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**Linear Modeling of Blackbird Populations Breeding in Central North America**

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**Introduction**

Accurate estimates of blackbird populations are needed to develop and assess management programs to reduce blackbird damage to sunflower. Our objective was to use North American Breeding Bird Survey (BBS) indices to estimate the total blackbird population causing sunflower damage in North Dakota, South Dakota, and Minnesota.



## Species Information

Most of the damage is done by three species of blackbirds: red-winged blackbirds, yellow-headed blackbirds, and common grackles.

### Red-winged Blackbird

The most abundant passerine; widely distributed throughout North America. A polygynous species that prefers to nest in shallow wetlands or dense upland vegetation. Average territory size is 0.5 acre, but size varies greatly depending on habitat quality. Primarily an insectivore during the reproductive season; a granivore during other phases of its life cycle. Feeds on several types of agricultural crops, including sunflower, corn, and rice. Considered a major pest by agricultural producers. Smallest of the three major blackbird species, averaging between 2-3 oz; length 8.75 in.

### Yellow-headeded Blackbird

Locally common throughout most of its range. More limited in distribution than the red-winged blackbird. Most abundant in the central region of North America where it breeds strictly in wetlands. Polygynous. Territories are usually much smaller than those of the red-winged blackbird. Similar in feeding habits to the red-winged blackbird; less likely to rely on agricultural crops, foraging more often on weed seeds. Length 9.5 in. Male 3-4 oz and nearly twice as large as the female.

# Common Grackle

Abundant east of the Rockies.  Less likely to use wetlands as nesting sites than the other two species.  Frequently found nesting in groves of trees or shrubs, often forming loose aggregations in towns and near farmsteads.  Monogamous.  Joins with red-winged blackbirds and yellow-headed blackbirds in large mixed-species flocks during late summer.  At times, feeding behavior can make this species a serious agricultural pest, particularly in corn and sunflower.  Largest of the three blackbird species.  Males usually greater than 4 oz; females 3.5 oz.  Length 12.5 in.

## Study Area

In the map below, the polygon encompasses an area that produces blackbirds responsible for most of the sunflower damage.  Seven different physiographic regions are found within this polygon.  Five of the seven regions have only BBS indices as measures of blackbird abundance.  Indices have been done annually since 1965 in most of the regions.
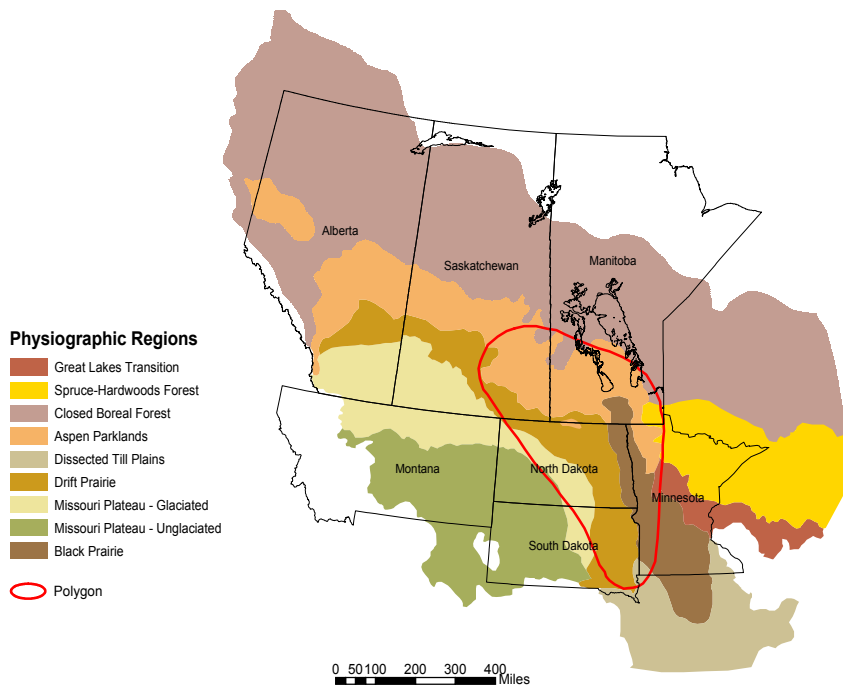


## Methods

Indices must be associated with some measure of density to predict population size.  Indices correlate nearly linearly with population density when conducted on conspicuous species in fairly open landscapes.  The landscapes and bird species met these requirements in our study.

We used density estimates of territorial male blackbirds from a random census of quarter sections conducted from 1996-1998 in the Drift Prairie and Glaciated Missouri Plateau of North Dakota.  To adjust for females, nonbreeding males, and males missed during the census, we multiplied the density of

territorial males per quarter section by 4.08. The 4.08-value was derived from models of demographic age structure. To obtain the total population size by physiographic region, we multiplied average density per quarter section by the area of the physiographic region within the polygon. We used a Geographic Information System to estimate areas of the physiographic regions.

To establish a proportional relationship between the two measures of abundance, the density estimates from 1996-1998 were linked to BBS indices over the same period in the Drift Prairie and Glaciated Missouri Plateau. Using this relationship, we calculated densities for the remaining five physiographic regions in which BBS indices were the only population measurements available.

## Results & Discussion

The polygon covered 180,000 mi$^2$. Canada accounted for the largest amount of land area, occupying 47% of the total area within the polygon (Table 1). Drift Prairie and Aspen Parkland were the dominate physiographic regions within the polygon.

Table 1. Percentage of area for seven physiographic regions found within the polygon.

| Physiographic Region[1] | North Dakota | South Dakota | Minnesota | Canada | Total |
|---|---|---|---|---|---|
| GLT | 0 | 0 | 1 | 0 | 1 |
| NSH | 0 | 0 | 1 | 1 | 2 |
| CBF | 0 | 0 | 0 | 4 | 4 |
| AP | 0 | 0 | 3 | 33 | 36 |
| DP | 16 | 10 | 0 | 7 | 33 |
| GMP | 8 | 1 | 0 | 0 | 9 |
| BP | 4 | 1 | 8 | 2 | 15 |
| Total | 28 | 12 | 13 | 47 | 100 |

[1]GLT - Great Lakes Transition, NSH - Northern Spruce Hardwoods, CBF - Closed Boreal Forest, AP - Aspen Parklands, DP - Drift Prairie, GMP - Glaciated Missouri Plateau, BP - Black Prairie

For every seven birds tallied on BBS routes, approximately one territorial male/0.4 mi$^2$ was counted in the quarter section surveys. This 7:1 ratio was similar to that found in other studies comparing BBS route indices to blackbird densities in open landscapes.

Nearly 40% of the total blackbird population produced within the polygon originated from North Dakota (Table 2). North Dakota and Canada produced 70% of the red-winged blackbird population, which comprised the largest population of the three species. Red-winged blackbirds outnumbered yellow-headed blackbirds and common grackles by greater than 2:1.

Table 2. Estimates of blackbird populations[1] in late-summer originating from the polygon.

| State/Country | Numbers (million) of Blackbirds by Species | | | |
|---|---|---|---|---|
| | Red-winged blackbird | Yellow-headed blackbird | Common grackle | Total |
| North Dakota | 15 | 8 | 8 | 31 |
| South Dakota | 6 | 5 | 3 | 14 |
| Minnesota | 6 | 1 | 5 | 12 |
| Canada | 13 | 4 | 3 | 20 |
| Total | 40 | 18 | 19 | 77 |

[1]The spring population was multiplied by 1.45 to allow for recruitment of young into the late-summer population.

More blackbirds are found in central North America than anywhere else on the Continent. Given this fact, it is not surprising that so many blackbirds were within the relatively confined area of the polygon. The total population of red-winged blackbirds, yellow-headed blackbirds, and common grackles in North America in late summer is probably near 500 million. Thus, the polygon held approximately 15% of the total population. The numerous wetlands in this region serve to attract blackbirds in such numbers.

There are several drawbacks to using indices to estimate densities of birds. For example, detectability of a species may change as the landscape changes; however, we believe that the relative homogeneity of the landscapes in the polygon combined with the abundance and conspicuousness of the three species during the breeding season justifies use of this method.