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Megan E. Klosterman

North Dakota State University, Megan.e.klosterman@ndsu.edu

George M. Linz

USDA/APHIS/WS National Wildlife Research Center, george.m.linz@aphis.usda.gov

Tony A. Slowik

USDA APHIS Wildlife Services

William J. Bleier

North Dakota State University, William.Bleier@ndsu.nodak

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Assessment of Bird Damage to Sunflower and Corn in North Dakota

Megan Klosterman¹, George Linz², Tony Slowik³, William Bleier¹

¹ Department of Biological Sciences, North Dakota State University, Fargo, ND 58108

² U.S. Department of Agriculture, Wildlife Services National Wildlife Research Center, Bismarck, ND 58501

³ U.S. Department of Agriculture, PPQ, Bismarck, ND 58501

Introduction

North Dakota is the top sunflower producer in the United States, annually harvesting about 1 million acres (404,686 ha). 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*) often cause significant damage to these crops. The National Sunflower Association considers blackbird depredation of sunflower to be a key factor in the reduction in sunflower acreage in the Prairie Pothole Region (PPR).

In 1979 and 1980, a field survey of bird damage to sunflower in North Dakota showed an estimated economic loss between \$4 and 11 million (Hothem et al., 1988). This was the last comprehensive field damage survey. Peer et al. (2003) used a bioenergetic model and estimated that bird damage was valued at \$5-10 million. Sunflower prices have increased 3-fold since these monetary losses were calculated. In 2008, plantings of sunflower and corn in North Dakota are projected to be 216,514 ha (535,000 acres) and 910,575 ha (2.25 million acres), respectively.

Red-winged blackbirds (*RWBL*), yellow-headed blackbirds (*YHBL*), and common grackles (*COGR*) are three of the leading contributors to sunflower and corn damage in North Dakota. According to Peer et al. (2003), economic damage totaled \$5.4 million to sunflowers from these three species. Blackbirds tend to feed on corn during the milk and dough stage when the kernels are soft and sunflower early in ripening, although male *RWBL*, *YHBL*, and *COGR* are known to continue sunflower and corn foraging later into the season due to their larger body and beak size (Dolbeer, 1980, Homan et al., 1994, Linz et al., 1984).

Nationally, *RWBL* populations have declined over the last decade, but population densities in the Dakotas and Minnesota are among some of the highest in the nation (Peer et al. 2003). *YHBL* breed in regions of the Dakotas and Minnesota where sunflower production is high (Twedt et al., 1991) and the population has grown over 300% from 1967-1981 (Besser, 1985). The common grackle population has also grown over time increasing from 334,500 breeding pairs in 1967 to 777,000 pairs in 1990 (Stewart and Kantrud, 1972, Nelms et al., 1994) and the North Dakota population has doubled (Homan et al., 1996). Blackbird populations in North Dakota reach their peak in August and September when sunflowers are reaching maturity (Peer et al., 2003). As these populations have grown, they have led to more extensive damage in agricultural fields such as sunflower and corn.

Complaints on blackbird damage to corn have increased in recent years. Thus, corn may be providing an alternate food for foraging blackbirds. Quantitative surveys of blackbird damage to corn, however, have not been conducted in North Dakota. This study measures blackbird damage to sunflower and corn crops across the PPR of North Dakota in 2008, 2009, and 2010 and determines possible factors correlated to this damage.

Study Area

Our study area (95,200 km²) is the Prairie Pothole Region (PPR) in North Dakota (Figure 1). The topography of the PPR consists of undrained depressions, known as potholes and sloughs, 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 grassland, 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). Large moraines accumulated along the edges of the region, which formed low rolling hills such as those in the Missouri Coteau.

Methods

In a previous study (Ralston et al., 2007), the PPR was stratified into four strata known as the Missouri Coteau, Northwest Drift Plains, Northeast Drift Plains, and Southern Drift Plains (Stewart and Kantrud, 1972, 1973). Ralston proportionally allocated 120-3.2 x 3.2 km (1,036 ha) sample plots to the four strata. In late September 2008 and 2009, in late September bird damage was estimated in all corn and sunflower fields in a 1.6 km² (1 mi², 640 acres) region placed in the center of each 3.2 x 3.2 km plot. In the case that no fields lied within the 1.6 km², section then no field was surveyed for the site.

The 2008 and 2009, sample sizes proved to be smaller than forecast. Thus, we sought to increase the sample size in 2010. In 2010, bird damage was estimated in all corn and sunflower fields in the 1.6 km² (1 mi², 640 acres) region placed in the center of each 3.2 x 3.2 km plot. In cases where no fields were located in this area, we searched a 4.8 km (3 mi) from the center in each direction (North, South, East, and West) for the presence of a sunflower or cornfield. The first sunflower or cornfield observed in this area was surveyed for damage in late September. As in 2008 and 2009, Ralston sites were surveyed for the presence of fields in July or August and damage estimates were collected in late September.

Each sampled field was divided into two strata, each containing an equal number of rows. One row was randomly selected from the first stratum; then a second row was randomly



Figure 2: Damage measurement taken on sunflower and corn.

selected in the other stratum. The location of the first sample plot 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, plots of five consecutive sunflower heads or corn ears were systematically sampled every 135 meters until the end of the field. If an uncultivated area existed within the sampled row, these areas were walked through as if it were a cultivated area. If the sunflower heads and corn ears were damaged by birds, percentage of head/ear that had been damaged was estimated (Dolbeer, 1975). For undamaged heads/ears, 0% damage was recorded. The percent loss for each field was calculated by averaging the percent loss of all heads across both strata.

Preliminary Results

In 2008, 38 cornfields and 14 sunflower fields were surveyed for blackbird damage, with cornfields typically planted in the Southeastern (Southeast Drift Plains) portion of the state and sunflower planted in the Northern region (Figure 3). In 2009, 30 cornfields and 15 sunflower fields were surveyed, with the distribution of corn and sunflower fields following the same regional trend as in 2008 (Figure 4). In 2010, the number of fields surveyed was nearly doubled using the expanded sample frame.. Cornfields surveyed numbered 65 and sunflower fields numbered 23, with field location following the same trend as the previous two years (Figure 5).

In 2008, sunflower damage averaged 0.95% (range: 0%-10.16%) and corn damage averaged 0.69% (range: 0%-5.27%). In 2009, sunflower damage averaged 2.17% (range: 0%-19.79%), with corn damage averaging 0.18% (range: 0%-1.52%). In 2010, sunflower damage averaged 2.32 % (range: 0%-13.57%) with corn damage averaging 0.21 % (range: 0%-2.85%). When analyzing the 2010 data using the same methodology as in 2008 and 2009, damage to corn was calculated at 0.13% (range: 0%-1.28%) and damage to sunflower was calculated at 3.29% (range: 0%-13.57%). Sunflower fields near the Southeastern region of the state tended to experience higher damage estimates than those located in the North. 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 7). In 2009, the cost was \$1.25 million for corn and \$4 million for sunflower. We have not calculated the cost of damage in 2010.

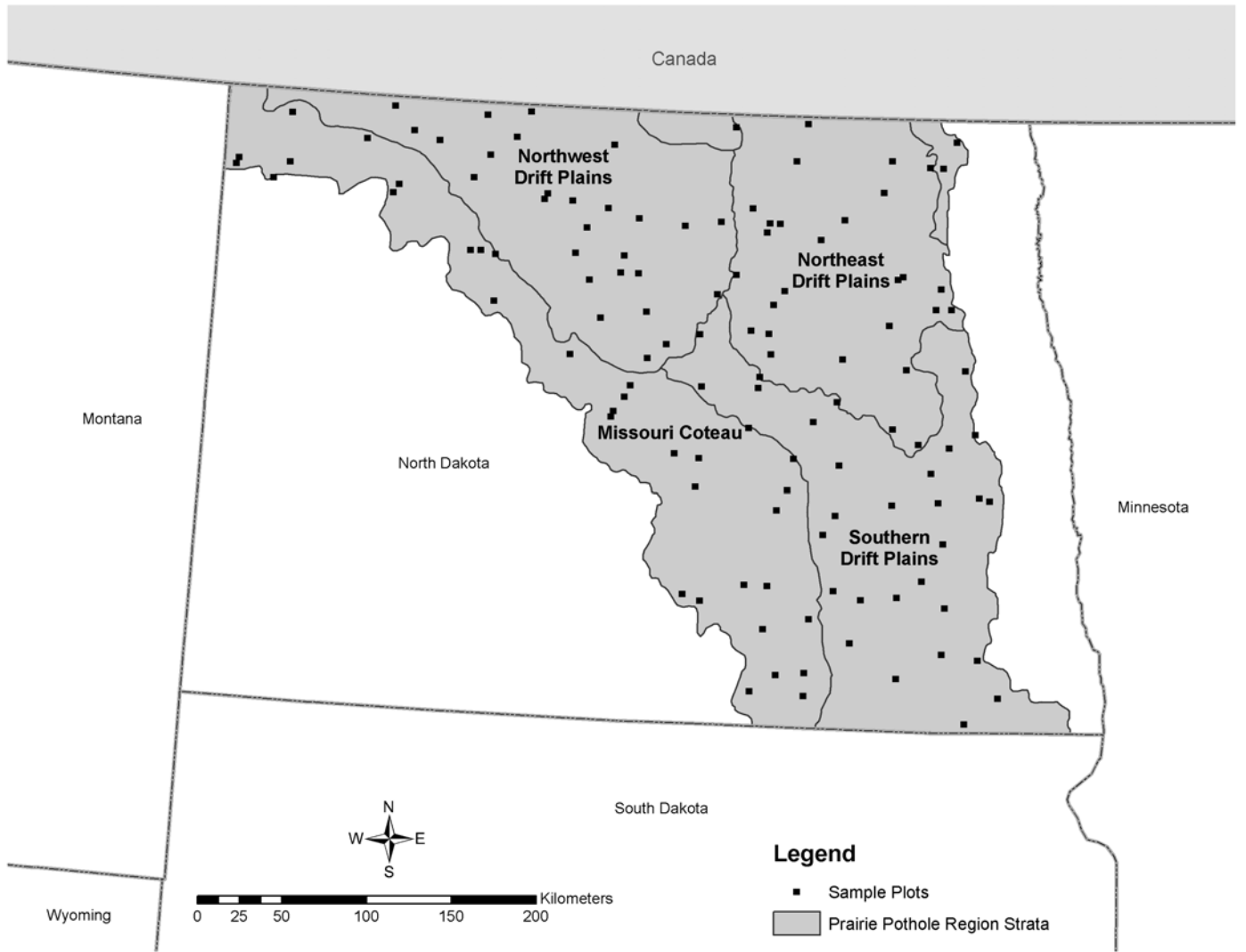


Figure 1: My study area, the Prairie Pothole Region of North Dakota, separated into four strata. My study sites, randomly selected by Scott Ralston (2007), are evenly distributed between the four strata of the PPR.

2008 Sunflower and Corn Fields

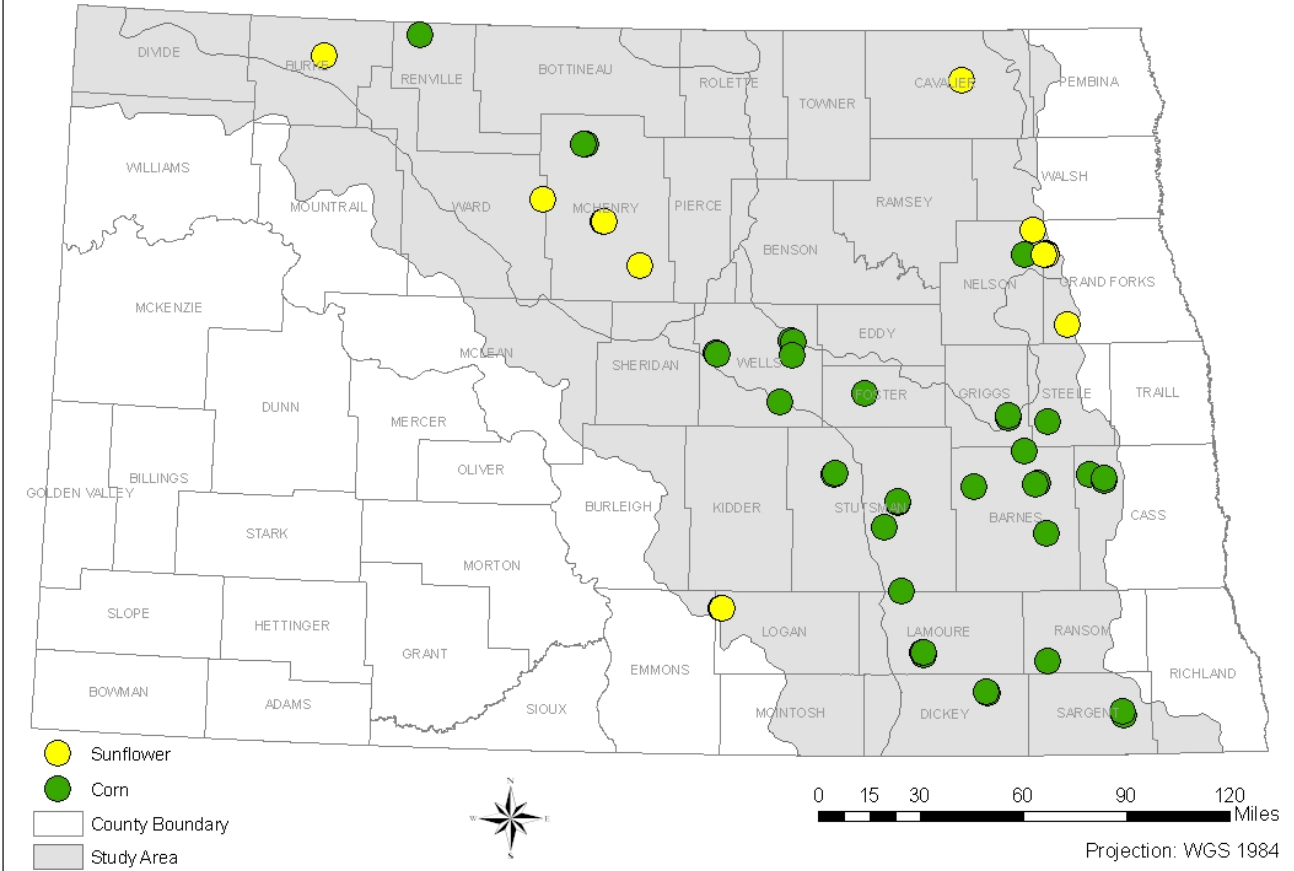


Figure 3: Locations of study fields within the Prairie Pothole Region of North Dakota for 2008. Cornfields are symbolized by green dots and sunflower is symbolized using yellow dots.

2009 Sunflower and Corn Fields

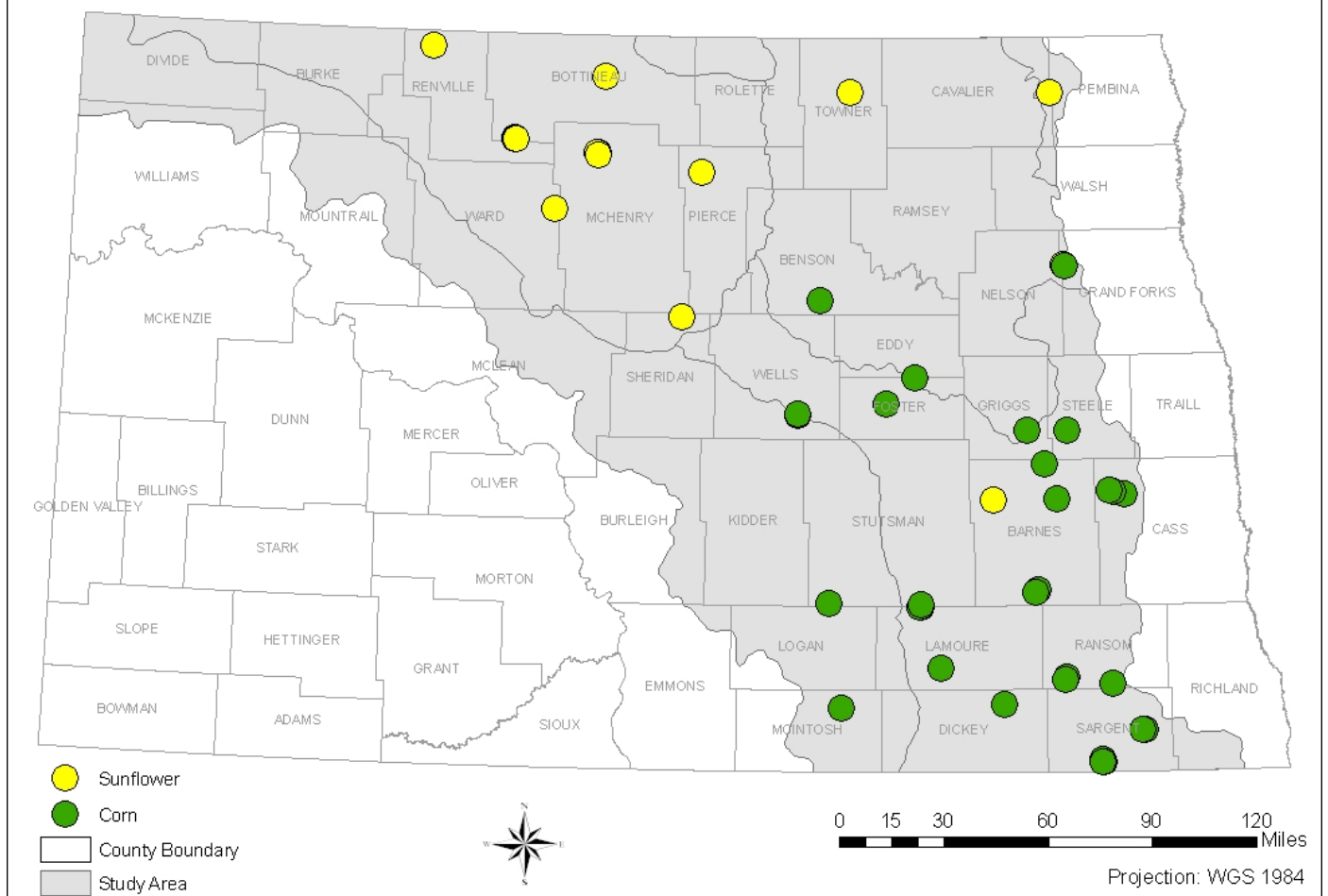


Figure 4: Locations of study fields within the Prairie Pothole Region of North Dakota for 2009. Cornfields are symbolized by green dots and sunflower is symbolized using yellow dots.

2010 Sunflower and Corn Fields

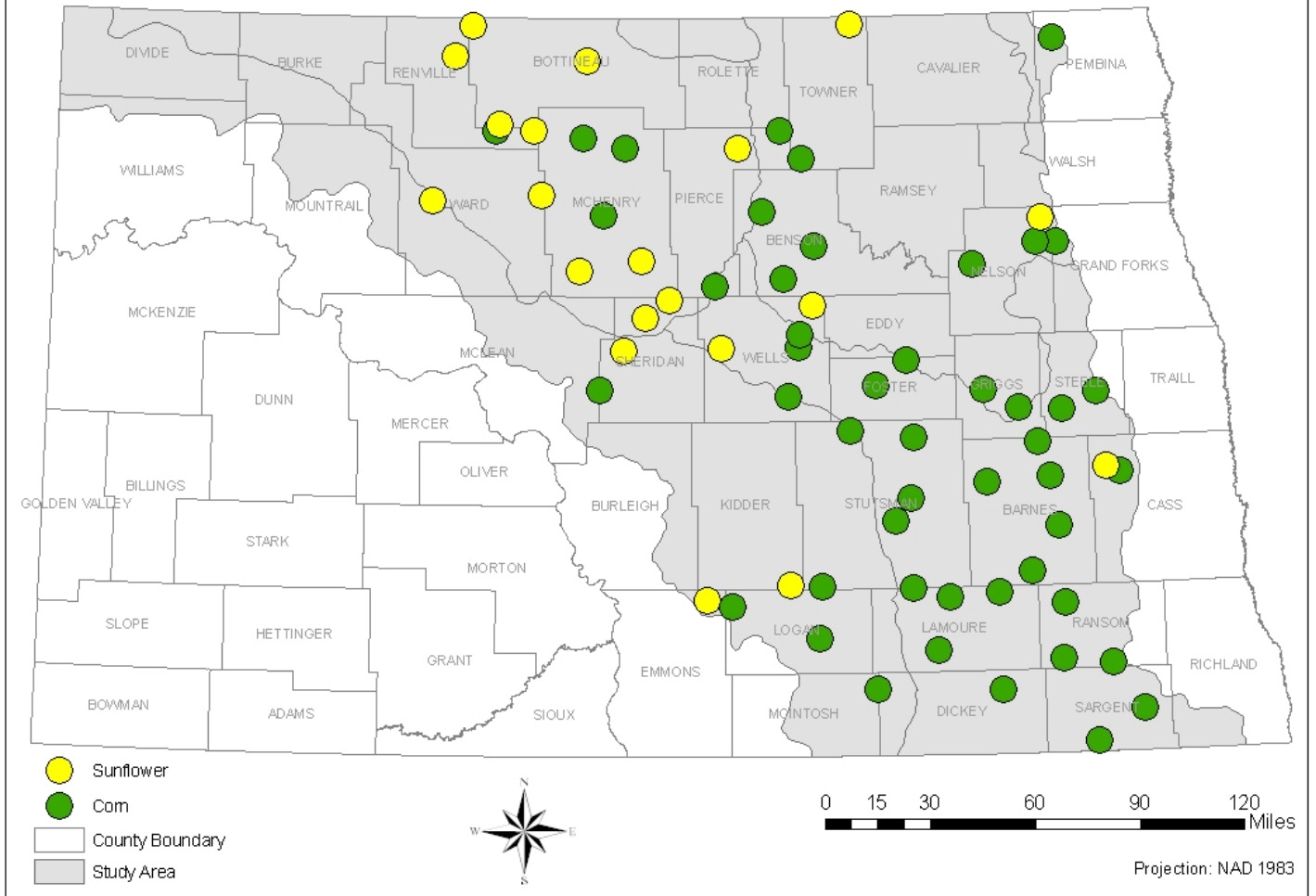


Figure 5: Locations of study fields within the Prairie Pothole Region of North Dakota for 2010. Cornfields are symbolized by green dots and sunflower is symbolized using yellow dots.

2008, 2009, and 2010 Crop Damage

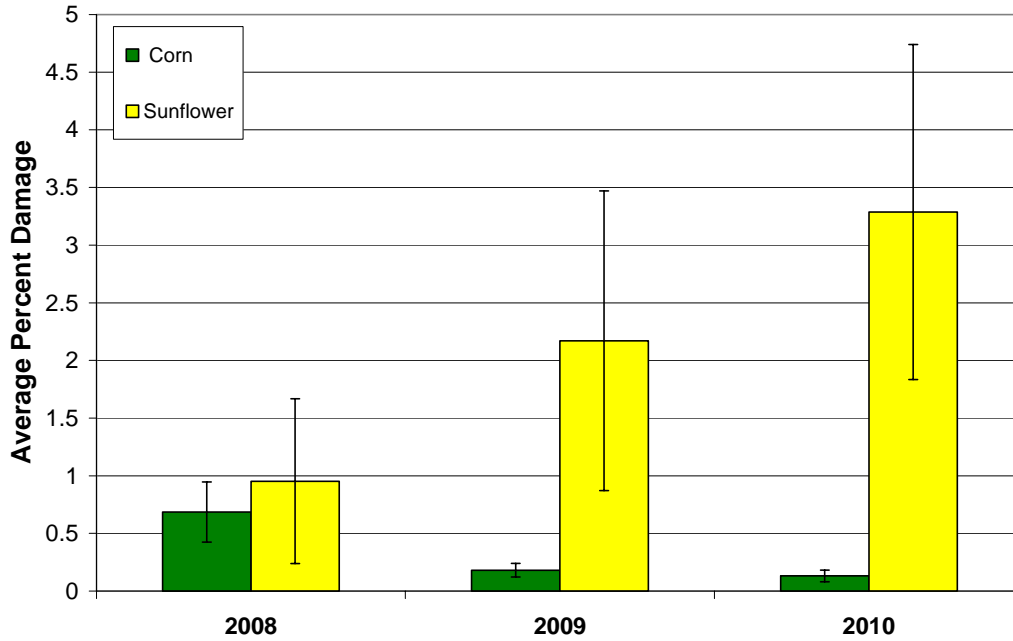


Figure 6: Average percent crop damage for 2008, 2009, and 2010, using fields located in the center square mile of each study site. Lines represent standard error for each crop per year.

Cost of Damage Statewide

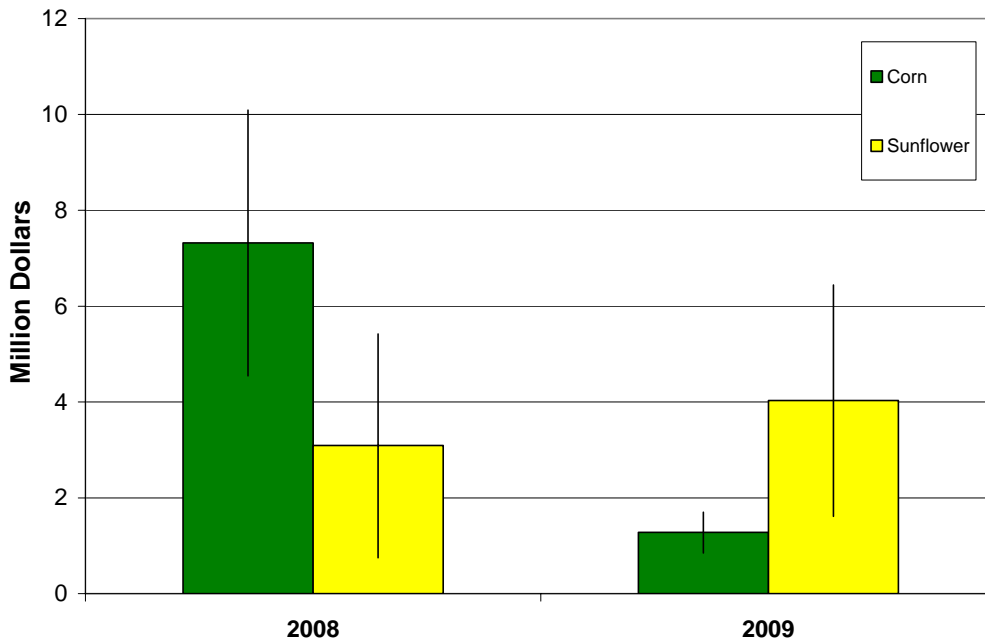


Figure 7: Cost of blackbird damage to sunflower and corn crops, in the PPR of North Dakota, for 2008 and 2009. Lines represent standard error for each crop per year.

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