FARMLAND WILDLIFE POPULATIONS

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2008 MINNESOTA AUGUST ROADSIDE SURVEY

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ABSTRACT

This report is a summary of the 2008 Minnesota August roadside survey. Population indices for ring-necked pheasants and mourning doves in 2008 declined from last year. Gray partridge, cottontail rabbit, and white-tailed jackrabbit indices were similar to 2007, whereas white-tailed deer indices increased significantly. The winter of 2007-08 was moderate to mild throughout much of Minnesota's agricultural zone, but spring weather was cool and wet. Overwinter survival of farmland wildlife in 2008 was probably above average, but reproductive success of small game was below average in many areas.

The 2008 pheasant index (80.8 birds/100 mi) declined 24% from 2007, was similar to the 10-year average, but was 22% below the long-term average and 69% below the benchmark years of 1955-64 (soil-bank years with marginal cropland in long-term set-aside, a diversified agricultural landscape, more small grains and tame hay, and less pesticide use). Adult pheasant indices in 2008 were significantly higher than the 10-year average, which reflected high overwinter survival associated with moderate winter weather. However, the number of broods observed was 31% below last year and average brood size was below the 10-year and long-term averages, which reflected poor nest success and chick survival. Overall, the size of the fall population will be close to the 10-year average, but with relatively more adults and fewer juveniles. The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the West Central, South Central, and East Central regions.

The gray partridge index was similar to last year, but 55% below the 10-year mean and 68% below the long-term average. Observed regional changes were not significant, but were based on small samples. The number of adults observed was similar to last year, but the proportion of adults with broods was down 31% from last year and the 10-year average. Average brood size also decreased in 2008. Gray partridge counts were highest in the Southwest region.

The cottontail rabbit index was similar to last year, the 10-year average, and the long-term average. Counts of cottontail rabbits were highest in the East Central and South Central regions. The jackrabbit index also did not change significantly in 2008, but was 56% below the 10-year average, and 92% below the long-term average. The range-wide jackrabbit population peaked in the late 1950's and declined to its lowest level in 1993 (and again this year), from which populations have not recovered. Counts of white-tailed jackrabbits were highest in the Southwest region.

The number of mourning doves observed in 2008 decreased 17% from last year, 14% from the 10-year average, and 25% from the long-term average. In contrast, the white-tailed deer index increased by 43% from last year, with a significant regional increase in the West Central region.

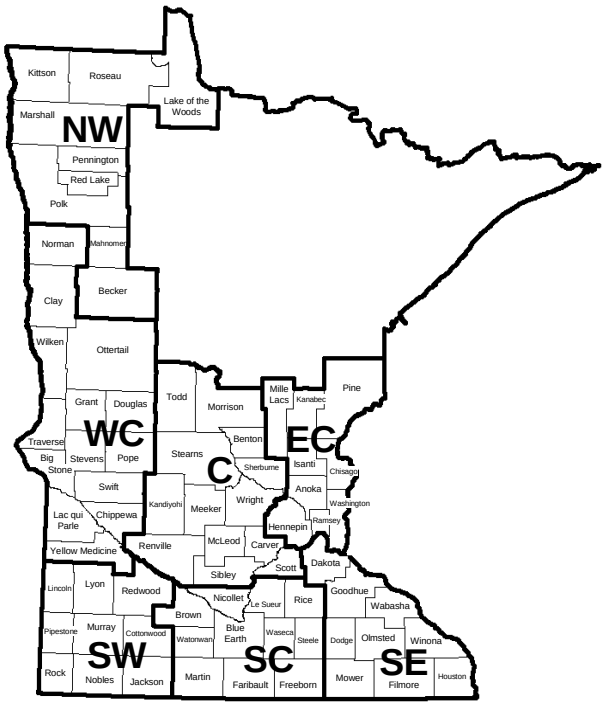

Figure 1. Survey regions for Minnesota's August roadside survey.

INTRODUCTION

This report is a summary of the 2008 Minnesota August roadside survey. The annual survey is conducted during the first 2 weeks in August by Minnesota Department of Natural Resource (MNDNR) enforcement and wildlife personnel throughout the farmland region of Minnesota (Figure 1). The August roadside survey consists of 171 25-mile routes (1-4 routes/county); 152 routes are located in the ring-necked pheasant range.

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

ACKNOWLEDGMENTS

We thank all cooperators for their efforts in completing routes in 2008; without their help the survey would not be possible. Janelle Grochowski and Tonya Klinkner provided assistance with data entry. John Giudice reviewed an early draft of this report. Tabor Hoek of the Minnesota Board of Water & Soil Resources (BWSR) provided enrollment data on cropland-retirement programs in Minnesota.

WEATHER SUMMARY

The severity of the winter of 2007-08, which is determined primarily by duration of snow cover, was moderate to mild throughout most of the farmland region in Minnesota (the seventh consecutive mild winter). Although much of the farmland zone was snow covered throughout December, an early January thaw opened croplands and gave food-stressed birds a reprieve (MCWG, http://climate.umn.edu/doc/snowmap.htm). However, the northern and southeastern pheasant range retained snow cover through at least mid-March. Regional temperatures averaged 3.0ºF below the long-term average for each month, December - March (range +1ºF to -8ºF), making the 2007-08 winter season the coldest since the winter of 2000-01 (Minnesota Climatology Working Group [MCWG], http://climate.umn.edu/cawap/monsum/monsum.asp). Below normal temperatures continued in all farmland regions from April - June. April was wetter than average and produced 4 major snow events. Furthermore, the first half of June (peak of hatch for most game birds) was plagued with frequent and heavy rains throughout the farmland zone. Thus, conditions for over-winter survival of farmland wildlife should have been above average throughout most of the pheasant range except possibly the northern and southeastern regions, but reproductive conditions were below average until after the normal peak of hatch.

HABITAT CONDITIONS

Conservation Reserve Program (CRP) enrollment in Minnesota's pheasant range declined by nearly 38,000 acres from 2007, reversing a trend of gradually increasing habitat abundance. However, gains in Wetlands Reserve Program (WRP) enrollment and acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) in the pheasant range offset CRP losses, yielding a net loss of about 25,000 acres of protected habitat. Over 1 million acres of habitat are currently enrolled in farm programs (e.g., CRP, Conservation Reserve Enhancement Program, Reinvest In Minnesota, WRP), and another 671,000 acres of habitat are protected as WMAs and WPAs. Within the pheasant range, protected grasslands account for about 6.2% of the landscape (range: 2.9-10.5%; Table 1).

Farm programs make up the largest portion of protected grasslands in the state. Although the expiration of a large proportion of existing CRP contracts is still a major concern for future wildlife populations, re-enrollment and extension opportunities delayed the loss of many CRP contracts that were scheduled to expire during 2007-2010. Also, interest is high in Minnesota's new CRP SAFE practice, with offers or enrollments for nearly half of the acres available in the first 3 months of the program.

However, the future of farmland retirement programs remains under threat due to continued high commodity prices and competing economic opportunities (e.g., ethanol production).

The MNDNR continues to expand the habitat base through accelerated WMA acquisition with nearly 8,000 acres of new WMAs in the pheasant range in the last year. In addition the Working Lands Initiative will attempt to protect and expand large wetland-grassland complexes in 12 counties in western Minnesota.

SURVEY CONDITIONS

Cooperators completed all of the 171 routes in 2008. Weather conditions during the survey ranged from excellent (calm, heavy dew, clear sky) to medium (light dew and overcast skies). Medium-to-heavy dew conditions were present at the start of 98% of the survey routes, which was greater than for 2007 (89%) and the 8-year average (91%). Clear skies (<30% cloud cover) were present at the start of 86% of routes, with wind speeds <4 mph recorded for 88% of routes. The survey period was extended to July 30th - August 19th to allow all routes to be completed.

RING-NECKED PHEASANT

The average number of pheasants observed (80.8/100 mi) decreased 24% from 2007. The pheasant index was similar to the 10-year average (Table 2; Figure 2A) but was 22% below the long-term average (95% CI: -33 to -9%; Table 2), and 69% below the benchmark years of 1955-64. Total pheasants observed per 100 miles ranged from 16.6 in the Southeast to 158.5 in the Southwest (Table 3, Figure 5). Declines from last year were significant only for the South Central region (Table 3).

The range-wide hen index (hens/100 mi) was similar to last year, 24% (95% CI: 4 to 44%) above the 10-year average (Table 2), and varied from 1.7 hens/100 miles in the Southeast to 29.4 hens/100 miles in the Southwest. The cock index was up from 2007 by 26% (95% CI: 8 to 43%), and 76% (95% CI: 54 to 99%) above the 10-year average (Table 2). The 2008 hen:cock ratio was only 1.2, which was below the 10-year average (1.5) and the lowest value since 2001. A low sex ratio may reflect a delayed nesting effort (i.e., more hens than average may have been on nests or with young broods during the 2008 surveys).

The number of pheasant broods observed (12.0/100 mi) declined 31% from last year, and was similar to the 10-year and long-term averages (Table 2). The brood index remains far below the benchmark years of 1955-64 (34.7 broods/100 mi). Regional brood indices ranged from 2.7 broods/100 miles in the Southeast to 25.8 broods/100 miles in the Southwest. Average brood size in 2008 (4.5 ± 0.1 [SE] chicks/brood) was similar to last year (4.6 ± 0.1 [SE] chicks/brood), but below the 10-year mean (4.9 chicks/brood) and the long-term average (5.6 chicks/brood; Table 2). The median hatch date for pheasants was June 12 (n = 453), 1 day later than last year and 4 days later than the 10-year average (Table 2). The distribution of estimated hatch dates for observed broods was unimodal and approximately normally distributed, which suggests that many early nesting attempts were successful (vs. wide-spread nest failure, which often leads to an extensive renesting effort and a wide or bimodal peak in hatch dates). However, successful late-season nests will likely be underrepresented in roadside data. Median age of broods observed was 8 weeks (range: 1-16 weeks).

Although a mild winter throughout most of the pheasant range resulted in high hen counts, cool and wet spring weather reduced nest success and brood survival. Thus, a decrease in the range-wide pheasant index was not surprising, although the true population decrease may not be as great as indicated by the survey in areas where late reproductive effort was successful. Overall, the size of the fall population will be close to the 10-year average, but with relatively more adults and fewer juveniles. The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the West Central, South Central, and East Central regions.

GRAY PARTRIDGE

Rangewide, the gray partridge index (4.8 partridge/100 miles) was similar to last year but 55% below the 10-year average and 68% below the long-term average (Table 2, Figure 2B). Within regions,

the partridge index ranged from 0.0/100 miles in the East Central region to 15.8/100 miles in the Southwest (Table 3, Figure 6). There were no significant regional changes from last year (Table 3).

The number of adults observed per 100 miles was similar to last year, but 47% below the 10-year mean and 64% below the long-term average (Table 2). The proportion of adult partridge observed with broods (23%) was 31% below 2007, 31% below the 10-year average, and 30% below the long-term average (Table 2). Average brood size in 2008 (9.3 chicks/brood) was smaller than in 2007 (9.9 chicks/brood), but larger than the 10-year average (7.8 chicks/brood) and the long-term average (8.9 chicks/brood). Total broods observed per 100 miles were 47% below 2007, 65% below the 10-year average, and 72% below the long-term average (Table 2). The median hatch date was June 25 (n = 15), which was 5 days later than in 2007 and the 10-year average.

Conversion of diversified agricultural practices to more intense land-use with fewer haylands, pastures, small grain fields, and hedgerows have reduced the amount of suitable habitat for the gray partridge in Minnesota. Gray partridge in their native range (southeastern Europe and northern Asia) are associated with arid climates and only produce well in the Midwest during dry or drought years. Consequently, gray partridge are more strongly affected by weather conditions during nesting and brood rearing than are pheasants. The Southwest and Southeast regions offer the best opportunity for harvesting gray partridge in 2008.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (6.3 rabbits/100 mi) was similar to last year, the 10-year average, and the long-term average (Table 2, Figure 3A). There continues to be high variability in counts and percent change by region (Table 3). The cottontail rabbit index ranged from 0.4 rabbits/100 miles in the Northwest to 13.1 rabbits/100 miles in the East Central region (Table 3, Figure 7). The best opportunities for harvesting cottontail rabbits are in the East Central and South Central regions.

The index of white-tailed jackrabbits did not change significantly from 2007, but was 56% (95% CI: -95 to-17%) below the 10-year average and 92% (95% CI: -106 to -77%) below the long-term average (Table 2, Figure 3B). The range-wide jackrabbit population peaked in the late 1950's and declined to its lowest level (0.2 rabbits/100 mi) in 1993, and again this year (Figure 3B). The long-term decline in jackrabbits probably reflects the loss of their preferred habitats (i.e., pasture, hayfields, and small grains). The greatest potential for white-tailed jackrabbit hunting is likely in the Southwest region (Table 3, Figure 8). However, indices of relative abundance and annual percent change should be interpreted cautiously because estimates are based on low numbers of sightings.

WHITE-TAILED DEER

The index for white-tailed deer (13.9/100 mi) increased by 43% (95% CI: 10 to 75%) from last year, was similar to the 10-year average, and increased 57% (95% CI: 28 to 86%) from the long-term average (Table 2, Figure 4A). Among regions, deer indices increased significantly from 2007 only in the West Central region (Table 3).

MOURNING DOVE

The number of mourning doves observed (192.9/100 mi) in 2008 decreased 17% (95% CI: -31 to -2%) from last year, 14% (95% CI: -24 to -4%) from the 10-year average, and 25% (95% CI: -36 to -15%) from the long-term average (Table 2, Figure 4B). The mourning dove index ranged from 85.2 doves/100 miles in the Northwest region to 353.4 doves/100 miles in the Southwest. The number of mourning doves heard along U.S. Fish and Wildlife Service call-count survey (CCS) routes (n = 8) in Minnesota was similar to last year. Trend analyses indicated the number of mourning doves heard along the CCS routes declined 1.2% per year (90% CI: -7.4 to 5.0%) during 1999-2008 and 1.9% per year (90% CI: -3.7 to -0.2%) during 1966-2008 (Dolton et al. 2008). In fall 2004, Minnesota held its first modern dove hunting season.

OTHER SPECIES

Notable incidental sightings: 1 bald eagle (Faribault County), 1 short-eared owl (Marshall County, 2 Coopers hawks (Le Sueur and Washington Counties), 1 American bittern (Marshall County), 112 sandhill cranes (Blue Earth, Chisago, Lake of the Woods, Le Sueur, Marshall, Pennington, Polk, Pope, Roseau, Stearns, and Waseca Counties), 9 great blue herons (Marshall and Watonwan Counties), 22 pied-billed grebes (Watonwan County), 2 prairie chickens (Clay County), 18 ruffed grouse (Chisago and Kittson counties), 14 sharp-tailed grouse (Kanabec, Marshall, Polk, and Roseau Counties), 165 wild turkeys (Blue Earth, Carver, Douglas, Grant, Le Sueur, Lincoln, Marshall, Mille Lacs, Mower, Nicollet, Olmsted, Pennington, Polk, Pope, Renville, Todd, Washington, Wilkin, and Waseca Counties), 3 coyotes (Martin County), and 5 red fox (Mower, Murry, Norman, and Scott Counties).

LITERATURE CITED

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Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within pheasant range, 2008[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi^2
WC[b]	360,542	37,450	17,079	822	19,659	171,925	104,174	711,650	10.5	67.0
SW	121,297	24,549	12,214	579	830	17,127	53,629	230,225	6.1	38.9
C	145,664	14,490	17,028	714	3,212	84,100	45,541	310,750	5.1	32.9
SC	96,440	27,610	11,813	3,730	9,367	8,095	30,438	187,491	4.6	29.7
SE	91,133	2,262	5,554	554	620	18,384	50,469	168,975	4.6	29.2
EC	4,666	0	1,265	0	4	2,504	84,314	92,753	2.9	18.5
Total	819,742	106,360	64,953	6,398	33,692	302,134	368,565	1,701,844	6.2	39.5

[a] Unpublished data, Tabor Hoek, BWSR, 15 August 2008.

[b] Does not include Norman County.

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

[d] MNDNR Wildlife Management Areas (WMA).

Table 2. Rangewide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2008.

Species	Change from 2007[a]					Change from 10-year average[b]				Change from long-term average[c]			
Subgroup	*n*	2007	2008	%	95% CI	*n*	1998-07	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	151	106.2	80.8	-24	±14	149	79.8	3	±13	151	102.8	-22	±13
Cocks	151	10.0	12.5	26	±17		7.2	76	±23		11.5	9	±17
Hens	151	16.2	14.4	-11	±16		11.8	24	±20		14.8	-3	±19
Broods	151	17.5	12.0	-31	±14		12.5	-3	±14		13.4	-11	±16
Chicks per brood	453	4.6	4.5	-2			4.9	-9			5.6	-20	
Broods per 100 hens	453	107.5	83.1	-23			108.2	-23			101.7	-18	
Median hatch date	453	Jun 11	Jun 12				Jun 08						
Gray partridge													
Total partridge	170	8.4	4.8	-43	±48	168	10.7	-55	±29	151	16.4	-68	±19
Adults	170	1.9	1.5	-22	±51		2.9	-47	±28		4.1	-64	±17
Broods	170	0.7	0.4	-47	±42		1.0	-65	±28		1.4	-72	±19
Chicks per brood	15	9.9	9.3	-6			7.8	19			8.9	5	
Broods per 100 adults	15	34.1	23.4	-31			33.9	-31			33.2	-30	
Median hatch date	15	Jun 20	Jun 25				Jun 20						
Eastern cottontail	170	7.1	6.3	-12	±21	168	6.7	-5	±15	151	6.8	5	±16
White-tailed jackrabbit	170	0.3	0.2	-39	±69	168	0.4	-56	±39	151	1.9	-92	±15
White-tailed deer	170	9.8	13.9	43	±32	168	13.4	5	±17	168	8.5	57	±29
Mourning dove	170	231.5	192.9	-17	±15	168	225.1	-14	±10	151	276.5	-25	±11

[a] Includes Northwest region, except for pheasants. Estimates based on routes (*n*) surveyed in both years.

[b] Includes Northwest region, except for pheasants. Estimates based on routes (*n*) surveyed at least 9 of 10 years.

[c] LTA = 1955-2007, except for deer = 1974-2007. Does not include Northwest region (8 counties in Northwest were added to survey in 1982). Estimates for all species except deer based on routes (*n*) surveyed ≥40 years; estimates for deer based on routes surveyed ≥25 years.

Table 3. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2008.

Region / Species	Change from 2007[a]					Change from 10-year average[b]					Change from long-term average[c]				
	n	2007	2008	%	95% CI	*n*	1998-07	%	95% CI		*n*	LTA	%	95% CI	
Northwest[d]															
Gray partridge	19	1.7	1.7	-0.1	±247	19	0.2	788	±1656		19	4.0	-58	±113	
Eastern cottontail		0.4	0.4	0.4	±306		1.1	-61	±114			0.9	-55	±95	
White-tailed jackrabbit		0.0	0.4				0.5	-18	±125			0.7	-41	±93	
White-tailed deer		34.4	45.1	31	±73		41.8	8	±36			27.5	64	±61	
Mourning dove		102.2	85.2	-17	±80		86.1	-1	±41			129.5	-34	±24	
West Central															
Ring-necked pheasant	37	117.8	90.4	-23	±27	36	68.2	36	±25		37	104.1	-13	±20	
Gray partridge		1.5	1.6	7	±64		2.8	-40	±72			10.7	-85	±29	
Eastern cottontail		4.1	3.6	-13	±57		3.4	8	±57			4.2	-15	±43	
White-tailed jackrabbit		0.3	0.1	-67	±135		0.7	-85	±50			2.5	-96	±22	
White-tailed deer		5.1	11.6	128	±80		11.0	7	±35			8.1	43	±49	
Mourning dove		225.9	185.0	-18	±25		287.8	-35	±15			385.4	-52	±11	
Central															
Ring-necked pheasant	30	72.8	61.2	-16	±37	29	65.5	-3	±39		29	76.7	-17	±32	
Gray partridge		3.2	2.3	-29	±173		5.1	-54	±69			10.5	-78	±37	
Eastern cottontail		5.6	6.9	23	±57		6.6	9	±38			6.5	10	±33	
White-tailed jackrabbit		0.1	0.0	-100	±205		0.2	-100	±56			1.4	-100	±22	
White-tailed deer		4.3	6.2	46	±112		6.2	4	±70			3.9	64	±112	
Mourning dove		215.7	159.8	-26	±35		195.8	-17	±20			237.5	-31	±20	
East Central															
Ring-necked pheasant	14	61.7	78.3	27	±50	14	57.0	37	±41		14	87.5	-11	±33	
Gray partridge		0.0	0.0				0.1	-100	±147			0.2	-100	±133	
Eastern cottontail		20.0	13.1	-34	±57		10.7	23	±42			8.6	53	±51	
White-tailed jackrabbit		0.0	0.0				0.0					0.3	-100	±59	
White-tailed deer		10.6	18.0	71	±84		14.2	27	±88			7.4	142	±145	
Mourning dove		143.4	87.1	-39	±47		99.3	-12	±33			128.9	-32	±37	

Table 3. Continued.

Region / Species	Change from 2007					Change from 10-year average				Change from long-term average			
	n	2007	2008	%	95% CI	*n*	1998-07	%	95% CI	*n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	222.5	158.5	-29	±34	19	154.3	3	±31	19	119.2	33	±48
Gray partridge		25.7	15.8	-39	±113		40.7	-61	±50		44.2	-64	±39
Eastern cottontail		5.7	3.8	-34	±44		9.5	-60	±14		8.4	-55	±20
White-tailed jackrabbit		1.3	0.8	-34	±111		0.9	-11	±123		4.1	-80	±35
White-tailed deer		8.8	11.8	33	±53		11.3	4	±39		7.5	58	±65
Mourning dove		353.8	353.4	-0.1	±29		340.1	4	±29		315.4	12	±28
South Central													
Ring-necked pheasant	32	121.4	81.1	-33	±24	32	94.9	-15	±25	32	137.5	-41	±25
Gray partridge		13.5	5.0	-63	±70		19.7	-75	±35		20.1	-75	±32
Eastern cottontail		12.6	10.9	-14	±34		9.4	15	±35		7.7	41	±41
White-tailed jackrabbit		0.3	0.1	-50	±179		0.3	-54	±108		1.9	-93	±24
White-tailed deer		4.9	4.9	0	±74		5.2	-6	±49		3.2	51	±84
Mourning dove		310.5	266.6	-14	±43		254.6	5	±27		256.9	4	±36
Southeast													
Ring-necked pheasant	19	27.4	16.6	-40	±64	19	40.4	-59	±34	20	78.2	-80	±34
Gray partridge		17.5	10.3	-41	±98		7.1	46	±146		14.7	-33	±72
Eastern cottontail		4.8	6.3	30	±75		8.3	-24	±27		7.9	-16	±39
White-tailed jackrabbit		0.2	0.0	-100	±210		0.2	-100	±98		0.7	-100	±42
White-tailed deer		11.6	13.8	20	±59		15.4	-10	±45		9.5	43	±79
Mourning dove		206.3	161.7	-22	±26		218.3	-26	±30		229.2	-31	±26

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

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

[c] LTA = 1955-2007, except for Northwest region (1982-2007) and white-tailed deer (1974-2007). Estimates based on routes (*n*) surveyed ≥40 years (1955-2007), except for Northwest (≥20 years) and white-tailed deer (≥25 years).

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

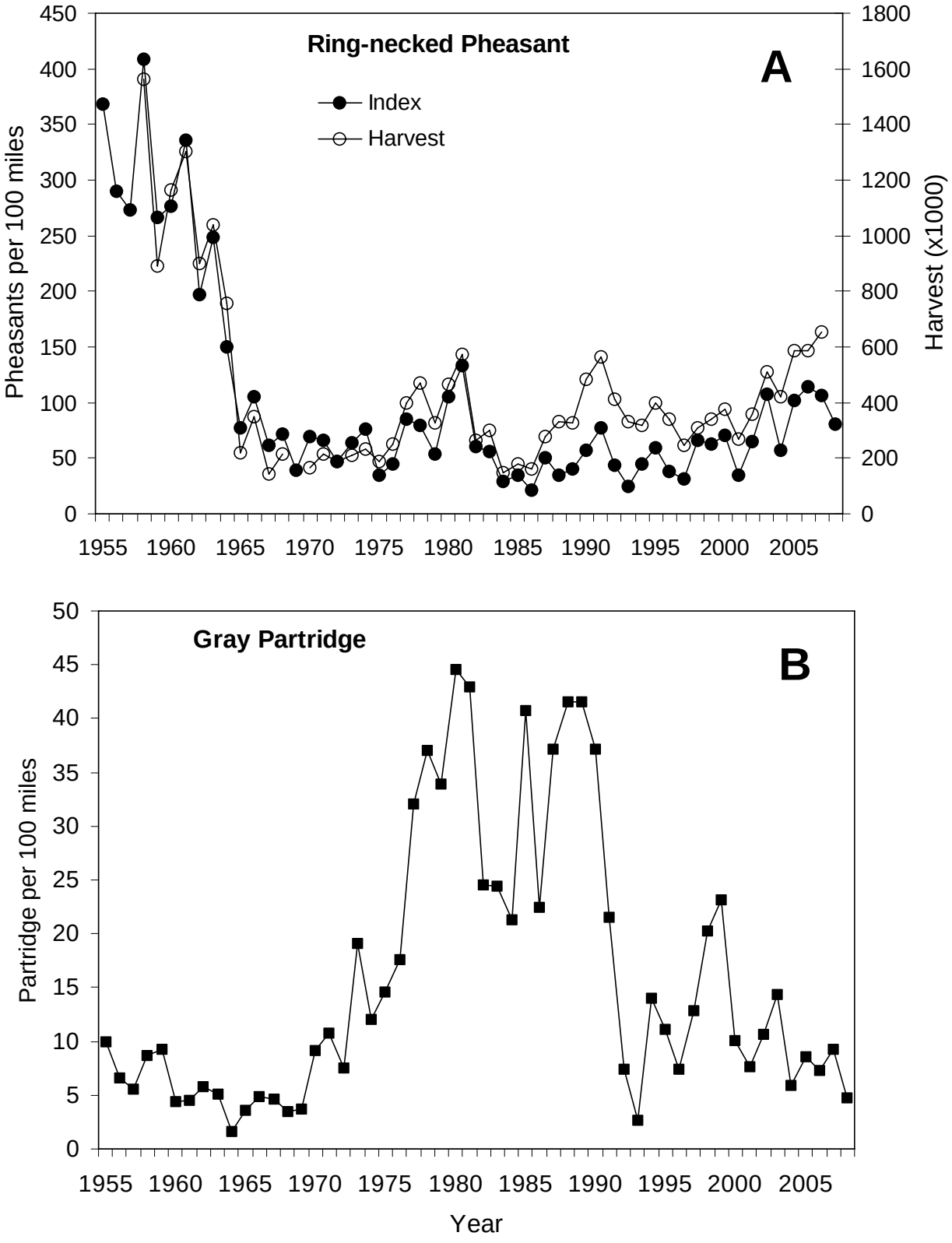


Figure 2. Rangewide index of ring-necked pheasants (A) and gray partridge (B) seen per 100 miles driven. Does not include the Northwest region. Based on all survey routes completed.

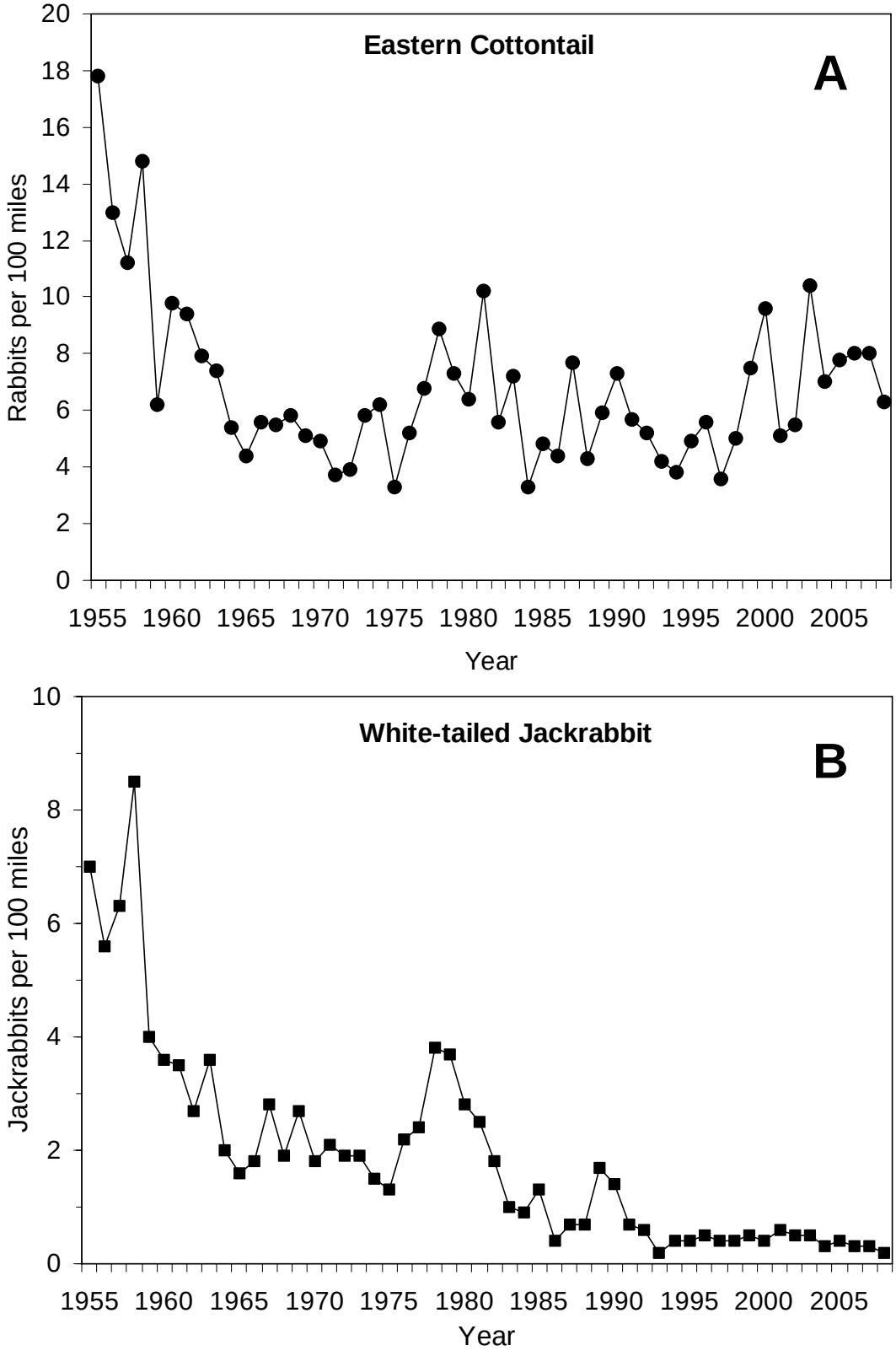


Figure 3. Rangewide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven. Does not include the Northwest region. Based on all survey routes completed.

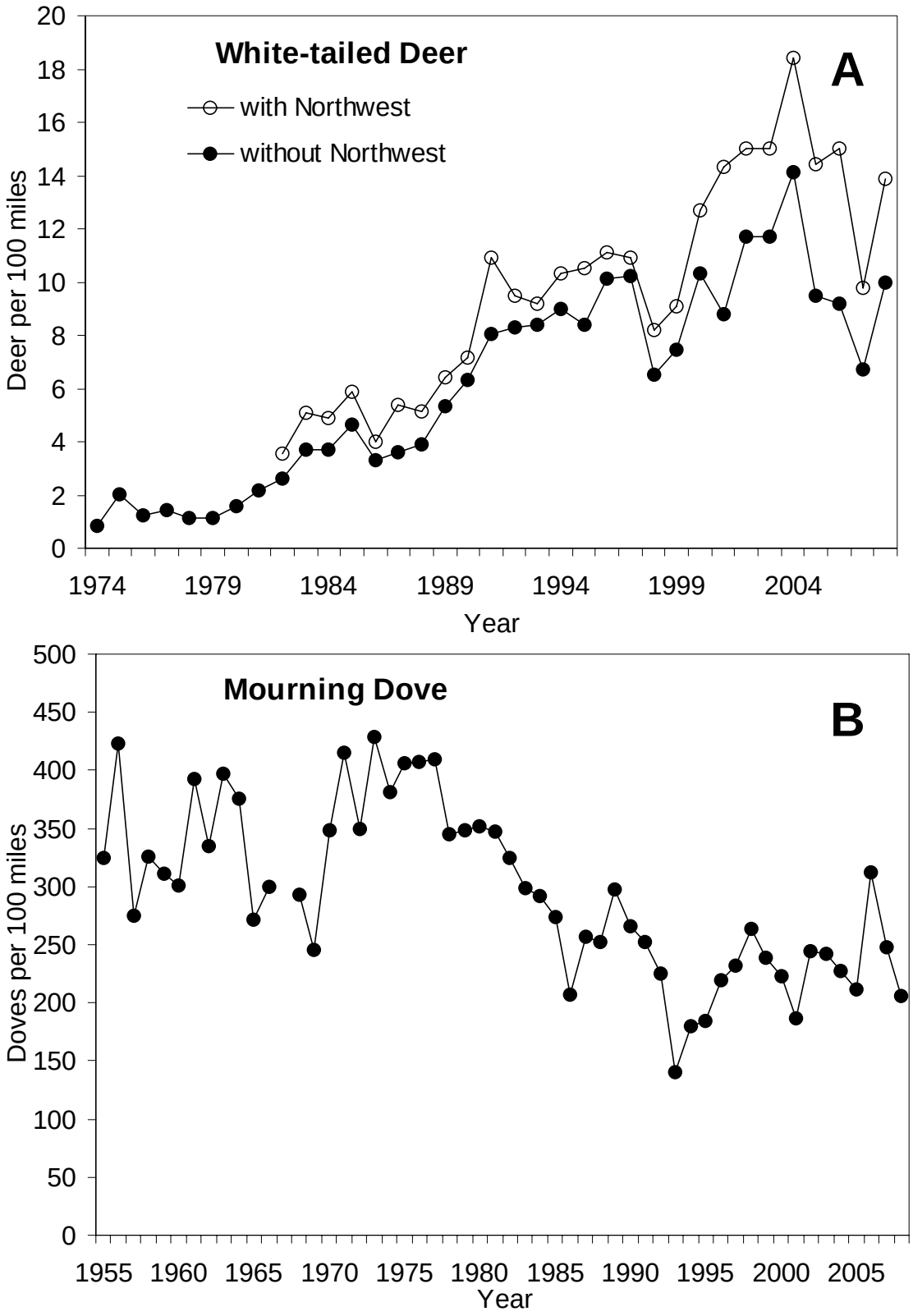
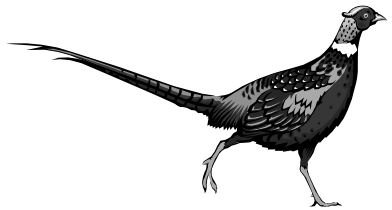


Figure 4. Rangewide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.



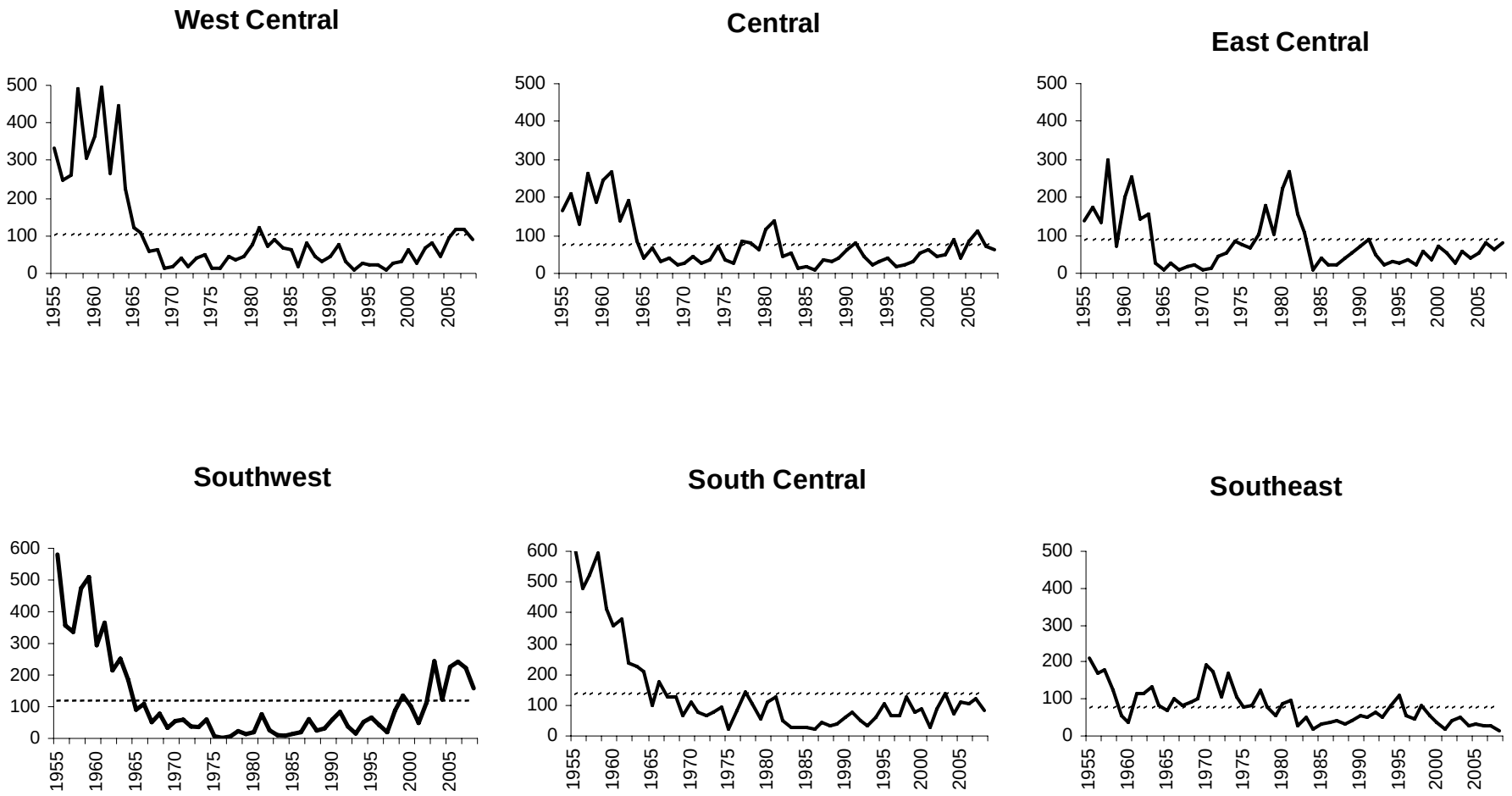


Figure 5. Regional index (——) and long-term average (·····) of **ring-necked pheasants seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same scale among survey regions.

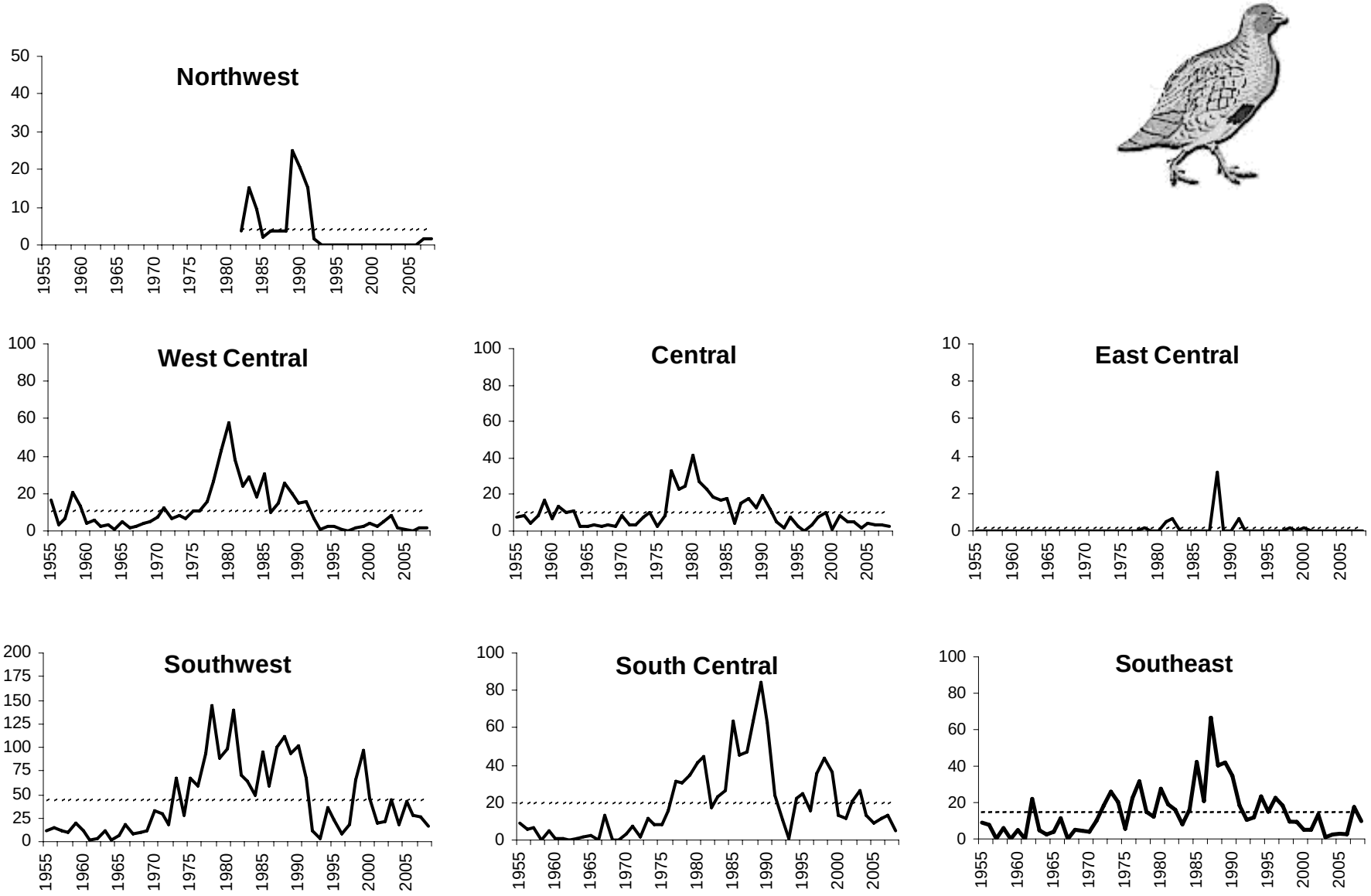


Figure 6. Regional index (——) and long-term average (·····) of **gray partridge seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

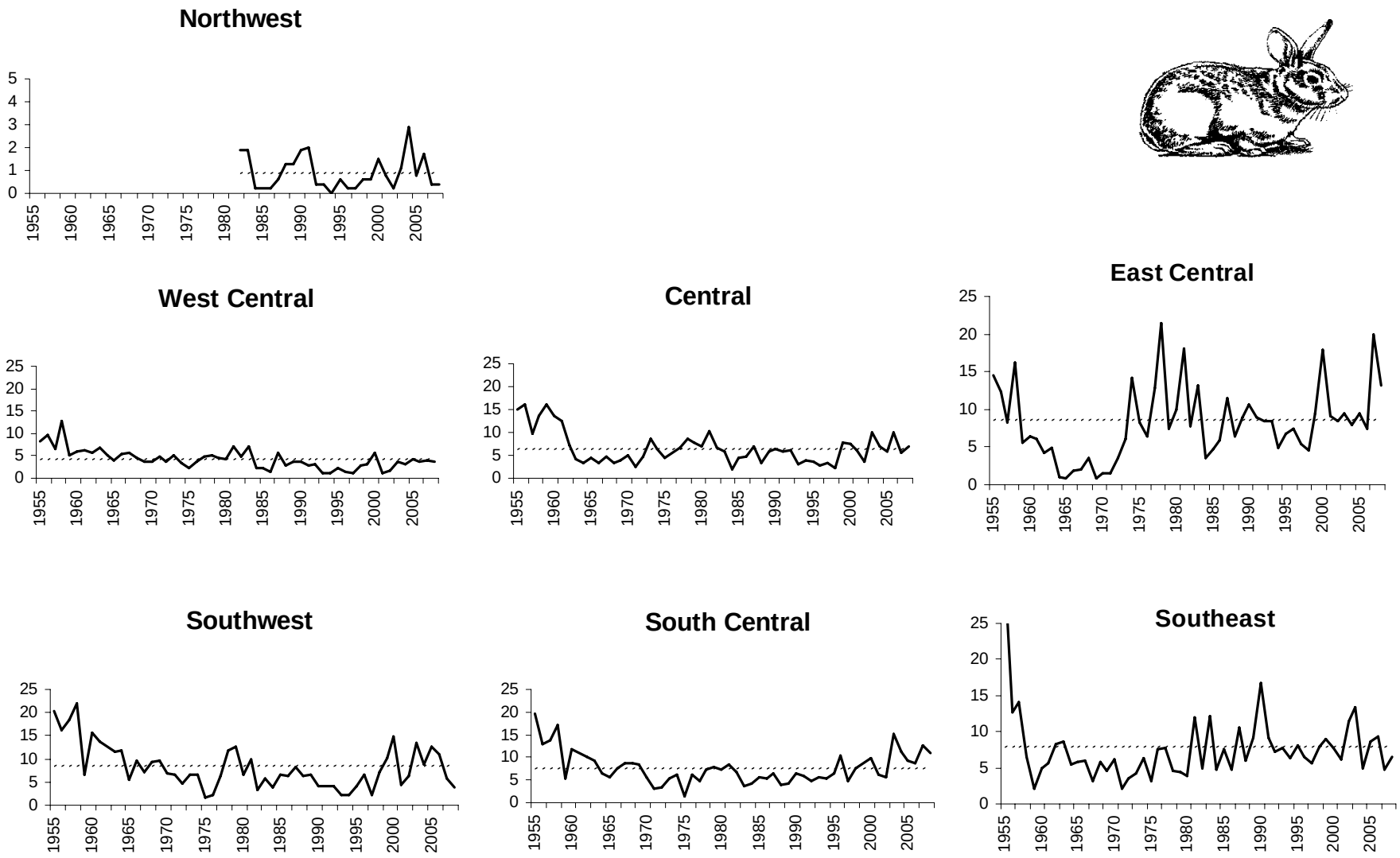


Figure 7. Regional index (——) and long-term average (••••••) of **cottontail rabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

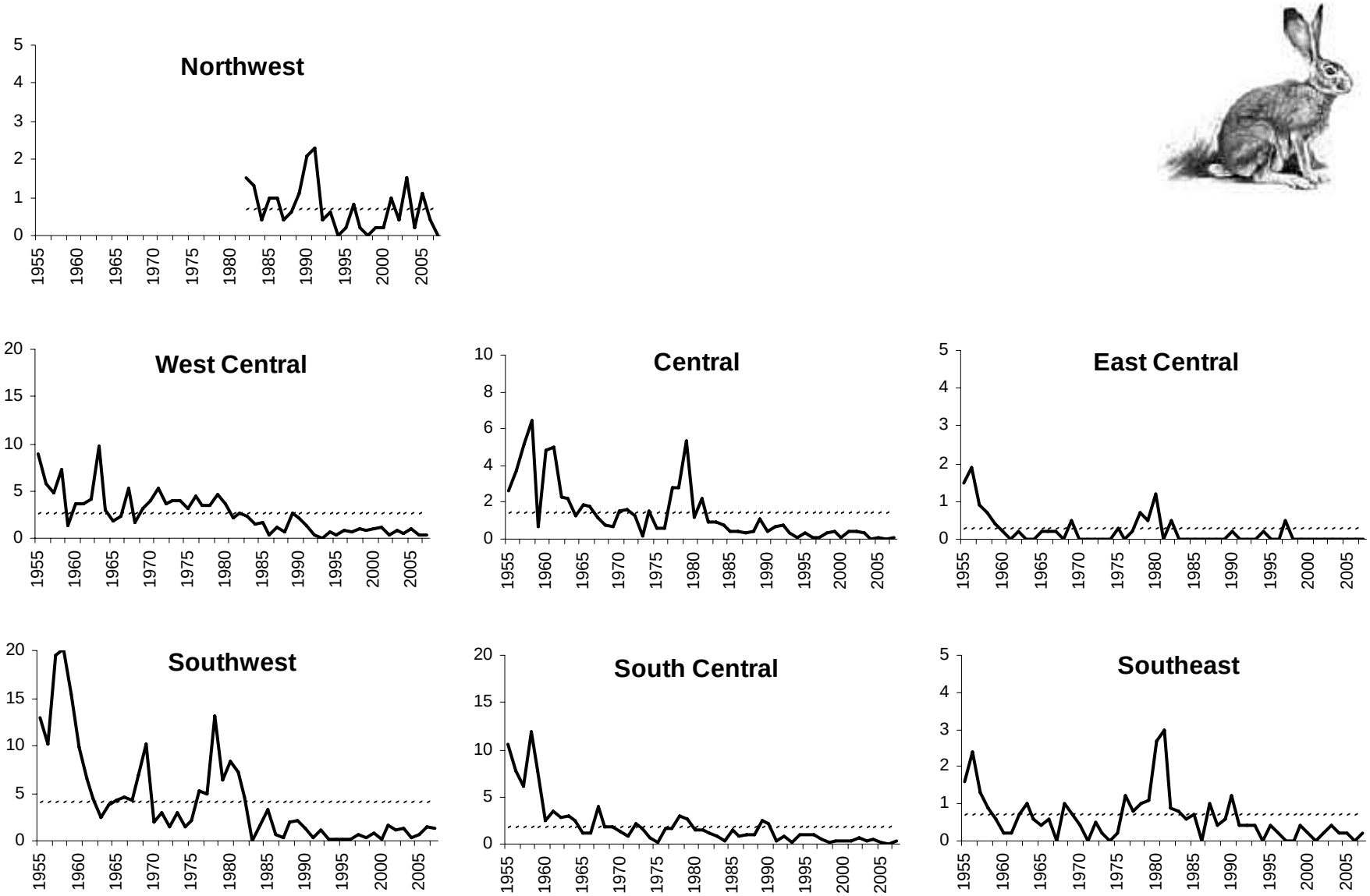


Figure 8. Regional index (——) and long-term average (••••••) of **white-tailed jackrabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis is not the same among survey regions.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA'S FARMLAND/TRANSITION ZONE – 2008

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INTRODUCTION

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

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

METHODS

Minnesota Farmland/Transition Zone

There were 4 deer management units (DMUs) in Minnesota's farmland/transition zone (Figure 1), and these DMUs are partitioned into Sub-DMUs for discussion in this report (Table 1). Permit areas (PAs) delineated within DMUs served as the basis for population modeling and managing antlerless harvests. Several management strategies are available, the management strategies employed during a given year depends on where the population density is relative the population goal (Figure 2). There were 86 PAs in Minnesota's farmland zone in 2007. However, the 2 PAs encompassing the Twin Cities metro region were not modeled, and PAs 224 and 235 were not modeled due to their small size (Grund 2001).

Marked changes in the season format occurred between 2007 and 2008. The most notable change was that the Zone 4 season had been a split 2-day season with the 2-day season beginning on the Saturday nearest to 6 November; a 4-day season would occur the following weekend. In 2008, the Zone 4 season was eliminated and a continuous 9-day season will be used, similar to the season format used in Zone 2 during 2007. Consequently, all Zone 4 PAs were identified with new numbers in the 200 series. The split season format did not change in Zone 3, so no changes were made to the PA numbering system in Zone 3.

Population Modeling

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

management efforts through simulations, projections, and predictions of different management prescriptions.

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

Population Trends and Densities

Deer densities continue to increase throughout most of the transition zone. Deer densities were highest in the Big Woods DMU, lowest in the Prairie DMU, and at intermediate levels in the Northwest (Agassiz & Red River DMUs). Detailed long-term trends in deer densities are presented in Table 1.

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

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

In the Prairie DMU, the farmland model suggests that deer densities have increased slowly over the last couple of years. Rate of increase is fastest in the North and Southwest permit areas. This trend reflects management strategies used to accommodate the established population goal density (Figure 2).

Harvest Trends and Model Performance

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

Harvest densities fluctuated substantially across the Big Woods DMU and across years. Trends in harvest densities have been most stable in the Metro and most variable in the Southeast permit areas of

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

In the Prairie DMU, harvest densities have substantially declined over the past decade. However, the farmland model indicated that populations have increased in most Prairie DMU permit areas. Based on my interpretation of these trends, the farmland model is performing very poorly in most Prairie PAs and I highly recommend recalibrating the farmland model in these areas. Based on the marked declines in harvests over the past 10-15 years and the fact that current densities are 25-50% below newly established goals, antlerless harvest quotas have generally been reduced by 50-75% from over the past 2 to 3 years in most permit areas in the Prairie DMU.

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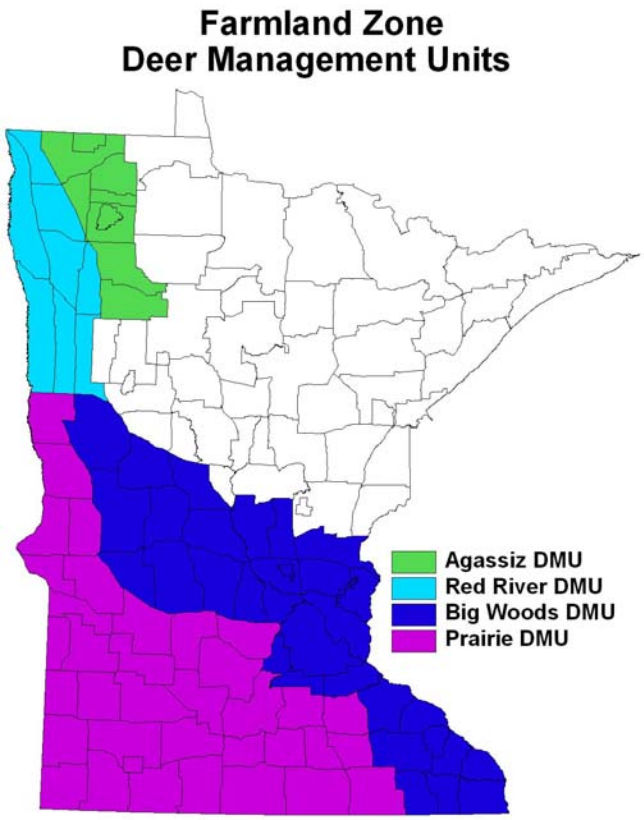

Figure 1. Deer management units in the farmland zone of Minnesota, 2008.

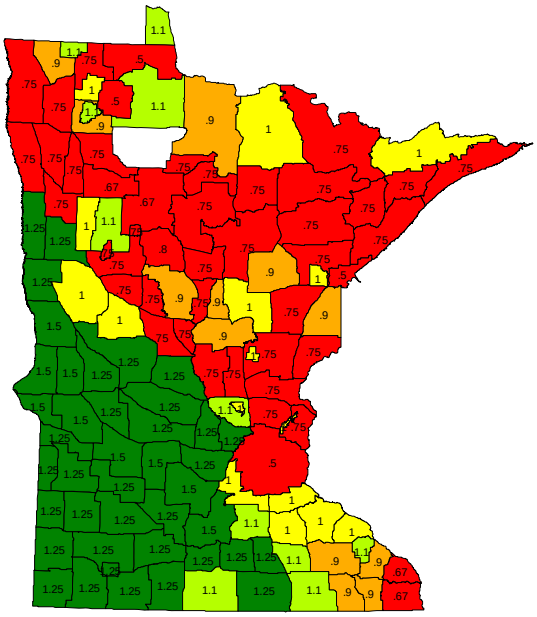

Figure 2. Population density goals in deer permit areas in Minnesota, 2008.

Table 1. Pre-fawning deer density estimates[a] (deer/mi^2) by Deer Management Unit (DMU), sub-unit (DMSU), and permit area (PA) in Minnesota's Farmland/Transition Zone, 1996-2008.

DMU	DMSU	PA	Area mi^2	Pre-fawning density												
				1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
RED RIVER		260	1249	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4[a]	4
		261	795	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3[a]	4
		262	677	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3	3[a]
AGASSIZ		201	155	2	2	3	3	4	5	5	5	5	5	6	6	6
		203	108	3	2	2	3	4	5	6	7	7	7	4[a]	4	4
		209	576	5	5	6	6	6	7	7	7	7	7	6[a]	7[a]	6[a]
		210	485	11	10	10	11	11	11	11	12	11	11	11[a]	11[a]	10[a]
		256	654	6	6	6	7	7	8	8	8	7	7	3[a]	3[a]	3[a]
		257	413	11	10	10	10	11	11	10	8	9	8	9[a]	10[a]	9[a]
		263	512	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	5
		264	669	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7	7
		265	494	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	9[a]
		266	617	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	6[a]
		267	472	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	4
		268	230	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9	9
		297	438	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	6
BIG WOODS	*North*	213[c]	644	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13	13
		214	557	17	17	17	17	18	19	19	19	20	19	18	18	16
		215	702	9	9	9	9	9	9	9	10	9	8	9	8	8
		218[c]	813	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	6
		219	393	10	10	9	8	8	9	9	9	10	11	11	12	14
		229	288	5	5	5	5	5	6	6	6	7	6	7	7	7
		239	924	14	14	13	13	15	16	15[a]	14	14	13	12	11	10
		240	642	21	21	20	21	23	25	26	27	29	25[a]	26	27	28
		273[c]	575	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7	8

		276	544	10	10	9	9	9	8	8	8	8	7	8	7	9
		277	885	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	10[a]
	Central	221	642	9	9	9	10	11	12	11	12	13	13	13	13	12
		222	412	13	13	13	13	14	14	14	15	15	14	14	13	11
		223	376	13	13	13	13	13	13	13	14	14	12[a]	13	14	14
		225	619	19	18	18	18	18	19	19	19	20	22	24	14[a]	14
	Metro[b]	227	472	13	13	13	13	13	14	15	15	18	20	14[a]	14	13
		236	374	17	16	16	16	17	17	19	23	26	31	18[a]	19	18
		338	452	5	4	4	4	4	5	6	7	4[a]	4	4	4	4
		339	409	6	6	5	4	5	5	6	8	10	4[a]	5	6	7
	Southeast	341	596	9	9	9	9	9	9	10	11	10	10	9	9	9
		342	352	10	10	11	11	12	11	13	15	17	13[a]	13	13	14
		343	663	8	8	8	8	9	9	11	13	16	19	23	11[a]	11
		344	189	17	16	15	14	14	15	17	20	24	28	37	12	12
		345	326	10	11	11	11	11	10	10	11	12	14	17	19	21
		346	319	17	18	18	18	19	19	20	23	25	27	29	23[a]	22
		347	434	10	10	9	9	9	9	10	11	12	13	13	13	13
		348	332	17	17	17	17	16	15	15	16	17	17	16	13	13
		349	492	13	14	15	16	17	17	18	21	24	28	31	21[a]	21
PRAIRIE	*North*	269	651	4	3	3	3	4	4	4	4	4	4	3	3	3
		270	749	3	3	3	3	3	3	3	4	4	3[a]	3	3	4
		271	634	2	2	2	2	2	2	2	3	3	3	4	2[a]	2
		272	531	4	4	3	3	3	3	3	4	4	3[a]	3	4	5
		275	766	7	5	4	4	4	3	3	3	4	4	3	4	4
		282	779	2	1	1	1	1	1	1	1	2	2[a]	1	1	1
		283	614	3	3	3	3	3	3	3	4	4	3[a]	3	4	4
		284	837	2	2	1	1	2	2	2	2	2	3	2[a]	2	2
		285	550	4	4	3	4	4	4	4	5	6	4	4	3	3

River	274	360	8	7	6	6	5	4	4	4	4	4	4[a]	4	5
	278	397	10	9	9	8	8	8	8	9	9	10	7[a]	8	8
	281	575	6	5	5	5	5	5	4	5	5	6	4[a]	4	5
	290	662	5	4	4	4	4	4	4	4	4	4	4	5	5
	291	806	5	4	4	4	4	4	4	5	6	4[a]	4	4	5
	299	386	7	6	6	5	5	5	5	5	5	5	6	5[a]	6
Southwest	279	345	7	7	6	6	6	6	5	5	5	4[a]	4	4	5
	280	675	3	2	2	2	2	2	2	2	3	3	2[a]	3	3
	286	447	3	3	2	2	3	4	4	4	4	4[a]	4	4	5
	288	625	3	3	3	2	3	4	4	4	4	4[a]	4	5	6
	289	816	2	2	1	2	1	1	1	2	2	1[a]	2	2	2
	294	687	3	3	3	3	3	3	3	3	4	3[a]	3	3	4
	234	637	3	3	3	3	4	4	4	4	5	4[a]	4	4	4
	237	729	2	2	2	2	2	2	2	3	4	3[a]	3	3	3
	295	840	4	3	3	3	3	3	3	4	4	3[a]	3	3	4
	238	95	5	4	4	4	4	4	4	4	4	5	5	5[a]	5
	250	712	4	3	3	3	3	4	4	4	5	4[a]	4	4	4
	296	666	3	2	2	3	3	3	3	3	3	3	3	4[a]	5
	252	715	3	3	2	2	2	2	2	3	3	3	3[a]	3	4
	253	974	3	3	3	3	3	3	3	3	4	3[a]	3	3	4
Southeast	292	481	9	9	8	8	8	7	7	8	7	7	8[a]	7	6
	293	506	8	9	8	8	8	8	7	8	7[a]	7	7	7	7
	230	453	3	3	3	3	3	3	3	4	4	4[a]	4	5	6
	232	377	5	4	4	4	4	4	4	4	4[a]	4	5	5	5
	233	385	5	5	4	4	4	4	4	5	5	4[a]	4	4	4
	254	931	4	4	4	4	4	4	4	4	5[a]	4	4	5	5
	255	774	4	4	3	4	4	4	4	4	4	4	4	4[a]	3

[a]Density estimates are subject to change as new data are incorporated or the model is revised.
[b]Excluding permit areas 228 & 337, which were not modeled.
[c] New permit area so no historical information is available