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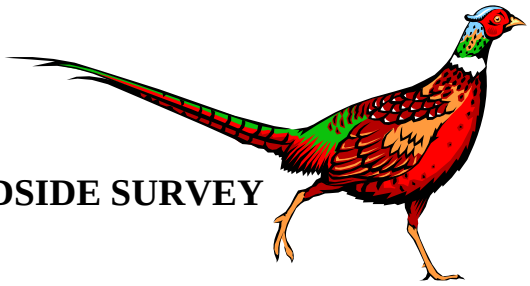

2010 MINNESOTA AUGUST ROADSIDE SURVEY

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ABSTRACT

This report is a summary of the 2010 Minnesota August roadside survey. Population indices for ring-necked pheasants, gray partridge, cottontail rabbits, and white-tailed jackrabbits were similar to 2009 but below the 10-year and long-term averages. Population indices for white-tailed deer and mourning doves were similar to 2009 and the 10-year average. Sandhill crane indices were also unchanged from 2009. Conservation Reserve Program (CRP) enrollment in Minnesota declined by 54,000 acres from 2009, including 21,000 acres from the pheasant range, but increases in enrollment of other farm programs and acquisition of public lands exceeded CRP losses, yielding a net gain of about 4,000 acres of protected habitat. The winter of 2009-10 was the most severe since 2000-01 for much of the farmland region. Weather during March-May was warm and dry (except for the Northwest), but June turned wetter than normal. Thus, conditions for overwinter survival of farmland wildlife in 2010 were below average, whereas reproductive conditions were excellent early but then declined in June.

The 2010 pheasant index (62.8 birds/100 mi) was similar to 2009 but remained 22% below the 10-year average, 38% below the long-term average, and 79% 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). The 2010 hen pheasant index was similar to last year range-wide but was 28% below the 10-year average. The number of broods observed was similar to last year but 20% below the 10-year average, which reflected fewer hens available for nesting. Overall, the size of the fall population will be close to that of last year, when approximately 400,000 roosters were harvested. The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the Central and West Central regions.

The gray partridge index was similar to last year, but 55% below the 10-year mean and 76% below the long-term average. Observed regional changes were not significant, but were based on small samples. Gray partridge counts were highest in the Southwest and Southeast regions.

The cottontail rabbit index was similar to last year, but 31% below the 10-year average and 24% below the long-term average. Counts of cottontail rabbits were highest in the East Central, Southeast, and Central regions. The jackrabbit index did not change significantly in 2010, but was 96% below the long-term average. The range-wide jackrabbit population peaked in the late 1950's and declined to low levels in the 1980s, from which populations have not recovered. Counts of white-tailed jackrabbits were highest in the Southwest region.

The number of mourning doves observed in 2010 was similar to last year and the 10-year average but below the long-term average. In contrast, the white-tailed deer index was similar to last year and the 10-year average, but significantly higher than the long-term average. Sandhill crane indices were unchanged from 2009.

INTRODUCTION

This report is a summary of the 2010 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 2010; without their help the survey would not be possible. 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

After a series of mild to moderate winters, the winter of 2009-10 was the most severe since 2000-01 for much of the farmland region of Minnesota. Snow cover exceeded 6 inches throughout most of the farmland zone from mid-December through early March, and snow depths exceeded 30 inches in parts of southwest and south central Minnesota for up to 7 weeks (Minnesota Climatology Working Group [MCWG], http://climate.umn.edu/doc/snowmap.htm). However, March was warmer (range +5ºF to +10ºF, MCWG, http://climate.umn.edu/cawap/monsum/monsum.asp) and drier than average and snow cover was virtually gone throughout the entire farmland region by mid-March. Warm, dry conditions continued through April and May in all farmland regions except the Northwest, offering an excellent start to the spring nesting period. June, however, was wetter and slightly cooler than average. Thus, conditions for over-winter survival of farmland wildlife were below average throughout most of the farmland region (especially parts of the Southwest and South Central agricultural regions), whereas reproductive conditions were excellent early but then declined in June, the critical peak of hatch for pheasants in Minnesota when chicks are most vulnerable to weather.

HABITAT CONDITIONS

Conservation Reserve Program (CRP) enrollment continued a declining trend with losses from 2009 of 21,000 acres in Minnesota's pheasant range, 36,000 acres in the prairie-chicken range, and 54,000 acres statewide. However, gains in Reinvest in Minnesota (RIM), RIM-Wetlands Reserve Program (RIM-WRP), and Conservation Reserve Enhancement Program (CREP) enrollments and acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) in the pheasant range exceeded CRP losses, yielding a net gain of about 4,000 acres of protected habitat since 2009. Habitat enrolled in farm programs (e.g., CRP, CREP, RIM, WRP) declined from a 2007 peak of 1.1 million acres to 963,000 acres in the pheasant range, whereas habitat protected as WMAs and WPAs increased to 712,000 acres. Within the pheasant range, protected grasslands account for about 6.1% of the landscape (range: 3.0-10.2%; Table 1).

Farm programs make up the largest portion of protected grasslands in the state. The expiration of a large proportion of existing CRP contracts is still a major concern for future wildlife populations, with nearly 500,000 acres in Minnesota scheduled to expire in the next 3 years. However, the first general CRP signup since 2006 was just completed and interest is high in Minnesota's State Acres For wildlife Enhancement (SAFE) initiative under the CRP (http://www.fsa.usda.gov/Internet/FSA_File/mn_cp38e_factfheet_20080403.pdf). The future of farmland retirement programs remains under threat due to continued high land-rental rates and competing economic opportunities (e.g., ethanol production).

The MNDNR continues to expand the habitat base through accelerated WMA acquisition with 1,900 acres of new WMAs in the pheasant range in the last year. New funding from the Lessard-Sams Outdoor Heritage account is expected to further accelerate acquisition of WMAs and WPAs. In addition, the Working Lands Initiative (http://www.dnr.state.mn.us/workinglands/index.html) will attempt to protect and expand large wetland-grassland complexes in 12 counties in western Minnesota.

SURVEY CONDITIONS

Cooperators completed 168 of the 171 routes in 2010. 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 95% of the survey routes, which was similar to 2009 (94%) but better than the 10-year average (92%). Clear skies (<30% cloud cover) were present at the start of 90% of routes, with wind speeds <7 mph recorded for 96% of routes. The survey period was extended to July 29th - August 19th to allow most routes to be completed.

RING-NECKED PHEASANT

The average number of pheasants observed (62.8/100 mi) was similar to 2009 (95% CI on percent change: -12 to 24%; Table 2) but remained 22% below the 10-year average (95% CI: -36 to -9%; Table 2; Figure 2A), 38% below the long-term average (95% CI: -50 to -26%; Table 2), and 79% below the benchmark years of 1955-64 (95% CI: -90 to -67%). Total pheasants observed per 100 miles ranged from 8.2 in the Southeast to 104.2 in the Southwest (Table 3, Figure 5). Changes from last year were not significant in any region (Table 3).

The range-wide hen index (8.9 hens/100 mi) was similar to last year (95% CI: -24 to 10%), but 28% below the 10-year average (95% CI: -42 to -14%; Table 2). The hen index varied from 0.8 hens/100 miles in the Southeast to 12.8 hens/100 miles in the Southwest, and was lower than last year only for the Southwest region (95% CI: -65 to -4%). The cock index (8.0 cocks/100 mi) was also similar (95% CI: -17 to 25%) to 2009 and the 10-year average (95% CI: -16 to 11%; Table 2). The 2010 hen:cock ratio was 1.12, which was below average (1.51) for the CRP years (1987-2010). A low sex ratio may reflect a delayed nesting effort, but evidence of this is relatively weak for 2010.

The number of pheasant broods observed (10.1/100 mi) was similar (95% CI: -7 to 29%) to last year, but 20% (95% CI: -33 to -7%) below the 10-year average, and 24% (95% CI: -38 to -10%) below the long-term average (Table 2). The brood index remains far below the benchmark years of 1955-64 (34.8 broods/100 mi). Regional brood indices ranged from 1.8 broods/100 miles in the Southeast to 17.5 broods/100 miles in the Southwest. Average brood size in 2010 (4.5 ± 0.2 [SE] chicks/brood) was similar to last year (4.6 ± 0.1 [SE] chicks/brood), but below the 10-year mean (4.8 chicks/brood) and the long-term average (5.5 chicks/brood; Table 2). The median hatch date for pheasants was June 9 (n = 376), the same as 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 (versus 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).

A severe winter throughout the pheasant range (the first since 2001) was expected to result in reduced hen counts, but this was observed only in the Southwest region. In addition, wet weather during June (the normal peak of pheasant hatch) probably held brood survival below average, similar to 2009 which also had cool, wet weather during June. Thus, we expected a decline in the range-wide pheasant index due to weather and were pleasantly surprised to detect no change from 2009. Overall, the size of the fall population will be close to last year, when 400,000 roosters were harvested (Figure 2A). The best opportunity for harvesting pheasants appears to be in the Southwest region, although good opportunities will likely also be available in the Central and West Central regions.

GRAY PARTRIDGE

Range-wide, the gray partridge index (3.4 partridge/100 miles) was similar to last year but 55% below the 10-year average (95% CI: -87 to -23%) and 76% below the long-term average (95% CI: -94 to -58%, Table 2, Figure 2B). Within regions, the partridge index ranged from 0.0/100 miles in the Northwest, Central, and East Central regions to 8.2/100 miles in the Southwest (Table 3, Figure 6). There were no significant regional changes from last year (Table 3). Observations of gray partridge were too few for analysis by age class.

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 their reproductive success is limited in the Midwest except during successive dry or drought years. Consequently, gray partridge are more strongly affected by weather conditions during nesting and brood rearing than are pheasants. The Southwest, Southeast, and South Central regions offer the best opportunity for harvesting gray partridge in 2010.

COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT

The eastern cottontail rabbit index (4.6 rabbits/100 mi) was similar to last year (95% CI: -8 to 56%), but 31% below the 10-year average (95% CI: -47 to -15%) and 24% below the long-term average (95% CI: -41 to -7%, Table 2, Figure 3A). The cottontail rabbit index ranged from 0.2 rabbits/100 miles in the Northwest to 12.0 rabbits/100 miles in the East Central region (Table 3, Figure 7). Changes from 2009 were significant only in the East Central region, where the counts increased by 200% (95% CI: 42 to 357%; Table 3). The best opportunities for harvesting cottontail rabbits are in the East Central, Southeast, and Central regions.

The index of white-tailed jackrabbits did not change significantly from 2009, but was 76% below the 10-year average (95% CI: -108 to -44%) and 96% below the long-term average (95% CI: -109 to -83%, Table 2, Figure 3B). The range-wide jackrabbit population peaked in the late 1950's and declined to low levels in 1980s (Figure 3B). The 2010 index is the lowest ever recorded in Minnesota, with only 4 observations in 4,200 miles of survey. The long-term decline in jackrabbits reflects the loss of their preferred habitats (i.e., pasture, hayfields, and small grains). The greatest potential for white-tailed jackrabbit hunting is likely in the Southwest region (Table 3, Figure 8). However, indices of relative abundance and annual percent change should be interpreted cautiously because estimates are based on a small number of sightings.

WHITE-TAILED DEER

The index for white-tailed deer (15.4 deer/100 mi) was similar to last year (95% CI: -31 to 3%) and the 10-year average (95% CI: -12 to 22%), but 69% above the long-term average (95% CI: 35 to 103%, Table 2, Figure 4A). Among regions, deer indices were not significantly different from 2009 (Table 3).

MOURNING DOVE

The number of mourning doves observed (211.0 doves/100 mi) in 2010 was similar to last year and the 10-year average, but was below the long-term average (95% CI: -29 to -3%; Table 2, Figure 4B). The mourning dove index ranged from 74.5 doves/100 miles in the Northwest region to 330.2 doves/100 miles in the West Central Region (Table 3). The number of mourning doves heard along U.S. Fish and Wildlife Service call-count survey (CCS) routes (n = 14) in Minnesota was similar to last year. Trend analyses indicated the number of mourning doves heard along the CCS routes declined 1.1% per year (90% CI: -2.7 to 1.1%) during 2001-2010 and declined 1.3% per year (90% CI: -2.0 to -0.5%) during 1966-2010 (Sanders and Parker 2010).

SANDHILL CRANE

For only the second consecutive year, observers were asked to report the number of adult and juvenile sandhill cranes observed on the August Roadside Survey. Range-wide, the 2010 index averaged 10.1 cranes/100 miles of survey, including 2.0 juveniles/100 miles (Table 2). Compared to 2009, we detected no change in the total number of cranes observed (95% CI: -32 to 76%) or the number of juvenile cranes observed (95% CI: -1 to 135%; Table 2). Among regions, crane indices ranged from 0.0/100 miles in the West Central, Southwest, and Southeast regions to 44.3 cranes/100 miles in the Northwest region (Table 3). Juvenile cranes were observed in the Central (3.7/100 mi), East Central (8.6/100 mi), South Central (0.1/100 mi), and Northwest (5.6/100 mi) regions.

OTHER SPECIES

Notable incidental sightings: bald eagle (Jackson County), northern harrier (Renville County), merlin (Washington County), great blue heron (Waseca County), belted kingfishers (LeSuer and Watonwan Counties), magpies (Pennington County), yellow-billed cuckoo (Rice County), red-headed woodpeckers (Stearns and Watonwan Counties), upland sandpipers (Stevens County), prairie chickens (Red Lake County), sharp-tailed grouse (Marshall County), wild turkeys (Chippewa, Chisago, Dodge, Grant, Kandiyohi, Kittson, Le Sueur, Lincoln, McCleod, Marshall, Mille Lacs, Morrison, Mower, Murray, Olmsted, Rice, Sherburne, Stearns, Steele, Todd, Traverse, Washington, Wilkin, and Winona Counties), black bear (Marshall County), coyotes (Big Stone, Clay, Grant, Otter Tail, and Roseau Counties), fisher (Douglas County), and red fox (Steele County).

LITERATURE CITED

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Table 1. Abundance (total acres) and density (acres/mi^2) of undisturbed grassland habitat within Minnesota's pheasant range, 2010[a].

	Cropland Retirement									Density
AGREG	CRP	CREP	RIM	RIM-WRP	WRP	USFWS[c]	MNDNR[d]	Total	%	ac/mi^2
WC[b]	320,837	39,203	20,938	5,041	18,453	178,952	107,832	691,255	10.2	65.1
SW	102,996	25,286	14,393	713	766	19,400	55,850	219,404	5.8	37.1
C	134,953	15,320	21,696	1,422	3,100	86,047	46,242	308,781	5.1	32.7
SC	89,262	28,181	13,038	5,184	8,791	8,495	31,643	184,594	4.6	29.2
SE	74,207	2,718	9,132	556	771	36,224	52,259	175,867	4.7	30.4
EC	4,133	0	2,368	0	4	4,720	84,743	95,968	3.0	19.1
Total	726,388	110,707	81,564	12,916	31,886	333,839	378,569	1,675,868	6.1	38.9

[a] Unpublished data, Tabor Hoek, BWSR, 12 August 2010.

[b] Does not include Norman County.

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

[d] MNDNR Wildlife Management Areas (WMA).

Table 2. Range-wide trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2010.

Species	Change from 2009[a]					Change from 10-year average[b]				Change from long-term average[c]			
Subgroup	*n*	2009	2010	%	95% CI	*n*	2000-09	%	95% CI	*n*	LTA	%	95% CI
Ring-necked pheasant													
Total pheasants	149	59.3	62.8	6	±18	147	81.8	-22	±13	148	101.7	-38	±12
Cocks	149	7.7	8.0	4	±21		8.3	-3	±14		11.5	-30	±13
Hens	149	9.6	8.9	-7	±17		12.5	-28	±14		14.8	-39	±13
Broods	149	9.1	10.1	11	±18		12.8	-20	±13		13.3	-24	±14
Chicks per brood	376	4.6	4.5	-1			4.8	-5			5.5	-18	
Broods per 100 hens	376	94.5	112.9	20			103.0	10			101.2	12	
Median hatch date	376	Jun 12	Jun 9				Jun 09						
Gray partridge													
Total partridge	167	2.8	3.4	23	±97	166	7.6	-55	±32	148	16.1	-76	±18
Eastern cottontail	167	3.7	4.6	24	±32	166	6.6	-31	±16	148	6.8	-24	±17
White-tailed jackrabbit	167	0.3	0.1	-64	±69	166	0.4	-76	±32	148	1.8	-96	±13
White-tailed deer	167	17.9	15.4	-14	±17	166	14.9	5	±17	167	9.2	69	±34
Mourning dove	167	246.5	211.0	-14	±17	166	221.0	-5	±14	148	273.2	-16	±13
Sandhill Crane													
Total cranes	167	8.2	10.1	22	±54								
Juveniles	167	1.2	2.0	67	±68								

[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 = 1955-2009, except for deer = 1974-2009. Estimates for all species except deer based on routes (*n*) surveyed ≥40 years; estimates for deer based on routes surveyed ≥25 years. Thus, Northwest region (8 counties in Northwest were added to survey in 1982) included only for deer.

Table 3. Regional trends (% change) in number of wildlife observed per 100 miles driven, Minnesota August roadside survey, 1955-2010.

Region	Change from 2009[a]					Change from 10-year average[b]				Change from long-term average[c]			
Species	*n*	2009	2010	%	95% CI	*n*	2000-09	%	95% CI	*n*	LTA	%	95% CI
Northwest[d]													
Gray partridge	18	0.2	0.0	-100	±211	19	0.4	-100	±104	19	3.8	-100	±68
Eastern cottontail		0.2	0.2	0			1.0	-79	±70		0.9	-76	±56
White-tailed jackrabbit		0.2	0.2	0	±307		0.6	-62	±97		0.7	-69	±82
White-tailed deer		48.2	46.5	-4	±38		47.0	-4	±37		28.9	57	±81
Mourning dove		63.4	74.5	17	±69		84.9	-16	±29		125.6	-43	±27
Sandhill Crane		36.7	44.3	21	±74								
West Central													
Ring-necked pheasant	35	68.9	70.4	2	±42	34	83.1	-13	±34	35	104.0	-32	±22
Gray partridge		1.0	2.3	122	±486		2.8	-16	±191		10.2	-78	±54
Eastern cottontail		2.9	0.9	-68	±79		3.6	-77	±34		4.3	-79	±27
White-tailed jackrabbit		0.1	0.1	0			0.6	-80	±69		2.3	-95	±22
White-tailed deer		17.6	16.8	-5	±35		12.4	39	±39		8.7	93	±59
Mourning dove		321.4	330.2	3	±43		262.9	28	±43		374.9	-12	±30
Sandhill Crane		0.0	0.0										
Central													
Ring-necked pheasant	30	59.2	76.4	29	±47	29	69.0	14	±34	29	76.1	3	±36
Gray partridge		0.8	0.0	-100	±205		3.6	-100	±71		10.1	-100	±44
Eastern cottontail		3.2	6.1	92	±93		6.6	-4	±46		6.5	-2	±52
White-tailed jackrabbit		0.3	0.0	-100	±142		0.2	-100	±69		1.3	-100	±22
White-tailed deer		8.7	9.0	4	±47		6.9	35	±54		4.2	124	±95
Mourning dove		255.3	183.2	-28	±28		195.1	-4	±23		236.4	-21	±27
Sandhill Crane		7.1	10.8	53	±102								
East Central													
Ring-necked pheasant	13	43.7	49.8	14	±62	13	59.9	-17	±42	13	85.2	-42	±25
Gray partridge		0.0	0.0				0.0	-100	±218		0.2	-100	±133
Eastern cottontail		4.0	12.0	200	±158		11.1	8	±64		8.5	40	±71
White-tailed jackrabbit		0.0	0.0				0.0				0.3	-100	±60
White-tailed deer		17.8	10.4	-42	±47		16.8	-38	±55		8.0	30	±101
Mourning dove		114.1	97.8	-14	±27		96.9	1	±37		127.3	-23	±33
Sandhill Crane		38.1	40.9	7	±128								

Table 3. Continued.

Region / Species	Change from 2009					Change from 10-year average				Change from long-term average			
	n	2009	2010	%	95% CI	*n*	2000-09	%	95% CI	*n*	LTA	%	95% CI
Southwest													
Ring-necked pheasant	19	115.8	104.2	-10	±30	19	159.5	-35	±30	19	119.8	-13	±31
Gray partridge		8.2	8.2	0	±156		27.0	-70	±31		43.0	-81	±24
Eastern cottontail		6.3	3.4	-47	±63		8.7	-62	±25		8.3	-59	±30
White-tailed jackrabbit		1.3	0.4	-67	±109		1.0	-59	±62		4.0	-90	±21
White-tailed deer		19.1	20.0	4	±46		13.4	49	±50		7.9	153	±98
Mourning dove		327.8	238.7	-27	±23		343.6	-31	±21		316.4	-25	±24
Sandhill Crane		0.0	0.0										
South Central													
Ring-necked pheasant	32	52.5	56.5	8	±35	32	88.1	-36	±21	32	134.8	-58	±21
Gray partridge		7.5	5.7	-24	±122		13.1	-56	±50		19.5	-71	±27
Eastern cottontail		4.9	5.4	10	±51		9.4	-43	±28		7.7	-31	±29
White-tailed jackrabbit		0.0	0.0	0.0			0.2	-100	±65		1.8	-100	±25
White-tailed deer		6.3	3.4	-46	±51		5.6	-40	±43		3.4	0	±58
Mourning dove		330.3	294.4	-11	±41		269.1	9	±31		258.4	14	±34
Sandhill Crane		0.3	1.0	298	±471								
Southeast													
Ring-necked pheasant	20	9.6	8.2	-15	±73	20	28.6	-71	±25	20	75.7	-89	±29
Gray partridge		0.0	7.2				5.9	23	±190		14.3	-49.7	±68
Eastern cottontail		4.6	7.8	70	±74		7.7	1	±41		7.8	0	±47
White-tailed jackrabbit		0.2	0.0	-100	±209		0.2	-100	±96		0.6	-100	±43
White-tailed deer		22.4	13.0	-42	±64		15.6	-17	±49		10.0	31	±62
Mourning dove		141.8	81.3	-43	±28		203.4	-60	±25		226.2	-64	±21
Sandhill Crane		0.0	0.0										

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

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

[c] LTA = 1955-2009, except for Northwest region (1982-2009) and white-tailed deer (1974-2009). Estimates based on routes (*n*) surveyed ≥40 years (1955-2009), 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.

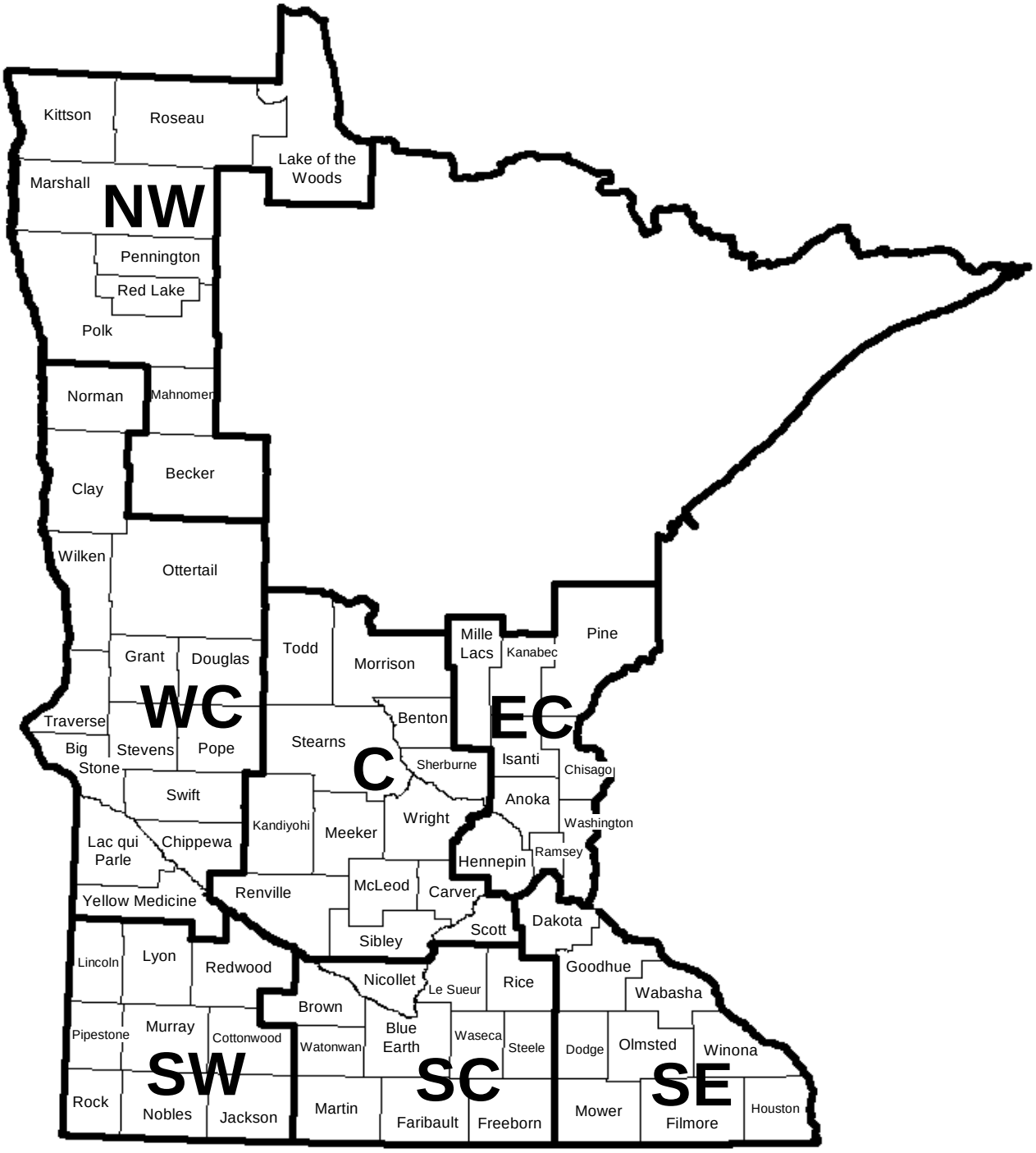
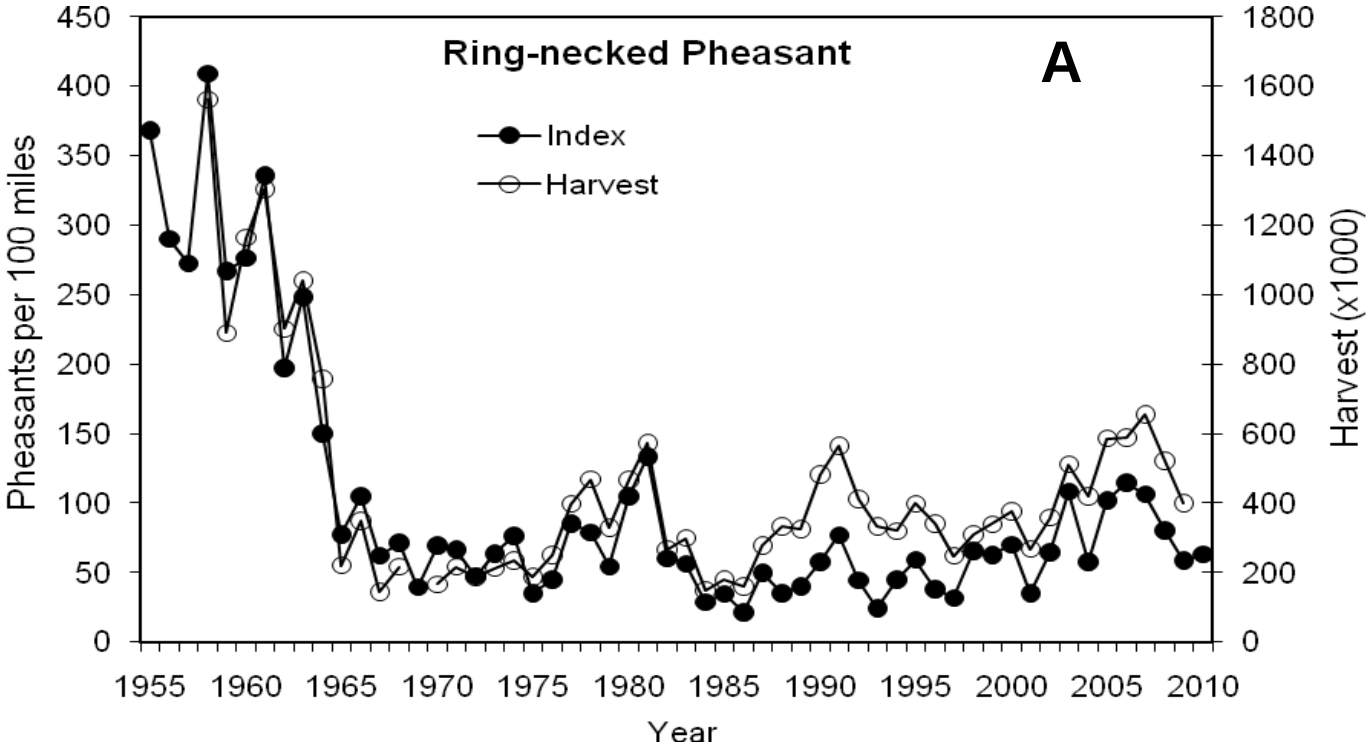


Figure 1. Survey regions for Minnesota's August roadside survey, 2010.



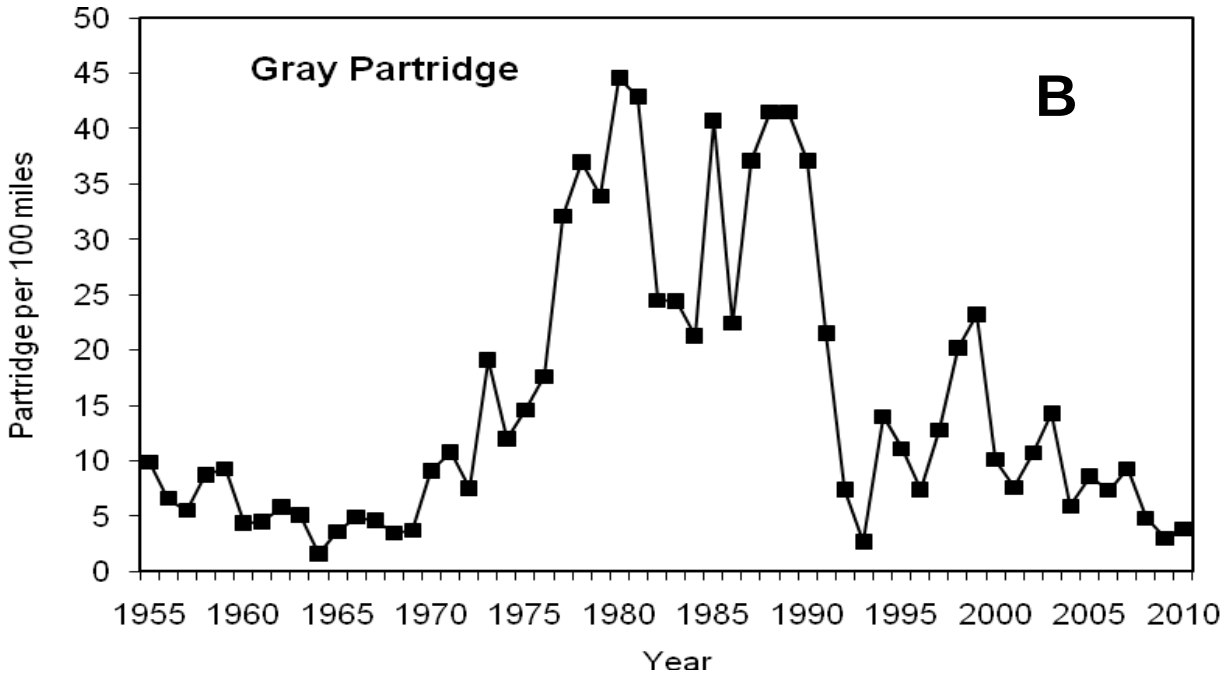


Figure 2. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 2010. Does not include the Northwest region. Based on all survey routes completed.

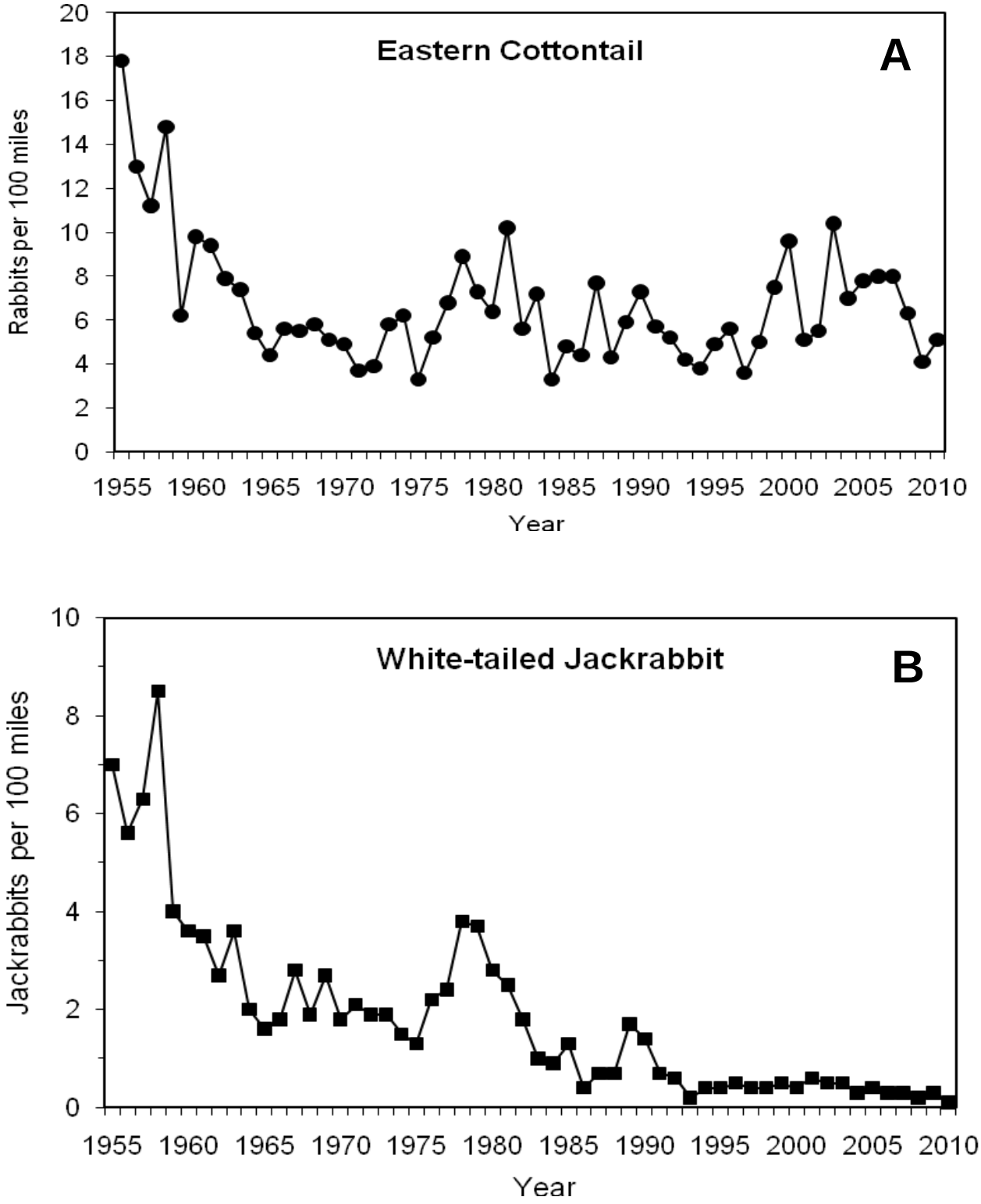


Figure 3. Range-wide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven in Minnesota, 2010. Does not include the Northwest region. Based on all survey routes completed.

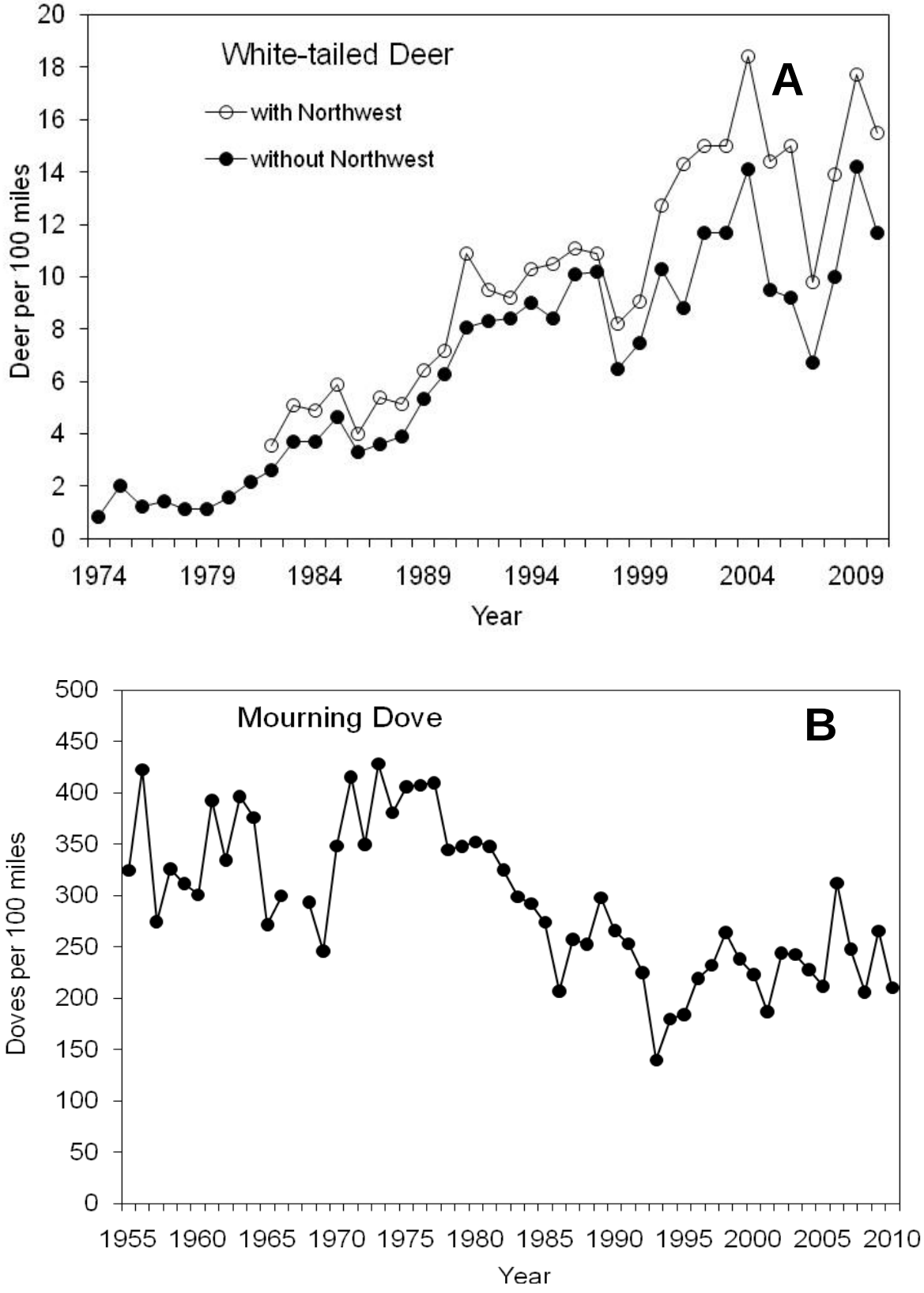


Figure 4. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2010. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

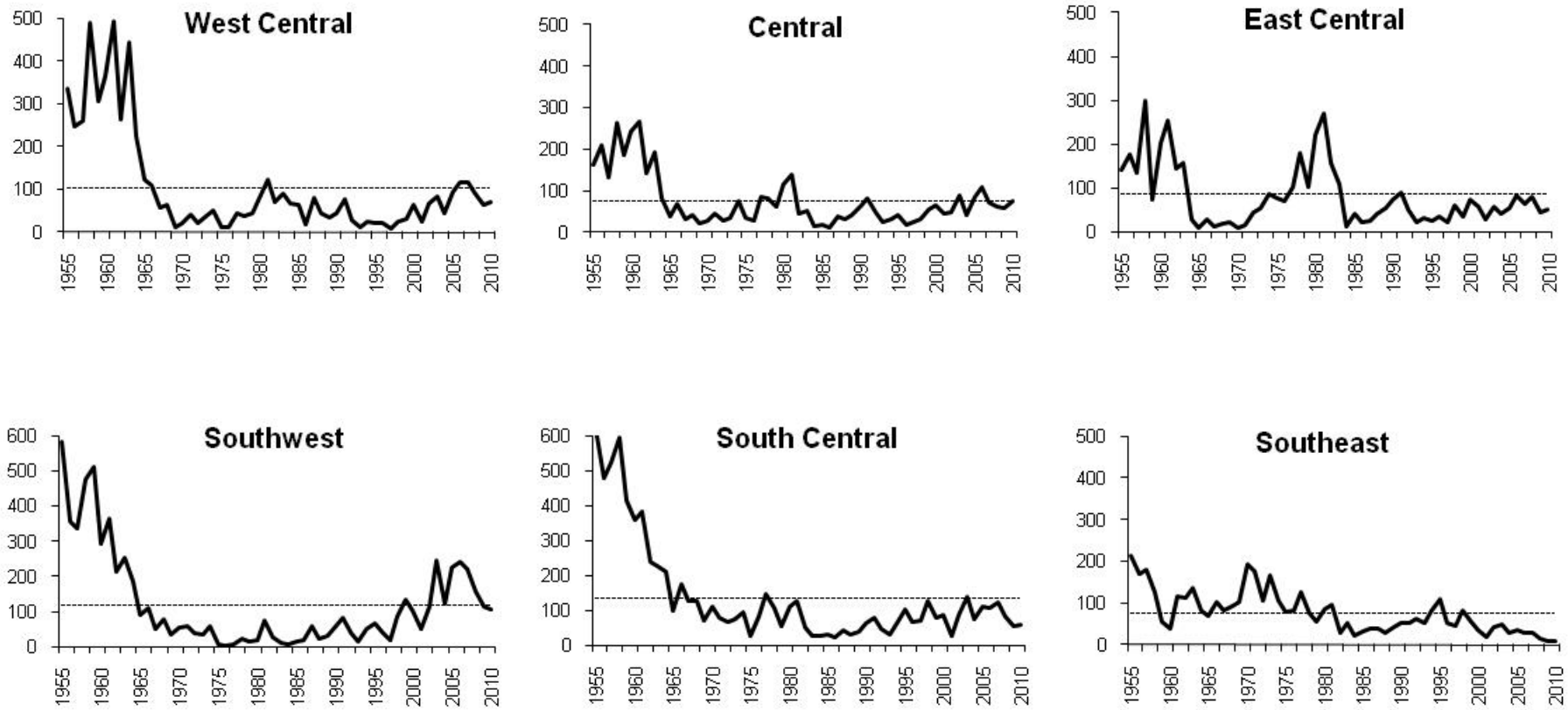


Figure 5. Regional index (——) and long-term average (·····) of **ring-necked pheasants seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis differs among survey regions.

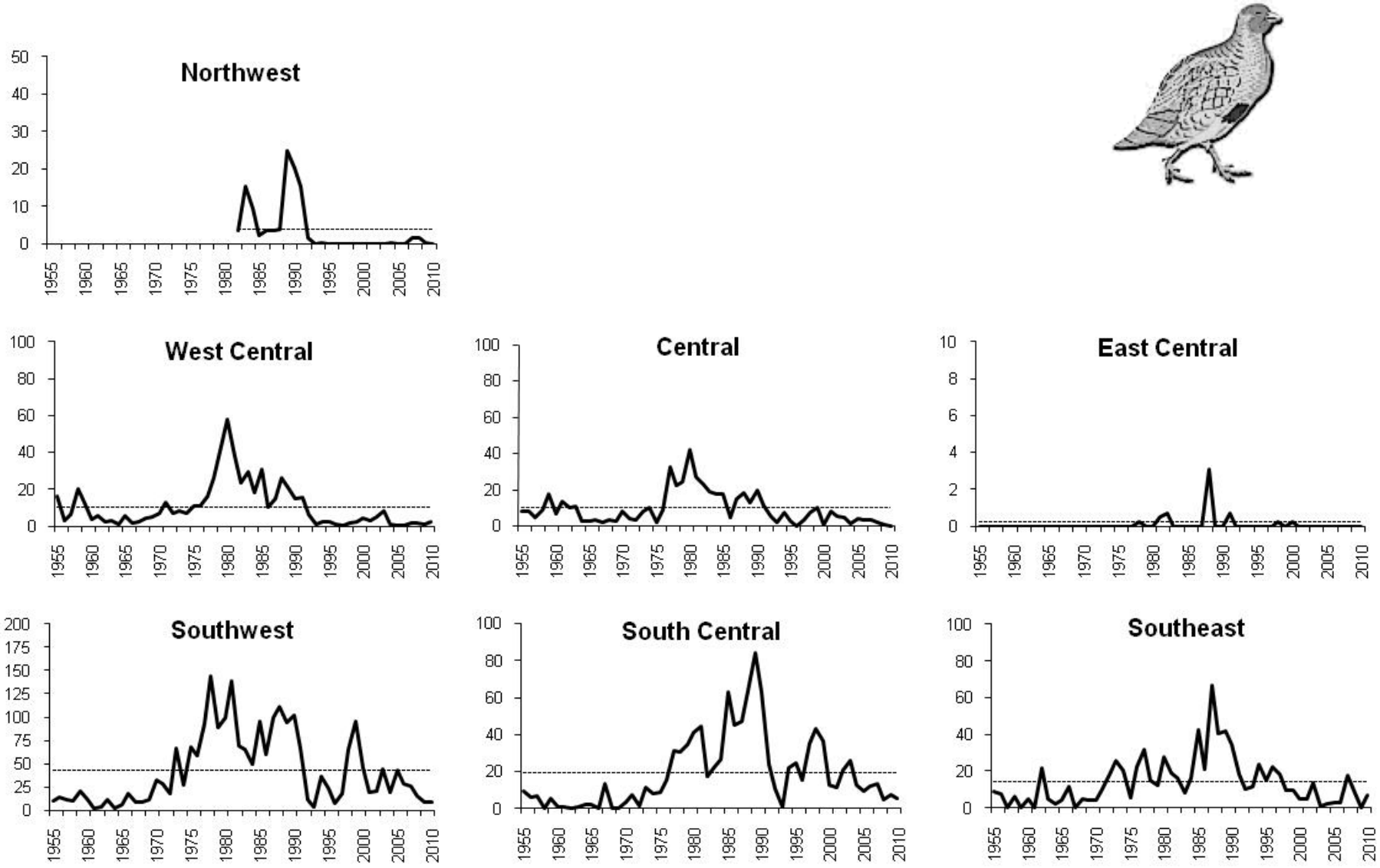


Figure 6. Regional index (——) and long-term average (.....) of **gray partridge seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis differs among survey regions.

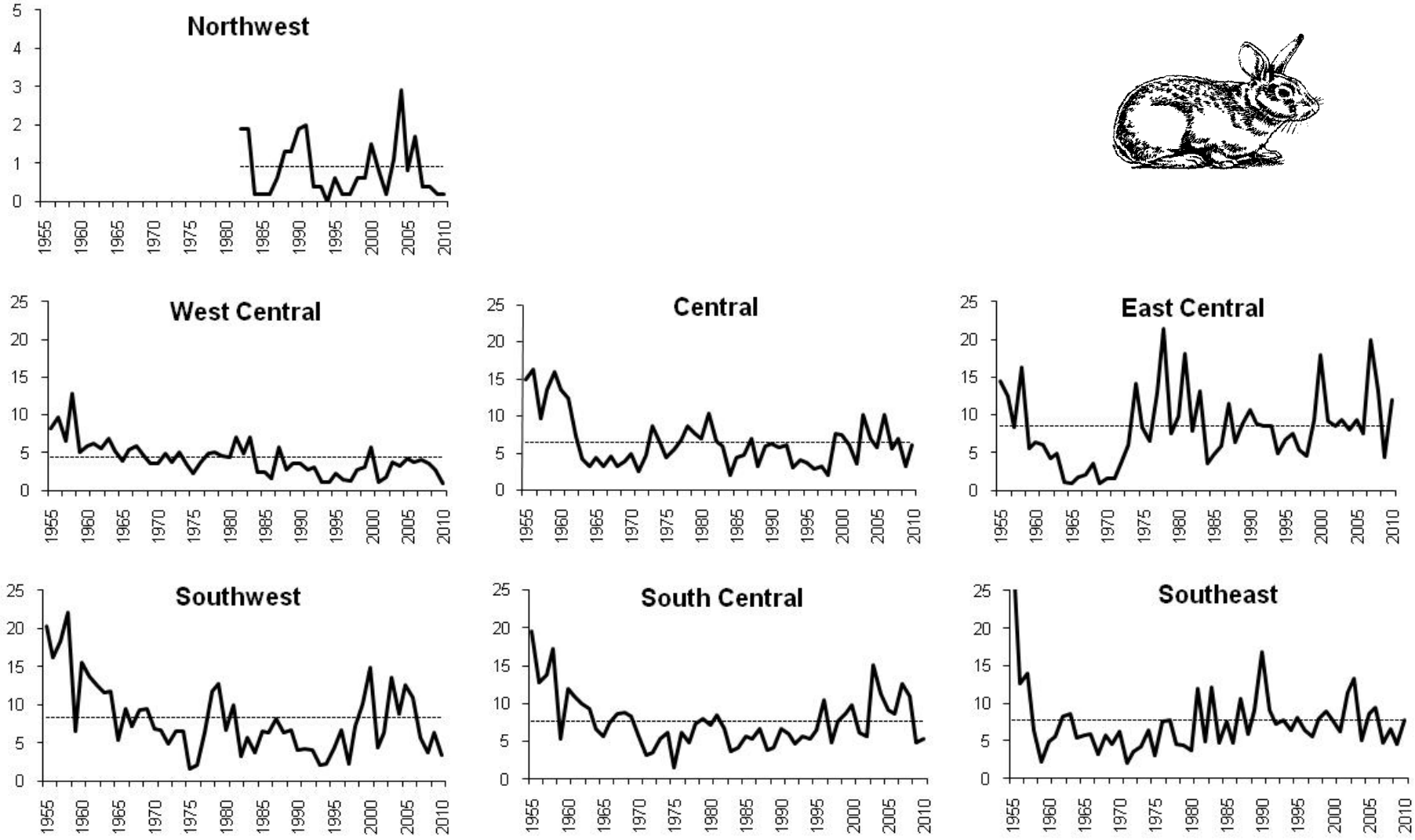


Figure 7. Regional index (——) and long-term average (·····) of **cottontail rabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis differs among survey regions.

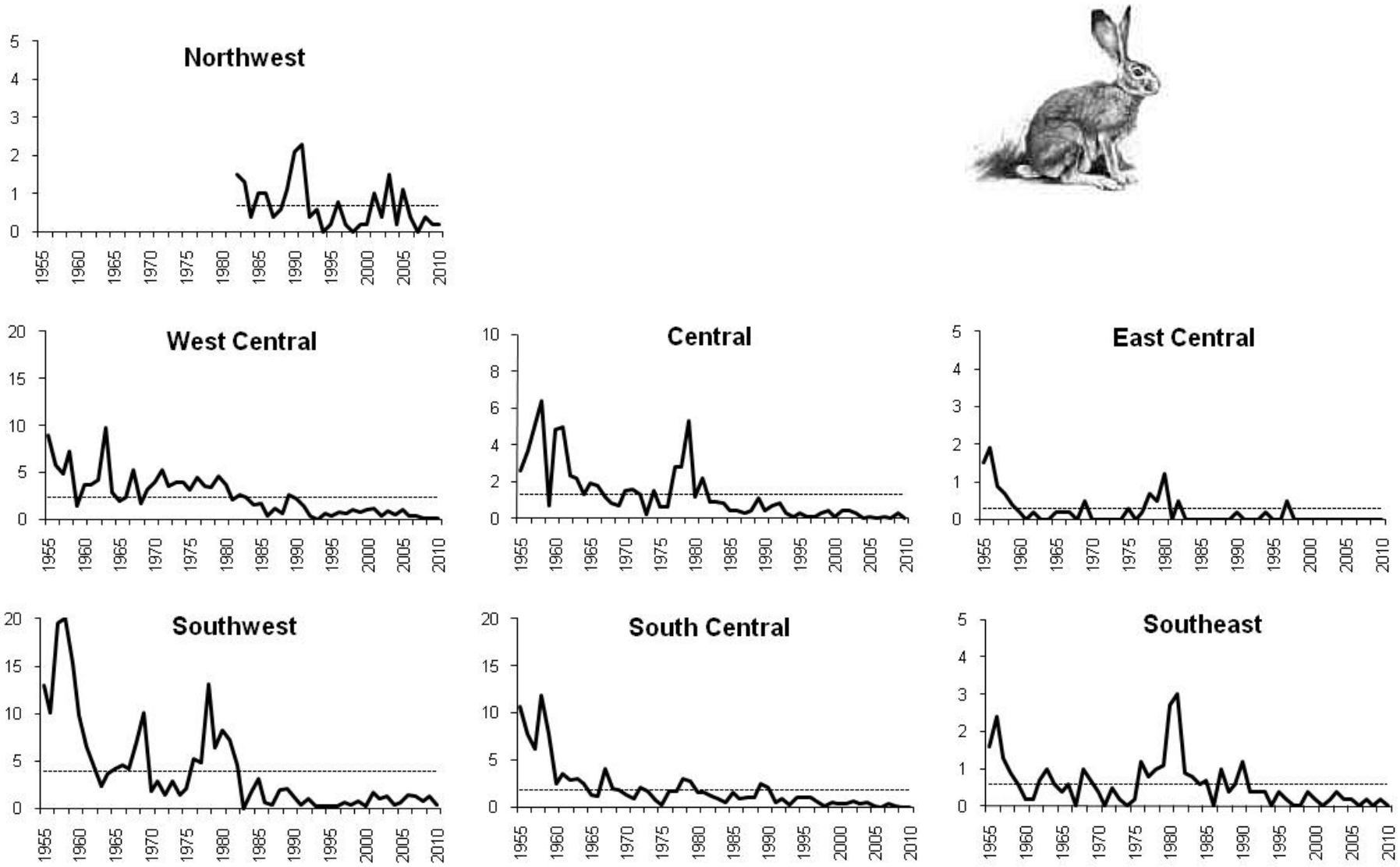


Figure 8. Regional index (——) and long-term average (.....) of **white-tailed jackrabbits seen per 100 miles driven**, Minnesota August roadside survey (1955-present). Based on all survey routes completed. **Note:** scale of vertical axis differs among survey regions.

MONITORING POPULATION TRENDS OF WHITE-TAILED DEER IN MINNESOTA'S FARMLAND/TRANSITION ZONE – 2010

Marrett Grund, Farmland Wildlife Populations and Research Group

INTRODUCTION

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

This document 1) 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, and 3) discusses general trends of deer density and current abundance.

METHODS

Minnesota Farmland/Transition Zone

The farmland/transition zone encompasses >46,000 square miles and 87 permit areas (PAs). I arbitrarily pooled PAs into 11 geographic units to describe general population trends and management issues at a broader scale (Figure 1). Several management strategies were available in 2010 including: 1) youth-only lottery with varying number of permits, 2) lottery with varying number of antlerless permits, 3) managed, and 4) intensive (Figure 2). The strategy employed during a given year depended upon where the population density was in relation to the population density goal (Figures 3 and 4).

We began using a youth-only antlerless permit system for the first time in 2009 (herein referred to as "bucks-only), which was the most conservative management strategy available to Minnesota wildlife managers. The Twin Cities metro region (PA 601) was not modeled due to limited hunting opportunities, and PAs 224, 235 and 238 were not modeled due to demographic stochastic error associated with their small population sizes (Grund and Woolf 2004).

Population Modeling

The population model used to analyze past population trends and test harvest strategies can be best described as an accounting procedure that subtracts losses, adds gains, and keeps a running total of the number of animals alive in various sex-age classes during successive periods of the annual cycle. The deer population 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. Fertility rates were typically estimated at the regional 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 region. The deer population increased in size after reproduction was simulated. Non-hunting mortality rates occurring during summer months (prior to the hunting season) were estimated from field studies conducted in Minnesota and other agricultural 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 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 (Grund and Woolf 2004). 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.

RESULTS

Population Trends and Densities

Northwest Management Units

Karlstad Unit – Populations were generally stable (Table 1) and deer densities were at or near the deer density goals established in 2005 in each of these units. However, deer populations immediately to the west of PA 101 were managed more aggressively and population reductions were expected. These populations were not managed according to the population goals due to concerns about potential transmission of Bovine Tuberculosis into adjacent permit areas. Deer densities averaged 6 deer per square mile (SD = 2 deer per square mile).

Crookston/TRF Unit – Deer densities have declined throughout all of these units due to the use of early antlerless seasons in 5 consecutive years (Table 1). Consequently, these PAs were designated as managed or intensive and early antlerless seasons were not used during the 2010 hunting season. These more conservative management strategies will reduce the antlerless harvest by >40% and will allow the populations to stabilize or increase toward goal densities. Similar to the Karlstad unit, deer densities averaged 5 deer per square mile (SD = 2 deer per square mile).

Mahnomen Unit – With the exception of PA 262, all populations were at or near goal densities (Table 1). The antlerless harvest should be reduced by >40% in the Mahnomen Unit during the 2010 hunting season because early antlerless seasons were used in most of these PAs during 2009 whereas most of them were designated as managed during the 2010 hunting season (Figure 2). The deer density averaged 6 deer per square mile (SD = 4 deer per square mile) and managers expressed few management concerns in this region.

Central Management Units

Morris Unit – All populations were at goal densities with the exception of PA 276, which the population model indicated was above goal in 2010 (Figure 4). Population densities varied considerably in this region and averaged 4 deer per square mile (SD = 3 deer per square mile).

Osakis Unit – All populations were at or near goal densities in 2010 (Figure 4). Permit areas 239 and 213 were designated as managed rather than lottery during the 2010 season, which

will increase the antlerless harvest 30-40% and allow populations stabilize at the established goal densities. Population densities averaged 13 deer per square mile (SD = 3 deer per square mile) and managers expressed few management concerns in this region.

Cambridge Unit – Deer densities were generally stable throughout this unit (Table 1). However, all PA populations remained well above goal in 2010 with the exception of the deer herd in PA 223 (Figure 4). This unit was an active participant in the ADM study and 3 of the PAs were managed with early antlerless seasons for 5 consecutive years. Aerial surveys conducted in 2010 confirmed deer densities did not decline as a result of the early antlerless seasons, however. Population densities averaged 13 deer per square mile (SD = 3 deer per square mile).

Hutchinson Unit – About half of these PAs were at goal in this unit, the other half were below goal (Figure 4). Populations have increased throughout this unit as a result of designating the PAs as bucks-only or using very conservative lottery quotas over the past 2-3 years (Table 1). Densities varied considerably in this unit and averaged 6 deer per square mile (SD = 4 deer per square mile).

Southern Management Units

Minnesota River Unit – All permit areas were at goal in this unit (Figure 4) and more aggressive management were used in 2010 to stabilize deer numbers (Figure 3). Deer densities averaged 6 deer per square mile (SD = 2 deer per square mile).

Slayton Unit – Deer densities remain below goal in about 75% of the PAs in this unit. However, deer densities were increasing and all should be at or near goal densities by 2012. As a result of increasing deer densities, the number of PAs designated as bucks-only decreased from 6 to 4 from 2009 to 2010, respectively. No PAs should be designated as bucks-only in 2011. Deer densities averaged 3 deer per square mile (SD = 1 deer per square mile) in spring 2010.

Waseca Unit – Population densities have generally been stable over the past few years and were at or near density goals (Table 1, Figure 4). There was relatively little variability in deer densities across the unit and deer densities averaged 5 deer per square mile (SD = 1 deer per square mile).

Rochester Unit – Most deer densities were at or near goal with the exception of PA 346 and 349 where early antlerless seasons have been used the past 3 years. Although deer densities have begun to decline in those 2 PAs, early antlerless seasons will be used again in 2010 to further move the populations toward goal. Deer densities were much lower in the northern portion of the unit and deer densities averaged 13 deer per square mile (SD = 6 deer per square mile) throughout this entire unit.

LITERATURE CITED

DUNBAR, E. J. 2005. Fetus survey data result of white-tailed deer in the farmland/transition zone of Minnesota—2005 *in* Dexter, M. H., editor, Status of wildlife populations, fall 2005. Unpublished report, Division of Fish and Wildlife, Minnesota Department of Natural Resources, St. Paul, Minnesota, USA. 270pp.

GRUND, M. D., and A. WOOLF. 2004. Development and evaluation of an accounting model for estimating deer population sizes. Ecological Modeling 180:345-357.

Figure 1. Deer management units in the farmland zone of Minnesota, 2010.

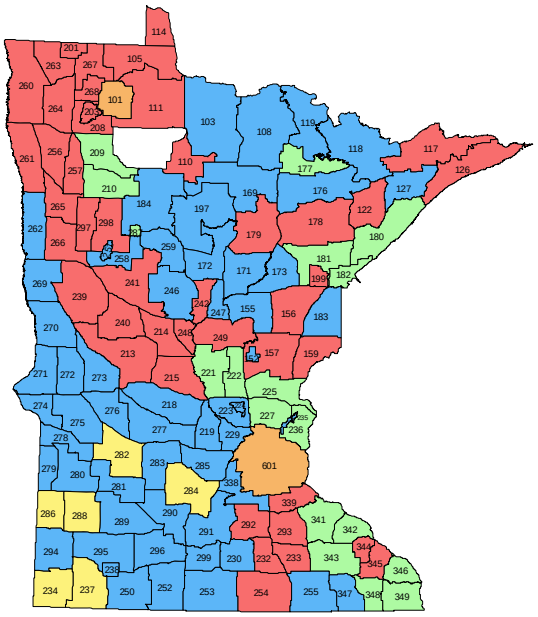


Figure 2. Deer management strategies used in permit areas throughout Minnesota, 2010. Permit areas are numbered and management strategies are color-coded. Permit areas are designated as: 1) bucks-only if colored yellow, 2) lottery if colored blue, 3) managed if colored red, and 4) intensive if colored green.

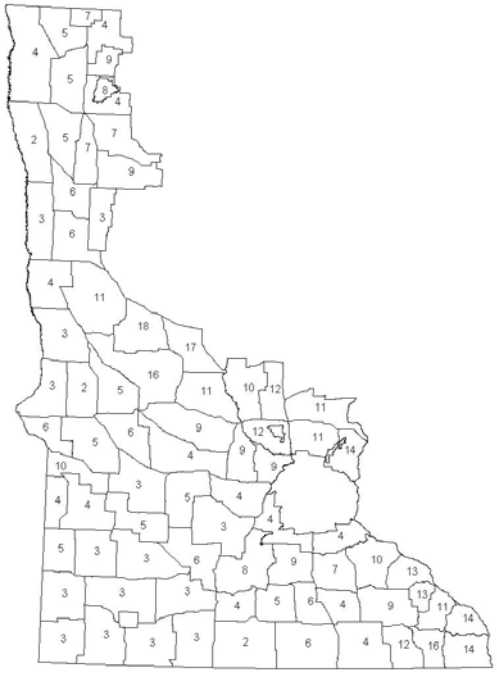


Figure 3. Population density goals in deer permit areas in Minnesota, 2010.

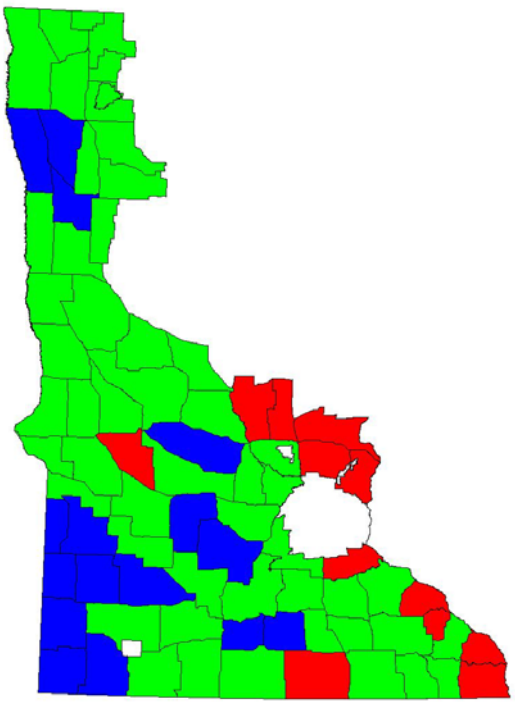


Figure 4. Population density relative to goal density in Minnesota, 2010. Permit areas colored in blue were below goal, permit areas colored in green were at goal, and permit areas colored in red were above goal.

Table 1. Pre-fawn deer density (deer/mi^2) as simulated from population modeling in each permit area of Minnesota's Farmland/Transition Zone, 1998-2010.

Region / Permit Area	Area (mi^2)	Pre-fawning Density												
		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Karlstad														
201	161	2	3	4	4	5	5	4	5	5	5	5	5	6
260	1249										4	4	4	4
263	512										5	5	5	5
203	118	3	4	5	5	6	8	7	7	7	7	6	7	7
208	379	3	3	4	4	4	5	4	4	4	4	4	4	4
267	472										5	4	5	4
268	229										9	10	10	10
264	669										7	7	7	6
Total	3789	3	3	4	4	5	6	5	4	4	6	6	6	6
Crookston														
261	795										2	2	1	1
256	653	6	6	6	7	8	8	8	7	7	6	4	4	3
257	413	8	8	8	8	8	7	8	9	8	8	7	7	6
209	639	6	6	6	7	7	7	8	9	9	8	8	8	7
210	615	10	11	11	11	12	11	12	13	12	12	11	10	10
Total	3115	8	8	8	8	9	8	8	8	8	7	7	6	5
Mahnomen														
262	677										2	2	2	2
265	494										8	7	6	4
266	617										5	6	7	7
297	438									4	3	3	2	3
Total	2226										6	6	6	6

Table 1. (continued)

Morris														
269	650	3	3	3	4	4	4	4	4	3	2	3	3	3
270	748	3	3	3	3	3	4	4	2	1	1	1	2	2
271	632	2	2	2	2	2	3	3	4	2	1	1	2	3
272	531	3	3	3	3	4	4	2	2	2	2	2	2	2
273	572									4	4	5	5	5
274	360	6	6	5	4	4	4	4	4	4	4	4	5	6
275	764	4	4	4	3	3	3	3	4	4	3	3	4	5
276	543	9	9	8	8	8	8	7	7	6	5	5	6	7
282	779	1	1	1	1	1	1	1	2	1	2	2	3	4
Total	5579	4	4	4	4	4	4	4	4	3	3	3	4	4
Osakis														
239	922	13	15	16	16	15	14	13	12	12	11	10	11	12
240	642	21	23	25	26	27	26	21	20	19	18	18	17	17
213	1057									14	13	13	15	17
214	557	17	18	18	19	19	19	20	19	18	19	18	17	16
215	701	9	9	9	9	10	10	9	8	9	9	9	10	10
Total	3879	15	16	17	18	18	17	16	15	15	14	13	13	13
Cambridge														
221	642	10	11	12	11	12	13	13	12	13	13	12	12	12
222	413	13	14	14	14	15	15	14	14	15	16	15	15	15
223	377	9	8	11	10	9	11	9	8	11	11	10	11	12
225	618	14	15	18	19	16	16	15	13	13	15	15	15	14
227	471	13	13	13	12	11	11	10	9	13	14	13	14	15
229	287	5	5	6	6	6	7	7	6	7	7	6	7	8
236	372	16	17	17	16	17	17	18	18	18	19	18	19	20
Total	3180	11	12	13	13	12	13	12	11	13	13	12	12	13

Table 1. (continued)

Hutchinson														
218	884									8	7	7	7	7
277	813									3	3	3	4	4
219	392	8	8	9	7	7	8	7	7	7	7	7	8	8
229	287	5	5	6	6	6	7	7	6	7	7	6	7	8
285	550	3	4	4	4	4	5	6	4	3	3	3	3	4
283	614	3	3	3	3	4	4	3	3	3	4	2	3	3
284	838	1	1	2	2	2	2	2	3	2	2	2	2	3
Total	4378	4	4	5	4	5	5	5	5	5	5	5	6	6
Minnesota River														
278	401	9	8	8	8	8	9	10	8	8	8	8	9	11
281	575	5	5	5	4	4	5	5	6	4	4	4	5	6
290	662	4	4	4	4	4	4	4	4	4	4	5	6	7
291	802	4	4	4	4	4	5	5	5	4	5	5	5	7
Total	2440	6	5	5	5	5	6	6	6	5	5	6	6	7
Slayton														
237	729	2	2	2	3	3	4	3	2	2	2	2	2	2
279	344	6	7	7	6	6	6	5	5	4	3	3	3	3
280	675	2	2	2	2	2	2	2	3	2	3	2	2	3
286	446	2	2	3	4	4	4	4	4	4	4	3	3	4
288	625	3	2	3	4	4	4	4	4	3	2	2	2	2
289	816	1	2	1	1	1	2	2	1	2	2	2	2	2
294	686	3	3	3	3	3	3	4	2	2	2	2	2	2
295	840	3	3	3	3	3	4	4	4	3	2	2	3	3
296	666	2	3	3	3	3	3	3	3	2	2	2	3	3
234	636	3	3	4	4	4	4	5	4	3	2	2	2	2
250	712	3	3	3	4	4	4	5	4	4	2	2	3	3
Total	5734	3	3	3	3	3	4	4	4	3	3	3	3	3

Table 1. (continued)

Waseca														
292	480	8	8	8	7	7	8	7	7	8	8	8	7	7
293	511	8	8	8	8	8	7	7	8	8	7	7	7	7
299	386	6	5	5	5	5	5	5	5	3	3	2	2	3
230	452	3	3	3	3	3	4	4	4	4	4	4	3	4
232	377	4	4	4	4	4	4	4	4	5	5	5	5	6
233	385	4	4	4	4	4	5	5	4	4	4	4	4	4
252	715	2	2	2	2	2	2	3	2	2	2	2	2	3
253	974	3	3	3	3	3	3	4	3	2	2	2	2	2
254	930	4	4	4	4	4	4	4	5	4	5	5	6	8
255	774	3	4	4	4	4	4	4	4	4	4	3	4	4
Total	5269	5	5	5	5	5	5	5	5	5	5	5	5	5
Rochester														
338	454	4	4	4	4	5	5	4	4	4	4	4	5	5
339	394	5	5	4	5	5	4	4	5	5	4	5	5	6
341	611	9	9	9	9	10	10	9	10	9	10	10	10	10
342	350	11	11	12	11	13	15	17	13	13	13	14	15	16
343	662	8	8	9	9	11	13	11	13	10	10	11	10	9
344	189	15	14	14	14	15	15	13	12	11	11	12	15	18
345	326	11	11	11	10	10	11	12	11	12	11	12	12	12
346	319	18	18	19	19	19	20	20	21	22	23	22	22	21
347	434	9	9	9	9	10	11	12	13	13	12	11	10	11
348	332	17	17	16	15	15	16	17	18	20	19	19	16	16
349	492	15	16	17	17	18	21	20	21	22	22	20	19	16
Total	4563	11	11	11	11	12	13	13	13	13	13	13	13	12