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AVIAN USE OF HARVESTED CROP FIELDS DURING SPRING MIGRATION TRROUGH NORTH DAKOTA

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Abstract

Over the past century, the amount of mixed-grass prairie in North Dakota has diminished with a concomitant increase in land used for crop production. Consequently, the diversity of habitat available for migrant birds has decreased, and birds are now limited to choosing habitats that are uncharacteristic of those used during other times of the year. Because of the extensive agricultural production in this region, the value of harvested crop fields to spring-migrating birds was studied by examining avian habitat use in harvested fields to determine differences in bird use among these habitats. In the spring of 2003, 60 harvested fields were surveyed [30 sunflower (oil or confection) and 30 non-sunflower (soybean, small grain, corn, or sorghum)] for bird abundance to determine what, if any, difference in bird use could be detected among the crop types available to migrating birds as stopover sites. We counted 10,200 birds constituting 33 different species throughout the study period. Horned larks (*Eremophila alpestris*) and lapland longspurs (*Calcarius lapponicus*) were seen in greatest numbers. Overall bird abundance was greatest in sunflower fields compared to non-sunflower fields. Due to the great abundance of cropland in this region, harvested crop fields may provide a good source of forage and stopover habitat.

Introduction

Birds that migrate spend alternating periods in stopover and flight. During stopover, energy in the form of fat is accumulated through foraging activities. This fat is then converted into useable energy during a bird's migratory flight. Fuel deposition during stopover periods is critical in determining the speed and success of migration and may vary among stopover sites due to habitat quality (Schaub and Jenni, 2001). Refueling is further made difficult because these birds are trying to meet their needs in unfamiliar habitats.

Most species use a restricted set of habitats from those available, but during migration

use of habitat is more variable than use in breeding or over-wintering periods. Although there is greater variability during migration, many species do express attractions for certain habitat types (Petit 2000).

What is available for habitat use greatly depends on the land use in the area. In North Dakota, land put into crop production has increased greatly over the last centuries. Of the approximately 70,000 square miles of land area in North Dakota, about 32,000 square miles are used for harvested cropland (USDA, 1997). As a result of this change in land use, land that had once contained great stretches of prairie is now covered with crop fields (Stewart 1975; Barbour et al., 1999). With the loss of natural habitat, the diversity of habitat available for migrants has diminished. Migrants that prefer stopover habitats that resemble their breeding or wintering grounds (Petit, 2000) now are limited to choosing habitats for stopover sites that are uncharacteristic of those used at other times of the year.

A decision to use a site as stopover habitat may depend on many factors including the tillage practices that occurred the preceding fall (Castrale, 1985), the amount of food available within a field (Hutto, 1985, Brush and Stiles, 1986, Diaz and Telleria ,1994), the energy value provided by that food (Kendeigh and West, 1965; Diaz, 1990), habitat surrounding the field, and climatic conditions. These factors as well as type of harvested crop will be analyzed to determine what migrants are using at a time when energy demands are high, surroundings are unfamiliar, and weather is unpredictable.

Methods and Materials

Study Area. This study was conducted in the Southern Drift Plains of North Dakota. In 2001 and 2002, 240 randomly selected quarter sections (approximately 65 ha) in this region were surveyed for breeding blackbird numbers. In late summer these same quarter sections were scouted for sunflower fields to perform sunflower damage assessments. From the quarter sections found to have sunflower (oil or non-oil) in 2002, 30 were randomly chosen for use as sunflower sites. Of the remaining quarter sections, another 30 fields were randomly chosen making sure that each contained a crop field of small grain corn, or soybean for use as non-sunflower sites. To minimize driving time, fields were surveyed in groups of four based on the nearness of sites to one another,.

Bird Abundance. Field habitat within each of the selected quarter sections was surveyed to assess avian use. Birds were counted on sample fields twice during the spring season, extending from 20 March when at least 50% of the selected field was snow free to 30 April when preparation for seeding had begun, or until the fields had been surveyed twice. The species and abundance of birds were recorded by two individuals walking line transects within the study fields. Each observer started at opposite ends of the field and walked perpendicular to the shortest axis of the field. Transects started 50 m in from the field edge, and were 100 m apart [adapted from Stewart and Kantrud (1972)]. Only birds observed on the ground in the field and 50 m on either side of each transect line were counted. Species, sex, and age were recorded. Deviation from the transect line was allowed if the need to get closer to a bird for identification was required. A marker was placed in the field to mark the place where the observer was last standing so he/she was able to return to the correct location. At time of surveying, field characteristics, including field type [sunflower (oil), sunflower (non-oil)], soybean, small grain, corn, or sorghum), till type (No Till or Till) and size were also recorded. Surveys were initiated at sunrise and ran until the four fields designated for

surveying that day were complete. Surveys were not conducted during steady precipitation or strong winds (> 24km/hr).

Variability in field size required that we determine the area of each field so that further comparisons could be made among field sites. ArcInfo 8.3 (Environmental Systems Research Institute, Inc., Redlands, CA) software was used to quantify the area within each field. Aerial photographs obtained from the USDA Farm Services Agency were also utilized to help determine field boundaries. Observed densities within fields were then easily determined by taking abundances divided by field area.

Data Analysis. Descriptive statistics for bird abundance across field types and Student's t-tests were calculated using Excel 2002. Analysis of variance on observed bird densities within differing field types was performed in SAS for Windows 8.2; post hoc comparisons were conducted using Duncan's multiple-range test. Logarithmic transformations were performed on bird abundance data to adjust for deviations from normality and then back-transformed for presentation in figures. All statistical tests were conducted using an alpha level of 0.05.

Results and Discussion

Overall, 10,200 birds, made up of 33 different bird species, were counted. The horned lark, the lapland longspur, and their associations with each other and unknowns in mixed flocks, constituted 67% of the total observations (Figure 1). Blackbirds, including red-winged blackbirds, yellow-headed blackbirds, common grackles, and brown-headed cowbirds comprised about 17% of the observations (Figure 1). All other species represented less than 3% of the observations.

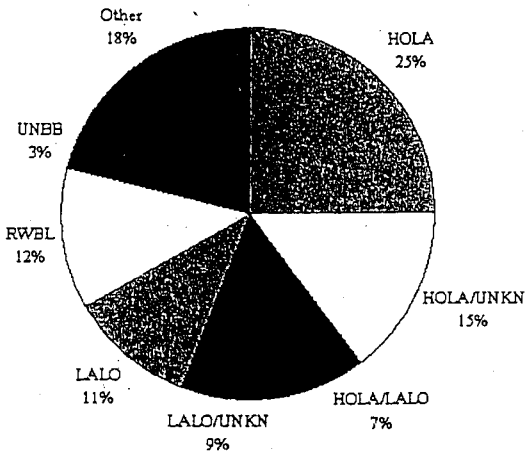

Figure 1. Percent observations by species during spring migration 2003. HOLA = horned lark, UNKN = unknown, LALO = lapland longspur, RWBL = red-winged blackbird, UNBB = unidentified blackbird, Other = those species whose numbers < 3% of the total observations.

In survey period 1 (Figure 2), we observed a significantly greater number of birds in sunflower than non-sunflower, in both untilled ($P < 0.001$) and tilled fields ($P = 0.004$). The number of birds observed was significantly greater in the untilled sunflower fields versus untilled non-sunflower fields, but there was no difference between tilled sunflower and tilled non-sunflower fields in survey period 2 (Figure 2; $P = 0.005$, $P = 0.086$ respectively). In the

second survey period, many of the study fields were plowed resulting in a decrease in the sample size and a reduction in statistical power. Because there was no difference between till types in either of the survey periods, we pooled the values for untilled and tilled fields and compared the numbers of birds seen in the different field types in each of the survey periods (Figure 3).

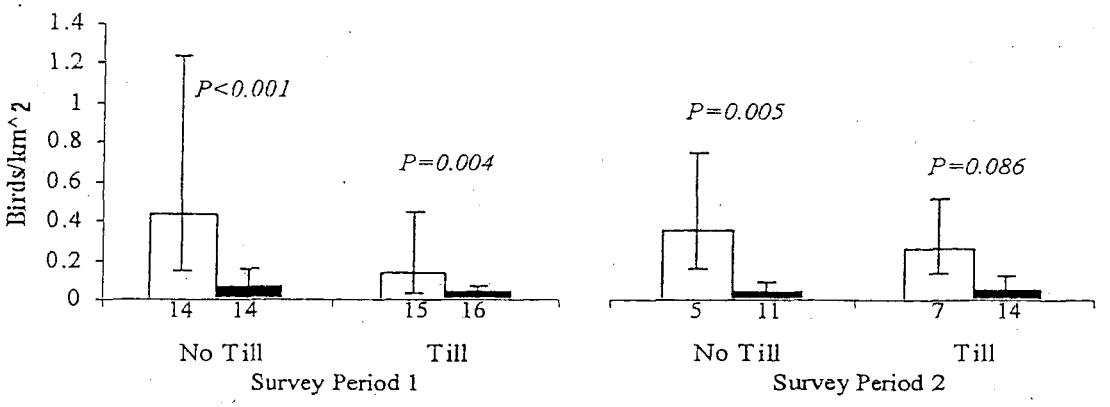

Figure 2. Comparison of avian use numbers and 95% CI between sunflower and non-sunflower field types using the Student's t-test. Open bars represent sunflower field sites (oil and non-oil). Dark bars represent non-sunflower field sites (soybean, small grain, corn, and sorghum). Numbers below bars are sample sizes.

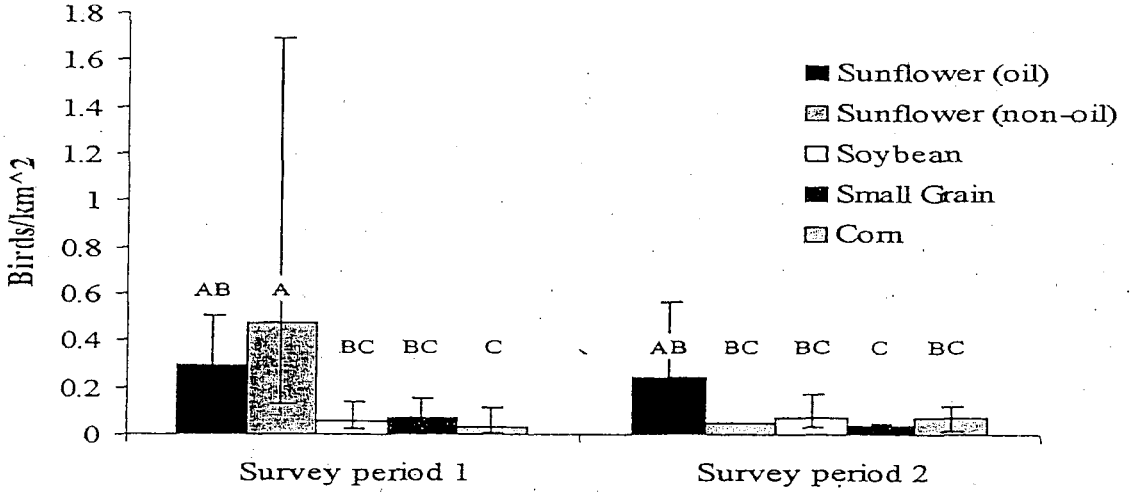

Figure 3. Comparison of avian use numbers and 95% CI using Duncan's multiple comparison test with till types pooled. Field types with different letters are significantly different. α=0.05

Horned larks, lapland longspurs, and their associations with each other and unknowns, were the dominant bird species using harvested crop fields. This result may be attributed to the fact that both of these species prefer open areas with little or no vegetation for foraging (Beason, 1995; Hussel & Montgomerie, 2002). Although no significant differences were found among many of the five different field types (Figure 3), when the field types were

grouped into categories of sunflower and non-sunflower, we found that a significantly greater number of birds were seen in sunflower fields than non-sunflower fields, which may indicate that either there is a greater amount of food, that there is more shelter available surrounding these fields, or that sunflower provides a better food resource than the other crops. Future research will be aimed at determining what might be influencing the use of these fields by different bird species.

Because much of the Southern Drift Plains Region is covered with cropland, harvested fields (especially sunflower) could provide a good source of forage and stopover habitat for migrating birds during a time when energy demands are high, surroundings are unfamiliar, and weather is unpredictable.

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