AVIAN SPECIES RESPONSE TO WETLAND RESTORATION: AN EXAMPLE IN SOUTHWESTERN MANITOBA PARKLAND

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Introduction

The Intergovernmental Panel on Climate Change has declared that urgent action is needed to mitigate further climate warming if a liveable future is to be secured for all.[1] Canadian governments, provincial and federal, have realized the need to address climate change and environmental degradation and recently have budgeted millions of dollars to conservation organizations tasked with the goal of mitigating these issues.[2,3] These organizations work primarily in agricultural areas using habitat conservation as a tool to improve wildlife populations and general ecosystem health. They provide expertise and direct financial support to landowners and through voluntary agreements, deliver ecological goods and services that help promote sustainable agriculture, reduce the effects of climate change, and enhance biodiversity for the benefit of future generations. Projects such as wetland restoration and enhancement, riparian buffers, shelterbelts, afforestation and native prairie grass restoration provide ecological goods and services such as flood control, cleaner water and air, wildlife habitat, carbon sequestration, and climate resiliency.[4]

Wetland restorations are prioritized because (i) their loss in Manitoba and worldwide has been startling[5,6] and (ii) because wetlands are among the most diverse and productive wildlife habitats in the world and support biodiversity that is disproportionately high for their area.[7] An example of one such conservation project in southwestern Manitoba is a wetland restoration at 50°26'30"N, 99°49'13"W, approximately nine kilometres southeast of Erickson. This project was initiated in 2016 using joint funding from two organizations to construct the infrastructure and compensate the landowner through a 10-year agreement. Both organizations are charitable: the Manitoba Habitat Conservancy (formally Manitoba Habitat Heritage Corporation) is dedicated to conservation and restoration enhancement of fish and wildlife habitat, and ALUS Canada (Alternative Land Use Services) promotes an innovative community-developed and farmer-delivered program that produces, enhances and maintains ecosystem services on agricultural lands.[8,9] A 1.9 ha Class IV-cover type 1[10] wetland (cattail [*Typha spp.*] centre with no or very little open water area, Figure 1) was restored by plugging a large ditch dug at an unknown time in the past (>50 years). Land use around this wetland is a mixture of open and bush pasture (Figures 1 and 2). Construction was completed in the fall of 2016, resulting in a dam

FIGURE 1. Google Earth view of wetland near Erickson, Manitoba, 2012, prior to restoration in 2017. Note location of future dam and central cattail (*Typha spp.*) patch surrounded by sedges (*Carex spp.*).

FIGURE 2. Google Earth view of restored wetland near Erickson, Manitoba, July 2019, showing location of dam constructed in 2016 and floating remnants of former cattail (*Typha spp.*) patch.

approximately 1.5 m high (Figure 3). The wetland filled behind the dam in 2017 with water draining from grasslands and cultivated fields, flooding pasture and poplar (*Populus spp.*) bush and resulting in a larger (~ 3.8 ha) class V-cover type 4 wetland (open water with little emergent vegetation, Figure 2,3). Beavers (*Castor canadensis*) immediately established themselves in the new wetland (Figure 3). As of summer 2018, emergent vegetation was sparse and the cattail patch centre of the drained condition initially floated to the top after filling and has gradually disappeared since then (Figures 1-4). Duckweed (*Lemna spp.*) has grown profusely each summer, forming dense patches in wind-protected areas (Figure 2-4). Fortunately, this wetland was situated on a long-term study area for waterfowl, enabling the capture of species change data from before and after the habitat alteration. The number or presence of other avian species (e.g., blackbirds [(*Icteridae*], rails [*Rallidae*], wrens [*Troglodytidae*]), and plant and insect species (aquatic and terrestrial) may have changed but effort to accurately record such change was beyond the scope of this study. Based on published literature,[11,12] I predicted that diversity and number of species easily observed using my methods would increase after restoration. The purpose of this manuscript is to present these change results and demonstrate the positive environmental contribution of this project.

FIGURE 3. View of restored wetland near Erickson, Manitoba, August, 2022 showing dam (left of cattail [***Typha spp.***]) and beaver (***Castor canadensis***) attempts at further damming.

FIGURE 4. View of restored wetland near Erickson, Manitoba, August, 2022, showing uplands surrounding the wetland and flooded trees (***Populus spp.***) and duckweed (***Lemna spp.***) patches.

Survey methods

From 2009 to 2018, I conducted three annual roadside breeding pair surveys during 21-25 May, 31 May-4 June, and 6-12 June. These dates were chosen to best determine breeding pair numbers for the primary species under study at the time, namely, Lesser Scaup (*Aythya affinis*) and Ring-necked Duck (*A. collaris*).[13] I walked to the wetland and, using binoculars and spotting scope, viewed it from several locations to ensure complete coverage. I clapped my hands together to bring hidden birds into view. In addition, I recorded the presence of other obvious avian species, mainly waterfowl but excluding smaller passerine birds due to time constraints. To observe waterfowl broods, I surveyed the wetland as above at approximately weekly intervals until early September. I used brood age (based on juvenile plumage characteristics[14]) and size to avoid duplication in counts. Brood search effort averaged about seven visits annually. For each species, I determined the greatest number of individuals or broods recorded during any survey and used that number as the result for that year. The pre-restoration wetland may have supported broods of waterfowl and other species but was not entered to flush hidden broods

because Lesser Scaup and Ring-necked Duck broods are rarely encountered in wetlands with no open water. I chose results from the last five years of the study because I felt that these years accurately represent the before and after restoration periods.

Results

The species of wetland-associated birds recorded before and after the wetland was restored are presented in Table 1. Species representation increased after restoration. The number of waterfowl species recorded before wetland restoration was one and the number after was 13. Four other wetland avian species common to the area were seen only after the restoration, but outside the pair census period. Nine of the 13 breeding waterfowl species recorded utilized this wetland for brood-rearing for at least one of the survey years after restoration. Diving (tribe Aythyini), sea (tribe Mergini) and dabbling duck and goose (tribe Anatini) broods were recorded. Toward the end of summer, large groups (10-20 individuals) of Canada Geese (*Branta canadensis*) and Wood Ducks (*Aix sponsa*) were noted on the wetland.

Discussion

As expected, most waterfowl species common to the area now were represented after restoration.[15] As well, the two species of grebe presently common on wetlands of this size were seen at least once. Interestingly, Red-necked Grebes (*Podiceps grisegena*), an overwater nesting species, were able to successfully raise a brood during the first years after impoundment when the floating cattail remnants remained (Figure 2). Northern Pintail (*Anas acuta*), American Wigeon (*Mareca americana*), and Horned Grebe (*Podiceps auratus*), recorded locally in surveys during the 1970s, are now much reduced in breeding numbers, and were not recorded.[15,16] The absence of extensive emergent growth (cattails, bullrushes [*Scirpus spp.*], sedges [*Carex spp.*]) soon after restoration may have deterred other overwater nesting species (e.g., Canvasback [*Aythya valisineria*], Ruddy Duck [*Oxyura jamaicensis*], American Coot [*Fulica americana*]) from utilizing this wetland to greater extent and may be a reason for them not being recorded.

Comparing before and after restoration brood use of this wetland is confounded by the lack of aggressive brood flushing (beat-outs) within the closed emergent patch before inundation. Females with broods can be found in shallow wetlands as existed here before restoration, usually as they transit between nesting and brood rearing areas or move towards larger and safer, more permanent ones; in years with adequate water levels and emergent cover, shallow wetlands may be used for feeding and avoiding predators.[13,17] However, it is unlikely that species use was extensive because females with broods of most species (e.g. Lesser Scaup, Bufflehead [*Bucephala albeola*], Mallard [*Anas platyrynchos*]) prefer permanent or semi-permanent wetlands with central open water for brood rearing[13,18,19] and, in most years, this wetland prior to restoration would contain little or no water by late summer. Accordingly, these data suggest that this restored class V wetland provides greater opportunity (than existed with the pre-impounded wetland) for waterbirds to settle, establish new or expanded home ranges and/or territories, forage, raise broods and stage prior to migration. Initially, it has not provided additional overwater nesting habitat for waterbirds.

It is important to note that this wetland is newly created, shorelines are encroaching on upland pasture or woodland and emergent vegetation succession is just beginning. At the time of this writing, cattail and sedge clumps are beginning to expand around the periphery. Emergent vegetation succession can be a lengthy process because seeds or vegetative parts need to be transferred from other wetlands. [20] Other similar looking but beaver-created wetlands in the area, with shorelines also flooded into uplands, have taken more than 15 years to produce a wide ring of emergent vegetation (personnel observation). Therefore, diversity of species may increase as the wetland

TABLE 1. Greatest number of selected waterbirds (males [M], females [F], unknown gender [U]) recorded during one of three breeding pair surveys and greatest number of broods (B) recorded during subsequent brood surveys on a Manitoba wetland before (2014-2016) and after (2017-2018) water levels were raised by wetland restoration.

SPECIES	2014	2015	2016	2017	2018
Lesser Scaup (*Aythya affinis*)	0	0	0	0	1M,1F,1B
Ring-necked Duck (*A. collaris*)	0	0	0	2M, 1F, 3B	5M,5F
Bufflehead (*Bucephala albeola*)	0	0	0	1F*	6M,2F*,1B
Common Goldeneye (*B. clangula*)	0	0	0	1F*	0
Redhead (*Aythya americana*)	0	0	0	2M, 1F	0
Hooded Merganser (*Lophodytes cucullatus*)	0	0	0	1F*	0
Mallard (*Anas platyrynchos*)	3M	0	0	3M, 1F, 1B	1M, 1B
Northern Shoveler (*Spatula clypeata*)	0	0	0	1M, 1B	1M, 1F
Gadwall (*Mareca strepera*)	0	0	0	0	1M, 1F
Blue-winged Teal (*Spatula discors*)	0	0	0	5M, 1F, 2B‡	1M, 1F
Green-winged Teal (*Anas crecca*)	0	0	0	4M	0
Wood Duck (*Aix sponsa*)	0	0	0	1M, 1B	10U
Red-necked Grebe (*Podiceps grisegena*)	0	0	0	1M, 1F, 1B	1M, 1F
Pied-billed Grebe† (*Podilymbus Podiceps*)	0	0	0	1U	0
Canada Goose (*Branta canadensis*)	0	0	0	1M, 1F	2B
Great Blue Heron† (*Ardea herodias*)	0	0	0	1U	0
Spotted Sandpiper† (*Actitis macularius*)	0	0	0	1U	1U
American White Pelican† (*Pelecanus erythrorhynchos*)	0	0	0	20U	0

F* represents adult female or yearling female

† Indicates species seen outside of pair survey dates

‡ Indicates Blue-winged or Green-winged brood

matures and the developing emergent vegetation ring becomes more attractive for those plant and animal species (e.g., overwater nesting waterfowl, songbirds, muskrats [*Ondatra zibethicus*]) associated with this habitat type.[21,22] Species loss occurring when the original wetland with closed emergent cover type was flooded likely will be mitigated in time by the newly created emergent ring habitat. However, highest total waterbird numbers may occur in the early years after flooding because the early secondary successional stages often provide an abundance of plant and animal food.[23] In conclusion, I expect this new wetland to develop into one similar in function to other class V wetlands in the area and provide breeding, staging and migration stop-over habitat for a plethora of avian (especially waterfowl) and other species. Over time, this project will also provide flood control, cleaner water, carbon sequestration, and climate resiliency.[22] Alternatively, without impoundment, this water with its accompanying nutrients and provision of ecological goods and services, would be lost annually to nearby streams and eventually, the Assiniboine River spring flow and further exacerbate nutrient and flooding issues in Lake Manitoba and Lake Winnipeg.[24,25]

Partnerships between governments, delivery agencies and landowners highlight the positive environmental and societal benefits that can be achieved through cooperation. Governments are supporting such projects to work toward their goal of successful climate crises mitigation and landowners are receiving rewards for adopting these programs. Indeed, when asked why they agreed to this restoration and their level of satisfaction with it, the landowners replied that they wanted to replace the environmental benefits lost when the wetland was drained, were satisfied with the work done and remuneration received, and were pleased to see the diversity of species now present. I would urge all landowners to consider these partnerships.

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