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## Assessment of Bird Damage to Sunflower and Corn in North Dakota

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**ABSTRACT** North Dakota is the top sunflower-producing state in the United States, annually harvesting about 404,686 ha (1 million acres). Since the early 2000s, corn also has become a major crop within the state due to increases in corn prices. Blackbirds (*Icteridae*) can cause significant damage to both ripening corn and sunflower. The National Sunflower Association considers blackbird depredation to be a key factor in the reduction in sunflower acreage in the Prairie Pothole Region (PPR). In order to better quantify the amount of damage caused by blackbirds, we assessed blackbird damage to ripening sunflower and corn in 120 randomly selected plots during 3 growing seasons, 2008–2010. On average, damage to sunflower was more intense than damage to corn, with sunflower in the southeastern region experiencing the greatest levels of damage. Further analysis will determine possible landscape characteristics associated with this damage.

**KEY WORDS** blackbirds, common grackle, corn, crop damage, North Dakota, Prairie Pothole Region, red-winged blackbird, sunflower, wetlands, yellow-headed blackbird.

North Dakota is the top sunflower-producing state in the United States, annually harvesting about 404,686 ha (Peer et al., 2003). Recently, corn has become a major crop within the state. Red-winged blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*) and yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) can cause significant damage to these crops. The National Sunflower Association considers blackbird depredation to be a key factor in the reduction of sunflower acreage in the Prairie Pothole Region (PPR) (L. Kleingartner, NSA, Bismarck, ND, unpublished report).

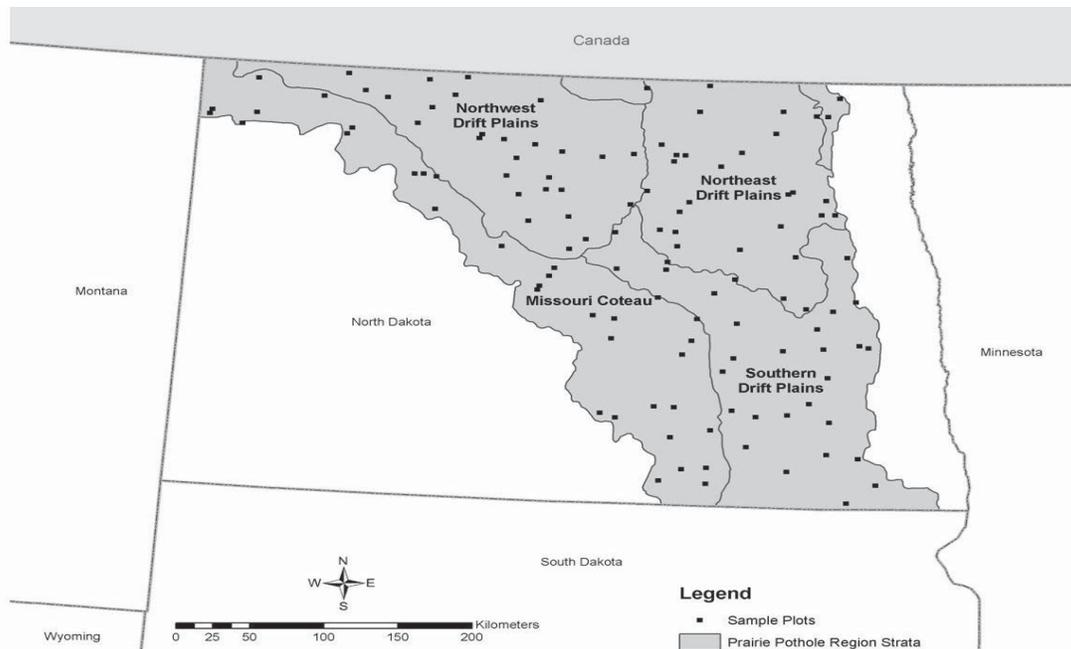
In 1979 and 1980, a field survey of bird damage to sunflower in North Dakota estimated an economic loss between \$ 4–11 million (Hothem et al. 1988). This was the last comprehensive field damage survey. Peer et al. (2003) used a bioenergetics model and estimated that blackbird damage was valued at \$ 5–10 million. Sunflower prices have increased since these monetary losses were calculated.

Red-winged blackbirds (RWBL), yellow-headed blackbirds (YHBL) and common grackles (hereafter, “grackles”) are three of the leading contributors to sunflower damage in North Dakota (Cummings et al. 1989, Dolbeer 1975, Sedgewick et al. 1986). Blackbirds tend to feed on corn during the milk and dough stage when the kernels are soft and in sunflower during early ripening. Some damage can occur later

in the season, especially by grackles and male RWBL and YHBL, which have larger bodies and beaks than do females (Dolbeer 1980, Homan et al. 1994, Linz et al. 1984).

Red-winged blackbird population densities in the Dakotas and Minnesota are among the highest in the nation (Peer et al. 2003). Yellow-headed blackbirds breed in regions of the Dakotas and Minnesota where sunflower production is high (Twedt et al. 1991), and their numbers in North Dakota have increased over 300% from 1967–1981 (Besser 1985). Likewise, grackle numbers in North Dakota have also grown, increasing from 334,500 breeding pairs in 1967 to 777,000 pairs in 1990 (Stewart and Kantrud 1972, Nelms et al. 1994). Blackbird populations in North Dakota reach their peak in August and September when sunflowers are reaching maturity (Peer et al. 2003). These resident and migrating populations have led to extensive damage in agricultural fields such as sunflower and corn.

Complaints of blackbird damage to corn have increased in recent years. Thus, corn may be providing an alternative food for foraging blackbirds. Quantitative surveys of blackbird damage to corn, however, have not been conducted in North Dakota. In 2008, 2009, and 2010, we assessed blackbird damage in ripening sunflower and cornfields. We will determine possible landscape characteristics correlated to this damage and report on these results at a later date.



**Figure 1:** The Prairie Pothole Region of North Dakota separated into four sample strata. Study sites were randomly selected and proportionately allocated among the strata.

## STUDY AREA

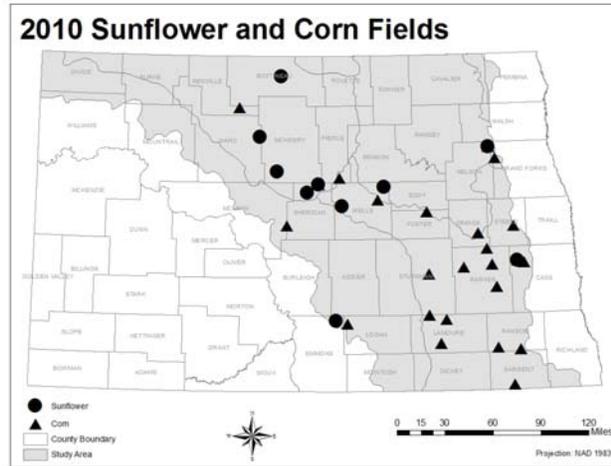
Our study area is the 95,200 km<sup>2</sup> Prairie Pothole Region (PPR) in North Dakota (Figure 1). Topography of the PPR consists of undrained depressions, known as potholes, sloughs, or wetlands, which were formed during the Pleistocene Epoch (Johnson et al. 2005, Neimuth and Solberg 2003, Stewart and Kantrud 1973). These wetlands are scattered throughout a matrix of grasslands, agricultural fields, and Conservation Reserve Program (CRP) land (Johnson et al. 2005, Stewart and Kantrud 1973). In 1967, total wetland acreage was estimated at 3.2 million acres (Stewart and Kantrud 1973). In a previous study (Ralston et al. 2007), the PPR was stratified into four strata: the Missouri Coteau, Northwestern Drift Plains, Northeastern Drift Plains and Southern Drift Plains (Stewart and Kantrud 1972, 1973). Ralston et al. (2007) proportionally allocated 120 3.2 x 3.2-km (1,036 ha) sample plots to the four strata.

## METHODS

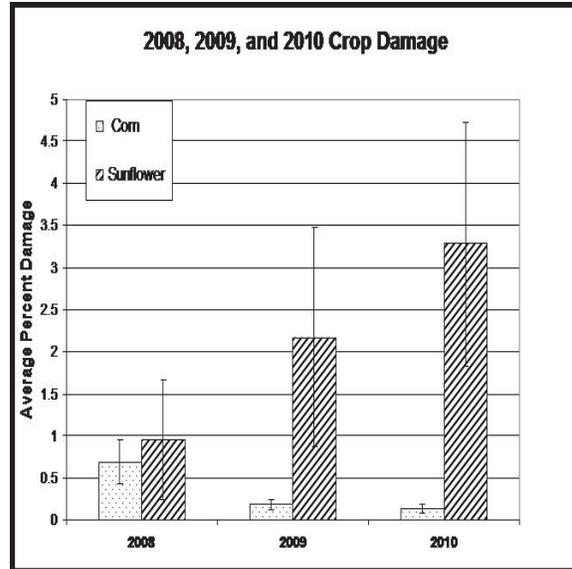
I assigned a 1.6-km<sup>2</sup> (160 ha) area plot to the center of each of the 120 “Ralston Plots.” In late September 2008, 2009, and 2010, we estimated bird damage in all corn and sunflower fields located within the 1.6-km<sup>2</sup> core area. In the event that no sunflower or corn-

fields were within the 1.6-km<sup>2</sup> area section, then no field was surveyed for that site. In 2010 we sought to increase the sample size, in cases where no fields were located in the core area, we searched a 4.8-km (3 mi) radius around the center of the core area for the presence of a sunflower or corn field. The first sunflower or cornfield observed in this area was surveyed for damage.

We divided each sampled field down the middle into two strata, each containing an equal number of rows. One row was randomly selected from each stratum. The location of the first field plot, consisting of five consecutive sunflower heads or corn ears, was a randomly selected distance in meters between 0 m (i.e., the edge of the field) and 135 m. After establishing the first plot, we sampled plots of five consecutive sunflower heads or corn ears every 135 m in the row. If an uncultivated area existed within the sampled row, this area was walked through as if it were a cultivated area. We estimated percentage damage for each sunflower head or corn ear. Sunflower damage was measured using the template method (Dolbeer 1975), and damage to corn was measured by comparing the area of damaged kernels to the possible area of undamaged kernels. For undamaged heads/ears, 0%



**Figure 2:** Locations of study fields, within the 1.6 km<sup>2</sup> core area, within the Prairie Pothole Region of North Dakota in 2010. Sample size was augmented to improve the variance associated with damage estimates.



**Figure 3:** Average percentage of sunflower and corn damage in 2008, 2009, and 2010. Lines represent standard error for each crop per year.

damage was recorded. The percent loss for each field was calculated by averaging the percent loss of all heads across both strata. The cost of the estimated damage for each crop was calculated by dividing the total average percent damage for each crop by the value of production using the USDA Crop Values Summary (2011).

**PRELIMINARY RESULTS**

In 2008, we surveyed 38 cornfields and 14 sunflower fields for blackbird damage. Most of the corn was planted in the southeast (Southeastern Drift Plains) and sunflower was planted in the northern region (Northeastern and Northwestern Drift Plains), respectively. In 2009, we surveyed 30 cornfields and 15 sunflower fields, with the distribution of corn and sunflower fields following the same regional trend as in 2008. In 2010, the number of fields surveyed was nearly doubled using the expanded sample scheme. We surveyed 65 cornfields and 23 sunflower fields, with field location following the same trend as the previous two years. We compared damage across years using only the fields within the 1.6-km<sup>2</sup> sample plots (Figure 2). We also conducted a separate analysis for the entire data set for 2010.

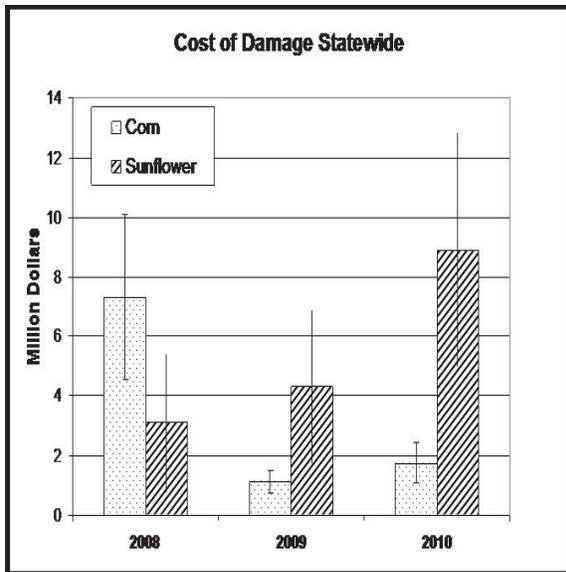
In 2008, sunflower damage averaged 0.95% (range: 0%-10.16%), and corn damage 0.69% (range: 0%-5.27%). In 2009, sunflower damage averaged 2.17%

(range: 0%-19.79%), and corn damage 0.18% (range: 0%-1.52%). In 2010, sunflower damage averaged 3.29% (range: 0%-13.57%), and damage to corn was calculated at 0.13% (range: 0%-1.28%). In 2010, using the expanded sample scheme, sunflower damage averaged 2.32% (range: 0%-13.57%) with corn damage averaging 0.21% (range: 0%-2.85%) (Table 1 and Figure 3).

**Table 1:** Average percent of sunflower and corn damage for each year within the study period.

Year	Sunflower Damage	n	Corn Damage	n
2008	0.95%	14	0.69%	38
2009	2.17%	15	0.18%	30
2010	3.29%	12	0.13%	38
2010 (extended sample)	2.32%	23	0.21%	65

Sunflower fields near the Southern Drift Plains tended to have higher damage estimates than those located in the Northern Drift Plains. The cost of damage in 2008, based on overall production value in the state, was \$ 7.3 million for corn and \$ 3 million for sunflower (Figure 4). In 2009, the cost was \$ 1.25 million and \$ 4 million for corn and sunflower, respectively. In 2010, the cost was \$ 1.7 million for corn and \$ 8.9 million for sunflower.



**Figure 4:** Estimate of economic losses associated with blackbird damage to sunflower and corn crops, in the Prairie Pothole Region of North Dakota, for 2008 and 2009. Lines represent standard error for each crop per year

## DISCUSSION

Our data show an overall increase, from 2008 to 2010, in damage to sunflower and a decrease in damage to corn. Corn production has increased in the state, with many farmers in the Southern Drift Plains planting corn rather than other crops, such as sunflower. Sunflower production is primarily confined to the north central region of state (Northwestern Drift Plains and Northeastern Drift Plains), with sunflower crops planted in the southern areas receiving more damage than those further north. Our data show that blackbirds forage in both sunflower and corn fields. In locations where corn and sunflower are grown in close proximity, blackbirds might forage in both crops, thus reducing overall damage in each one.

## ACKNOWLEDGMENTS

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