105	103	14	96	10	223
107	28	7	25	1	61
109	2	1	5	0	8
110	42	4	25	4	75
111	13	1	14	2	30
114	0	0	0	0	0
117	0	1	1	0	2
118	8	0	0	1	9
119	2	0	0	0	2
126	2	0	1	0	3
130	1	0	1	0	2
131	0	0	1	0	1
132	3	0	0	0	3
133	9	2	7	0	18
152	1	0	2	0	3
155	20	6	17	3	46
156	30	6	29	10	75
157	77	13	64	12	166
159	35	6	33	5	79
169	16	6	35	2	59
171	7	0	25	3	35
172	21	7	25	4	57
173	8	2	24	3	37
176	23	5	33	3	64
177	15	2	21	4	42
178	44	4	53	5	106
179	41	9	46	9	105
181	16	2	21	2	41
182	14	2	15	2	33
183	27	5	28	8	68
184	55	15	73	13	156
197	19	2	10	1	32
199	3	0	0	0	3
201	6	0	3	0	9
203	1	0	0	0	1

Table 7., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
208	23	1	16	2	42
209	55	8	26	4	93
210	38	6	29	2	75
213	112	27	90	22	251
214	101	24	74	20	219
215	88	19	63	19	189
218	53	10	38	15	116
219	22	9	32	8	71
221	100	27	112	18	257
222	56	15	62	12	145
223	20	11	22	5	58
224	2	0	3	0	5
225	56	16	64	11	147
227	31	5	25	7	68
229	13	0	17	2	32
230	10	1	6	1	18
232	9	2	9	3	23
233	7	1	4	0	12
234	5	0	5	0	10
235	0	0	0	0	0
236	18	3	14	5	40
237	7	2	3	0	12
238	0	0	2	0	2
239	63	16	80	8	167
240	109	20	101	15	245
241	173	54	171	28	426
246	46	17	58	6	127
248	15	3	6	4	28
249	41	25	53	8	127
250	7	0	7	1	15
251	1	0	1	0	2
252	15	1	9	0	25
253	13	4	11	1	29
254	16	3	10	1	30
255	6	3	8	4	21
256	42	4	32	2	80
257	31	4	23	3	61

Table 7., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
258	27	9	24	6	66
259	28	3	29	7	67
260	31	1	17	1	50
261	14	2	3	1	20
262	16	0	2	0	18
263	62	3	34	5	104
264	67	8	56	12	143
265	27	1	20	3	51
266	20	4	17	1	42
267	47	5	20	2	74
268	24	3	24	4	55
269	9	1	5	0	15
270	5	0	1	1	7
271	8	0	2	0	10
272	5	1	10	0	16
273	13	5	14	1	33
274	5	0	7	0	12
275	14	5	11	2	32
276	22	9	20	1	52
277	68	14	69	10	161
278	7	1	7	1	16
279	5	0	6	1	12
280	4	2	5	0	11
281	11	3	12	2	28
282	3	0	2	2	7
283	9	0	16	2	27
284	7	5	17	1	30
285	21	2	17	3	43
286	8	0	4	0	12
287	0	0	2	0	2
288	14	0	6	0	20
289	5	3	3	0	11
290	17	3	21	1	42
291	34	3	24	0	61
292	11	3	14	7	35
293	6	5	10	2	23
294	2	3	7	1	13

Table 7., continued.

Permit Area	Adult Male Harvest	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
295	18	0	14	1	33
296	11	2	8	1	22
297	6	1	3	3	13
298	20	0	10	2	32
299	7	0	5	2	14
338	8	2	11	3	24
341	72	9	29	5	115
342	49	5	26	11	91
343	25	6	8	2	41
344	15	5	18	3	41
604	46	6	37	2	91
605	36	10	30	3	79
643	24	1	8	3	36
645	25	4	12	6	47
646	48	10	30	4	92
647	20	2	9	2	33
648	30	6	17	3	56
649	46	6	25	3	80
655	7	0	6	1	14
701	10	6	8	1	25
Total	3,314	656	2,908	488	7,366

Table 8. Early-season antlerless deer harvest by DPA, 2020.

Permit Area	Fawn Male Harvest	Adult Female Harvest	Fawn Female Harvest	Total Harvest
213	229	675	198	1,102
214	144	420	132	696
215	104	341	107	552
341	17	60	21	98
342	22	63	25	110
343	10	40	2	52
344	15	67	25	107
604	69	198	62	329
605	30	122	17	169
643	12	40	9	61
645	9	42	13	64
646	30	96	23	149
647	9	34	4	47
648	18	58	17	93
649	25	110	38	173
655	5	18	0	23
Total	748	2,384	693	3,825

Table 9. 300 Series A and B Firearms Harvest by DPA, 2020.

Permit Area	Zone	Adult Male	Fawn Male	Adult Female	Fawn Female	Total
338	3A	225	22	90	15	352
	3B	21	14	28	4	67
341	3A	970	115	360	83	1,528
	3B	244	87	244	74	649
342	3A	592	56	269	54	971
	3B	128	58	179	42	407
343	3A	418	43	171	43	675
	3B	58	17	90	10	175
344	3A	312	25	105	27	469
	3B	44	16	55	11	126
605	3A	858	152	495	113	1,618
	3B	139	65	244	41	489
643	3A	298	45	158	54	555
	3B	100	44	132	30	306
645	3A	452	64	199	63	778
	3B	135	62	205	65	467
646	3A	780	100	315	102	1,297
	3B	196	86	285	95	662
647	3A	369	39	142	31	581
	3B	133	31	163	28	355
648	3A	527	74	268	47	916
	3B	109	51	172	40	372
649	3A	994	123	418	87	1,622
	3B	317	134	449	123	1,023
655	3A	168	24	66	10	268
	3B	23	11	31	10	75
Totals	**3A**	**6,963**	**882**	**3,056**	**729**	**11,630**
	3B	**1,647**	**676**	**2,277**	**573**	**5,173**

Table 10. Free landowner permit harvest by DPA, 2020.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
101	1	4	0	5
105	2	15	1	18
110	0	1	0	1
111	0	1	0	1
155	2	0	0	2
156	1	10	1	12
157	10	34	7	51
159	2	6	3	11
171	1	3	1	5
172	2	1	1	4
182	0	1	0	1
183	1	3	0	4
184	5	18	5	28
201	0	3	1	4
208	0	4	1	5
209	1	15	1	17
210	5	15	2	22
213	20	86	23	129
214	18	71	17	106
215	11	34	9	54
218	5	14	5	24
219	2	2	0	4
221	10	48	8	66
222	3	21	5	29
223	3	1	2	6
225	4	19	2	25
227	1	7	0	8
229	0	1	0	1
230	0	2	0	2
232	2	3	0	5
233	1	3	0	4
236	0	2	2	4
239	6	32	4	42
240	12	59	8	79
241	25	107	24	156
248	2	10	4	16
249	11	54	11	76
250	1	0	0	1

Table 10., Continued.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
254	1	5	2	8
255	0	7	2	9
256	2	16	5	23
257	5	12	1	18
258	2	6	1	9
260	0	4	0	4
261	0	5	0	5
262	1	2	1	4
263	0	4	2	6
264	4	27	3	34
265	1	15	2	18
266	2	3	1	6
267	0	7	1	8
268	1	1	0	2
269	0	1	0	1
271	0	1	0	1
273	0	3	0	3
276	0	4	0	4
277	2	21	0	23
280	0	0	1	1
281	1	5	0	6
283	0	1	0	1
285	0	2	0	2
290	1	1	0	2
291	0	1	0	1
292	2	4	2	8
293	3	3	0	6
297	1	2	0	3
298	0	7	0	7
338	2	0	0	2
341	7	32	5	44
342	6	23	6	35
343	1	10	0	11
344	2	11	1	14
604	0	3	1	4
605	2	6	1	9
643	0	1	0	1

Table 10., Continued.

Permit Area	Fawn Male	Adult Female	Fawn Female	Total
645	2	8	1	11
646	4	10	2	16
647	0	5	1	6
648	0	9	1	10
649	0	21	1	22
655	0	1	0	1
701	0	1	0	1
Total	222	1,001	191	1,414

Table 11. Summary of special firearms hunt deer harvest, 2020.

			Harvest[5]				
Area	**Dates**	**Permits Issued**	**Adult Male**	**Fawn Male**	**Adult Female**	**Fawn Female**	**Total**
900 - Cascade River State Park	11/7-11/22	100*	6	1	3	1	11
901 - Rice Lake NWR	11/14-11/22	40*	3	0	2	0	5
902 - St. Croix State Park	11/19-11/22	350*	31	12	40	8	91
903 - Lake Louise State Park	11/14-11/15	25*	5	1	13	3	22
904 - Gooseberry Falls State Park	11/7-11/22	40*	5	2	8	0	15
905 - Split Rock Lighthouse State Park	11/7-11/22	40*	6	3	6	2	17
906 - Tettegouche State Park	11/7-11/22	100*	4	0	5	2	11
907 - Scenic State Park	11/7-11/22	30*	1	0	2	0	3
908 - Hayes Lake State Park	11/7-11/22	50*	9	1	7	1	18
909 - Lake Bemidji State Park	11/7-11/10	30***	2	0	4	0	6
910 - Zippel Bay State Park	11/7-11/22	75***	6	6	14	5	31
911 - Judge CR Magney State Park	11/7-11/22	75*	5	0	6	0	11
912 - Schoolcraft State Park	11/7-11/22	NA*					0
913 - Lake Carlos State Park	11/7-11/10	17**	0	1	2	0	3
914 - William O'Brien State Park	11/14-11/15	50*	7	1	17	3	28
915 - Lake Bronson State Park	11/7-11/15	30***	7	2	10	4	23
916 - Maplewood State Park	11/7-11/10	100*	47	4	13	2	66
917 - Miesvile Ravine Park Reserve	11/7-11/15	40**	2	15	14	6	37
918 - Beaver Creek Valley State Park	11/7-11/8	25*	4	0	2	0	6
919 - Glacial Lakes State Park	11/12-11/15	20**	0	1	4	2	7
920 - Zumbro Falls Woods SNA	11/7-11/15	12*	5	1	2	1	9
922 - Old Mill State Park	11/7-11/10	10*	0	0	1	0	1
923 - Zumbro Falls Woods SNA	11/21-11/29	12*	1	0	6	1	8
925 - Vermillion Highlands Research, Recreation and WMNA	11/7-11/20	20*	4	1	3	0	8
927 - Whitewater State Park	11/21-11/22	50*	8	5	10	1	24
928 - Wild River State Park	11/7-11/8	75*	24	1	9	4	38
931 - City of Grand Rapids	11/7-11/22	N/A*	3	11	15	4	33
933 - Forestville/ Mystery Cave State Park	11/7-11/8	75*	17	5	9	3	34
934 - Whitewater State Game Refuge	11/21-11/29	100**	0	4	22	5	31
940 - Frontenac State Park	11/21-11/22	50*	9	6	13	3	31
941 - Elm Creek Park Reserve	11/14-11/15	140*	31	4	26	7	68
962 - Great River Bluffs State Park	11/21-11/22	50*	0	0	1	0	1
Total		**252**	**88**	**289**	**68**	**697**	

Key: *Either-sex, **Antlerless-only, ***Earn-a-buck

[5] Special hunt harvest is often miss-registered by Deer Permit Area, Electronic Licensing Data are not always correct.

Table 12. Summary of special muzzleloader deer hunts, 2020.

Area	Dates	Permits Issued	Harvest[5] Adult Male	Fawn Male	Adult Female	Fawn Female	Total
894 - Sakatah State Park	12/5-12/6	15**	0	0	3	0	3
929 - McCarthy Beach State Park	11/28-12/6	15*	2	0	2	0	4
930 - Nerstrand Big Woods State Park	12/5-12/6	50***	1	3	3	1	8
932 - Rice Lake State Park	12/5-12/6	20**	0	1	3	6	10
935 - Jay Cooke State Park	12/5-12/9	75*	7	6	19	0	32
936 - Crow Wing State Park	12/5-12/9	25*	1	0	9	2	12
937 - Lake Vermillion - Soudan Underground Mine State Park	11/28-12/13	25*	3	0	5	0	8
938 - City of Tower	11/28-12/31	20*	1	3	4	0	8
939 - Myre-Big Island State Park	12/5-12/6	50**	0	6	23	6	35
942 - Sibley State Park	11/28-11/29	60**	1	1	20	0	22
943 - Miesville Ravine Park Reserve	12/5-12/13	40**	0	2	5	7	14
944 - Vermillion Highlands Research, Recreation and WMA	11/28-12/13	20*	2	0	3	0	5
946 - City of Grand Rapids	11/28-12/13	N/A*	1	1	7	0	9
947 - Lake Bemidji State Park	12/4-12/6	30*	1	2	1	2	6
948 - Savanna Portage State Park	11/28-12/4	30*	0	1	1	0	2
949 - St. Croix State Park	12/2-12/6	100*	3	5	12	2	22
950 - Lake Maria State Park	12/8-12/10	25***	1	4	9	1	15
		Totals	23	31	120	26	200

[5] Special hunt harvest is often miss-registered by Deer Permit Area, Electronic Licensing Data are not always correct.

Table 13. Summary of youth and Camp Ripley special deer hunts, 2020.

Area	Dates	Permits Issued	Harvest[5] Adult Male	Fawn Male	Adult Female	Fawn Female	Total
951 - Afton State Park	11/7-11/8	30*	12	2	6	0	20
952 - Sibley State Park	10/31-11/1	10*	2	0	0	0	2
953 - Zippel Bay State Park	10/17-10/18	20*	0	0	2	0	2
954 - Lake Bemidji State Park	10/16-10/18	20*	0	0	1	0	1
956 - St. Croix State Park	10/31-11/1	90*	5	4	4	1	14
957 - Rydell National Wildlife Refuge	10/24-10/25	15*	1	0	2	1	4
958 - Savanna Portage State Park	10/24-10/25	25*	0	1	0	0	1
959 - Buffalo River State Park	11/7-11/8	12***	0	0	1	0	1
961 - Itasca State Park	10/10-10/11	75*	0	0	0	0	0
963 - Kilen Woods State Park	10/24-10/25	6*	1	0	2	0	3
965 - Banning State Park	10/31-11/1	6*	0	0	4	0	4
966 - Blue Mounds State Park	11/21-11/22	10***	1	0	2	0	3
967 - Camden State Park	10/24-10/25	12***	0	1	4	0	5
968 - Lake Shetek State Park	11/21-11/22	12**	0	1	10	0	11
969 - Lake Bronson State Park	10/24-10/25	10*	1	0	1	0	2
		Total	**23**	**9**	**39**	**2**	**73**
970 - Camp Ripley First Hunt[6]	10/15-10/16	2,000*	33	2	34	8	77
971 - Camp Ripley Second Hunt[6]	10/31-11/1	2,000*	117	12	81	23	233
		Total	**150**	**14**	**115**	**31**	**310**

Key: *Either-sex, **Antlerless-only, ***Earn-a-buck

[5] Special hunt harvest is often miss-registered by Deer Permit Area, Electronic Licensing Data are not always correct.

[6] Harvest reported from on-site registrations.

Table 14. 2020 Firearm Lottery Distribution Report

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
104	1	456	2	468	0	50
	2	163	1	141	22	
	3	13	1	0	13	
	4	10	0	0	10	
	5	4	0	0	4	
	6	1	0	0	1	
	Total	**647**	**4**	**609**	**50**	
107	1	180	0	180	0	393
	2	122	2	85	37	
	3	107	1	0	107	
	4	95	0	0	95	
	5	83	0	0	83	
	6	57	0	0	57	
	7	14	0	0	14	
	Total	**658**	**3**	**265**	**393**	
109	1	99	0	99	0	25
	2	102	0	102	0	
	3	74	0	74	0	
	4	86	0	86	0	
	5	72	0	72	0	
	6	49	0	38	11	
	7	14	0	0	14	
	Total	**496**	**0**	**471**	**25**	
110	1	467	3	467	0	496
	2	306	4	264	42	
	3	291	3	0	291	
	4	163	1	0	163	
	Total	**1227**	**11**	**731**	**496**	
111	1	309	0	309	0	25
	2	56	1	56	0	
	3	30	0	12	18	
	4	6	1	0	6	
	9	1	0	0	1	
	Total	**402**	**2**	**377**	**25**	

Table 14., continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	Rejected			
126	1	205	2	205	0	98
	2	159	0	100	59	
	3	38	1	0	38	
	4	1	0	0	1	
	Total	**403**	**3**	**305**	**98**	
131	1	99	1	99	0	48
	2	55	0	15	40	
	3	7	0	0	7	
	4	1	0	0	1	
	Total	**162**	**1**	**114**	**48**	
133	1	349	2	273	76	144
	2	60	1	0	60	
	3	6	0	0	6	
	4	2	0	0	2	
	Total	**417**	**3**	**273**	**144**	
169	1	1031	4	1031	0	495
	2	1268	6	1268	0	
	3	1186	7	836	350	
	4	141	5	0	141	
	5	2	1	0	2	
	6	2	0	0	2	
	Total	**3630**	**23**	**3135**	**495**	
173	1	1428	4	499	929	1478
	2	498	2	0	498	
	3	44	0	0	44	
	4	6	0	0	6	
	6	0	1	0	0	
	9	1	0	0	1	
	Total	**1977**	**7**	**499**	**1478**	
176	1	627	3	627	0	298
	2	956	3	956	0	
	3	334	1	44	290	
	4	7	2	0	7	
	5	1	0	0	1	
	Total	**1925**	**9**	**1627**	**298**	

Table 14., Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
177	1	749	2	701	48	594
	2	469	3	0	469	
	3	58	0	0	58	
	4	14	0	0	14	
	5	1	0	0	1	
	6	3	0	0	3	
	9	1	0	0	1	
	Total	**1295**	**5**	**701**	**594**	
178	1	928	3	928	0	398
	2	1010	3	1010	0	
	3	605	0	396	209	
	4	186	1	0	186	
	9	3	0	0	3	
	Total	**2732**	**7**	**2334**	**398**	
179	1	1568	13	0	1568	2976
	2	673	1	0	673	
	3	598	1	0	598	
	4	23	0	0	23	
	5	3	0	0	3	
	6	2	0	0	2	
	Total	**2867**	**15**	**0**	**2867**[7]	
181	1	1649	0	0	1649	1979
	2	145	2	0	145	
	3	18	2	0	18	
	4	3	0	0	3	
	Total	**1815**	**4**	**0**	**1815**[7]	
197	1	854	4	854	0	739
	2	691	3	515	176	
	3	510	2	0	510	
	4	50	2	0	50	
	5	1	1	0	1	
	9	2	0	0	2	
	Total	**2108**	**12**	**1369**	**739**	
234	1	115	2	115	0	93
	2	89	1	16	73	
	3	20	0	0	20	
	Total	**224**	**3**	**131**	**93**	

[7] Remaining permits sold over-the-counter.

Table 14., Continued.

Permit Area Number	Preference Level	Applications Total	Applications Rejected	Unsuccessful	Winners	Permits Available
237	1	88	0	88	0	47
	2	87	2	87	0	
	3	64	2	64	0	
	4	48	0	3	45	
	5	2	0	0	2	
	Total	**289**	**4**	**242**	**47**	
238	1	53	1	53	0	49
	2	54	0	9	45	
	3	4	0	0	4	
	Total	**111**	**1**	**62**	**49**	
250	1	322	0	322	0	277
	2	269	2	2	267	
	3	10	0	0	10	
	Total	**601**	**2**	**324**	**277**	
251	1	119	1	0	119	195
	2	39	1	0	39	
	3	1	0	0	1	
	Total	**159**	**2**	**0**	**159**[7]	
252	1	404	1	161	243	384
	2	136	1	0	136	
	3	5	0	0	5	
	Total	**545**	**2**	**161**	**384**	
253	1	337	3	337	0	267
	2	334	2	142	192	
	3	75	0	0	75	
	Total	**746**	**5**	**479**	**267**	
259	1	1441	5	577	864	1944
	2	676	4	0	676	
	3	391	6	0	391	
	4	11	0	0	11	
	5	1	0	0	1	
	6	1	0	0	1	
	Total	**2521**	**15**	**577**	**1944**	

[7] Remaining permits sold over-the-counter.

Table 14., Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	Rejected			
269	1	300	1	148	152	322
	2	159	0	0	159	
	3	10	1	0	10	
	9	1	0	0	1	
	Total	**470**	**2**	**148**	**322**	
270	1	150	0	150	0	141
	2	125	0	22	103	
	3	27	0	0	27	
	4	11	0	0	11	
	Total	**313**	**0**	**172**	**141**	
272	1	211	0	211	0	147
	2	176	0	45	131	
	3	14	0	0	14	
	4	1	1	0	1	
	9	1	0	0	1	
	Total	**403**	**1**	**256**	**147**	
274	1	249	1	249	0	230
	2	215	0	47	168	
	3	59	1	0	59	
	4	3	0	0	3	
	Total	**526**	**2**	**296**	**230**	
275	1	214	0	214	0	143
	2	257	0	257	0	
	3	199	0	89	110	
	4	33	0	0	33	
	Total	**703**	**0**	**560**	**143**	
288	1	466	0	300	166	459
	2	281	2	0	281	
	3	10	0	0	10	
	4	1	0	0	1	
	5	1	0	0	1	
	Total	**759**	**2**	**300**	**459**	
289	1	290	0	161	129	277
	2	138	2	0	138	
	3	9	0	0	9	
	4	1	0	0	1	
	Total	**438**	**2**	**161**	**277**	

Table 14., Continued.

Permit Area Number	Preference Level	Applications		Unsuccessful	Winners	Permits Available
		Total	Rejected			
291	1	942	4	673	269	923
	2	604	1	0	604	
	3	48	4	0	48	
	4	1	0	0	1	
	5	0	1	0	0	
	6	1	0	0	1	
	Total	**1596**	**10**	**673**	**923**	
294	1	327	2	38	289	466
	2	169	0	0	169	
	3	6	0	0	6	
	4	2	0	0	2	
	Total	**504**	**2**	**38**	**466**	
295	1	379	0	379	0	362
	2	277	2	107	170	
	3	186	0	0	186	
	4	6	2	0	6	
	7	0	1	0	0	
	Total	**848**	**5**	**486**	**362**	
296	1	310	1	310	0	358
	2	272	2	13	259	
	3	98	0	0	98	
	4	1	0	0	1	
	Total	**681**	**3**	**323**	**358**	
299	1	419	0	60	359	650
	2	278	1	0	278	
	3	13	0	0	13	
	5	0	2	0	0	
	Total	**710**	**3**	**60**	**650**	
	Total	**39,821**	**192**	**20,121**	**19,712**	**20,021**

Table 15. 2020 Muzzleloader Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
104	1	3	0	3	0	0
	2	1	0	1	0	
	Total	**4**	**0**	**4**	**0**	
107	1	3	0	3	0	7
	2	1	0	1	0	
	3	4	0	0	4	
	5	2	0	0	2	
	6	1	0	0	1	
	Total	**11**	**0**	**4**	**7**	
109	1	3	0	0	0	7
	Total	**3**	**0**	**3**	**0**	
110	1	7	0	5	2	4
	2	1	0	0	1	
	4	1	0	0	1	
	Total	**9**	**0**	**5**	**4**	
111	1	3	0	3	0	0
	Total	**3**	**0**	**3**	**0**	
126	1	7	0	7	0	2
	2	2	0	0	2	
	Total	**9**	**0**	**7**	**2**	
131	1	5	0	5	0	2
	2	3	0	1	2	
	Total	**8**	**0**	**6**	**2**	
133	1	17	0	11	6	6
	Total	**17**	**0**	**11**	**6**	
169	1	13	0	13	0	5
	2	15	0	15	0	
	3	5	0	0	5	
	Total	**33**	**0**	**28**	**5**	
173	1	21	0	7	14	22
	2	8	0	0	8	
	Total	**29**	**0**	**7**	**22**	
176	1	3	0	3	0	2
	2	6	0	5	1	
	3	1	0	0	1	
	Total	**10**	**0**	**8**	**2**	
177	1	9	0	6	3	6
	2	3	0	0	3	
	Total	**12**	**0**	**6**	**6**	
178	1	7	0	7	0	2
	2	7	0	7	0	
	3	2	0	0	2	
	Total	**16**	**0**	**14**	**2**	

Table 15., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
179	1	17	0	0	17	24
	2	3	0	0	3	
	3	2	0	0	2	
	6	1	0	0	1	
	Total	**23**	**0**	**0**	**23**	
181	1	17	0	0	17	21
	2	2	0	0	2	
	Total	**19**	**0**	**0**	**19**	
197	1	16	0	16	0	11
	2	9	0	3	6	
	3	5	0	0	5	
	Total	**30**	**0**	**19**	**11**	
234	1	14	0	11	3	7
	2	4	0	0	4	
	Total	**18**	**0**	**11**	**7**	
237	1	9	0	9	0	3
	2	7	0	6	1	
	3	2	0	0	2	
	Total	**18**	**0**	**15**	**3**	
238	1	2	0	1	1	1
	Total	**2**	**0**	**1**	**1**	
250	1	25	1	25	0	23
	2	24	0	2	22	
	3	1	0	0	1	
	Total	**50**	**1**	**27**	**23**	
251	1	3	0	0	3	4
	2	1	1	0	1	
	Total	**4**	**1**	**0**	**4**	
252	1	18	0	7	11	16
	2	2	0	0	2	
	3	3	0	0	3	
	Total	**23**	**0**	**7**	**16**	
253	1	49	0	49	0	33
	2	43	0	11	32	
	3	1	0	0	1	
	Total	**93**	**0**	**60**	**33**	
259	1	52	0	17	35	56
	2	20	0	0	20	
	3	1	0	0	1	
	Total	**73**	**0**	**17**	**56**	

Table 15., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
269	1	28	0	13	15	28
	2	12	0	0	12	
	3	1	0	0	1	
	Total	**41**	**0**	**13**	**28**	
270	1	13	0	12	1	9
	2	6	0	0	6	
	3	2	0	0	2	
	Total	**21**	**0**	**12**	**9**	
272	1	2	0	2	0	3
	2	5	0	2	3	
	Total	**7**	**0**	**4**	**3**	
274	1	24	0	24	0	20
	2	17	0	2	15	
	3	5	0	0	5	
	Total	**46**	**0**	**26**	**20**	
275	1	17	0	17	0	8
	2	13	0	12	1	
	3	7	0	0	7	
	Total	**37**	**0**	**29**	**8**	
278	1	57	0	25	32	87
	2	44	0	0	44	
	3	11	0	0	11	
	Total	**112**	**0**	**25**	**87**	
279	1	43	0	2	41	69
	2	28	0	0	28	
	Total	**71**	**0**	**2**	**69**	
280	1	13	0	13	0	4
	2	9	0	9	0	
	3	10	0	6	4	
	Total	**32**	**0**	**28**	**4**	
282	1	3	0	3	0	1
	2	1	0	1	0	
	3	2	0	2	0	
	4	1	0	0	1	
	Total	**7**	**0**	**6**	**1**	
283	1	11	0	11	0	8
	2	12	0	4	8	
	Total	**23**	**0**	**15**	**8**	
284	1	11	0	11	0	4
	2	13	0	12	1	
	3	3	0	0	3	
	Total	**27**	**0**	**23**	**4**	

Table 15., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
	1	42	0	15	27	
286	2	20	0	0	20	51
	3	4	0	0	4	
	Total	**66**	**0**	**15**	**51**	
	1	52	0	26	26	
288	2	15	0	0	15	41
	Total	**67**	**0**	**26**	**41**	
	1	23	0	13	10	
289	2	13	0	0	13	23
	Total	**36**	**0**	**13**	**23**	
	1	80	0	57	23	
291	2	53	0	0	53	77
	3	1	0	0	1	
	Total	**134**	**0**	**57**	**77**	
	1	23	0	3	20	
294	2	13	0	0	13	34
	3	1	0	0	1	
	Total	**37**	**0**	**3**	**34**	
	1	43	0	43	0	
295	2	37	0	8	29	38
	3	9	0	0	9	
	Total	**89**	**0**	**51**	**38**	
	1	40	0	38	2	
296	2	38	0	0	38	42
	3	2	0	0	2	
	Total	**80**	**0**	**38**	**42**	
	1	35	0	5	30	
299	2	19	0	0	19	50
	3	1	0	0	1	
	Total	**55**	**0**	**5**	**50**	
TOTAL		**1,281**	**2**	**560**	**721**	**724**

Table 16. 2020 Special Firearms Hunt Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
900- Cascade River SP	1	38	0	0	38	100
	2	4	0	0	4	
	3	1	0	0	1	
	Total	43	0	0	43	
901 - Rice Lake Wildlife Refuge	1	49	0	32	17	40
	2	23	0	0	23	
	Total	72	0	32	40	
902 - St. Croix SP	1	361	0	135	226	350
	2	119	0	0	119	
	3	3	0	0	3	
	9	2	0	0	2	
	Total	485	0	135	350	
903 - Lake Louise SP	1	36	0	36	0	25
	2	38	0	15	23	
	3	1	0	0	1	
	9	1	0	0	1	
	Total	76	0	51	25	
904 - Gooseberry Falls SP	1	46	0	9	37	40
	2	3	0	0	3	
	Total	49	0	9	40	
905 - Split Rock Lighthouse SP	1	43	0	4	39	40
	2	1	0	0	1	
	Total	44	0	4	40	
906 – Tettegouche SP	1	84	0	0	84	100
	2	1	0	0	1	
	3	1	0	0	1	
	4	1	0	0	1	
	Total	87	0	0	87	
907 – Scenic SP	1	34	0	13	21	30
	2	9	0	0	9	
	Total	43	0	13	30	

Table 16., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
908 - Hayes Lake SP	1	55	0	8	47	50
	2	2	0	0	2	
	3	1	0	0	1	
	Total	58	0	8	50	
909 - Lake Bemidji SP	1	26	0	0	26	26
	Total	26	0	0	26	
910 - Zippel Bay SP	1	81	0	12	69	75
	2	5	0	0	5	
	3	1	0	0	1	
	Total	87	0	12	75	
911 – Judge C. R. Magney SP	1	14	0	0	14	75
	2	4	0	0	4	
	Total	18	0	0	18	
913 - Lake Carlos SP	1	28	0	12	16	17
	2	2	0	0	2	
	Total	30	0	12	18	
914 - William O'Brien SP	1	76	0	76	0	50
	2	39	0	4	35	
	3	13	0	0	13	
	5	1	0	0	1	
	9	1	0	0	1	
	Total	130	0	80	50	
915 - Lake Bronson SP	1	38	0	31	7	30
	2	23	0	0	23	
	Total	61	0	31	30	
916 - Maplewood SP	1	129	0	129	0	100
	2	128	0	128	0	
	3	105	0	32	73	
	4	27	0	0	27	
	5	1	0	0	1	
	9	2	0	0	2	
	Total	392	0	289	103	
917 - Miesville Ravine SP	1	61	0	44	17	40
	2	21	0	0	21	
	3	2	0	0	2	
	Total	84	0	44	40	

Table 16., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
918 – Beaver Creek Valley SP	1	52	0	42	10	25
	2	15	0	0	15	
	3	1	0	0	1	
	Total	68	0	42	26	
919 - Glacial Lakes SP	1	24	0	16	8	20
	2	13	0	0	13	
	Total	37	0	16	21	
920 - Zumbro Falls SNA	1	26	0	26	0	12
	2	15	0	4	11	
	9	1	0	0	1	
	Total	42	0	30	12	
922 – Old Mill SP	1	15	0	12	3	10
	2	6	0	0	6	
	4	2	0	0	2	
	Total	23	0	12	11	
923 - Zumbro Falls SNA	1	11	0	1	10	12
	2	3	0	0	3	
	Total	14	0	1	13	
925 - Vermillion Highlands Research, Recreation, and WMA A Season	1	32	0	32	0	18
	2	27	0	25	2	
	3	13	0	0	13	
	4	3	0	0	3	
	Total	75	0	57	18	
925 - Vermillion Highlands Research, Recreation, and Wildlife Management Area B Season	1	5	0	5	0	2
	2	5	0	1	4	
	Total	10	0	6	4	
927 – Whitewater SP	1	52	0	17	35	50
	2	16	0	0	16	
	3	1	0	0	1	
	Total	69	0	17	52	

Table 16., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
928 - Wild River SP	1	158	0	158	0	75
	2	97	0	66	31	
	3	42	0	0	42	
	9	2	0	0	2	
	Total	299	0	224	75	
931 - Grand Rapids	1	53	0	0	53	54
	2	1	0	0	1	
	Total	54	0	0	54	
933 - Forestville Mystery Cave SP	1	89	0	0	89	130
	2	4	0	0	4	
	Total	93	0	0	93	
934 - Whitewater State Game Refuge	1	87	0	0	87	100[8]
	Total	87	0	0	87	
940 - Frontenac SP	1	45	0	0	45	60
	2	10	0	0	10	
	3	4	0	0	4	
	Total	59	0	0	59	
941 A – Elm Creek Park Reserve	1	199	0	199	0	135
	2	134	0	80	54	
	3	79	0	0	79	
	4	2	0	0	2	
	5	1	0	0	1	
	9	1	0	0	1	
	Total	416	0	279	137	
941 B – Elm Creek Park Reserve	1	9	0	9	0	5
	2	6	0	0	6	
	Total	15	0	9	6	
962 - Great River Bluffs SP	1	35	0	0	35	50
	2	1	0	0	1	
	Total	36	0	0	36	
	Total	**3182**	**0**	**1413**	**1769**	**1946**

[8] Remaining permits sold over-the-counter.

Table 17. 2019 Muzzleoader Special Hunts Lottery Distribution Report.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
894 - Sakatah Lake SP	1	12	0	0	12	15
	2	1	0	0	1	
	3	1	0	0	1	
	Total	14	0	0	14	
929 - McCarthy Beach SP	1	4	0	0	4	15
	Total	4	0	0	4	
930 - Nerstrand Big Woods SP	1	103	0	103	0	50
	2	66	0	29	37	
	3	13	0	0	13	
	Total	182	0	132	50	
932 - Rice Lake SP	1	18	0	16	2	20
	2	17	0	0	17	
	3	1	0	0	1	
	Total	36	0	16	20	
935 - Jay Cooke SP	1	80	0	49	31	75
	2	44	0	0	44	
	Total	124	0	49	75	
936 - Crow Wing SP	1	36	0	36	0	25
	2	26	0	3	23	
	3	2	0	0	2	
	9	1	0	0	1	
	Total	65	0	39	26	
937 – Lake Vermillion-Soudan Underground Mine SP	1	20	0	3	17	25
	2	9	0	0	9	
	Total	29	0	3	26	
938 - City of Tower	1	10	0	0	10	20
	Total	10	0	0	10	
939 - Myre-Big Island SP	1	57	0	57	0	50
	2	57	0	13	44	
	3	4	0	0	4	
	4	1	0	0	1	
	9	1	0	0	1	
	Total	120	0	70	50	

Table 17., Continued.

Permit Area Number	Preference Level	Applications Total	Rejected	Unsuccessful	Winners	Permits Available
942 - Sibley SP	1	77	0	77	0	60
	2	61	0	4	57	
	3	3	0	0	3	
	9	1	0	0	1	
	Total	142	0	81	61	
943 - Miesville Ravine Park Reserve	1	49	0	19	30	40
	2	10	0	0	10	
	Total	59	0	19	40	
944 - Vermillion Highlands Research, Recreation, and WMA	1	19	0	19	0	20
	2	22	0	1	21	
	Total	41	0	20	21	
946 - City of Grand Rapids	1	13	0	0	13	13
	Total	13	0	0	13	
947 - Lake Bemidji SP	1	16	0	0	16	30
	3	1	0	0	1	
	Total	17	0	0	17	
948 - Savanna Portage SP	1	13	0	0	13	30
	Total	13	0	0	13	
949 - St. Croix SP	1	61	0	61	0	25
	2	45	0	37	8	
	9	17	0	0	17	
	Total	123	0	98	25	
Total		**992**	**0**	**527**	**465**	**513**

2020 MINNESOTA ELK HARVEST REPORT

Jason Wollin, Acting Karlstad Area Wildlife Supervisor

Kyle Arola, Thief Lake Wildlife Area Supervisor

Barbara Keller, Big Game Program Leader

INTRODUCTION

Legislation passed in 2016 (MN Statute 97B.516b) directed the Department of Natural Resources (DNR) to "…not manage an elk herd in Kittson, Roseau, Marshall, or Beltrami counties in a manner that would increase the size of the herd, including adoption or implementation of an elk management plan designed to increase an elk herd, unless the commissioner of agriculture verifies that crop and fence damages paid under section 3.7371 and attributed to the herd have not increased for at least two years." In response, DNR adopted a 4-year Interim Strategic Management Plan for Elk in 2016 that will maintain a status quo in elk numbers at the current population estimates. This plan set herd goals at 50 – 60 elk for the Kittson Central herd, 30-38 elk for the Grygla herd, and 150-200 elk for the Caribou Vita herd. Since then, we have added two more years to this plan. Plans will be made to update the Strategic Management Plan for Elk in the near future.

The DNR conducts an annual aerial elk population survey each winter using a fixed-wing aircraft to fly over survey blocks consistent with the range of each elk herd. Survey results are presented in Table 1 and Figure 1 for the Kittson Central herd. Total elk recorded within the Kittson Central block was 102 and included 69 antlerless elk and 33 bulls. In the Grygla survey block, 24 total elk were observed including 10 bulls and 14 antlerless elk. A survey was not conducted over the Caribou-vita herd since Manitoba was unable to conduct a joint-survey at the same time.

For the 2019-2020 elk season a total of 44 elk licenses were offered to Minnesota hunters – the highest number of licenses ever offered - and this increased opportunity resulted in the highest elk harvest ever recorded for the state. There were two established zones open for elk hunting in Minnesota in 2020: 1) Zone 20 - Kittson Central and 2) Zone 30 - Kittson Northeast (Figure 2). Elk hunting in Zone 10 - Grygla, has been closed since 2013 because the population is below goal (Figure 3). To move the Kittson Central herd towards goal range, this year the number of seasons held in Zone 20 was increased to six regular season hunts. Another change in 2020 required hunters to apply for both the specific license type (either-sex, bull-only, or antlerless-only) and season dates. For the Zone 20 - Kittson Central there were 12 license/season date options : 1) Season A/G – August 22 through August 30, 2) Season B/H - September 5 through September 13, 3) Season C/I – September 19 through September 27, 4) Season D/J - October 3 through October 11, 5) Season E/K – October 24 through November 1, and 6) Season F/L – December 5 through December 13. There was one regular season hunt in Zone 30 – Kittson Northeast for two bull-only licenses: 1) Season M - September 5 through September 13. All of the seasons were 9 days in length, including two weekends. These dates were also chosen to avoid conflict with the Youth Firearm Deer Season on October 15 through October 18 and the Regular Firearm Deer Season November 7 through November 15. Overall, hunter success rates were high this year.

HUNTING SEASON OPTIONS AND LICENSE LOTTERY

A total of 44 licenses were available and 4,425 individuals or parties (up to two hunters) applied for the opportunity to hunt elk in Minnesota (Table 2). Applicants were given the opportunity to select both zone and season in which to hunt. Seasons in Zone 20 were also split between either-sex and antlerless- only licenses. This allowed applicants to choose the type of license desired during their application.

The Minnesota elk lottery is a three-step process. First, a lottery for qualifying landowner applicants is held for Zone 20 (20% = 8 licenses offered). Once landowner applicants were selected, the second round was for applicants that had applied for 10 years or more (20% = 8 licenses offered). All remaining applicants not selected in the first two steps were then placed into the general drawing with all the other applicant names for the remaining elk licenses (60%) available in the zone and season they had selected on their application. Zone 30 only had two bull-only licenses available, so no landowner licenses or 10 year history licenses were offered.

METHODS

All elk hunters are required to attend a mandatory orientation session, held virtually this year. At this session, DNR staff go over the logistics of the elk hunt and explain how to collect biological samples from their harvested animal. The Friday before a given hunt, DNR staff provide hunters with their license and a biological sampling kit. Field samples collected by the hunter include blood, hair with skin, muscle tissue, and the whole liver. Hunters must register their animal in person within 24 hours at the local DNR office and provide biological samples. DNR staff help map the harvest location, provide a possession tag, and take the hunter-collected biological samples. DNR staff also collect lymph nodes, the obex (brain stem), the whole brain (when feasible), and a tooth so an accurate age can be determined via cementum annuli. Alternative arrangements are made for the collection of some samples, if immediate collection would interfere with a hunter’s planned taxidermy mount. DNR staff submit all biological samples to the DNR Wildlife Health Program for disease testing and other monitoring projects.

RESULTS

In 2020, a total of 37 elk were harvested in Zones 20 and 30 (Table 3), for an overall hunter success rate of 83% for Zone 20 and 100% for Zone 30. Although success rates were generally high, there was a gradual decrease in success rates for Zone 20 as the seasons progressed. Two antlerless elk and 15 bull elk were taken from hunters using either-sex licenses for Zone 20, and 18 antlerless elk were taken by hunters using antlerless-only licenses. One female elk was killed but not recovered in the Zone 20 - I Season, it is not reflected in the harvest totals. Long-term elk harvest for all zones is depicted in Tables 4, 5, and 6.

Table 1. License allocation and application numbers of the 2020 Minnesota elk seasons

Zone	Season Dates	Bull-Only	Either-Sex	Antlerless-Only	Total	Total Applicants
Zone 20	A: Aug 22-30	0	3	0	**3**	489
Zone 20	G: Aug 22-30	0	0	4	**4**	56
Zone 20	B: Sept 5-13	0	3	0	**3**	730
Zone 20	H: Sept 5-13	0	0	4	**4**	65
Zone 20	C: Sept 19-27	0	3	0	**3**	875
Zone 20	I: Sept 19-27	0	0	4	**4**	95
Zone 20	D: Oct 3-11	0	3	0	**3**	673
Zone 20	J: Oct 3-11	0	0	4	**4**	117
Zone 20	E: Oct 29-Nov 1	0	3	0	**3**	275
Zone 20	K: Oct 29-Nov 1	0	0	4	**4**	83
Zone 20	F: Dec 5-13	0	3	0	**3**	316
Zone 20	L: Dec 5-13	0	0	4	**4**	144
Zone 30	M: Sept 5-13	2	0	0	**2**	507
OVERALL	**TOTAL**	**2**	**18**	**24**	**44**	**4,425**

Table 2. Distribution of the 2020 Minnesota elk harvest.

Kittson County Central Hunt

Zone 20

Season	Either-Sex Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken	Success rate
Season A & G (Aug 22-30)	3	4	3	4	**7**	100%
Season B & H (Sept 5-13)	3	4	3	4	**7**	100%
Season C & I (Sept 19-27)	3	4	3	3	**6**	86%
Season D & J (Oct 3-11)	3	4	1	5	**6**	86%
Season E & K (Oct 24-Nov 1)	3	4	3	2	**5**	71%
Season F & L (Dec 5-13)	3	4	2	2	**4**	57%
Total	**18**	**24**	**15**	**20**	**35**	**83%**

Kittson County Northeast Hunt
Zone 30

Season	Bulls-only Licenses	Antlerless Licenses	Bulls taken	Antlerless taken	Total elk taken	Success rate
Season M (Sept 5-13)	2	0	2	0	**2**	100%
Total	**2**	**0**	**2**	**0**	**2**	**100%**

Table 3. Grygla (Zone 10) elk harvests, 1987-2012

Year	***Total Bull or Either-Sex Licenses***	***Total Bulls Harvested***	***Total Antlerless Licenses***	***Total Antlerless Harvested***	***Total Harvest***	***Hunter Success Rate***
1987	2	1	2	1	2	50%
1996	2	2	7	6	8	89%
1997	5	1	5	2	3	30%
1998	4	2	0	0	2	50%
2004	1	1	4	2	3	60%
2005	1	0	4	0	0	0%
2006	2	2	6	2	4	50%
2007	0	0	6	6	6	100%
2008	2	2	10	6	8	67%
2009	2	2	12	12	14	100%
2010	2	1	5	3	4	57%
2011	2	2	3	0	2	40%
2012	2	1	3	0	1	20%

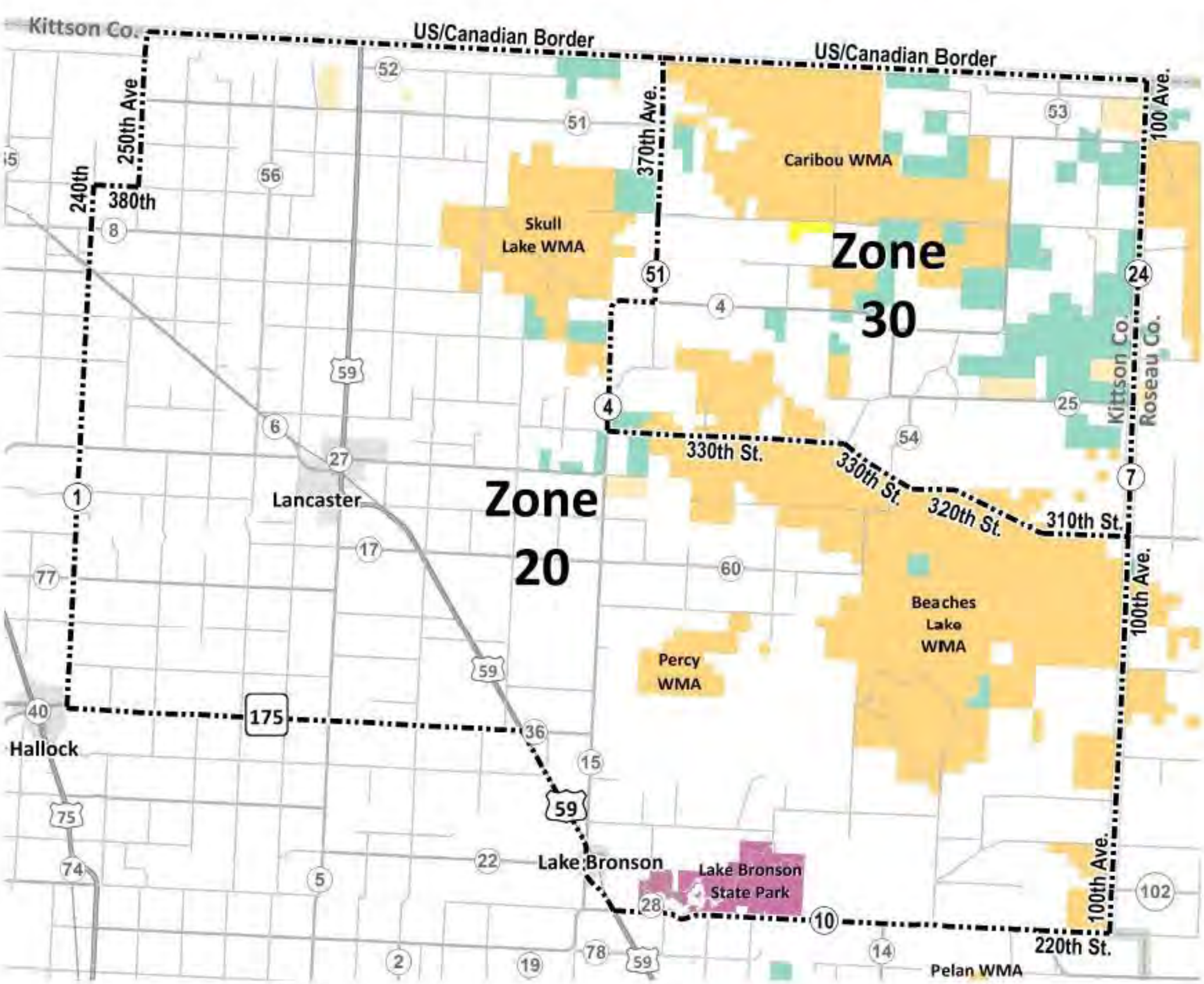
Table 4. Kittson Central (Zone 20) elk harvests, 2008-2020

Year	Total Bull or Either-Sex Licenses	Total Bulls Harvested	Total Antlerless Licenses	Total Antlerless Harvested	Total Harvest	Hunter Success Rate
2008	1	1	10	10	11	100%
2009	12	9	4	5	14	88%
2010	1	1	3	3	4	100%
2011	2	3	6	4	7	88%
2012	3	3	13	3	6	38%
2013	6	4	15	6	10	48%
2014	7	4	0	0	4	57%
2015	5	3	0	0	3	60%
2016	5	3	0	0	3	60%
2017	6	5	2	1	6	75%
2018	4	3	16	12	15	75%
2019	4	4	21	10	14	56%
2020	18	15	24	20	35	83%

Table 5. Kittson Northeast (Zone 30) elk harvests, 2012-2020

Year	Total Bull Licenses	Total Bulls Harvested	Hunter Success Rate
2012	2	1	50%
2013	2	2	100%
2014	2	2	100%
2015	2	2	100%
2016	2	2	100%
2017	5	4	80%
2018	2	2	100%
2019	2	1	50%
2020	2	2	100%

Minnesota 2019 Elk Hunt Zones



Season	Date
Season A	September 7 - 15, 2019
Season B	September 21 - 29, 2019
Season C	October 5 - 13, 2019
Season D	December 7 - 15, 2019

Application Deadline June 14, 2019

DEPARTMENT OF NATURAL RESOURCES

Date: 2019-05-15

Figure 1. Kittson County Elk Hunt zones.

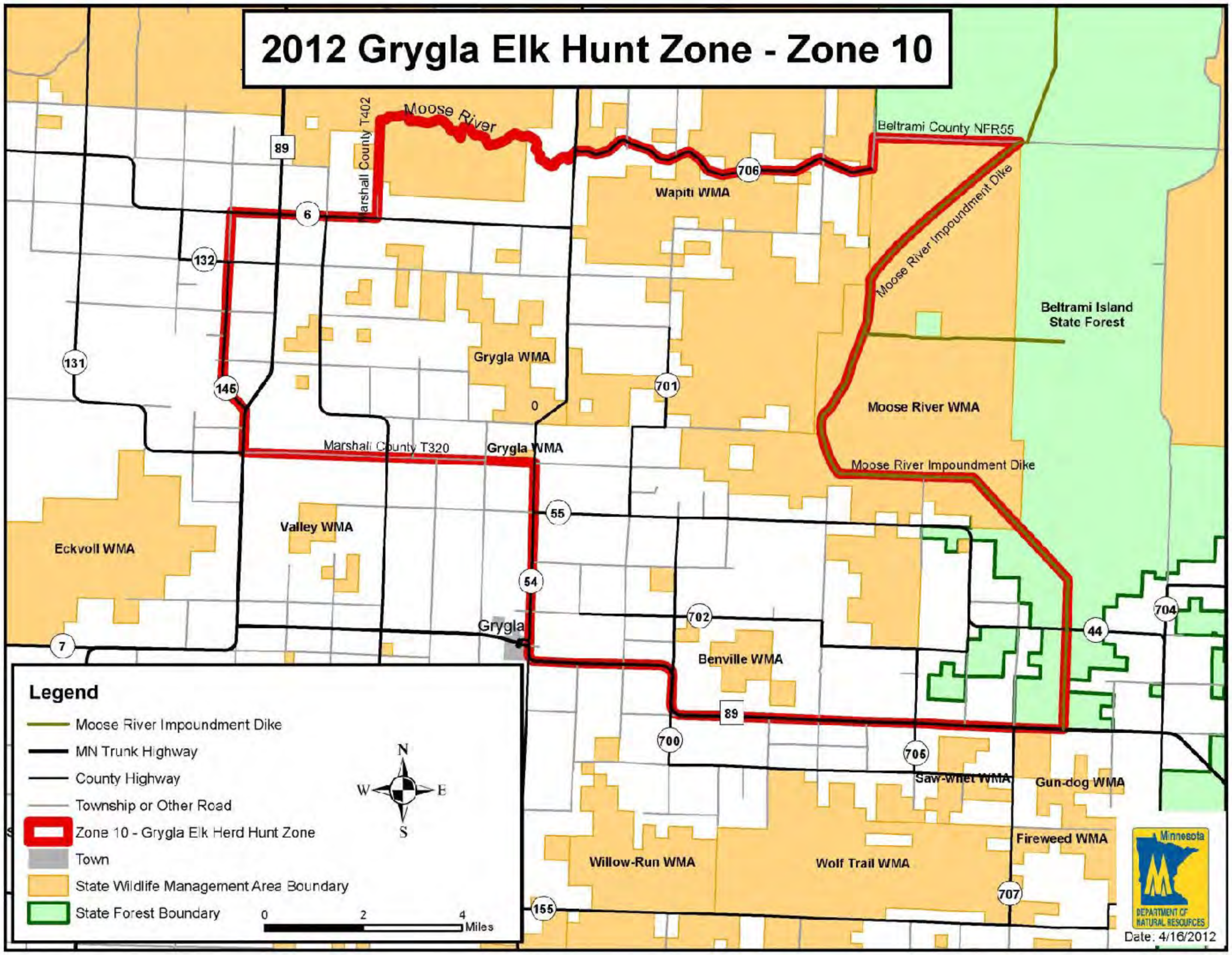


Figure 2. Grygla Elk Hunt zone.

MINNESOTA SANDHILL CRANE HARVEST REPORT, 2020

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. In 2017 the season was shifted to open the third Saturday in September and close the fourth Sunday in October with no changes to the daily and possession limits. This remained the same for the 2018, 2019 and 2020 seasons. 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

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

Dubovsky, J.A. 2016. Status and harvests of sandhill cranes:Mid-Continent, Rocky Mountain, Lower Colorado River Valley and Eastern Populations. Administrative Report, U.S. Fish and Wildlife Service, Denver, Colorado. 15pp.) http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html

Table 1. Sandhill Crane season dates and limits in Minnesota, 2010 – 2020.

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
2015	12 Sept – 18 Oct	1	3
2016	10 Sept – 16 Oct	1	3
2017	16 Sept – 22 Oct	1	3
2018	15 Sept – 21 Oct	1	3
2019	14 Sept – 20 Oct	1	3
2020	19 Sept – 25 Oct	1	3

Table 2. Sandhill crane permit sales, estimated number of active hunters and harvest for NW Minnesota, 2010-2020. (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
2015	1,199	424	212
2016	1,139	471	287
2017	1,125	397	196
2018	1,091	383	129
2019	1,073	333	179
2020	1,288	480	472

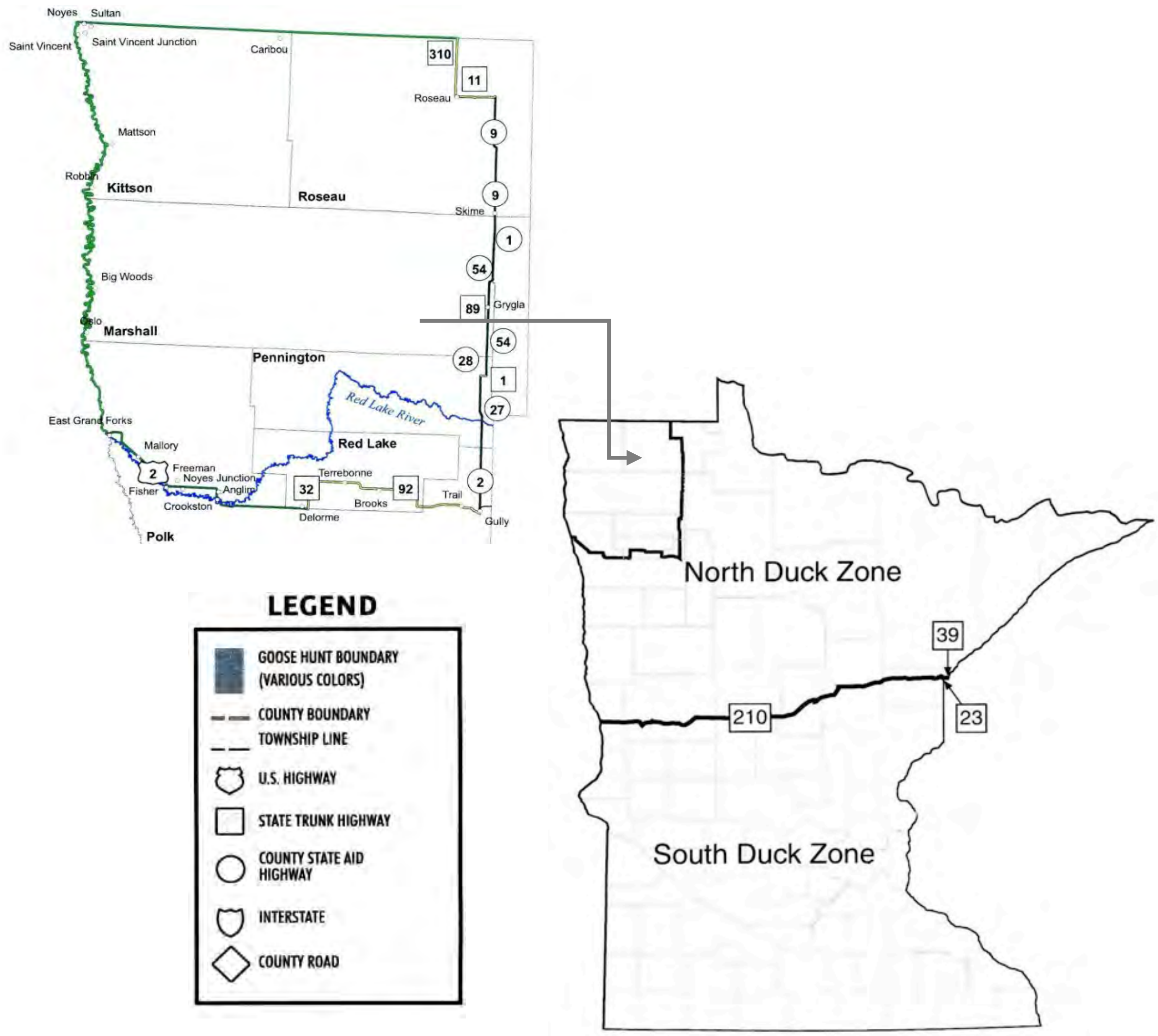


Figure 1. Sandhill crane hunting zone in Minnesota, 2010-2019.

TRAPPING HARVEST STATISTICS

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

2020 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. Beginning in 2017, we excluded license holders <18 years old at the time of the survey, which represents ~3% of license sales. 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) except for youth <18 years old who were excluded from the survey, listed in the Electronic License System (ELS) database in late February 2021. There were 7,139 active trapping licenses in the ELS database, which consisted of 5,052 Resident Regular Trappers, 21 age - eligible Resident Junior Trappers, 1,241 Resident Senior Trappers, 618 "active" Lifetime Trappers, and 16 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 = 67%, range: 49–79%). 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 (>=18-yr old) 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 were tabulated using Viking Data Entry VDE+ software, and then summarized using the R programming language (R version 4.1.0 (2021-05-18); R Development Core Team 2018).

RESULTS

We mailed out 6,948 surveys, 132 surveys were undeliverable and 3,339 were returned for an adjusted response rate of 49%. Among respondents, 66% 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.

Dear Trapper:

You are being asked as a trapping license buyer to assist us in evaluating the 2020-2021 trapping season (**March 2020-February 2021**). For Spring Beaver, please report only animals taken between March 1, 2020 and May 15, 2020. 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 checked per day** for each species. If a trap is set for multiple species, count the trap for both species when answering the question. For example, if you ran 20 mink/coon traps each day, enter 20 traps/day for both mink and coon.

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

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

THANK YOU FOR YOUR COOPERATION

Michelle Carstensen, Acting Wildlife Research Program Manager
Division of Fish and Wildlife
Department of Natural Resources

DEPARTMENT OF NATURAL RESOURCES
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St Paul MN 55155

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2020 Trapper Report

1. Did you set traps/snares in Minnesota this year during the 2020-2021 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 checked PER DAY for each species, and 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.

		Number YOU Trapped All Season	# Days Trapped All Season	Average # traps/snares checked per day	County You Trapped In Most
Muskrat	80				
Mink	32				
Gray Fox	96				
Striped skunk	34				
Coyote (brush wolf)	97				
Beaver (Mar-May'20)	81				
Beaver (Oct'20-Feb'21)	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				

Figure 1. Trapper survey card 2020.

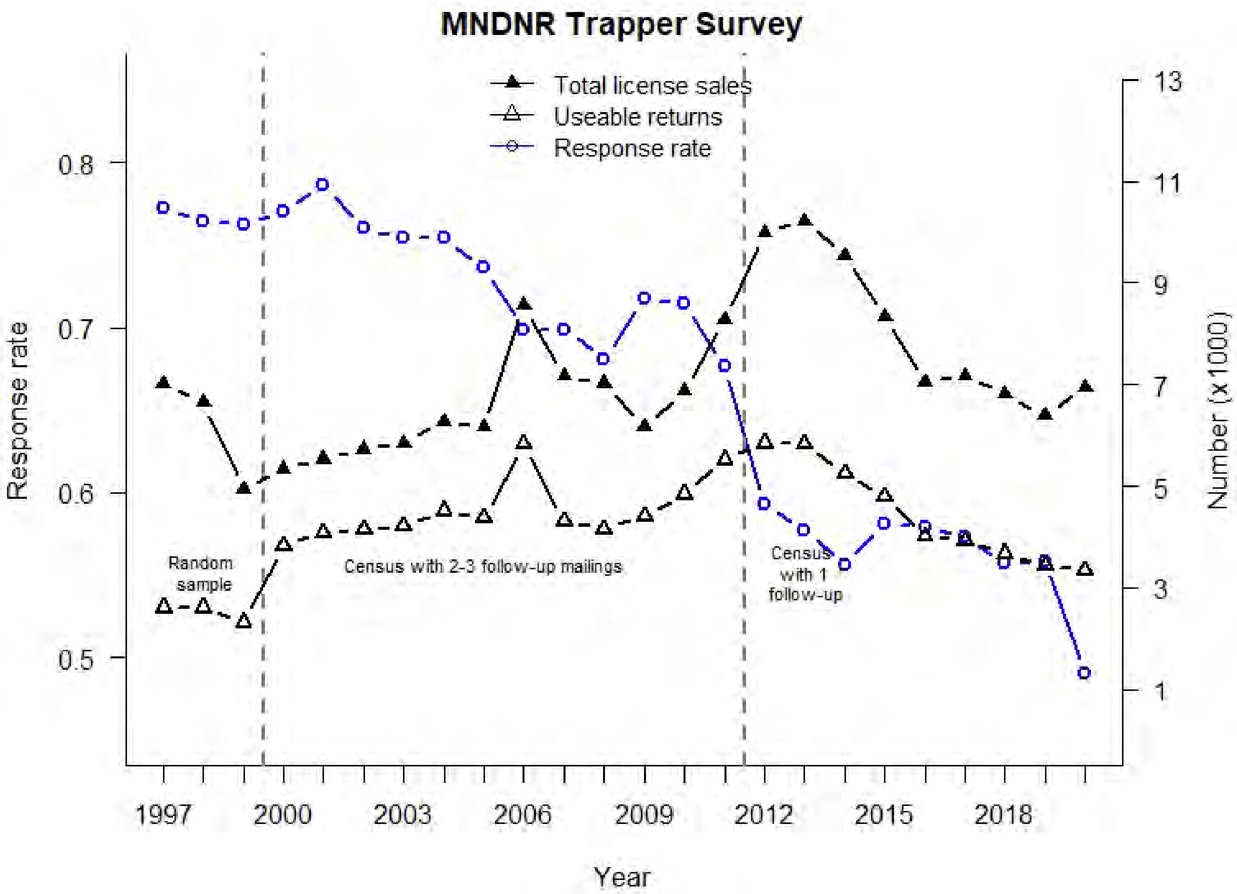

Figure 2. Trapper annual license sales and mail survey response, 1997-98 through 2020-21.

Table 1. Use of trapper licenses, 2009-10 through 2020-21.

Year		Returns from mail survey	Projections from license sales
2009-10	Trapped	3,202 (72.7%)	4,467
	Did not trap	1,202 (27.3%)	1,677
		4,404 (100.0%)	6,144[a]
2010-11	Trapped	3,546 (73.2%)	5,032
	Did not trap	1,298 (26.8%)	1,843
		4,844 (100.0%)	6,875[a]
2011-12	Trapped	4,498 (81.5%)	6,748
	Did not trap	1,019 (18.5%)	1,532
		5,517 (100.0%)	8,280[a]
2012-13	Trapped	4,537 (77.6%)	7,747
	Did not trap	1,307 (22.4%)	2,236
		5,844 (100.0%)	9,983[a]
2013-14	Trapped	4,342 (74.6%)	7,627
	Did not trap	1,480 (25.4%)	2,597
		5,822 (100.0%)	10,224[a]
2014-15	Trapped	3,786 (72.2%)	6,888
	Did not trap	1,459 (27.8%)	2,652
		5,245 (100.0%)	9,540[a]
2015-16	Trapped	3,296 (68.8%)	5,734
	Did not trap	1,496 (31.2%)	2,600
		4,792 (100.0%)	8,334[a]
2016-17	Trapped	2,558 (63.7%)	4,487
	Did not trap	1,458 (36.3%)	2,557
		4,016 (100.0%)	7,044[a]
2017-18	Trapped	2,654 (67.6%)	4,692
	Did not trap	1,272 (32.4%)	2,249
		3,926 (100.0%)	6,941[a]
2018-19	Trapped	2,382 (64.8%)	4,326
	Did not trap	1,292 (35.2%)	2,350
		3,674 (100%)	6,676[a]
2019-20	Trapped	2,182 (63.6%)	3,954
	Did not trap	1,249 (36.4%)	2,263
		3,431 (100%)	6,217[a]
2020-21	Trapped	2,214 (66.3%)	4,607
	Did not trap	1,125 (33.7%)	2,341
		3,339 (100%)	6,948[a]

[a] excludes duplicates.

Table 2. Estimated number of trappers of various furbearers, 2009-10 through 2020-21.

	Estimated number of trappers											
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Muskrat	2088	2760	4,320	4,110	3,410	2,902	2,218	1,797	1,882	1,583	1,225	1,296
Mink	1541	1847	2,470	3,110	2,780	2,158	1,587	1,049	1,084	995	795	905
Short-tailed weasel	417	546	800	690	510	666	289	195	283	166	261	345
Long-tailed weasel	254	333	560	540	480	519	265	174	190	151	168	238
Raccoon	2320	2567	4,060	4,680	4,660	4,182	2,781	2,032	2,168	1,952	1,806	1,925
Striped skunk	949	1130	1,800	1,940	1,610	1,541	1,234	907	840	798	739	789
Badger	206	229	310	360	390	284	247	193	167	164	161	146
Opossum	701	645	830	1,100	1,110	575	463	469	785	646	548	606
Red fox	1006	1068	1,900	2,240	2,080	2,012	1,434	1,048	1,258	1,091	955	1,181
Gray fox	529	555	970	1,180	1,060	1,035	684	446	458	381	241	261
Coyote	888	998	1,720	2,360	2,200	2,396	1,981	1,479	1,781	1,586	1,344	1,683
Beaver (Oct - Feb)	1650	1722	2,360	2,620	2,710	2,189	1,894	1,642	1,495	1,535	1,333	1,561
Beaver (previous Spring)	1260	1367	1,510	1,810	1,150	1,305	1,145	1,130	1,194	1,000	1,153	1,347

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, 2009-10 through 2020-2021.

	Estimated take per successful trapper reporting that species											
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Muskrat	48	66	82	59	36	39	51	49	45	40	32	36
Mink	9	8	7	6	6	5	5	6	5	5	5	4
Short-tailed weasel	8	10	10	7	5	8	4	5	5	6	5	4
Long-tailed weasel	4	6	6	4	3	5	3	3	3	3	3	3
Raccoon	20	23	25	18	16	15	11	12	14	13	17	11
Striped skunk	7	8	7	7	6	6	6	7	6	5	6	6
Badger	2	2	2	2	2	2	2	2	2	2	2	2
Opossum	8	7	6	7	7	7	4	5	8	9	7	6
Red fox	3	4	4	4	3	4	3	3	4	4	4	4
Gray fox	3	2	3	3	2	2	2	2	2	2	2	2
Coyote	5	5	6	5	5	5	6	5	7	8	7	7
Beaver (Oct –Feb)	12	10	12	10	9	8	8	8	8	9	8	11
Beaver (previous Spring)	20	22	20	20	9	16	14	17	19	19	23	20

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, 2009-10 through 2020-2021[a]

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Trapper license sales [b]	6,158	6,885	8,280	9,998	10,224	9,540	8,334	7,044	7,163	6,815	6,386	7,139
Estimated harvest [c, d, e]												
Muskrat	98,524	180,480	352,030	242,120	120,500	111,998	112,219	87,958	83,844	63,021	38,777	46,224
Mink	13,207	13,837	15,770	18,460	14,710	10,211	7,745	5,439	5,218	4,412	3,483	3,024
Short-tailed weasel	3,128	4,939	7,300	4,500	2,360	4,806	1,083	930	1,305	995	1,245	1,359
Long-tailed weasel	838	1,728	3,020	2,030	1,410	2,568	734	466	554	340	379	689
Raccoon	45,118	57,189	98,240	79,800	70,380	58,868	29,963	22,874	28,899	24,845	29,297	19,740
Striped skunk	6,194	7,979	12,250	12,620	9,430	7,956	6,349	5,458	4,476	3,961	4,078	4,023
Badger	316	337	490	570	600	347	376	286	278	221	231	280
Opossum	4,963	4,194	4,400	6,780	6,720	3,524	1,814	2,124	6,160	5,248	3,548	3,143
Red fox	2,984	3,303	7,250	7,540	5,710	6,040	4,061	2,707	4,500	3,530	2,896	3,953
Gray fox	1,084	1,093	2,100	2,550	1,940	1,902	1,161	715	736	611	336	321
Coyote	3,797	4,264	8,780	11,130	9,010	11,703	10,084	7,308	12,303	11,359	8,630	10,183
Beaver (Oct- Feb)	18,178	17,114	26,620	24,590	23,220	15,671	14,181	13,070	11,223	12,937	9,900	15,823
Beaver (previous Spring)	25,008	29,148	29,500	34,600	10,110	20,820	15,966	19,004	22,293	18,649	26,368	26,464
Registered harvest [e, f]												
Otter	1,544	1,814	2,294	3,171	2,824	2,148	1,955	1195	1,295	1,351	1,050	1,304
Bobcat [g]	884	1,012	1,711	1,875	1,038	1,380	766	485	731	1,015	695	1,325
Fisher	1,259	903	1,473	1,293	1,146	919	756	399	477	510	463	712
Marten	2,073	1,842	2,525	1,472	1,014	1,055	877	551	979	665	585	766
Wolf [h]	Closed	Closed	Closed	413	238	272	Closed	Closed	Closed	Closed	Closed	Closed

[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 2021- 7,139 trapping licenses were sold in 2020: 186 (0.3%) were junior licenses, 5,056 (71.5%) were regular adult licenses, 1,243 (18.9%) were senior licenses, 638 (9.1%) were Lifetime licenses, and 16 (<1%) were Nonresident (MN Landowner) licenses. Duplicate licenses excluded.

[c] Based upon trappers' responses to mail surveys.

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

[e] There has been no open season in Minnesota on Eastern spotted skunk (Threatened) since 1996 or Lynx (Special Concern) since 1984. They are fully protected.

[f.] Registered harvest information as reported from annual, mandatory registration.

[g] Registered harvest for bobcat includes animals taken by hunting.

[h] A wolf season was opened in 2012, 2013, and 2014. The season was closed pre-2012 and post-2014. Registered harvest includes animals taken by hunting.

Minnesota Fur Buyers Survey for the 2020-2021 Hunting and Trapping Season

Jason Abraham, Season Setting/Furbearer Specialist
Margaret Dexter, 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

This survey was not completed as planned. If it had been done, surveys would have been sent in September 2021, to licensed fur buyers in Minnesota. The survey asks them to report the number and type of fur purchased from Minnesota trappers and hunters and the "average price" paid to those hunters and trappers based on all furs purchased.

Calculations of average pelt price for each species are weighted according to the number of pelts purchased by each buyer. Total estimated value of the furbearer harvest to trappers and hunters in 2019-20 was $953,951.88.

Table 1. Minnesota fur prices as reported by licensed fur dealers, 2020-21.

Not Available for this year.

Species	Number Pelts	Minimum Price	Maximum Price	Weighted Mean
Muskrat	NA	NA	NA	NA
Mink Female	NA	NA	NA	NA
Mink male	NA	NA	NA	NA
Raccoon	NA	NA	NA	NA
Red Fox	NA	NA	NA	NA
Gray Fox	NA	NA	NA	NA
Coyote	NA	NA	NA	NA
Bobcat	NA	NA	NA	NA
River Otter	NA	NA	NA	NA
Beaver 10-12	NA	NA	NA	NA
Beaver 3-4	NA	NA	NA	NA
L.T. Weasel	NA	NA	NA	NA
S.T. Weasel	NA	NA	NA	NA
Striped Skunk	NA	NA	NA	NA
Badger	NA	NA	NA	NA
Opossum	NA	NA	NA	NA
Fisher Male	NA	NA	NA	NA
Fisher Female	NA	NA	NA	NA
Marten Male	NA	NA	NA	NA
Marten Female	NA	NA	NA	NA
Deer Hides	NA	NA	NA	NA
Bear Hides	NA	NA	NA	NA

Table 2. Average price per pelt paid to hunters and trappers in Minnesota, 2009-10 through 2020-21

	Average pelt prices paid hunters and trappers in Minnesota (dollars)										
Species	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Muskrat	5.33	5.86	7.91	8.72	4.85	2.28	2.65	2.59	2.38	2.84	NA
Mink (female)	9.33	11.54	17.53	13.72	7.45	4.99	6.20	5.80	6.02	3.07	
Mink (male)	13.66	14.68	18.27	18.11	10.50	6.18	7.47	7.29	7.61	3.46	
Raccoon	10.87	12.57	16.60	16.58	8.64	5.11	4.92	5.76	7.30	6.66	
Red Fox	13.35	22.87	33.52	30.90	20.41	11.86	10.52	13.30	10.93	9.95	
Gray Fox	14.64	15.11	19.20	21.27	14.17	10.64	10.33	11.32	13.42	12.70	
Coyote	9.47	17.99	22.04	21.30	25.10	21.48	17.39	25.15	36.20	38.71	
Bobcat	71.44	98.18	144.79	88.63	66.67	57.46	35.88	63.52	60.33	61.97	
Otter	34.53	51.40	72.12	61.32	34.57	30.03	21.05	21.98	25.07	20.64	
Beaver (fall-winter)	11.95	14.29	18.47	16.52	12.40	8.77	8.14	8.32	8.30	7.66	
Beaver (spring)	14.50	19.96	12.80	14.77	10.69	8.24	7.33	10.39	8.95	7.86	
L.T. Weasel	2.87	4.02	4.10	2.35	1.78	1.46	1.41	0.00	0.00	0.00	
S.T. Weasel	1.50	2.10	2.51	0.00	2.00	1.41	0.00	2.79	2.45	2.08	
Striped Skunk	3.29	3.55	5.00	4.14	3.86	3.65	4.00	7.12	5.25	6.30	
Badger	10.43	13.47	14.54	13.72	9.52	9.57	7.86	9.09	7.94	8.14	
Opossum	2.64	5.80	1.52	1.52	1.17	1.98	1.32	1.34	0.96	0.83	
Fisher (male)	38.19	47.69	62.38	61.32	41.76	34.88	28.00	29.87	43.03	21.02	
Fisher (female)	37.31	39.59	63.02	67.73	50.87	34.39	37.07	36.75	39.57	19.84	
Marten (male)	39.80	42.32	56.57	74.10	38.92	30.83	29.94	36.90	41.81	27.35	
Marten (female)	36.57	39.49	54.29	70.94	32.20	28.89	30.41	33.96	33.06	23.75	
Deer Hides	4.41	3.95	5.18	6.09	5.59	5.62	4.00	4.14	3.18	2.91	
Bear Hides	33.38	28.79	30.28	42.63	32.94	46.03	32.97	25.91	32.33	32.72	

REGISTERED FURBEARER HARVEST STATISTICS

Forest Wildlife Populations and Research Group
1201 East Highway 2
Grand Rapids, MN 55744
(218) 328-8875

REGISTERED FURBEARER HARVEST STATISTICS 2020-21

John Erb, Minnesota Department of Natural Resources, Forest Wildlife 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 monitoring the effects of changes in harvest seasons, harvest techniques, and habitat. The level of detail or accuracy necessary in harvest information varies across species, depending on factors such as population density, harvest pressure, habitat 'sensitivity' of the species, and reproductive potential.

In Minnesota, detailed harvest information is collected on 4 carnivores – fishers (*Pekania pennanti*), martens (*Martes americana*), bobcats (*Lynx rufus*), and river otters (*Lontra canadensis*). These species have lower reproductive potential, naturally occur at low to moderate densities, have comparatively restricted distributions, or may be more influenced by habitat change. Hence, detailed harvest information has been collected on these species for the past 43 years to help ensure sustainable harvests and populations.

METHODS

Hunters and trappers are required to bring pelts from harvested animals (fishers, martens, bobcats, and river otters) in to fur registration stations usually within 48 hours of the close of the season. Upon registration, information is collected on the sex, date, method of take, and harvest location (township) for each animal, and the pelt is tagged to verify it has been registered.

RESULTS

Currently, harvest of fishers, martens, and bobcats is allowed in approximately the northern 60% of the state, while river otter harvest is allowed statewide (Figure 1). There were no changes to season structures for any of the four registered species this year compared to the 2019-20 season. Bobcat harvest increased 91%, fisher harvest increased 54%, marten harvest increased 31%, and otter harvest increased 24%. Detailed harvest summaries are provided in the following tables and graphs. Data for years prior to those presented in this report are available (back to 1977) by contacting the Minnesota DNR.

ACKNOWLEDGMENTS

I thank the many individuals from the Minnesota Department of Natural Resources for their assistance with collection of data contained in this report. This work was funded in part by the Wildlife Restoration Program (Pittman-Robertson).

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

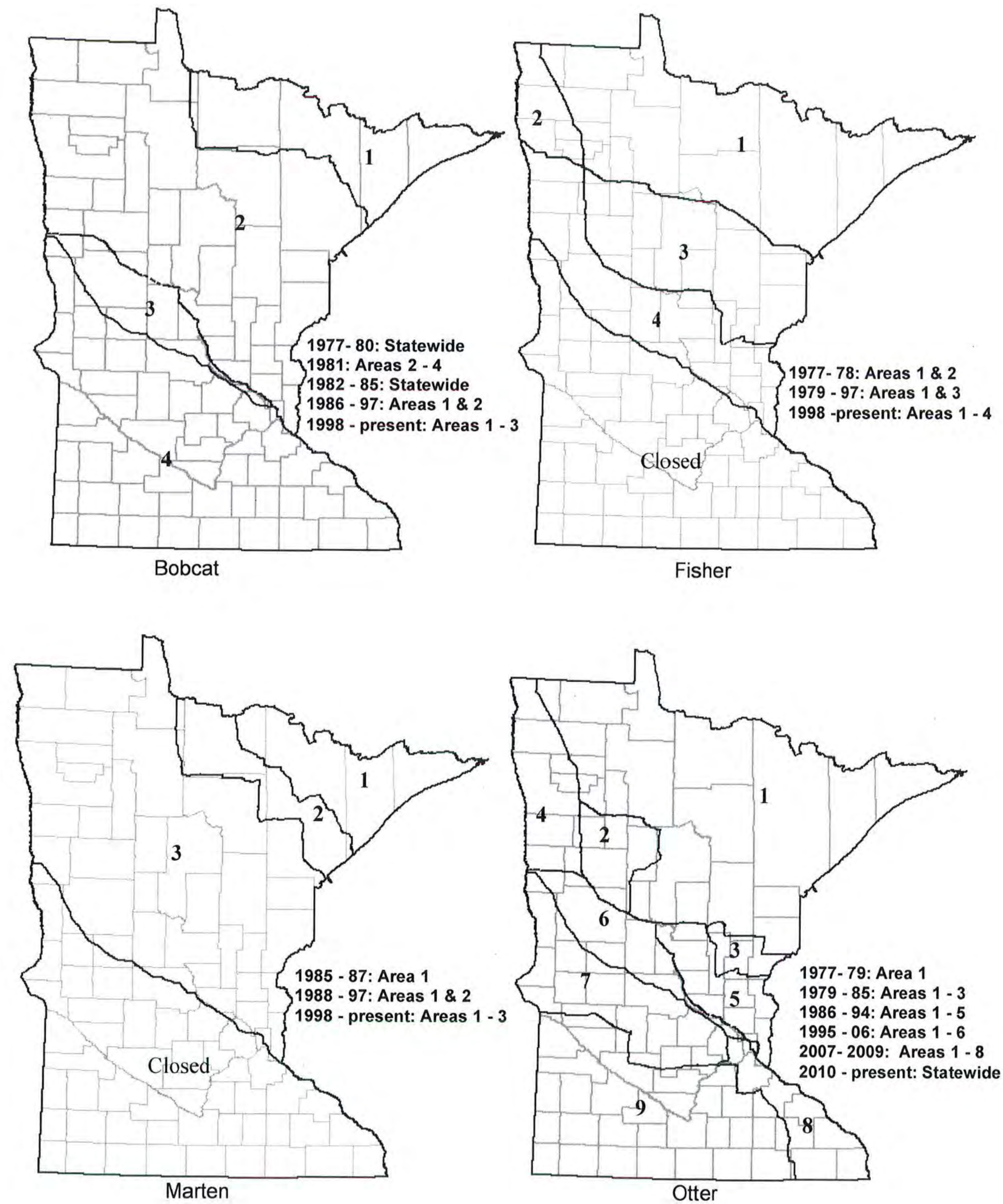

Figure 1. Open trapping areas in Minnesota for fisher, marten, bobcat, and river otter, 1977 - present.

Table 1. Registered furbearer seasons and harvests, 1990-2020.

	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
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
2015-16	11/28-1/3	37	5	766	11/28-12/3	6	2	756	11/28-12/3	6	2	877	10/24-1/3	71	4	1955
2016-17	11/26-1/8	44	5	485	11/26-12/1	6	2	399	11/26-12/1	6	2	551	10/29-1/8	78	4	1195
2017-18	11/25-1/7	44	5	731	11/25-11/30	6	2	477	11/25-11/30	6	2	979	10/28-1/7	78	4	1295
2018-19	11/24-1/6	44	5	1015	11/24-11/29	6	2	510	11/24-11/29	6	2	665	10/27-1/6	78	4	1351
2019-20	12/21-1/26	37	5	695	12/21-12/29	9	2	463	12/21-12/29	9	2	585	10/26-1/26	99	4	1050
2020-21	12/19-1/24	37	5	1325	12/19-12/27	9	2	712	12/19-12/27	9	2	766	10/24-1/24	99	4	1304

[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).

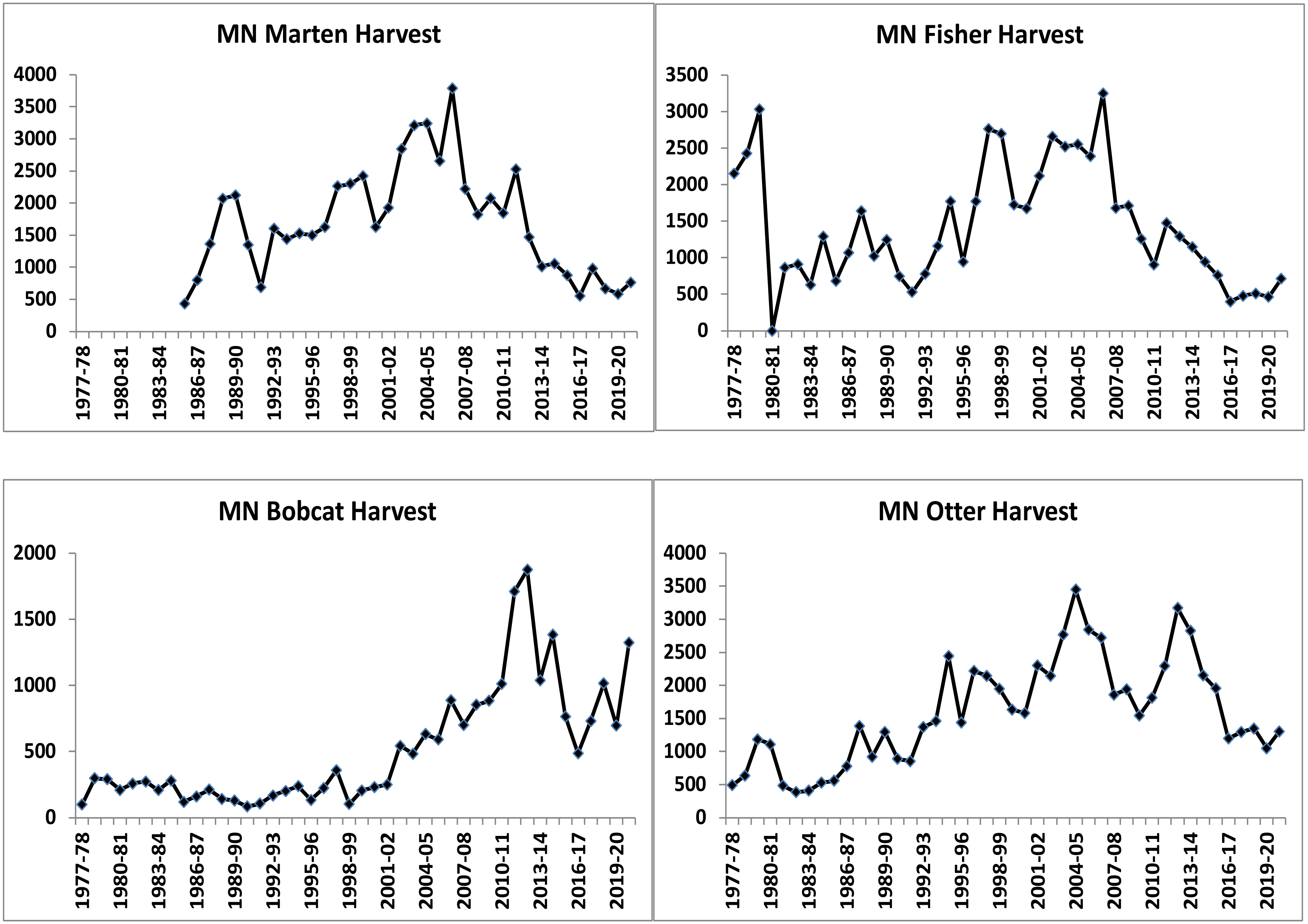

Figure 2. Harvest of registered furbearers in Minnesota, 1977-present.

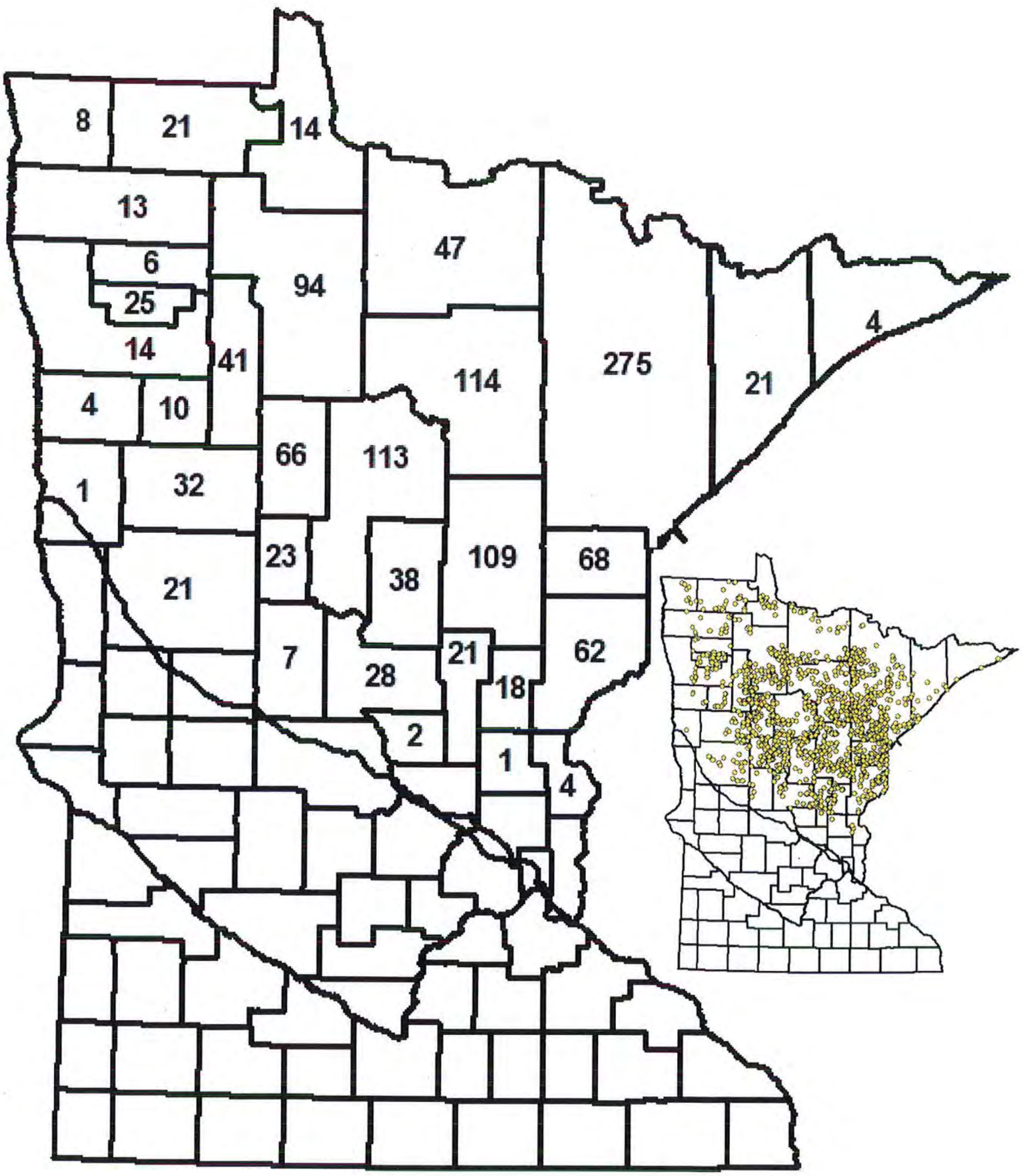

Figure 3. Bobcat harvest by county, 2020-21. Inset shows spatial distribution of harvest locations.

Table 2. Bobcat harvest by county and sex, 2020-21.

County	Sex* Female	Male	Unknown	Total	Harvest/ 100 Mile²
Aitkin	54	55		109	5.47
Anoka	0	0		0	0.00
Becker	11	21		32	2.21
Beltrami	43	51		94	3.08
Benton	1	1		2	0.48
Carlton	32	36		68	7.78
Cass	61	52		113	4.68
Chisago	3	1		4	0.90
Clay	0	1		1	0.09
Clearwater	21	20		41	3.98
Cook	4			4	0.25
Crow Wing	24	14		38	3.29
Douglas	0	0		0	0.00
Hubbard	36	30		66	6.60
Isanti	1	0		1	0.22
Itasca	61	52	1	114	3.90
Kanabec	12	6		18	3.38
Kittson	5	3		8	0.72
Koochiching	23	24		47	1.49
Lake	14	7		21	0.92
Lake of the Woods	8	6		14	0.79
Mahnomen	5	5		10	1.71
Marshall	6	7		13	0.72
Mille Lacs	14	7		21	3.08
Morrison	13	15		28	2.43
Norman	2	2		4	0.46
Otter Tail	9	11	1	21	0.94
Pennington	1	5		6	0.97
Pine	41	21		62	4.33
Polk	10	4		14	0.70
Red Lake	15	10		25	5.77
Roseau	10	11		21	1.25
Sherburne	0	0		0	0.00
St. Louis	175	99	1	275	4.08
Stearns	0	0		0	0.00
Todd	3	4		7	0.71
Wadena	10	13		23	4.23
Unknown	0	0	0	0	
Total	728	594	3	1325	

* 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, 2010-2020.

County	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Aitkin	73	121	142	65	105	39	22	41	51	55	109
Anoka	0	1	0	0	1	0	0	0	0	0	0
Becker	39	70	58	36	48	36	10	31	22	14	32
Beltrami	108	139	139	59	73	49	30	37	60	34	94
Benton	0	4	3	3	0	0	1	2	3	1	2
Carlton	37	94	63	42	88	25	16	33	42	27	68
Cass	117	164	150	76	126	73	44	72	91	52	113
Chisago	1	0	3	1	1	3	4	2	5	3	4
Clay	3	1	3	2	3	1	0	0	2	0	1
Clearwater	30	58	40	19	29	15	13	14	18	14	41
Cook	1	3	3	9	17	1	0	2	0	2	4
Crow Wing	29	64	65	19	32	21	7	24	28	15	38
Douglas	0	0	1	1	0	0	0	0	1	0	0
Hubbard	59	129	105	51	50	45	21	44	41	19	66
Isanti	0	0	0	1	0	1	1	0	0	0	1
Itasca	132	186	194	93	110	50	19	54	86	57	114
Kanabec	16	21	46	16	46	12	11	16	24	12	18
Kittson	9	10	7	5	5	7	6	3	3	10	8
Koochiching	54	66	82	50	40	22	25	26	62	24	47
Lake	7	15	21	13	15	8	4	8	24	8	21
Lake of the Woods	10	28	13	20	26	10	7	5	14	13	14
Mahnomen	2	9	7	4	4	3	5	2	4	2	10
Marshall	31	42	44	15	21	19	14	12	30	25	13
Mille Lacs	10	13	23	7	14	5	2	10	19	8	21
Morrison	23	25	35	15	25	16	17	19	37	22	28
Norman	0	3	6	3	8	4	1	4	7	2	4
Otter Tail	14	21	38	18	17	16	15	22	12	6	21
Pennington	5	4	13	7	3	4	1	4	8	7	6
Pine	50	94	135	54	87	56	37	43	46	47	62
Polk	9	17	20	10	16	15	10	9	5	3	14
Red Lake	16	20	25	6	11	3	1	15	10	10	25
Roseau	26	46	60	38	27	20	23	23	45	20	21
Sherburne	0	3	0	0	0	0	0	0	0	1	0
St. Louis	81	202	283	255	307	156	91	123	182	154	275
Stearns	0	0	0	2	0	1	0	0	0	0	0
Todd	9	14	16	5	8	8	9	13	10	7	7
Wadena	9	17	23	18	18	10	18	18	23	21	23
Unknown	2	7	9	0	3	12	0	0	0	0	0
Total	1012	1711	1875	1038	1384	766	485	731	1015	695	1325

Table 4. Bobcat harvest by sex and week, 2020-21 season.

	Sex*				% of	Cumulative
Date	Female	Male	Unknown	Total	Total	%
Dec.19 - Dec.25	203	174	1	378	28.53	28.53
Dec.26 - Jan.1	138	121		259	19.55	48.08
Jan.2 - Jan.8	123	87	1	211	15.92	64.00
Jan.9 - Jan.15	112	101		213	16.08	80.08
Jan.16 - Jan.24**	146	108	1	255	19.25	99.32
Unknown	6	3		9	0.68	100.00
Total	728	594	3	1325	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, 1995-2020.

Number (%) of Takers	Number Taken					
	1	2	3	4	5	Total Takers
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
2015-16	248 (59)	87 (21)	33 (8)	29 (7)	25 (6)	422
2016-17	126 (58)	47 (22)	26 (12)	6 (3)	11 (5)	216
2017-18	257 (61)	95 (22)	31 (7)	16 (4)	25 (6)	424
2018-19	260 (53)	87 (18)	59 (12)	42 (8)	47 (9)	495
2019-20	214 (57)	77 (21)	37 (10)	19 (5)	27 (7)	374
2020-21	319 (50)	138 (22)	67 (11)	35 (6)	76 (12)	635

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

Table 6. Bobcat harvest by method of take, 1993-2020.

	Total	Trapping					Hunting				
Year	Harvest[a]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]	Harvest	% of Total	# Takers	Ave. Take	% Males[b]
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
2014-15	1384	1260	91	622	2.0	44	124	9	86	1.4	56
2015-16	766	657	86	355	1.9	49	109	14	68	1.6	70
2016-17	485	377	78	215	1.8	41	108	22	69	1.6	54
2017-18	731	606	83	335	1.8	45	125	17	93	1.3	59
2018-19	1015	865	85	406	2.1	48	150	15	98	1.5	58
2019-20	692	570	82	297	1.9	36	122	18	84	1.5	66
2020-21	1325	1124	85	512	2.2	43	201	15	126	1.6	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

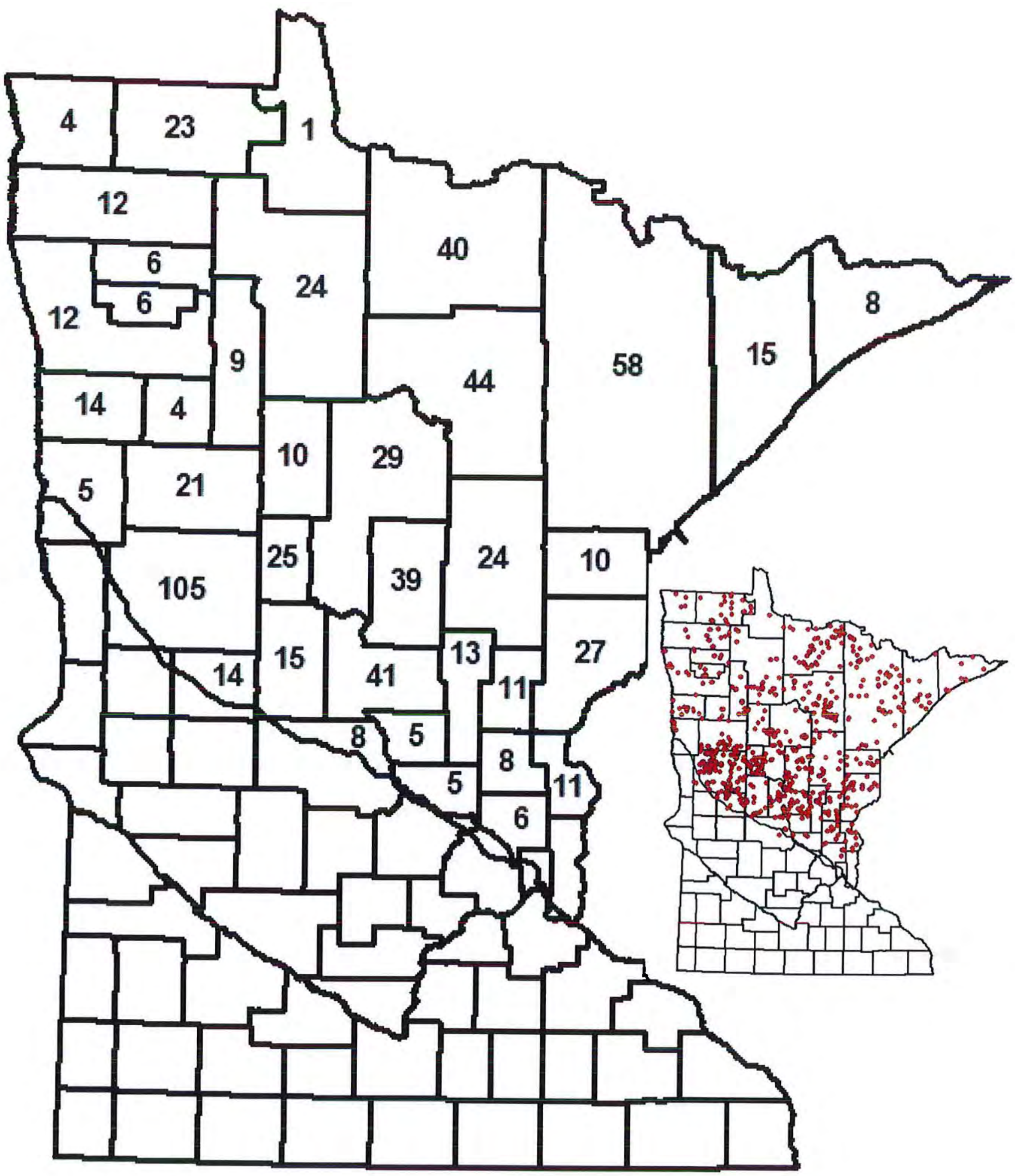

Figure 4. Fisher harvest by county, 2020. Inset shows spatial distribution of harvest locations.

Table 7. Fisher harvest by county and sex, 2020 season.

County	Sex: Female	Sex: Male	Sex: Unknown	Total	Harvest/ 100 Mile^2
Aitkin	11	13		24	1.20
Anoka	3	3		6	1.35
Becker	4	17		21	1.45
Beltrami	12	12		24	0.79
Benton	4	1		5	1.21
Carlton	4	6		10	1.14
Cass	10	19		29	1.20
Chisago	5	6		11	2.49
Clay	3	2		5	0.47
Clearwater	4	5		9	0.87
Cook	3	5		8	0.50
Crow Wing	15	24		39	3.37
Douglas	3	11		14	1.94
Grant	0	0		0	0.00
Hubbard	2	8		10	1.00
Isanti	3	4	1	8	1.77
Itasca	19	25		44	1.50
Kanabec	2	9		11	2.06
Kittson	1	3		4	0.36
Koochiching	21	19		40	1.27
Lake	7	8		15	0.66
Lake of the Woods	1	0		1	0.06
Mahnomen	0	4		4	0.69
Marshall	9	3		12	0.66
Mille Lacs	7	6		13	1.91
Morrison	16	25		41	3.56
Norman	3	11		14	1.60
Otter Tail	35	69	1	105	4.72
Pennington	1	5		6	0.97
Pine	9	17	1	27	1.88
Polk	3	9		12	0.60
Red Lake	3	3		6	1.39
Roseau	9	14		23	1.37
Sherburne	1	4		5	1.11
St. Louis	30	28		57	0.86
Stearns	2	6		8	0.58
Todd	5	10		15	1.53
Wadena	4	21		25	4.60
Washington	0	0		0	0.00
Wilkin	0	0		0	0.00
Unknown				0	
Total	274	435	3	712	

Table 8. Comparison of fisher harvest by county, 2009-2020.

County	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Aitkin	50	35	55	52	47	24	38	16	10	15	17	24
Anoka	0	0	1	2	1	2	7	4	0	4	3	6
Becker	44	30	32	45	38	21	23	3	18	10	11	21
Beltrami	22	10	25	21	17	4	8	9	6	6	15	24
Benton	2	0	5	5	2	4	3	7	4	7	8	5
Carlton	15	12	12	14	8	14	13	6	1	9	8	10
Cass	57	43	41	37	23	30	24	11	12	16	10	29
Chisago	10	6	10	3	4	16	18	11	8	23	12	11
Clay	0	6	10	6	5	6	4	4	2	8	4	5
Clearwater	13	6	8	5	12	3	2	3	0	7	3	9
Cook	11	17	28	11	13	11	5	4	3	8	4	8
Crow Wing	42	48	64	55	51	34	31	13	17	17	19	39
Douglas	2	6	15	24	8	20	12	6	2	8	9	14
Grant	0	1	0	0	0	0	0	0	0	0	0	0
Hubbard	18	13	10	11	10	8	6	5	6	8	4	10
Isanti	9	1	4	6	11	11	12	3	13	6	1	8
Itasca	166	88	142	105	116	78	47	13	34	30	31	44
Kanabec	20	13	21	27	30	9	10	6	2	6	7	11
Kittson	5	7	5	9	11	2	3	5	7	6	8	4
Koochiching	96	51	116	80	51	67	45	23	40	31	42	40
Lake	49	45	56	53	35	28	14	14	12	16	10	15
Lake of the Woods	21	9	33	21	13	12	15	6	9	3	3	1
Mahnomen	3	0	3	0	4	2	0	0	0	0	0	4
Marshall	6	7	13	14	17	22	22	6	5	12	7	12
Mille Lacs	18	18	17	20	17	12	6	13	7	8	3	13
Morrison	10	8	10	24	25	23	15	16	11	25	15	41
Norman	7	4	10	19	21	12	5	9	3	6	8	14
Otter Tail	67	100	138	121	117	102	77	41	53	59	43	105
Pennington	2	4	8	8	11	19	11	4	9	10	7	6
Pine	30	26	22	42	46	44	35	18	17	7	10	27
Polk	31	25	54	58	45	32	22	11	9	11	3	12
Red Lake	23	10	17	16	24	18	6	8	18	14	5	6
Roseau	58	20	79	61	42	32	26	15	24	18	29	23
Sherburne	3	1	6	2	2	2	2	0	0	6	0	5
St. Louis	296	186	350	233	220	171	125	61	72	66	73	58
Stearns	1	0	4	1	4	2	3	3	5	2	2	8
Todd	22	18	15	29	22	15	19	12	20	7	12	15
Wadena	23	23	31	25	23	21	26	9	17	11	16	25
Washington	0	0	1	1	0	2	2	1	1	4	1	0
Wilkin	0	0	1	0	0	0	0	0	0	0	0	0
Unknown	7	6	1	27	0	8	14	0	0	0	0	0
Total	1,259	903	1,473	1,293	1,146	943	756	399	477	510	463	712

Table 9. Fisher harvest by date and sex, 2020 season.

	Sex				% of Known	Cumulative
Date	Female	Male	Unknown	Total	Total	%
Dec. 19	1	4	1	6	0.84	0.84
Dec. 20	40	70		110	15.45	16.29
Dec. 21	57	67	1	125	17.56	33.85
Dec. 22	40	68		108	15.17	49.02
Dec. 23	38	46		84	11.80	60.81
Dec. 24	17	38		55	7.72	68.54
Dec. 25	18	27		45	6.32	74.86
Dec. 26	36	58		94	13.20	88.06
Dec. 27	25	49		74	10.39	98.46
Unknown	2	8	1	11	1.54	100%
Total	274	435	3	712	100%	

Table 10. Distribution of fisher harvest* among trappers, 1994-2020.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
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
2015	346 (63)	203 (37)	----	----	----	549	1.4
2016	177 (61)	111 (39)	----	----	----	288	1.4
2017	246 (68)	114 (32)	----	----	----	360	1.3
2018	253 (66)	128 (34)	----	----	----	381	1.3
2019	259 (72)	101 (28)	----	----	----	360	1.3
2020	337 (65)	185 (35)	----	----	----	522	1.4

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

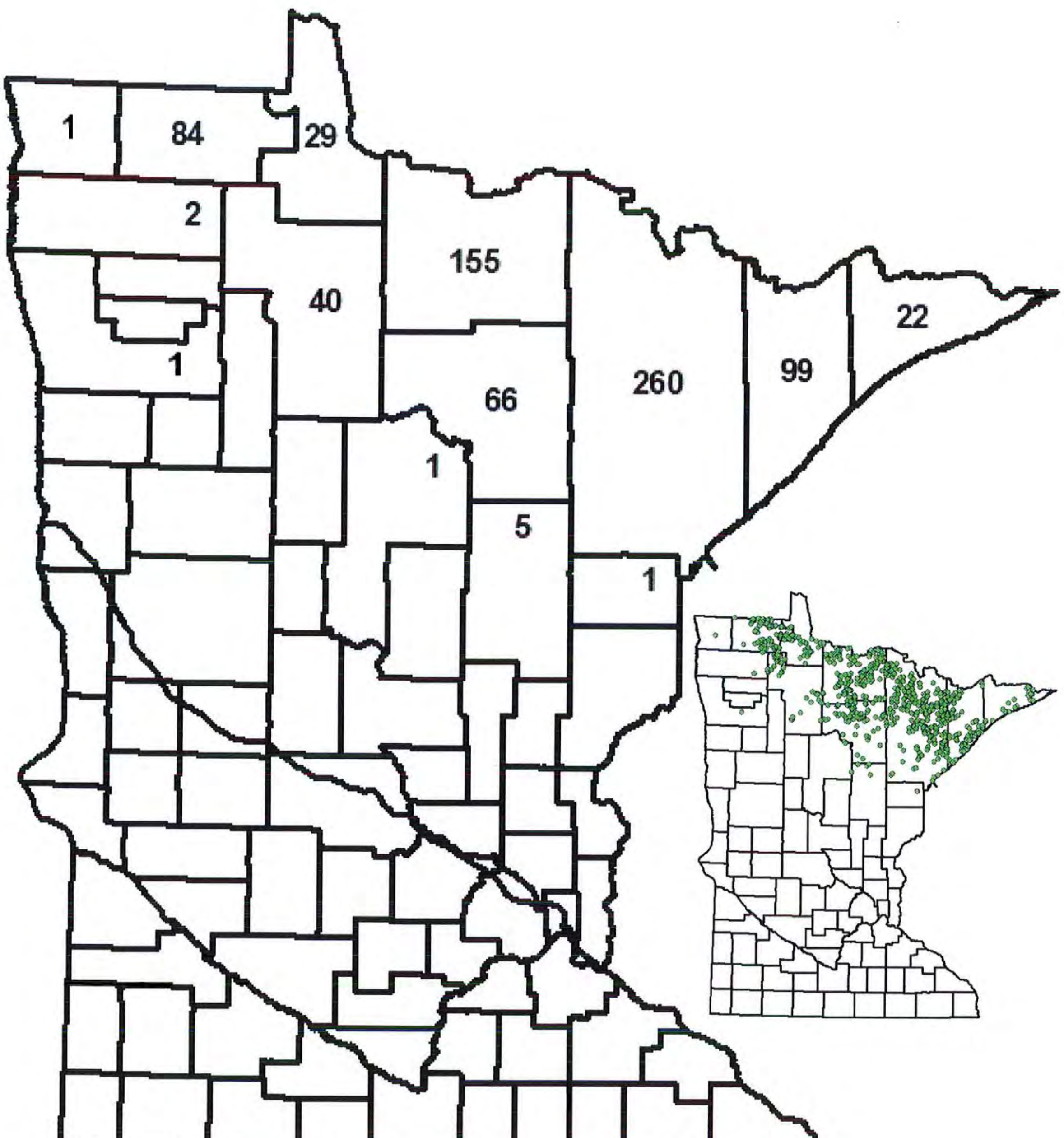

Figure 5. Marten harvest by county, 2020. Inset shows spatial distribution of harvest locations.

Table 11. Marten harvest by county and sex, 2020 season.

County	Sex			Total	Harvest/
	Female	Male	Unknown		100 Mile^2
Aitkin	2	3		5	0.25
Becker	0	0		0	0.00
Beltrami	11	29		40	1.31
Carlton	1	0		1	0.11
Cass	1	0		1	0.04
Clearwater	0	0		0	0.00
Cook	2	20		22	1.37
Crow Wing	0	0		0	0.00
Hubbard	0	0		0	0.00
Itasca	26	40		66	2.26
Kanabec	0	0		0	0.00
Kittson	0	1		1	0.09
Koochiching	59	96		155	4.92
Lake	28	71		99	4.33
Lake of the Woods	10	16	2	28	1.57
Mahnomen	0	0		0	0.00
Marshall	0	2		2	0.11
Otter Tail	0	0		0	0.00
Pennington	0	0		0	0.00
Pine	0	0		0	0.00
Polk	1	0		1	0.05
Red Lake	0	0		0	0.00
Roseau	32	53		85	5.06
St. Louis	93	167		260	3.86
Unknown	0	0		0	
Total	266	498	2	766	

Table 12. Comparison of marten harvest by county in Minnesota, 2009-2020.

County	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Aitkin	5	4	13	10	8	12	4	1	7	2	0	5
Becker	0	0	0	0	0	0	1	0	0	0	0	0
Beltrami	10	2	11	20	15	7	15	7	16	2	9	40
Carlton	8	5	6	3	1	1	0	0	7	7	1	1
Cass	2	1	2	0	0	3	2	2	2	2	2	1
Clearwater	0	0	0	0	0	0	0	0	0	0	0	0
Cook	244	191	205	148	78	43	39	23	40	44	15	22
Crow Wing	1	0	1	0	0	1	0	2	0	0	0	0
Hubbard	0	0	0	0	0	0	1	0	0	0	1	0
Itasca	91	73	118	46	62	79	64	28	52	35	35	66
Kanabec	0	0	0	0	0	0	0	0	0	0	0	0
Kittson	0	1	0	4	0	1	0	0	3	1	0	1
Koochiching	354	336	516	276	218	265	169	107	176	117	146	155
Lake	496	491	577	290	185	149	138	109	172	131	78	99
Lake of the Woods	17	13	49	32	18	23	25	21	32	16	45	28
Mahnomen	0	0	0	0	0	0	0	0	0	0	0	0
Marshall	4	0	3	3	5	5	3	1	1	1	3	2
Otter Tail	0	0	0	0	0	1	0	0	0	0	0	0
Pennington	0	0	0	0	0	0	1	0	0	0	0	0
Pine	0	1	0	0	0	1	0	0	0	0	0	0
Polk	0	0	0	0	0	0	0	0	0	0	0	1
Red Lake	0	0	0	1	1	0	0	0	0	0	0	0
Roseau	32	13	98	77	37	40	33	31	74	41	79	85
St. Louis	803	709	926	562	386	421	377	219	397	266	171	260
Unknown	6	2	0	0	0	7	5	0	0	0	0	0
Total	2,073	1,842	2,525	1,472	1,014	1,059	877	551	979	665	585	766

Table 13. Marten harvest by date and sex, 2020 season.

Date	Sex: Female	Sex: Male	Sex: Unknown	Total	% of Known Total	Cumulative %
Dec. 19	0	0		0	0.00	0.00
Dec. 20	49	118	1	168	21.93	21.93
Dec. 21	49	87	1	137	17.89	39.82
Dec. 22	39	93		132	17.23	57.05
Dec. 23	34	60		94	12.27	69.32
Dec. 24	19	24		43	5.61	74.93
Dec. 25	8	27		35	4.57	79.50
Dec. 26	27	52		79	10.31	89.82
Dec. 27	39	33		72	9.40	99.22
Unknown	2	4		6	0.78	100%
Total	266	498	2	766	100%	

Table 14. Distribution of marten harvest* among trappers, 1994-2020.

Number (%) of Takers	Number Taken						
	1	2	3	4	5	Total Takers	Ave. Take
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
2015	247 (44)	309 (56)	----	----	----	556	1.6
2016	142 (41)	202 (59)	----	----	----	344	1.6
2017	233 (39)	365 (61)	----	----	----	598	1.6
2018	200 (46)	231 (54)	----	----	----	431	1.5
2019	200 (51)	191 (49)	----	----	----	391	1.5
2020	221 (45)	268 (55)	----	----	----	489	1.5

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

Table 15. Number of trappers with different fisher/marten combinations, 2020.
(Combined limit = 2)

Number of Takers		Number of Marten					
		0	1	2	3	4	5
Number of Fisher	0		120	268			
	1	237	101				
	2	185					
	3						
	4						
	5				Total takers of at least 1 fisher or marten		911

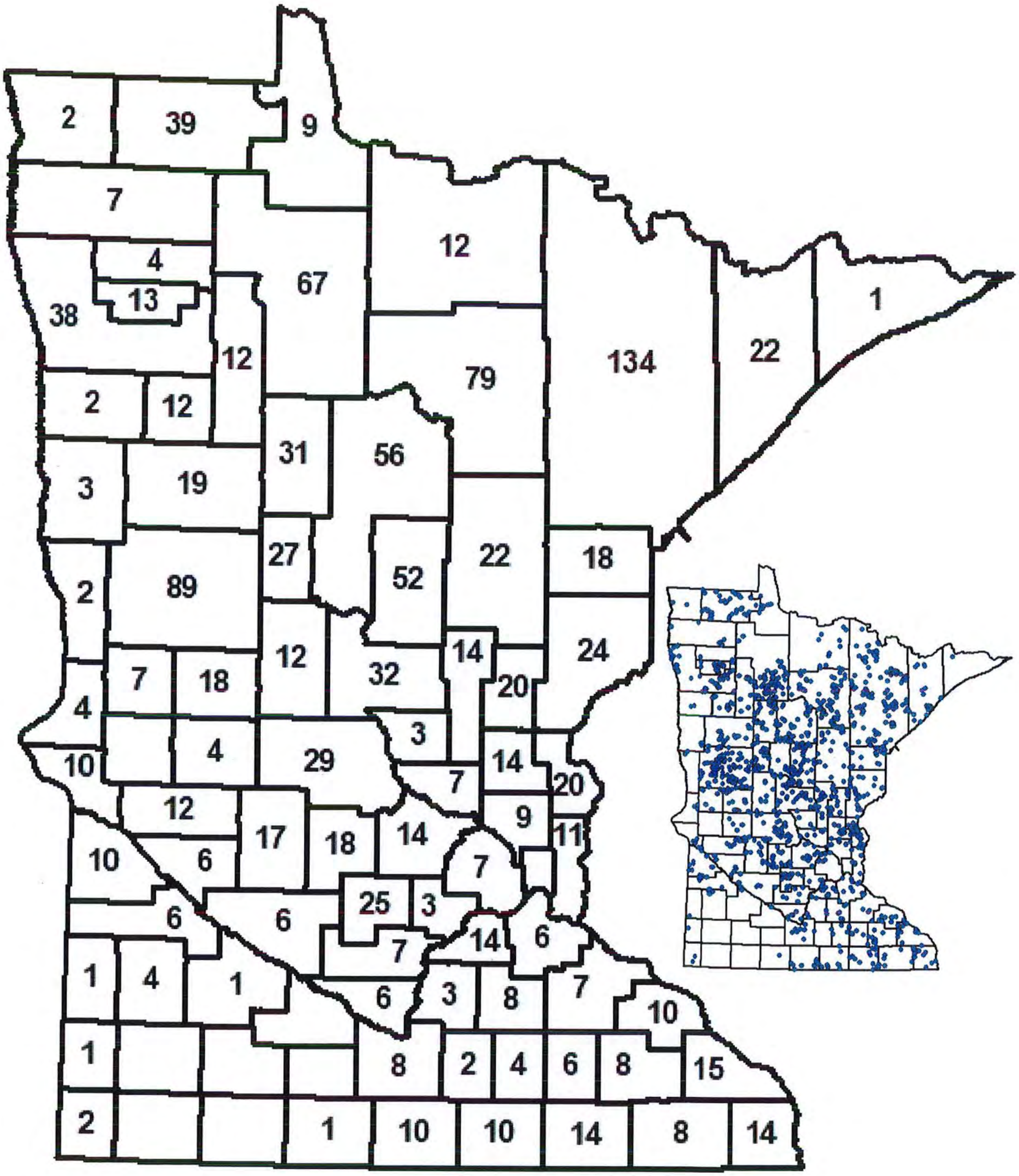

Figure 6. Otter harvest by county, 2020-21. Inset shows spatial distribution of harvest locations.

Table 16. Otter harvest by county and sex, 2020-21 season.

	Sex				Harvest/
County	Female	Male	Unknown	Total	100 Mile^2
Aitkin	14	8		22	1.10
Anoka	6	3		9	2.02
Becker	6	13		19	1.31
Beltrami	28	39		67	2.19
Benton	2	1		3	0.73
Big Stone	3	7		10	1.89
Blue Earth	4	4		8	1.05
Brown	0	0		0	0.00
Carlton	8	10		18	2.06
Carver	2	1		3	0.80
Cass	23	33		56	2.32
Chippewa	4	2		6	1.02
Chisago	13	7		20	4.52
Clay	1	2		3	0.28
Clearwater	5	7		12	1.17
Cook	1	0		1	0.06
Cottonwood	0	0		0	0.00
Crow Wing	24	28		52	4.50
Dakota	2	4		6	1.02
Dodge	5	1		6	1.37
Douglas	6	11	1	18	2.50
Faribault	5	5		10	1.39
Fillmore	2	6		8	0.93
Freeborn	4	5	1	10	1.39
Goodhue	3	4		7	0.90
Grant	2	1	4	7	1.22
Hennepin	1	6		7	1.15
Houston	3	11		14	2.46
Hubbard	14	17		31	3.10
Isanti	6	8		14	3.10
Itasca	33	46		79	2.70
Jackson	0	0		0	0.00
Kanabec	5	15		20	3.75
Kandiyohi	8	9		17	1.97
Kittson	1	1		2	0.18
Koochiching	7	5		12	0.38
Lac Qui Parle	5	5		10	1.28
Lake	10	12		22	0.96
Lake of the Woods	5	4		9	0.51
Le Sueur	2	1		3	0.63
Lincoln	1	0		1	0.18
Lyon	3	1		4	0.55
Mahnomen	4	8		12	2.06
Marshall	2	5		7	0.39
Martin	0	1		1	0.14
McLeod	13	12		25	4.95
Meeker	11	7		18	2.79
Mille Lacs	6	8		14	2.06
Morrison	17	15		32	2.78
Mower	8	6		14	1.97
Murray	0	0		0	0.00
Nicollet	5	1		6	1.29
Nobles	0	0		0	0.00

Table 16 (continued). Otter harvest by county and sex, 2020-21 season.

County	Sex: Female	Male	Unknown	Total	Harvest/ 100 Mile^2
Norman	1	1		2	0.23
Olmsted	5	3		8	1.22
Otter Tail	30	59		89	4.00
Pennington	0	4		4	0.65
Pine	11	13		24	1.67
Pipestone	1	0		1	0.21
Polk	16	22		38	1.90
Pope	2	2		4	0.56
Ramsey	0	0		0	0.00
Red Lake	5	8		13	3.00
Redwood	1	0		1	0.11
Renville	2	4		6	0.61
Rice	4	4		8	1.55
Rock	1	1		2	0.41
Roseau	13	26		39	2.32
Scott	5	9		14	3.80
Sherburne	4	3		7	1.55
Sibley	4	3		7	1.17
St. Louis	60	74		135	2.00
Stearns	14	15		29	2.09
Steele	1	3		4	0.93
Stevens	0	0		0	0.00
Swift	9	3		12	1.60
Todd	5	7		12	1.23
Traverse	1	3		4	0.68
Wabasha	3	7		10	1.82
Wadena	15	12		27	4.97
Waseca	1	1		2	0.46
Washington	8	3		11	2.60
Watonwan	0	0		0	0.00
Wilkin	2	0		2	0.27
Winona	6	9		15	2.34
Wright	4	10		14	1.96
Yellow Medicine	1	5		6	0.79
Unknown	0	0		0	
Total	578	720	6	1,304	

Table 17. Comparison of otter harvest by county, 2009-2020.

County	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Aitkin	54	59	107	111	90	67	74	61	33	34	25	22
Anoka	26	8	13	31	25	23	20	12	18	15	13	9
Becker	39	53	95	127	87	77	83	21	27	42	24	19
Beltrami	74	77	112	120	98	74	76	43	40	51	34	67
Benton	3	13	13	21	17	8	1	3	3	6	8	3
Big Stone	1	0	3	3	9	8	3	1	6	3	0	10
Blue Earth	0	0	2	3	1	2	1	3	3	2	4	8
Brown	0	0	0	0	0	0	2	2	0	0	1	0
Carlton	30	35	29	38	37	26	42	32	9	12	9	18
Carver	6	5	15	8	9	17	11	8	8	12	8	3
Cass	90	135	140	183	161	193	172	74	92	98	63	56
Chippewa	0	5	7	8	12	6	4	3	8	8	7	6
Chisago	18	23	19	24	32	26	20	12	18	12	10	20
Clay	7	23	42	23	16	14	18	10	10	11	1	3
Clearwater	19	38	41	46	47	23	38	21	33	21	11	12
Cook	16	19	36	55	57	28	9	4	0	4	1	1
Cottonwood	0	0	0	0	0	0	0	0	0	1	0	0
Crow Wing	76	66	107	117	96	83	59	35	41	55	36	52
Dakota	7	1	0	11	10	6	13	3	8	10	4	6
Dodge	0	3	1	1	3	4	2	0	3	2	3	6
Douglas	11	14	34	37	23	33	22	21	15	15	13	18
Faribault	0	0	1	12	3	1	3	5	9	3	11	10
Fillmore	1	5	5	10	6	13	3	3	4	1	4	8
Freeborn	0	5	10	10	1	7	6	2	11	7	20	10
Goodhue	7	11	7	18	2	2	11	4	9	0	2	7
Grant	6	1	8	12	6	13	4	3	5	2	2	7
Hennepin	6	2	3	4	5	6	3	2	2	9	4	7
Houston	11	11	10	26	22	14	9	2	8	10	6	14
Hubbard	41	52	42	67	61	36	32	26	39	30	23	31
Isanti	18	14	9	18	28	23	13	17	13	10	9	14
Itasca	191	247	281	346	345	184	159	67	84	123	76	79
Jackson	0	0	0	0	0	0	1	0	0	1	0	0
Kanabec	23	17	22	52	45	34	26	20	29	7	8	20
Kandiyohi	6	8	8	10	20	20	23	17	18	19	23	17
Kittson	3	8	2	9	7	4	0	8	8	5	5	2
Koochiching	61	81	62	127	115	55	68	19	16	13	20	12
Lac Qui Parle	0	2	6	15	6	1	7	0	8	0	2	10
Lake	45	28	36	66	67	45	26	23	12	13	11	22
Lake of the Woods	8	15	27	27	27	31	31	8	16	20	11	9

Table 17 (continued). Comparison of otter harvest by county, 2009-2020.

County	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Le Sueur	0	3	0	9	5	2	2	4	3	4	6	3
Lincoln	0	0	0	4	0	0	0	0	2	0	0	1
Lyon	0	0	0	0	0	0	0	0	1	0	0	4
Mahnomen	7	9	20	15	25	7	6	3	9	16	9	12
Marshall	0	13	13	15	15	4	9	12	15	10	5	7
Martin	0	0	0	1	0	0	1	1	1	1	1	1
McLeod	8	12	18	19	22	18	16	14	16	26	16	25
Meeker	16	12	28	19	32	35	23	11	26	29	32	18
Mille Lacs	28	19	15	30	39	28	16	13	26	14	12	14
Morrison	31	29	29	52	52	50	31	22	24	35	33	32
Mower	0	8	20	14	9	8	2	13	7	11	13	14
Murray	0	0	0	0	0	0	1	0	0	0	0	0
Nicollet	0	2	1	5	7	1	0	0	4	3	0	6
Nobles	0	0	0	0	0	4	0	0	0	0	0	0
Norman	11	12	21	45	27	19	13	9	8	5	2	2
Olmsted	3	2	3	0	7	7	5	3	5	4	8	8
Otter Tail	32	65	109	173	154	97	87	92	100	82	71	89
Pennington	1	4	2	12	5	8	8	11	2	7	2	4
Pine	37	38	44	66	98	59	86	48	20	36	35	24
Pipestone	0	0	0	0	0	0	0	1	1	0	0	1
Polk	19	36	49	83	71	47	37	20	12	14	12	38
Pope	12	11	20	22	14	19	8	19	8	14	19	4
Ramsey	0	0	0	3	1	1	1	0	0	0	0	0
Red Lake	20	22	19	26	11	10	14	13	1	3	3	13
Redwood	0	0	2	4	6	8	3	0	2	4	3	1
Renville	0	0	1	6	0	3	1	1	6	1	1	6
Rice	0	1	9	4	8	1	2	6	3	8	4	8
Rock	0	0	0	2	0	0	0	2	0	2	0	2
Roseau	23	32	33	64	48	44	23	24	22	20	20	39
Scott	1	4	2	4	3	2	4	5	4	7	8	14
Sherburne	17	7	19	12	9	10	10	11	8	9	3	7
Sibley	0	6	6	6	3	2	3	2	2	5	10	7
St. Louis	233	253	239	363	293	258	260	109	146	127	105	134
Stearns	24	13	41	53	53	41	50	45	28	34	22	29
Steele	0	1	0	3	1	0	1	3	3	4	6	4
Stevens	1	6	1	3	12	4	2	1	1	3	2	0
Swift	5	2	11	10	10	9	3	7	7	13	4	12
Todd	32	41	63	55	55	19	28	22	24	18	14	12
Traverse	2	0	1	4	1	0	3	7	4	11	3	4

Table 17 (continued). Comparison of otter harvest by county, 2009-2020.

County	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Wabasha	18	7	8	20	21	19	9	11	11	17	9	10
Wadena	15	16	20	43	30	30	19	5	8	8	11	27
Waseca	0	0	0	0	0	2	2	0	0	1	1	2
Washington	11	16	18	12	24	27	9	12	20	13	5	11
Watonwan	0	0	0	0	1	0	0	0	0	1	0	0
Wilkin	0	0	0	3	2	0	3	1	2	2	4	2
Winona	13	15	20	21	17	5	17	6	13	7	16	15
Wright	8	11	17	23	26	21	21	11	22	33	7	14
Yellow Medicine	0	0	0	7	9	0	3	0	2	2	1	6
Unknown	12	2	17	40	2	18	18	0	0	0	0	0
Totals	1,544	1,814	2,294	3,171	2,824	2,154	1,955	1,195	1,295	1,351	1,050	1,304

Table 18. Otter harvest by sex and week, 2020-21 season.

Date	Sex			Total	% of	Cumulative
	Female	Male	Unknown	Harvest	Total	%
Oct.24 - Oct.30	37	50		87	6.67	6.67
Oct.31 - Nov.6	92	137	2	231	17.71	24.39
Nov.7 - Nov.13	77	98	2	177	13.57	37.96
Nov.14 - Nov.20	61	55	2	118	9.05	47.01
Nov.21 - Nov.27	56	57		113	8.67	55.67
Nov.28 - Dec.4	59	72		131	10.05	65.72
Dec.5 - Dec.11	40	49		89	6.83	72.55
Dec.12 - Dec.18	43	54		97	7.44	79.98
Dec.19 - Dec.25	36	48		84	6.44	86.43
Dec.26 - Jan.1	31	30		61	4.68	91.10
Jan.2 - Jan.8	13	17		30	2.30	93.40
Jan.9 - Jan.15	14	27		41	3.14	96.55
Jan.16 - Jan.24*	18	26		44	3.37	99.92
Unknown	1	0		1	0.08	100.00
Total	578	720	6	1,304	100%	

* 9-day interval.

Table 19. Distribution of otter harvest* among trappers, 1994-2020.

Number (%) of Takers	Number Taken					
	1	2	3	4	Total Takers	Ave. Take
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
2015-16	337 (39)	183 (21)	142 (16)	203 (23)	865	2.2
2016-17	270 (46)	135 (23)	80 (14)	101 (17)	586	2.0
2017-18	243 (41)	139 (23)	77 (13)	135 (23)	594	2.2
2018-19	276 (44)	134 (21)	78 (12)	142 (23)	630	2.1
2019-20	206 (42)	107 (22)	59 (12)	113 (23)	485	2.2
2020-21	258 (42)	135 (22)	90 (15)	126 (21)	609	2.1

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