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# RESPONSE OF AVIAN COMMUNITY TO WILLOW RING MANGEMENT IN PRAIRIE POTHOLE WETLANDS

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## ABSTRACT

Wetlands surrounded by willow vegetation (willow rings) within the Prairie Pothole Region (PPR) are an important part of the prairie landscape. They provide habitat for wildlife, remove agricultural runoff, and reduce soil salinity. However, willow rings in the PPR are continually destroyed to increase crop production. Recently willow rings have been targeted as a renewable source of biomass for bioenergy operations because it is adapted for quick growth following harvest. Management of willow vegetation from wetlands will increase the economic incentive to retain wetlands intact on the prairie landscape. However, there is currently, little known about the avian species inhabiting willow rings or the impact that harvesting natural willow vegetation will have on these species. My research will look at the natural variation in willow ring coverage and age to simulate harvest treatments of willow rings. Point counts will provide information on the bird species that use each wetland as well as how birds react to changes in willow vegetation structure. Comparisons of high and low density wetland areas across different land cover types will be used to demonstrate any habitat preferences bird species may have. The results of this research will determine the impact that willow harvest will have on avian populations inhabiting these wetlands. This research can then be used to create guidelines for sustainable willow ring management practice in the future.

Keywords: wetlands, willow vegetation, birds

## INTRODUCTION

Millions of highly productive wetlands were created during the last glacial retreat, creating the Prairie Pothole Region. These depressional wetlands perform important ecological functions within the prairie ecosystem; including the removal of agricultural runoff from soils and reduction of slough ring salinity (Kuzovkina and Quigley 2005). This matrix of wetlands also provides habitat and necessary resources for wildlife and is especially important to avian species. This region is known as an important stopover for migratory birds, supporting over 50% of North Americas waterfowl migrants alone (Leon and Smith 1999). During the breeding season this region hosts over 100 different bird species (Haig *et al.* 1998).

However, the processes that created the Prairie Pothole Region also created exceptionally fertile soils with high potential for agricultural production. Consequently, 50% of historical wetland area in the United States and 71% in Canada has been drained for agricultural use (Rashford *et al.* 2011). Between 1985 and 2001 over 500,000 acres of Canadian Prairie Pothole Region was lost with 62% of it converted for agricultural activities (Rashford *et al.* 2011). In addition

agricultural and urban activities have altered upland pasture and grassland, lowering the habitat suitability of the wetlands for biota (Naugle *et al.* 2000).

The development of bioenergy has put pressure on wetlands with willow (*Salix sp.)* vegetation growing around them (willow rings). Willow biomass has been found to be an efficient and renewable feedstock for bioenergy (Schroeder et al 2009). The harvest of natural willow biomass will increase the economic value of willow rings, influencing land owners to maintain these wetlands on their land rather than the common alternative of draining them. However, little is known about the avian communities that make use of willow rings or how willow ring management will affect avian species.

To understand how willow ring management will affect avian community structure one must understand what influences birds to use a specific habitat. Characteristics important to habitat selection include the size of the habitat patch available. Some species use large territories that include foraging and breeding habitat while other species forage outside of their nesting territory and defend a smaller territory (Lowther *et al.* 1999, Grant and Knapton 2012, Yasukawa and Searcy 1995). Differences in nesting preferences (shrub, ground, cavity, and reed nesters, for example) will also influence what site a bird chooses. Food and feeding preferences can also influences how species choose their territory; whether they forage by gleaning shrubs, ground or aquatic vegetation or feed on grains or berries (Lowther *et al.* 1999, Grant and Knapton 2012, Yasukawa and Searcy 1995).

A single willow ring may contain several different resources. Wetland vegetation zones develop in concentric rings from the centre point. Each zone is characterized by a different type of vegetation based on moisture levels (Steward and Kantrud 1971). This creates a wetland system that has diverse vegetation structure and multiple niches for many species to inhabit, creating a diverse avian community within willow rings.

The objectives of my research include:
1. To determine what species make up the avian community of a willow ring.
2. To determine species' preferences to landscape (wetland density, land cover) and local (wetland vegetation) habitat characteristics.
3. To determine the impacts of periodic willow biomass harvest on the avian community.
This information can be used to inform industry on sustainable willow ring management practice and to create best practice guidelines for future management of willow rings to maintain healthy wetlands for numerous breeding bird species, and millions of spring and fall migrants using the willow rings in the Prairie Pothole Region.

## METHODS

FlySask aerial photos along with a water body inventory layer were used to randomly select 116 willow ring sites. The selected sites were then ground truthed to determine they were willow rings. If the wetland lacked willow vegetation or was dominated by another tree or shrub species the nearest willow ring is then used. All sites were divided into two land cover categories; Cropland and grassland. Cropland cover includes various annual crops; flax, wheat, canola and legumes. Grassland cover includes perennial forage crop and tame grass. The sites were then

further divided into low and high wetland density classes. Between 27 May and 7 July 2012 point count surveys were conducted at each willow ring beginning at sunrise and ending at 08:00. Point counts were then conducted again the following breeding season. From July to October 2012 vegetation measurements were taken including willow height and willow stem density. Wetland and willow area was measured using a geographic information system (ArcMap).

Using this collected data I will analyze changes in avian richness and abundance along a gradient of varying vegetation structures. This will determine which willow ring characteristics contribute the most to habitat selection in different bird species. Analysis of avian communities along a gradient of percent willow cover will simulate how willow harvest will affect bird populations using these wetlands.

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