QUANTIFICATION OF CATTAIL (*TYPHA* SPP.) IN THE PRAIRIE POTHOLE REGION OF NORTH DAKOTA IN RELATION TO BLACKBIRD DAMAGE TO SUNFLOWER

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Abstract

Sunflower is an important crop for many farmers in the upper Midwest, especially in North Dakota and South Dakota. Blackbirds have been a major problem for the sunflower grower community. Bird depredation to a field can be devastating. The USDA-APHIS-WS is charged with reducing the conflict between the birds and the farmers. Many methods have been employed by Wildlife Services and other agencies to lessen the damage. One method is the reduction of the cattail (*Typha* spp.) habitat used by blackbirds in and around wetlands; however, cattails are used by other animals. Consequently, there is a need to insure habitat manipulation is not significantly affecting non-target species, hence knowing what portion of the total cattail habitat is being manipulated is critical. The purpose of this study was to quantify cattail habitat in the Prairie Pothole Region (PPR) of North Dakota. Remote sensing using aerial infrared photographs was used to sample 120, 10.36 km sq. plots, randomly distributed throughout each of four strata dividing the PPR in ND. ArcInfo 8x Geographic Information System (GIS) software was used to run a supervised classification to delineate cattail from other vegetation. Results found 2,245 ± 257 (S.E.) km sq. of cattail in the PPR. These findings show that less than one percent of the total cattail stand in the PPR is being affected by the USDA cattail management efforts.

Introduction

Study Area. The Prairie Pothole Region (PPR) of North Dakota extends across the middle of the state from just east of the Missouri River to the western edge of the Lake Agassiz basin. This region lies at the center of the North American continent and is crossed by a continental divide, separating drainage systems of the Hudson Bay and the Gulf of Mexico (Stewart and Kantrud, 1972). Glaciers shaped the topography of the region during the

Pleistocene Epoch. These glaciers formed uneven deposits of glacial till and large buried ice blocks that today make up the numerous prairie potholes and sloughs (Colton et al., 1963).

Sunflower Depredation. Production of sunflower in North Dakota and South Dakota has grown exponentially from a few thousand acres in the 1960s to nearly 1.1 million acres in 2001 (North Dakota Agricultural Statistical Service, 2002; Lilleboe, 1979). Red-winged blackbirds (*Agelaius phoeniceus* L.), yellow-headed blackbirds (*Xanthocephalus xanthocephalus* Bonaparte), and common grackles (*Quiscalus quiscula* L.) comprise over 10% of the avifauna in North Dakota and use the rich sunflower crops as energy during their fall migration through the Northern Great Plains. This migration occurs in late summer when the sunflowers are ripening and can cost sunflower growers millions of dollars in damage to their crops (Lamey and Luecke, 1991; Hothem et al., 1988; Stewart and Kantrud, 1972). Red-winged blackbirds and common grackles generate the most damage, with yellow-headed blackbirds also contributing a minor amount during their migration (Homan et al., 1994). During fall migration, blackbirds use large stands of cattail as night roosts (Lutman, 2000). If these roosts are large and are located near a sunflower field, that field may experience severe damage (Otis and Kilburn, 1988). Farmers may prevent excess damage to their crops by not planting sunflower crops near large roosting sites (Arnett, 1984). In the PPR of North Dakota, avoiding these areas can be difficult due to the abundance of wetlands formed during glaciation of the region (Judson and Kauffman, 1990). When such conditions exist where crops cannot be safely rotated due to locations of blackbird roosts, farmers must turn to alternative methods to protect their crops.

Cattail Management. Cattail (*Typha* spp.) is the dominant wetland emergent vegetation in the PPR. The type of cattail that is most common is thought to be a hybrid of a broad and narrow leaf cattail (Kantrud, 1992). This hybrid is ideally suited for the agricultural environment within its range. The abundance of slightly saline wetlands as well as the frequent disturbance by tillage contributes to the success of cattail growth in the area. Animals such as white-tailed deer (*Odocoileus virginianus* Zimmerman), ring-necked pheasants (*Phasianus colchicus* L.), marsh wrens (*Cistothorus platensis* Latham), waterfowl (Anatidae) and blackbirds (Icteridae) use cattail as an important source of shelter (Kantrud, 1992). The overabundance of cattail in some wetlands may also have negative effects for some wildlife. Many waterfowl prefer open water interspersed with emergent vegetation (Linz et al., 1996a; Solberg and Higgens, 1993). Shorebirds like the black tern (*Chlidonias niger* L.) also use wetlands with exposed mudflats and floating masses of dead cattail (Linz and Blixt, 1997; Linz. et al., 1997; Linz et al., 1994; Blixt, 1993).

Successful reduction of cattail in some wetlands has been achieved by using an aquatic herbicide. Currently the only aquatic herbicide that is registered with the EPA is a glyphosate-based product (Ware, 1989). Glyphosate can virtually eliminate all treated cattail, but the cattail may grow back in later years (Linz et al., 1996b; Solberg and Higgins, 1993). By fragmenting dense cattail stands near sunflower areas, managers may be able to reduce blackbird damage to crops (Lutman, 2000). The reduction of cattail may also raise concerns about organisms that benefit from cattail habitat. The purpose of this project is to provide managers with data to make informed decisions about cattail management.

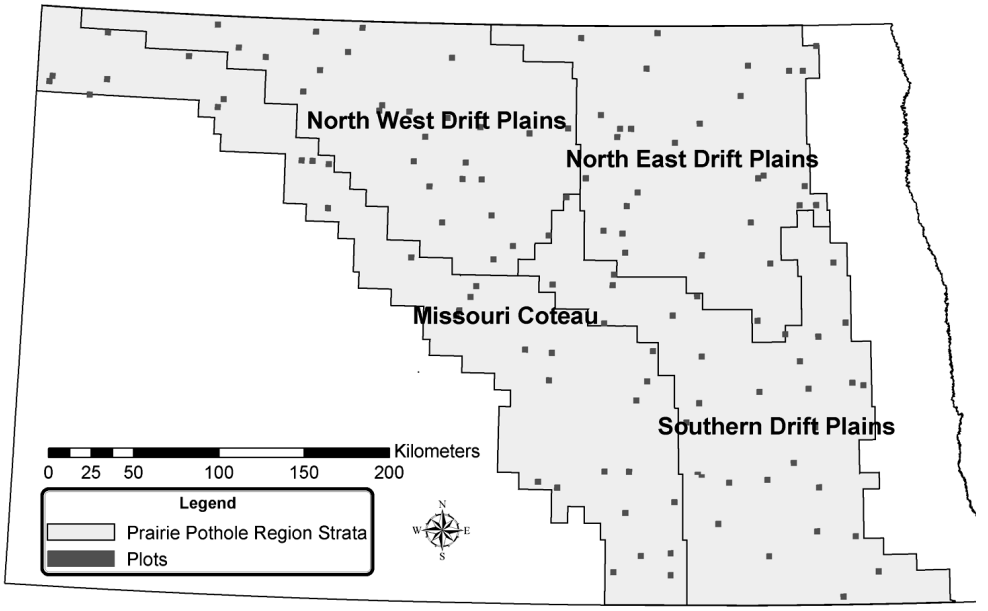

Figure 1. Sample sites within the strata of the North Dakota Prairie Pothole Region.

Methods

Study Site Selection. The Prairie Pothole Region of North Dakota was stratified into four zones based on biotic differences described by Stewart and Kantrud (1972). The divisions include the Missouri Coteau, Northwest Drift Plains, Northeast Drift Plains, and Southern Drift Plains (Figure 1). Physiographic boundaries were drawn along the nearest township lines (ND D.O.T., 2002). A total of 120 10.36 km sq. sample plots were randomly selected with allocation to each stratum based on its proportionate area (Figure 1, Table 1).

Data Collection. Data were collected from each site by taking aerial color infrared photographs (CIR). Four photographs were taken of each site, with one photograph for each quarter of the square sample plot. Photographs were taken from mid-August to early September of 2002.

Ground surveys were conducted on half (60) of the sample sites distributed throughout the study area. The surveys were done to gain knowledge in reading and interpreting aerial CIR images as well as to serve as a later check for accuracy of image classification of cattail.

GIS Image Analysis. The photographs were developed and then digitized at 300 dpi into a TIFF format. Subsequently the photographs were imported into a Geographic Information Systems (GIS) program for analysis. The GIS program used throughout this study is ESRI's ArcInfo 8x package. Photographs were georeferenced using at least four identifiable ground features in the image and referencing them with pre-referenced North Dakota Department of

Transportation coverage layers. Once georeferenced, the images were rectified to correct for pixel distortion caused by photographic angles. Each photograph was analyzed separately due to the color variation among images.

Shapefiles were created and used for each photograph to serve as an analysis mask for cattail-containing areas. The masked areas were reclassified into 3-32 pixel classes. These classes were then manually sorted into either being cattail or non-cattail groups. The cattail pixels were then converted from raster to vector format where topological information such as area and perimeter could then be extracted. This process was repeated for all four photographs of the sample plot, and cattail for the entire site was summed. This process was repeated for all sample plots. In order to improve accuracy, United States Geological Service digital elevation models as well as United States Fish and Wildlife Service national wetlands inventory data were used during photographic analysis to gain more information about the sites and possible cattail-containing areas. For sample plots that were visited, data were checked against recorded cattail locations to ensure accuracy.

Results

Results for all photographic analyses were summed and extrapolated to each stratum. Missouri Coteau estimates were 343.6 ± 43.9 (S.E.) km sq. of cattail; Northwest Drift Plains estimates were 257.5 ± 59.7 (S.E.) km sq. of cattail; Northeast Drift Plains estimates were

Table 1. 2002 land characteristic data by strata.

	Area (square km)	Number of Sample Sites	Estimated % of Land Covered by Cattail Mean (S.E.)	*Wetlands / square km	**Area of Sunflower in 2002 (square km)
North Dakota	183,123	-----	-----	4.17	6,572
Prairie Pothole Region	95,172	120	2.36(0.27)	6.57	4,156
Missouri Coteau	26,143	33	1.31(0.17)	4.40	887
Northwest Drift Plains	21,740	27	1.18(0.27)	6.79	1,260
Northeast Drift Plains	21,927	28	4.25(0.87)	8.19	971
Southern Drift Plains	25,361	32	2.83(0.47)	7.21	1,038

*Results from National Wetlands Inventory Data complied and manipulated using GIS.
** Results from 2002 NASS/NDSU Agriculture Extension Service satellite crop data manipulated using GIS.

931.7 ± 190.5 (S.E.) km sq. of cattail; Southern Drift Plains estimates were 717.6 ± 118.0 (S.E.) km sq. of cattail. The estimated average for the entire Prairie Pothole Region of North Dakota is 2,244.5 ± 257.3 (S.E.) km sq. of cattail (Table 1).

In order to help explain the differences in cattail amounts between strata, national wetlands inventory data were compiled and summed for each stratum. As expected, a correlation was found with more wetlands relating to more cattail (Table 1). Incidentally, the same positive correlation was found with the amount of sunflower grown in each stratum in 2002; the areas with more cattail wetlands also contained more acres of sunflower with the exception of the Northwest Drift Plains (Table 1). Thus, the USDA Cattail Management Program may be beneficial in reducing sunflower depredation in "high risk" areas. In 2002, the USDA Wildlife Services sprayed 1,652 ha of cattail enrolled in their cattail management program (USDA, 2002, Pers. Cor.). According to our estimates, the amount sprayed represents only 0.74% of the total cattail present in the Prairie Pothole Region of North Dakota.

Discussion

Blackbird and agricultural conflicts will continue to be a vexing problem. Managers are constantly searching for effective control methods to reduce pest damage. Managers are also under much pressure from the public to not negatively impact non-target species during their management efforts. No one control method will provide a solution to the large scale problem of the blackbird/sunflower issue. Many processes must be combined to be effective. However, cattail control has been an effective tool for localized situations. USDA-APHIS Wildlife Services can spray cattail stands in and around a sunflower field before flocks of migrating birds arrive. Without roosting sites, these birds will be less likely to remain in the area of the sunflower field and, therefore, not cause significant damage. Because this habitat manipulation affects other wildlife that also use the cattail, the public and other interest groups must be assured that cattail management is not having a significant negative impact on those non-target species. As our data suggest, less than one percent of the total available cattail is being affected, therefore probably not causing a significant reduction in habitat for non-target species.

Acknowledgments

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References

Arnett, G. R. 1984. Blackbird control in sunflower. The Sunflower. 10:37.

Blixt, D. C. 1993. Effects of glyphosate-induced habitat alteration on birds. M.S. Thesis, North Dakota State University, Fargo, North Dakota, USA.

Colton, R. B., R. W. Lemke, and R. M. Lindvall. 1963. Preliminary glacial map of North Dakota. U.S. Geological Survey. Geologic Investigations.

Homan, H.J., G.M. Linz, W.J. Bleier, and R.B. Carlson. 1994. Dietary comparisons of adult male common grackles, red-winged blackbirds, and yellow-headed blackbirds in north central North Dakota. Prairie Naturalist. 26:273-281.

Hothem, R. L., R. W. DeHaven, and S. D. Fairaizl. 1988. Bird damage to sunflower in North Dakota, South Dakota, and Minnesota, 1979–1981. U. S. Fish and Wildlife Service Technical Report 15. U. S. Government Print Office, Washington, D. C.

Judson, S., and M. E. Kauffman. 1990. Physical Geology. Eighth edition. Prentice-Hall, Inc. Englewood Cliffs, New Jersey, USA.

Kantrud, H.A. 1992. History of cattails on the prairies: wildlife impacts. *In*: Proceedings of a Cattail Management Symposium (G.M. Linz, Ed.). U.S. Department of Agriculture, Denver Wildlife Research Center and the U.S. Fish and Wildlife Service, Fargo, North Dakota, USA.

Lamey, H. A., and J. L. Luecke. 1991. Preliminary results of the 1990 North Dakotas grower survey of pest problems and pesticide use. Proc. Sunflower Research Workshop, Fargo, North Dakota, 10-11 Jan. p. 27-29.

Lilleboe, D. 1979. Crop Reporting Service "Our goal is to provide facts for decision-making." The Sunflower 5:12, 26, 28.

Linz, G. M., and D. C. Blixt. 1997. Black terns benefit from cattail management in the Northern Great Plains. Colonial Waterbirds. 20:617-621.

Linz, G. M., D. L. Bergman, D. C. Blixt, and C. McMurl. 1997. Response of American coots and soras to herbicide-induced vegetation changes in wetlands. Journal of Field Ornithology. 68:450-457.

Linz, G. M., D. C. Blixt, D. L. Bergman, and W. J. Bleier. 1994. Response of black terns (*Chlidonias niger*) to glyphosate-induced habitat alterations on wetlands. Colonial Waterbirds. 17:160-167.

Linz, G. M., D. C. Blixt, D. L. Bergman, and W. J. Bleier. 1996a. Response of ducks to gyphosate-induced habitat alterations in wetlands. Wetlands. 16:38-44.

Linz, G. M., D. C. Blixt, D. L. Bergman, and W. J. Bleier. 1996b. Responses of red-winged blackbirds, yellow-headed blackbirds and marsh wrens to glyphosate-induced alterations in cattail density. Journal of Field Ornithology. 67:167-176.

Lutman, M. W. 2000. Location and habitat characteristics of late-summer blackbird roosts in the sunflower-growing region of North Dakota. M.S. Thesis, North Dakota State University, Fargo, North Dakota, USA.

North Dakota Agricultural Statistical Service. 2002. North Dakota Agricultural Statistics 2002. North Dakota Agricultural Statistical Service, Fargo, North Dakota, USA.

North Dakota Department of Transportation. 2002. North Dakota Minor Civil Divisions – Townships Map. North Dakota Department of Transportation. Planning Division, Bismarck, North Dakota, USA.

Otis, D.L., and C.M. Kilburn. 1988. Influence of environmental factors on blackbird damage to sunflower. U.S. Fish and Wildlife Service, Fish and Wildlife Technical Report 16. Washington, D.C., USA.

Solberg, K. L., and K. F. Higgins. 1993. Effects of glyphosate herbicide on cattail, invertebrates, and waterfowl in South Dakota wetlands. Wildlife Society Bulletin. 21:229-307.

Stewart, R. E., and H. A. Kantrud. 1972. Population estimates of breeding birds in North Dakota. The Auk. 89:766-788.

Ware, G. W. 1989. The Pesticide Book. Third edition. Thompson Publications, Fresno, California, USA.