# FARMLAND WILDLIFE POPULATIONS

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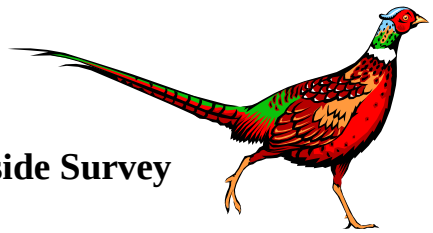

# 2012 Minnesota August Roadside Survey

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## ABSTRACT

Population indices for ring-necked pheasants, gray partridge, and mourning doves increased from last year, and population indices for cottontail rabbits and white-tailed jackrabbits were similar to 2011 but below long-term averages. The population index for white-tailed deer was similar to 2011 and the 10-year average. Sandhill crane indices were also unchanged from last year. Conservation Reserve Program (CRP) enrollment in Minnesota declined by 43,000 acres from 2011, but increases in enrollment of other farm programs and acquisition of public lands partially offset CRP losses, yielding a net loss of about 4,300 acres of protected grassland habitat. Within the pheasant range, a net gain of farm program enrollments and public land acquisitions yielded a net gain of nearly 32,000 acres of protected habitat. The winter of 2011-12 was unusually mild for the entire farmland region, and it was followed by a warm spring. Thus, conditions for overwinter survival of farmland wildlife in 2012 were above average, and reproductive conditions were generally favorable.

The 2012 pheasant index (38.9 birds/100 mi) increased 68% from 2011, but remained 51% below the 10-year average, 62% below the long-term average, and 87% 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 2012 hen pheasant index was 75% above last year but 51% below the 10-year average, reflecting progress toward recovery from last year's dramatic decline. The number of broods observed was 105% above last year but 48% below the 10-year average. Projecting from the roadside index, an estimated 291,000 roosters may be harvested this fall, similar to 2001. The best opportunity for harvesting pheasants appears to be in the West Central, East Central, and Southwest regions.

The gray partridge index increased 180% from last year, was similar to the 10-year mean, but 68% 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, South Central, and Southeast regions.

The cottontail rabbit index was similar to last year, but 34% below the 10-year average and 34% below the long-term average. Counts of cottontail rabbits were highest in the East Central, Southeast, and South Central regions. The jackrabbit index did not change significantly in 2012, but was 93% 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 South Central region.

The number of mourning doves observed in 2012 was 36% above last year, similar to the 10-year average, but 16% below the long-term average. In contrast, the white-tailed deer index was similar to last year and the 10-year average, but 51% higher than the long-term average. Sandhill crane indices were unchanged from 2011.

## INTRODUCTION

This report summarizes the 2012 Minnesota August roadside survey. The survey is conducted annually during the first half of August by Minnesota Department of Natural Resources (MNDNR) enforcement and wildlife personnel throughout 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. These data provide an **index of relative abundance** and are used to monitor annual changes and long-term trends in regional and range-wide populations. Results are reported by agricultural region (Figure 1) and range-wide; however, population indices for species with low detection rates are imprecise and should be interpreted cautiously.


## ACKNOWLEDGMENTS

I thank all cooperators for their efforts in completing routes in 2012; without their help the survey would not be possible. Tonya Klinkner provided logistical assistance including mailing packages and entering data. John Giudice and Marrett Grund 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 winter of 2011-12 was the unusually mild for the farmland region of Minnesota. Snow cover from early-December through late March was intermittent throughout the farmland zone, with snow depths exceeding 6 inches for less than 3 consecutive weeks (Minnesota Climatology Working Group [MCWG], http://climate.umn.edu/doc/snowmap.htm). In addition, monthly temperatures averaged 10$^{o}$F above normal (range 6$^{o}$F to 16$^{o}$F, MCWG, http://climate.umn.edu/cawap/monsum/monsum.asp) in all farmland regions from December through March. Warm conditions continued through April, May, and June in most farmland regions, and spring precipitation was normal to below normal except in May. Thus, conditions for over-winter survival of farmland wildlife were very good throughout most of the farmland region in 2012, and conditions for production of young were generally favorable except for excessive rain in May.

## HABITAT CONDITIONS

Habitat changes since 2011 varied widely across Minnesota. CRP enrollment declined by nearly 43,000 acres statewide, but losses in northwestern Minnesota's prairie chicken range

(46,987 acres lost) were contrasted by a net gain of 10,027 acres in Minnesota's pheasant range. In addition, gains in enrollments of Reinvest in Minnesota (RIM), Wetlands Reserve Program (WRP), RIM- WRP, and acquisitions of Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA) offset CRP losses, yielding a net loss of protected habitat statewide of 4,318 acres. In Minnesota's pheasant range, a net gain of 24,758 acres of farm program enrollments plus 6,942 new acres protected as WMAs and WPAs yielded a net increase of 31,701 acres of protected habitat. Within the pheasant range, protected habitats account for about 6.2% of the landscape (range: 3.0-10.3%; 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 a major concern for future wildlife populations, with over 620,000 acres in Minnesota scheduled to expire in the next 3 years. Furthermore, the 43rd general CRP signup held during spring, 2012, enrolled far fewer acres (99,565) than are expiring on September 30, 2012 (289,796 acres). The future of farmland retirement programs remains under threat due to competing economic opportunities (e.g., high land rental rates, ethanol production).

New funding from the Legacy Amendment has accelerated acquisition of WMAs and WPAs throughout Minnesota's farmland zone. In addition, the Working Lands Initiative (http://www.dnr.state.mn.us/workinglands/index.html) continues to protect and expand large wetland-grassland complexes in selected counties in western Minnesota.

## SURVEY CONDITIONS

Observers completed all 171 routes in 2012. 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 97% of the survey routes, which was similar to 2011 (96%) but better than the 10-year average (93%). Clear skies (<30% cloud cover) were present at the start of 88% of routes, with wind speeds <7 mph recorded for 95% of routes. The survey period was extended to July 30$^{th}$ - August 20$^{th}$ to allow all routes to be completed.

## RING-NECKED PHEASANT

The average number of pheasants observed (38.9/100 mi) increased 68% (Table 2) from 2011 but remained 51% below the 10-year average (Table 2; Figure 2A), 62% below the long-term average (Table 2), and 87% below the benchmark years of 1955-64. Total pheasants observed per 100 miles ranged from 3.6 in the Southeast to 58.0 in the West Central region (Table 3). Changes from last year were significant in the West Central (+105%), Central (+57%), and Southwest regions (+173%; Table 3).

The range-wide hen index (6.0 hens/100 mi) was 75% above last year, but 51% below the 10-year average (Table 2). The hen index varied from 1.1 hens/100 miles in the Southeast to 8.9 hens/100 miles in the East Central region, and was higher than last year for the Southwest region. The range-wide cock index (4.4 cocks/100 mi) was similar to 2011 but 48% below the 10-year average (Table 2). The 2012 hen:cock ratio was 1.33, which was very close to average (1.47 ± 0.33 [SD]) for the CRP years (1987-2011).

The number of pheasant broods observed (6.4/100 mi) was 105% above last year, but 48% below the 10-year average, and 52% 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 0.8 broods/100 miles in the Southeast to 9.5 broods/100 miles in the West Central region. Average brood size in 2012 (4.4 ± 0.2 [SE] chicks/brood) was similar to last year (4.6 ± 0.2 [SE] chicks/brood), but below the 10-year mean (4.7 ± 0.1 [SE] chicks/brood) and the long-term average (5.5 ± 0.1 [SE] chicks/brood; Table 2). The median hatch date for pheasants was June 7 ($n$ = 236), similar to the 10-year average (Table 2). The distribution of estimated hatch dates for observed broods was unimodal and normally distributed, which suggests that the heavy rains in May were not abnormally disruptive to nesting attempts. Successful late-season nests tend to be underrepresented in roadside data. Median age of broods observed was 8 weeks (range: 1-16 weeks).

A mild winter throughout the pheasant range was expected to result in greater hen counts, and this was observed in the survey data. In addition, warm weather during April - June likely contributed to greater brood survival rates. Thus, an increase in the range-wide pheasant index was expected, but counts remain well below the 10-year average. Projecting from the roadside index, an estimated 291,000 roosters may be harvested this fall, similar to 2001 (Figure 2A). The best opportunity for harvesting pheasants appears to be in the West Central, East Central, and Southwest regions.

**GRAY PARTRIDGE**

Range-wide, the gray partridge index (4.8 partridge/100 miles) was greater than last year, similar to the 10-year average and 68% below the long-term average (Table 2, Figure 2B). Within regions, the partridge index ranged from 0.3/100 miles in the East Central region to 9.9/100 miles in the Southwest region (Table 3). There were no significant regional changes from last year (Table 3). Observations of gray partridge were too few for analysis by age class ($n$=18 broods statewide).

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, South Central , and Southeast offer the best opportunity for harvesting gray partridge in 2012.

**COTTONTAIL RABBIT and WHITE-TAILED JACKRABBIT**

The eastern cottontail rabbit index (4.1 rabbits/100 mi) was similar to last year, but 34% below the 10-year average and 34% below the long-term average (Table 2, Figure 3A). The cottontail rabbit index ranged from 0.2 rabbits/100 miles in the Northwest to 12.6 rabbits/100 miles in the East Central region (Table 3). Among regions, cottontail indices increased significantly from last year only in the West Central region +218%; Table 3). The best opportunities for harvesting cottontail rabbits are in the East Central, Southeast, and South Central regions.

The index of white-tailed jackrabbits did not change significantly from 2011 or the 10-year average, but was 93% below the long-term average (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 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 and South Central regions (Table 3). 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 (14.2 deer/100 mi) was similar to last year and the 10-year average, but 51% above the long-term average (Table 2, Figure 4A). Among regions, deer indices were comparable to indices derived in 2011 (Table 3).

**MOURNING DOVE**

The number of mourning doves observed (213.8 doves/100 mi) in 2012 was 36% above last year, similar to the 10-year average, but 16% below the long-term average (Table 2, Figure 4B). The mourning dove index ranged from 80.1 doves/100 miles in the Northwest region to 315.5 doves/100 miles in the South 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 0.8% per year (95% CI: -2.6 to 1.5%) during 2003-2012 and declined 1.3% per year (95% CI: -2.0 to -0.5%) during 1966-2012 (Seamans et al. 2012).

**SANDHILL CRANE**

For only the fourth consecutive year, observers were asked to report the number of adult and juvenile sandhill cranes observed on the August Roadside Survey. Range-wide, the 2012 index averaged 10.3 cranes/100 miles of survey, including 1.4 juveniles/100 miles (Table 2). Compared to 2011, we detected no change in the total number of cranes observed or the number of juvenile cranes observed (Table 2). Among regions, crane indices ranged from 0.0/100 miles in the Southwest and Southeast regions to 42.0 cranes/100 miles in the Northwest region (Table 3). Regional crane indices were not significantly different from last year (Table 3). Juvenile cranes were observed in the Central (3.9/100 mi), East Central (1.7/100 mi), West Central (0.6/100 mi), South Central (0.4/100 mi), and Northwest (3.1/100 mi) regions.

**OTHER SPECIES**

Notable incidental sightings: trumpeter swan (Clay and Kandiyohi Counties), indigo bunting (Le Sueur County), red-headed woodpecker (Todd County), northern shrike (Le Sueur County), and upland sandpiper (Watonwan and Wilkin Counties).

## LITERATURE CITED

Seamans, M. E., R. D. Rau, and T. A. Sanders. 2012. Mourning dove population status, 2012. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

[MCWG] Minnesota Climatology Working Group. 2012. MCWG Home Page http://climate.umn.edu/. Accessed on August 24, 2012.

Table 1. Abundance (total acres) and density (acres/mi$^2$) of undisturbed grassland habitat within Minnesota's pheasant range, 2012[a].

| | Cropland Retirement | | | | | | | | | Density |
|---|---|---|---|---|---|---|---|---|---|---|
| AGREG | CRP | CREP | RIM | RIM-WRP | WRP | USFWS[c] | MNDNR[d] | Total | % | ac/mi2 |
| WC[b] | 316,175 | 39,240 | 19,732 | 10,628 | 19,176 | 183,630 | 108,917 | 697,497 | 10.3 | 65.7 |
| SW | 105,154 | 25,286 | 17,990 | 1,251 | 766 | 20,643 | 58,160 | 229,248 | 6.1 | 38.8 |
| C | 136,743 | 15,320 | 17,273 | 4,694 | 3,100 | 86,708 | 47,137 | 310,975 | 5.1 | 32.9 |
| SC | 90,358 | 28,237 | 12,397 | 7,107 | 8,791 | 8,515 | 32,474 | 187,880 | 4.6 | 29.8 |
| SE | 74,443 | 2,733 | 9,589 | 630 | 812 | 36,370 | 52,659 | 177,237 | 4.8 | 30.6 |
| EC | 4,387 | 0 | 1,131 | 0 | 4 | 4,720 | 86,315 | 96,556 | 3.0 | 19.3 |
| Total | 727,260 | 110,816 | 78,112 | 24,309 | 32,649 | 340,587 | 385,661 | 1,699,393 | 6.2 | 39.4 |

[a] Unpublished data, Tabor Hoek, BWSR, 23 August 2012.
[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, 1955-2012.

| Species | Change from 2011[a] | | | | | Change from 10-year average[b] | | | | Change from long-term average[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subgroup | *n* | 2011 | 2012 | % | 95% CI | *n* | 2002-11 | % | 95% CI | *n* | LTA | % | 95% CI |
| **Ring-necked pheasant** | | | | | | | | | | | | | |
| Total pheasants | 147 | 23.2 | 38.9 | 68 | ±34 | 147 | 79.7 | -51 | ±14 | 150 | 99.4 | -62 | ±9 |
| Cocks | 147 | 5.2 | 4.4 | -15 | ±25 | | 8.6 | -48 | ±13 | | 11.2 | -61 | ±12 |
| Hens | 147 | 3.4 | 6.0 | 75 | ±42 | | 12.2 | -51 | ±14 | | 14.4 | -60 | ±11 |
| Broods | 147 | 3.1 | 6.4 | 105 | ±41 | | 12.4 | -48 | ±14 | | 13.0 | -52 | ±11 |
| Chicks per brood | 236 | 4.6 | 4.4 | -4 | | | 4.7 | -6 | | | 5.5 | -20 | |
| Broods per 100 hens | 147 | 92.1 | 107.8 | 17 | | | 101.6 | 6 | | | 101.3 | 6 | |
| Median hatch date | 236 | Jun 9 | Jun 7 | | | | Jun 09 | | | | | | |
| **Gray partridge** | | | | | | | | | | | | | |
| Total partridge | 165 | 1.7 | 4.8 | 180 | ±175 | 166 | 6.4 | -26 | ±40 | 150 | 15.5 | -68 | ±21 |
| **Eastern cottontail** | 165 | 3.6 | 4.1 | 12 | ±30 | 166 | 6.1 | -34 | ±15 | 150 | 6.7 | -34 | ±15 |
| **White-tailed jackrabbit** | 165 | 0.2 | 0.2 | 1 | ±121 | 166 | 0.3 | -41 | ±50 | 150 | 1.8 | -93 | ±15 |
| **White-tailed deer** | 165 | 14.9 | 14.2 | -5 | ±22 | 166 | 15.2 | -5 | ±18 | 169 | 9.4 | 51 | ±22 |
| **Mourning dove** | 165 | 157.0 | 213.8 | 36 | ±18 | 166 | 219.1 | -3 | ±11 | 150 | 272.9 | -16 | ±12 |
| **Sandhill Crane** | | | | | | | | | | | | | |
| Total cranes | 165 | 10.7 | 10.3 | -4 | ±44 | | | | | | | | |
| Juveniles | 165 | 2.4 | 1.4 | -43 | ±50 | | | | | | | | |

[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 = 1955-2011, except for deer = 1974-2011. 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, 1955-2012.

| Region | Change from 2011[a] | | | | | Change from 10-year average[b] | | | | Change from long-term average[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | *n* | 2011 | 2012 | % | 95% CI | *n* | 2002-11 | % | 95% CI | *n* | LTA | % | 95% CI |
| **Northwest**[d] | | | | | | | | | | | | | |
| Gray partridge | 18 | 0.0 | 2.0 | | | 17 | 0.4 | -100 | ±104 | 17 | 4.0 | -100 | ±70 |
| Eastern cottontail | | 0.0 | 0.2 | | | | 1.0 | -100 | ±81 | | 1.0 | -100 | ±63 |
| White-tailed jackrabbit | | 0.0 | 0.4 | | | | 0.5 | -100 | ±47 | | 0.7 | -100 | ±46 |
| White-tailed deer | | 33.2 | 27.3 | -18 | ±68 | | 44.1 | -28 | ±44 | | 26.9 | 18 | ±78 |
| Mourning dove | | 94.5 | 80.1 | -15 | ±108 | | 83.6 | 19 | ±123 | | 129.1 | -23 | ±67 |
| Sandhill Crane | | 33.6 | 42.0 | 25 | ±75 | | | | | | | | |
| **West Central** | | | | | | | | | | | | | |
| Ring-necked pheasant | 33 | 28.2 | 58.0 | 105 | ±84 | 33 | 85.2 | -67 | ±30 | 33 | 105.0 | -73 | ±18 |
| Gray partridge | | 0.0 | 0.6 | | | | 2.7 | -100 | ±58 | | 10.0 | -100 | ±23 |
| Eastern cottontail | | 0.7 | 2.3 | 218 | ±162 | | 3.2 | -77 | ±27 | | 4.3 | -83 | ±18 |
| White-tailed jackrabbit | | 0.1 | 0.2 | 100 | ±461 | | 0.5 | -74 | ±82 | | 2.1 | -94 | ±22 |
| White-tailed deer | | 18.2 | 14.1 | -23 | ±28 | | 12.8 | 42 | ±46 | | 9.1 | 99 | ±75 |
| Mourning dove | | 201.7 | 244.2 | 21 | ±24 | | 267.7 | -25 | ±21 | | 371.3 | -46 | ±12 |
| Sandhill Crane | | 1.2 | 2.3 | 90 | ±289 | | | | | | | | |
| **Central** | | | | | | | | | | | | | |
| Ring-necked pheasant | 30 | 18.9 | 29.7 | 57 | ±51 | 29 | 70.2 | -72 | ±22 | 29 | 76.2 | -74 | ±19 |
| Gray partridge | | 0.3 | 3.9 | 1350 | ±2040 | | 3.5 | -92 | ±64 | | 9.9 | -97 | ±42 |
| Eastern cottontail | | 2.7 | 3.2 | 20 | ±69 | | 6.5 | -57 | ±36 | | 6.4 | -57 | ±21 |
| White-tailed jackrabbit | | 0.0 | 0.0 | | | | 0.2 | -100 | ±74 | | 1.3 | -100 | ±22 |
| White-tailed deer | | 12.7 | 13.2 | 4 | ±43 | | 7.2 | 83 | ±70 | | 4.3 | 204 | ±123 |
| Mourning dove | | 155.5 | 238.7 | 54 | ±55 | | 196.5 | -19 | ±27 | | 235.5 | -32 | ±23 |
| Sandhill Crane | | 17.2 | 22.0 | 28 | ±95 | | | | | | | | |
| **East Central** | | | | | | | | | | | | | |
| Ring-necked pheasant | 13 | 50.6 | 55.2 | 9.1 | ±56 | 14 | 55.5 | -9 | ±57 | 14 | 85.9 | -41 | ±36 |
| Gray partridge | | 0.0 | 0.3 | | | | 0.0 | | | | 0.1 | -100 | ±133 |
| Eastern cottontail | | 9.1 | 12.6 | 38 | ±96 | | 10.1 | -10 | ±70 | | 8.7 | 5 | ±68 |
| White-tailed jackrabbit | | 0.0 | 0.0 | | | | 0.0 | | | | 0.2 | -100 | ±57 |
| White-tailed deer | | 19.1 | 17.4 | -9 | ±98 | | 16.0 | 20 | ±127 | | 8.1 | 137 | ±248 |
| Mourning dove | | 99.4 | 92.5 | -7 | ±50 | | 100.1 | -1 | ±30 | | 127.1 | -22 | ±36 |
| Sandhill Crane | | 42.0 | 11.7 | -72 | ±72 | | | | | | | | |

Table 3. Continued.

| Region | Change from 2011 | | | | | Change from 10-year average | | | | Change from long-term average | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | *n* | 2011 | 2012 | % | 95% CI | *n* | 2002-11 | % | 95% CI | *n* | LTA | % | 95% CI |
| **Southwest** | | | | | | | | | | | | | |
| Ring-necked pheasant | 19 | 19.2 | 52.4 | 173 | ±134 | 19 | 159.8 | -88 | ±20 | 19 | 119.5 | -84 | ±15 |
| Gray partridge | | 4.0 | 9.9 | 147 | ±307 | | 23.3 | -83 | ±46 | | 42.4 | -91 | ±27 |
| Eastern cottontail | | 3.8 | 3.8 | 0 | ±89 | | 7.6 | -50 | ±40 | | 8.2 | -54 | ±33 |
| White-tailed jackrabbit | | 0.6 | 0.2 | -67 | ±173 | | 1.0 | -39 | ±93 | | 3.9 | -84 | ±30 |
| White-tailed deer | | 9.7 | 18.3 | 89 | ±89 | | 14.5 | -33 | ±38 | | 8.2 | 17 | ±58 |
| Mourning dove | | 189.6 | 229.8 | 21 | ±25 | | 334.1 | -43 | ±18 | | 314.9 | -40 | ±18 |
| Sandhill Crane | | 0.0 | 0.0 | | | | | | | | | | |
| **South Central** | | | | | | | | | | | | | |
| Ring-necked pheasant | 32 | 23.1 | 33.7 | 46 | ±77 | 32 | 85.1 | -73 | ±26 | 32 | 133.3 | -83 | ±13 |
| Gray partridge | | 4.3 | 9.5 | 123 | ±271 | | 12.4 | -66 | ±49 | | 19.3 | -78 | ±28 |
| Eastern cottontail | | 4.6 | 4.8 | 3 | ±50 | | 9.0 | -48 | ±21 | | 7.7 | -40 | ±23 |
| White-tailed jackrabbit | | 0.4 | 0.3 | -32 | ±155 | | 0.2 | 73 | ±158 | | 1.8 | -79 | ±32 |
| White-tailed deer | | 6.0 | 6.0 | 0 | ±76 | | 5.5 | 9 | ±62 | | 3.4 | 79 | ±98 |
| Mourning dove | | 177.4 | 315.5 | 78 | ±52 | | 278.3 | -36 | ±15 | | 259.0 | -32 | ±16 |
| Sandhill Crane | | 0.6 | 1.3 | 100 | ±176 | | | | | | | | |
| **Southeast** | | | | | | | | | | | | | |
| Ring-necked pheasant | 19 | 4.8 | 3.6 | -26 | ±139 | 19 | 26.6 | -80 | ±30 | 19 | 73.7 | -93 | ±27 |
| Gray partridge | | 3.2 | 6.1 | 93 | ±347 | | 5.7 | -44 | ±133 | | 13.9 | -77 | ±59 |
| Eastern cottontail | | 7.6 | 4.8 | -36 | ±57 | | 8.0 | -5 | ±51 | | 7.7 | -2 | ±51 |
| White-tailed jackrabbit | | 0.0 | 0.0 | | | | 0.1 | -100 | ±90 | | 0.6 | -100 | ±43 |
| White-tailed deer | | 12.9 | 11.4 | -12 | ±39 | | 15.9 | -19 | ±47 | | 10.2 | 26 | ±47 |
| Mourning dove | | 116.6 | 150.7 | 29 | ±40 | | 194.6 | -39 | ±19 | | 225.1 | -47 | ±17 |
| 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 = 1955-2011, except for Northwest region (1982-2011) and white-tailed deer (1974-2011). Estimates based on routes (*n*) surveyed ≥40 years (1955-2011), 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.

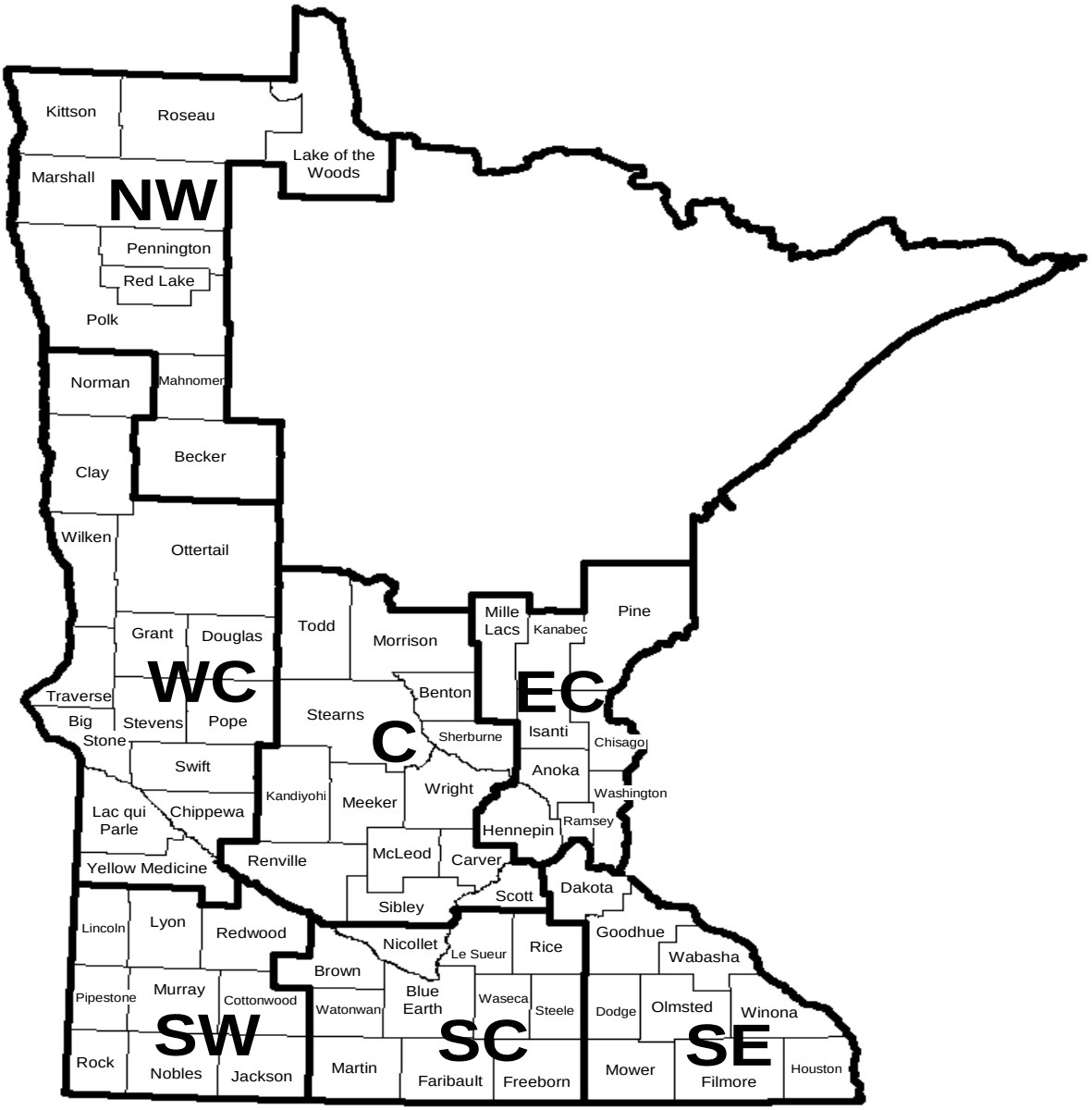


Figure 1. Survey regions for Minnesota's August roadside survey, 2012.

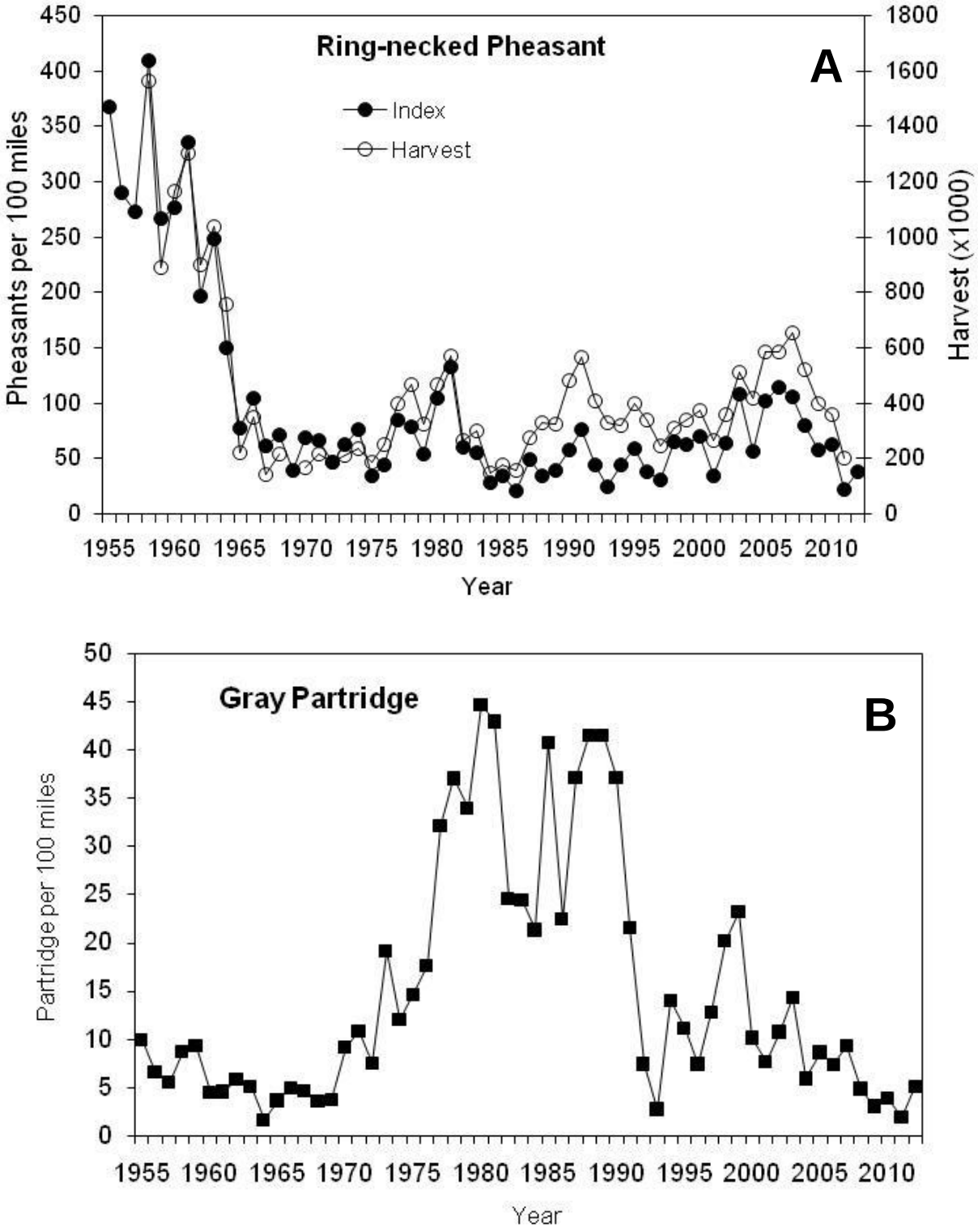


Figure 2. Range-wide index of ring-necked pheasants (**A**) and gray partridge (**B**) seen per 100 miles driven in Minnesota, 1955-2012. Does not include the Northwest region. Based on all survey routes completed.

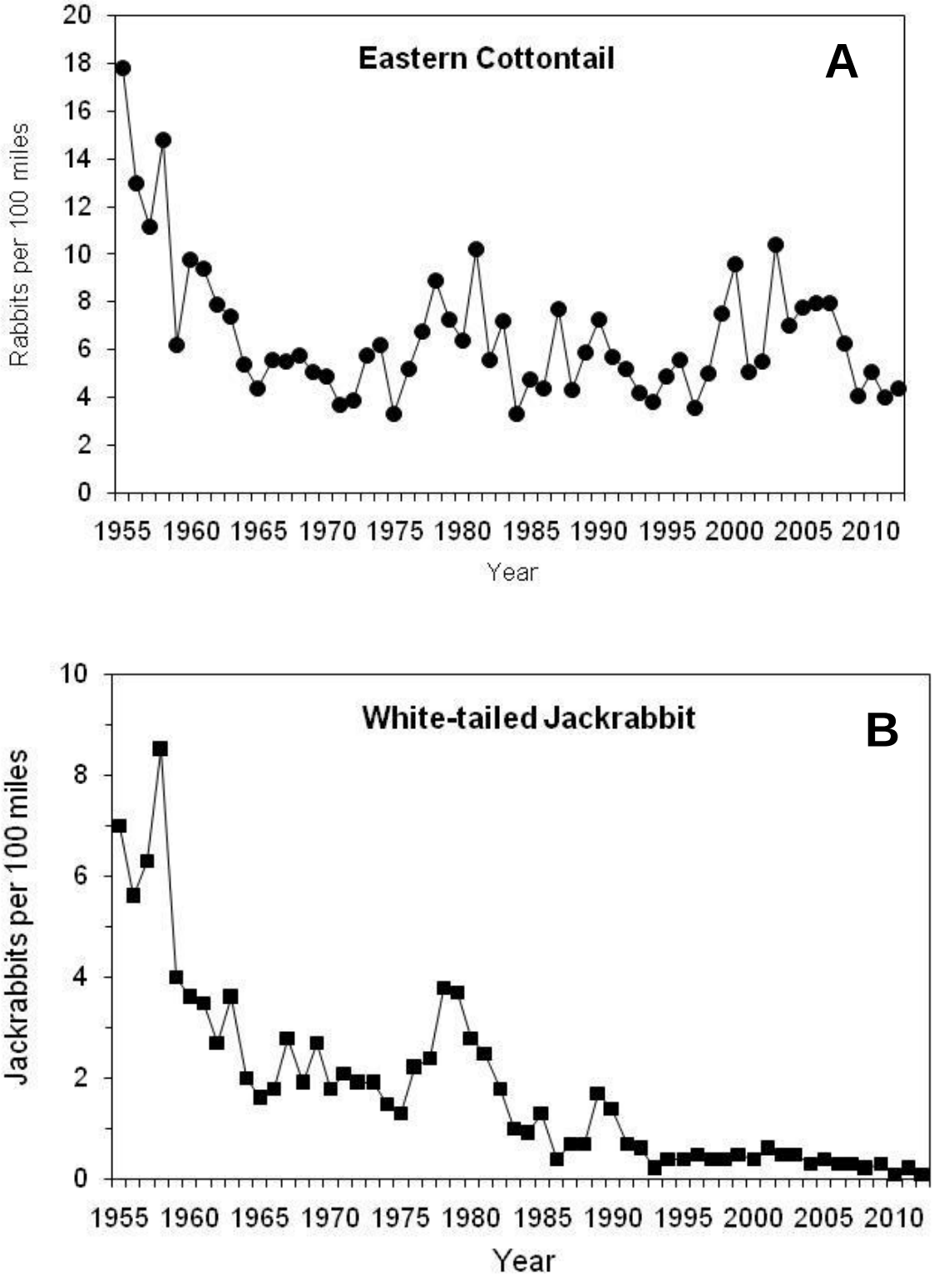


Figure 3. Range-wide index of eastern cottontail (**A**) and white-tailed jackrabbits (**B**) seen per 100 miles driven in Minnesota, 1955-2012. Does not include the Northwest region. Based on all survey routes completed.

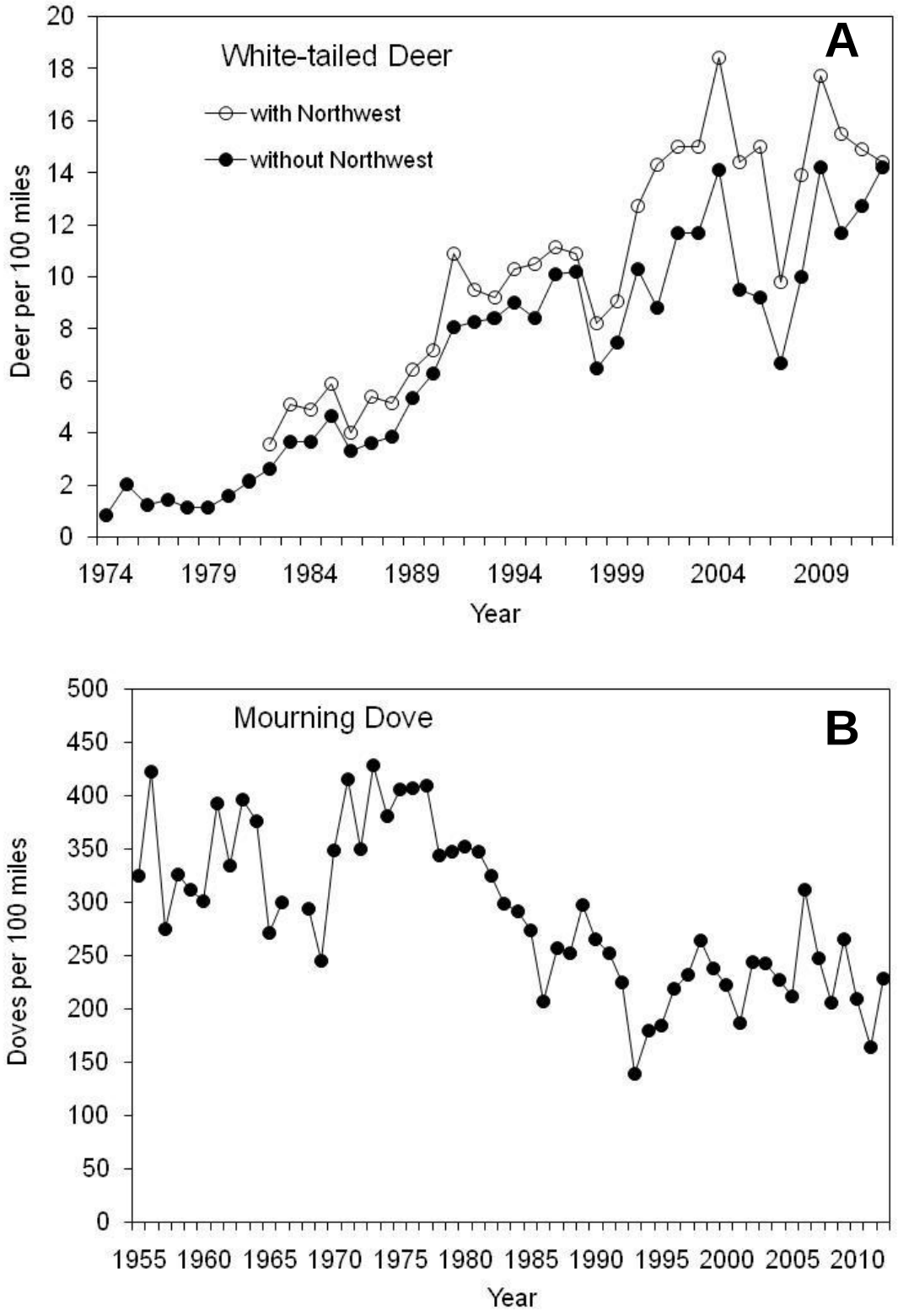


Figure 4. Range-wide index of white-tailed deer (**A**) and mourning doves (**B**) seen per 100 miles driven in Minnesota, 2012. Doves were not counted in 1967 and the dove index does not include the Northwest region. Based on all survey routes completed.

# Monitoring Population Trends Of White-Tailed Deer In Minnesota - 2012

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

## METHODS

I arbitrarily pooled permit areas (PAs) into 12 geographic units to describe general population trends and management issues at a broader scale (Figure 1). Several management strategies were available in 2011 including: 1) lottery with varying number of antlerless permits, 2) hunter's choice where hunters could hunt either-sex, 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. 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 population 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 (Figure 2).

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

## RESULTS

## Population Trends and Densities

### Northwest Management Units

*Karlstad Unit* – Deer numbers have declined 25-30% in this unit since 2007 and most populations are at or slightly below the goal density. Thus, management strategies applied during the 2012 hunting season were more conservative than those used over the past 5-7 years. However, deer populations immediately to the west of PA 101 were managed more aggressively than what would have been used if Bovine TB was not a concern. Spring deer densities were 3 - 5 deer per square mile in this unit, which is substantially lower than the Spring 2007 deer density (>5.0 deer per square mile).

*Crookston/TRF Unit* – Deer densities have declined 25-35% in this unit due to the use of early antlerless seasons in 5 consecutive years and winter mortality associated with the severe winter of 2010/2011 (Table 1). Consequently, most of these herds are at or below goal and the PAs were designated as hunter's choice or lottery. The unit deer density was 4-6 deer per square mile in Spring 2012.

*Mahnomen Unit* – Deer herd dynamics in this unit have been very stable over the last 5 years with deer densities varying between 3-5 deer per square mile (Table 1). All populations are at or slightly below goal densities (Figs. 3 and 4) and all permit areas were designated as lottery throughout the unit (Figure 2) in attempt of maintaining or slightly increasing the deer density.

## Central Management Units

*Morris Unit* – Deer densities have increased from about 3 deer per square mile in 2007 and were on track to reach deer goals, but the severe winter of 2010/2011 significantly increased winter mortality on fawns so the populations remain slightly below goal (Table 1). Most 2012 management strategies used in this unit were designed to slightly increase deer densities toward goal through 2013 (Figure 2).

*Osakis Unit* – Deer densities have been very stable in the Osakis unit over the past 5 years with deer densities fluctuating between 12-14 deer per square mile (Table 1). All populations were at or near goal densities in 2012 (Figs. 3 and 4). Due to increased thermal cover and slightly less snow in this region during the winter of 2010/2011, it appears winter mortality rates were not as significant compared to western and southern farmland units. However, management strategies used in 2012 were more conservative to protect additional antlerless deer and allow the population to slightly increase (Figure 2).

*Cambridge Unit* – Deer densities have been very stable with about 13 deer per square mile over the last 5 years (Table 1). Snow depths in this region were not a concern during the winter of 2010/2011 and therefore the winter had almost no impact on this deer herd. Consequently, this was the only region in the state where management strategies continued to be more aggressive. 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.

*Hutchinson Unit* – Deer densities were increasing in this unit since 2007, but the winter of 2010/2011 included deep snow and this unit has significantly less thermal cover than the units to the north. Consequently, winter mortality rates were higher in this unit and as a result and more conservative management strategies were used in 2012 to allow the populations to increase through the 2013 season (Figure 2).

## Southern Management Units

*Minnesota River Unit* – Although this unit has substantially more thermal cover than the surrounding units, the adult buck harvest unexpectedly declined in 2011, an indication of high winter mortality rates on fawn males. All trend indicators were increasing, but winter mortality rates on fawns in 2010 and 2011 could be as high as 30%, which significantly reduced recruitment during those years. Modeling suggests the deer densities were about 4 deer per square mile (Table 1). Management strategies were conservative again this year to allow the deer density to increase (Figure 2).

*Slayton Unit* – Harvest sex ratios have been heavily skewed towards adult bucks over the past 5 years, an indication that populations have been increasing. The impact the 2010 and 2011 winters had on these populations is very apparent, particularly with the unexpected drop in the adult buck harvest in 2011. Current deer densities remain low and are 2-4 deer per square mile. Many of these permit areas have been recalibrated using distance sampling, so most modeling estimates are based on field studies. Management strategies used in 2012 were conservative again this year in attempt to allow the population to increase (Figure 2).

*Waseca Unit* – The winter of 2010/2011 impacted deer populations along the western edge of this unit, but lower snow depths and more thermal cover throughout most of the unit lessened the impact of winter severity. Consequently, management strategies were more

conservative along the western portion of the unit but were more liberal in other permit areas (Figure 2).

*Rochester Unit* – Deer densities are at or are approaching desired goal densities throughout the unit (Table 1). Consequently, management strategies used were more conservative throughout the unit and the antlerless harvest is expected to decline in this unit during 2012 (Fig 2.). Similar to the Cambridge unit, snow depths were less in 2010 than in the southwestern deer units and this unit also has some of the best deer habitat in the state. Consequently, no measureable impact was observed from the winters of 2010 and 2011.

**Forest Unit** – The model used to monitor these populations changed between years due to a staff retirement and a slightly different approach at studying population characteristics and interpreting population dynamics across time. Catch-per-unit effort analyses and harvest sex ratio analyses indicated that most populations had declined so that they were at goal or slightly below goal. Modeling harvest data to generate population estimates suggested similar patterns throughout the forest unit. Thus, most management strategies were more conservative in 2012 than they have been in the past few years (Figure 2). Due to good habitat conditions and a mild winter in 2011/2012, recruitment rates will likely be high and these populations should rebound quickly so they are at goal again. Harvest age structure data should be collected from this unit so that additional analyses can be performed, such as population reconstruction analyses.

## 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 Minnesota, 2012.

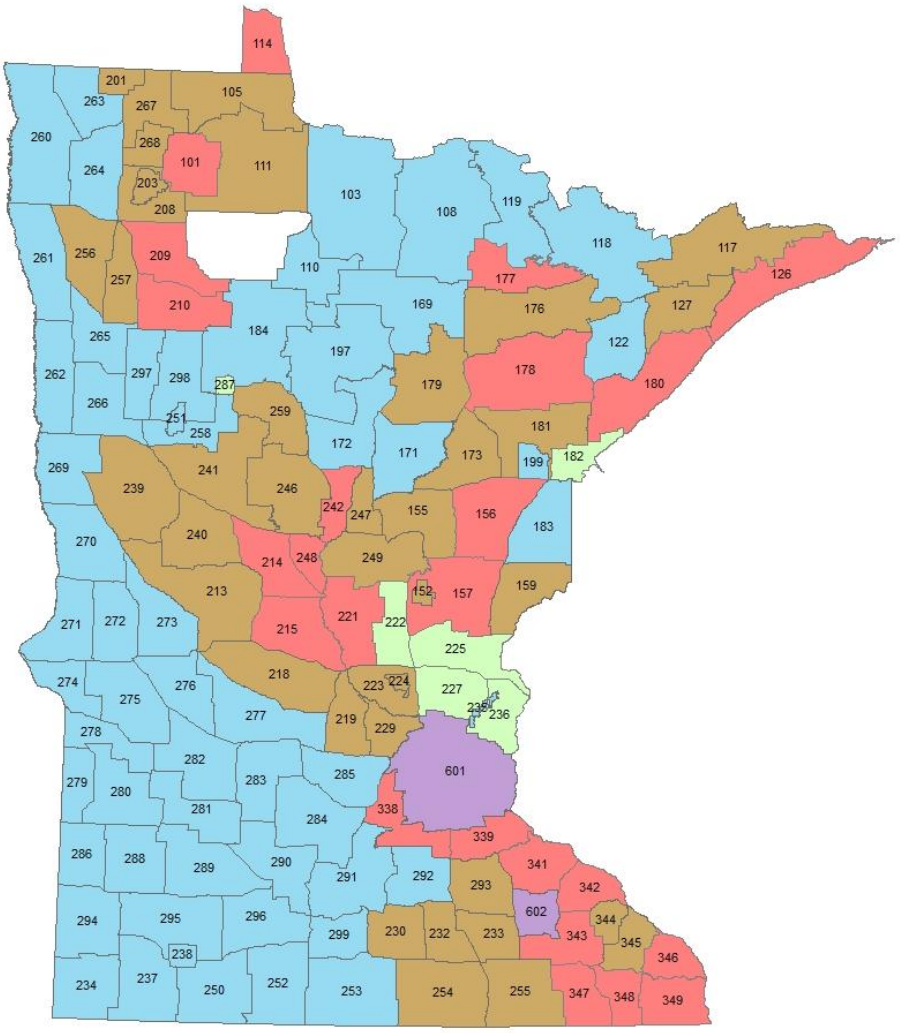


Figure 2. Deer management strategies used in permit areas throughout Minnesota, 2012. Permit areas are numbered and management strategies are color-coded. Permit areas are designated as: 1) lottery if colored blue, 2) hunter's choice if colored brown, 3) managed if colored red, 4) intensive if colored green, and 5) unlimited antlerless if colored purple.

Table 1. Pre-fawn deer density (deer/mi$^2$) as simulated from population modeling in each permit area in Minnesota, 2007-2012.

| Region | | Pre-fawning Density | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit Area** | **Area (mi$^2$)** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| **Karlstad** | | | | | | | |
| 201 | 155 | 6 | 6 | 6 | 6 | 6 | 5 |
| 203 | 108 | 6 | 6 | 7 | 7 | 8 | 5 |
| 208 | 443 | 4 | 4 | 4 | 4 | 4 | 3 |
| 260 | 1249 | 4 | 3 | 3 | 2 | 2 | 2 |
| 263 | 512 | 5 | 5 | 5 | 5 | 4 | 3 |
| 264 | 669 | 7 | 7 | 7 | 6 | 5 | 3 |
| 267 | 472 | 4 | 3 | 3 | 2 | 2 | 1 |
| 268 | 230 | 9 | 8 | 9 | 8 | 7 | 9 |
| Total | 3,838 | 5 | 5 | 5 | 4 | 4 | 3 |
| **Crookston** | | | | | | | |
| 209 | 576 | 9 | 9 | 9 | 9 | 9 | 5 |
| 210 | 485 | 13 | 12 | 12 | 11 | 10 | 6 |
| 256 | 654 | 7 | 6 | 6 | 5 | 5 | 3 |
| 257 | 413 | 8 | 8 | 7 | 7 | 7 | 4 |
| 261 | 795 | 2 | 2 | 2 | 2 | 2 | 1 |
| Total | 3,053 | 7 | 7 | 7 | 6 | 6 | 4 |
| **Mahnomen** | | | | | | | |
| 262 | 677 | 2 | 2 | 2 | 2 | 2 | 2 |
| 265 | 494 | 10 | 9 | 10 | 8 | 7 | 5 |
| 266 | 617 | 5 | 6 | 7 | 7 | 7 | 3 |
| 297 | 438 | 3 | 3 | 2 | 3 | 3 | 3 |
| Total | 2,226 | 4 | 5 | 5 | 4 | 4 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Morris** | | | | | | | |
| 269 | 651 | 2 | 2 | 2 | 3 | 4 | 3 |
| 270 | 749 | 1 | 1 | 2 | 2 | 3 | 2 |
| 271 | 634 | 1 | 2 | 2 | 3 | 3 | 2 |
| 272 | 531 | 1 | 2 | 2 | 2 | 3 | 2 |
| 273 | 575 | 4 | 5 | 5 | 6 | 7 | 5 |
| 274 | 360 | 3 | 3 | 5 | 6 | 7 | 3 |
| 275 | 766 | 4 | 3 | 4 | 5 | 6 | 5 |
| 276 | 544 | 4 | 4 | 4 | 5 | 7 | 5 |
| 282 | 779 | 1 | 2 | 2 | 3 | 4 | 1 |
| Total | 5,589 | 2 | 2 | 3 | 3 | 3 | 3 |
| **Osakis** | | | | | | | |
| 213 | 1058 | 12 | 12 | 13 | 15 | 15 | 13 |
| 214 | 557 | 20 | 20 | 19 | 19 | 19 | 20 |
| 215 | 702 | 9 | 9 | 10 | 10 | 10 | 10 |
| 239 | 924 | 10 | 10 | 9 | 10 | 11 | 9 |
| 240 | 642 | 19 | 18 | 18 | 18 | 19 | 16 |
| Total | 3,879 | 13 | 13 | 13 | 14 | 12 | 13 |
| **Cambridge** | | | | | | | |
| 221 | 642 | 13 | 12 | 12 | 12 | 11 | 11 |
| 222 | 412 | 16 | 15 | 15 | 15 | 15 | 15 |
| 223 | 376 | 11 | 10 | 11 | 12 | 14 | 16 |
| 225 | 619 | 15 | 16 | 16 | 16 | 15 | 14 |
| 227 | 472 | 14 | 13 | 14 | 14 | 14 | 15 |
| 229 | 287 | 6 | 6 | 6 | 7 | 8 | 6 |
| 236 | 374 | 17 | 16 | 16 | 16 | 16 | 16 |
| Total | 2,895 | 14 | 14 | 14 | 14 | 14 | 14 |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Waseca** | | | | | | | |
| 230 | 453 | 3 | 2 | 3 | 3 | 3 | 2 |
| 232 | 377 | 5 | 5 | 4 | 5 | 5 | 3 |
| 233 | 390 | 4 | 4 | 4 | 4 | 4 | 3 |
| 252 | 715 | 2 | 2 | 2 | 2 | 2 | 2 |
| 253 | 974 | 2 | 2 | 2 | 2 | 3 | 3 |
| 254 | 931 | 3 | 3 | 3 | 3 | 3 | 2 |
| 255 | 774 | 3 | 3 | 3 | 3 | 4 | 3 |
| 292 | 481 | 8 | 8 | 7 | 7 | 7 | 5 |
| 293 | 506 | 7 | 7 | 7 | 6 | 6 | 7 |
| 299 | 386 | 4 | 4 | 4 | 4 | 5 | 4 |
| Total | 5,987 | 4 | 3 | 3 | 4 | 3 | 3 |
| **Rochester** | | | | | | | |
| 338 | 452 | 4 | 4 | 5 | 5 | 6 | 5 |
| 339 | 409 | 4 | 5 | 5 | 6 | 6 | 6 |
| 341 | 596 | 10 | 10 | 10 | 10 | 10 | 11 |
| 342 | 352 | 12 | 13 | 13 | 13 | 14 | 11 |
| 343 | 663 | 11 | 11 | 11 | 10 | 10 | 11 |
| 344 | 189 | 11 | 12 | 12 | 15 | 16 | 13 |
| 345 | 326 | 10 | 10 | 9 | 8 | 8 | 9 |
| 346 | 319 | 22 | 21 | 20 | 19 | 19 | 17 |
| 347 | 434 | 11 | 10 | 10 | 10 | 12 | 10 |
| 348 | 332 | 18 | 17 | 14 | 14 | 13 | 13 |
| 349 | 492 | 23 | 22 | 21 | 20 | 19 | 18 |
| Total | 4,564 | 12 | 12 | 11 | 11 | 11 | 11 |
| **Forest** | | | | | | | |
| 103 | 1824 | 6 | 6 | 5 | 5 | 4 | 5 |
| 105 | 932 | 13 | 12 | 9 | 8 | 6 | 6 |
| 108 | 1701 | 9 | 9 | 6 | 6 | 6 | 7 |
| 110 | 530 | 26 | 26 | 23 | 21 | 18 | 20 |
| 111 | 1440 | 4 | 4 | 3 | 3 | 2 | 3 |
| 117 | 1129 | 2 | 2 | 2 | 3 | 2 | 3 |
| 118 | 1445 | 6 | 5 | 4 | 5 | 4 | 5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 119 | 946 | 7 | 7 | 5 | 5 | 4 | 5 |
| 122 | 622 | 5 | 5 | 4 | 5 | 5 | 5 |
| 126 | 979 | 5 | 4 | 4 | 4 | 3 | 4 |
| 127 | 587 | 4 | 3 | 3 | 3 | 3 | 3 |
| 155 | 639 | 13 | 12 | 12 | 13 | 14 | 14 |
| 156 | 834 | 15 | 14 | 14 | 14 | 13 | 12 |
| 157 | 904 | 21 | 20 | 17 | 18 | 16 | 14 |
| 159 | 575 | 19 | 18 | 17 | 16 | 15 | 14 |
| 169 | 1202 | 10 | 9 | 9 | 9 | 8 | 9 |
| 171 | 729 | 12 | 10 | 9 | 9 | 10 | 10 |
| 172 | 786 | 17 | 15 | 13 | 13 | 13 | 13 |
| 173 | 617 | 9 | 9 | 8 | 8 | 8 | 8 |
| 176 | 1150 | 8 | 9 | 8 | 9 | 7 | 8 |
| 177 | 553 | 24 | 23 | 17 | 20 | 16 | 18 |
| 178 | 1325 | 17 | 18 | 14 | 16 | 13 | 13 |
| 179 | 939 | 16 | 15 | 15 | 15 | 14 | 14 |
| 180 | 999 | 11 | 10 | 9 | 9 | 8 | 9 |
| 181 | 746 | 19 | 18 | 17 | 17 | 14 | 13 |
| 182 | 280 | 25 | 27 | 28 | 25 | 21 | 19 |
| 183 | 675 | 14 | 13 | 12 | 13 | 12 | 13 |
| 184 | 1318 | 19 | 18 | 16 | 16 | 14 | 16 |
| 197 | 1343 | 7 | 8 | 7 | 7 | 5 | 5 |
| 241 | 1047 | 33 | 33 | 28 | 30 | 24 | 25 |
| 242 | 307 | 23 | 22 | 22 | 22 | 21 | 21 |
| 246 | 860 | 16 | 14 | 14 | 15 | 15 | 15 |
| 247 | 263 | 20 | 18 | 19 | 20 | 21 | 22 |
| 248 | 229 | 23 | 22 | 21 | 21 | 20 | 21 |
| 249 | 729 | 11 | 10 | 11 | 12 | 11 | 11 |
| 251 | 68 | 16 | 16 | 16 | 17 | 14 | 16 |
| 258 | 381 | 25 | 23 | 17 | 20 | 16 | 18 |
| 259 | 546 | 21 | 22 | 17 | 20 | 16 | 15 |
| 287 | 51 | 53 | 64 | 62 | 74 | 71 | 85 |
| 298 | 677 | 19 | 20 | 17 | 18 | 14 | 18 |
| Total | 32,907 | 13 | 12 | 11 | 11 | 10 | 10 |