

Bird Monitoring Results 2020

Bobolink Meadow LWR and Bartel Grasslands LWR

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Bobolink photographed at Bobolink Land and Water Reserve on May 29, 2020.

PC: Libby Keyes, Bird Monitor

Dedication

I have had the honor of being associated with this project from the moment of its inception on a chilly day in the field - with Marianne Hahn, bird monitor; Stephen Packard, Audubon Chicago Region; Alan Anderson, Chicago Audubon Society; and Chris Merenowicz, Forest Preserves of Cook County - to now.

This report documents a significant achievement for bird conservation in the Chicago Region. Bartel Grassland was among the first of a large crop of projects to use new research by Jim Herkert showing that grassland birds need large, unbroken grasslands; and conclusions from a bird monitor and steward in DuPage County, Joe Suchecki, showing that grassland birds respond better to seed mixes that omit the tallest grasses, big bluestem and Indian grass. The Bobolink LWR restoration came a few years later and built upon lessons learned. These two projects converted hayfields, picnic groves, weedy meadows and former agricultural fields to thriving bird habitat. At many points in this project, partners had to take a chance on doing things a different way. Partners are the Forest Preserves of Cook County and Openlands along with Audubon Chicago Region, Living Habitats, and many contractors. Many, many of the region's ecologists attended planning meetings to develop consensus plans with the landowning partners.

The vision that drove all this came from community members – including many birders – who fell in love with the idea that rare grassland birds could thrive in this Cook County Forest preserve. And the report you are reading today could not have happened without many hot days of data collection in wet or tick-infested fields by volunteer bird monitors. Their passion and vision are a key part of the partnership. This project, of course, required large sums of money and savvy professionals to pull off, chief among them Linda Masters and Joe Roth of Openlands, Heidi Natura of Living Habitats and many staff of the Forest Preserves of Cook County. But this report is dedicated to those community bird conservationists whose vision and hard work both provided the spark and then verified the efficacy of the plan:

The first set of monitors at Bartel: Marianne Hahn, Marlys Oosting and Penny Kneisler; and the monitors who succeeded them: Robert Sliwinski, Dan Lory and Judy Pollock

The first monitors at Bobolink: Al Thomas, Lisa Rade, Amar Ayyash, Fran Morel and Joan Norek; and the monitors who succeeded them: Vera Miller, Libby Keyes and Stephanie Beilke

All the birders who entered sightings into eBird, too many to name; but including Wes Serafin, who did so much to generate enthusiasm for this place among birders. May Wes, Joan and Penny rest in peace; they are missed.

And to Stephen Packard, then Director of Audubon Chicago Region, who listened to the voices of community conservationists and used his savvy and connections to help make this project a reality.

The monitoring was conducted under the aegis of the BCN, an entirely volunteer effort to collect data on the region's public lands. This month, the BCN is releasing the results of 20 years of monitoring, which demonstrate that grassland bird populations in the Chicago region are doing far better than any others in the state.

This, and other grassland projects which followed – Orland Grassland and Orland South, Schaumburg Road Grassland, Spring Creek, Bergman Slough, and many in surrounding counties - are a legacy of the region's collaborative and pioneering spirit of bird conservation, of which we all can be proud.

This report contains a summary of the major observations and conclusions from avian monitoring and research at Bobolink Meadow LWR (part of the OMMA project), from the overall grassland complex which also includes Bartel Grassland LWR, and from the 2020 monitoring season. The year 2020 was the final year of bird monitoring at this site. This report contains a look at changes in the site's bird life over the 14 years of the Bobolink Meadow restoration and the 23 years of the Bartel Grassland restoration.

More thorough details of prior years' monitoring and research results and protocols can be found in the comprehensive report submitted to Openlands in 2015 called *Bird Monitoring Summary 2009-2015*, and the subsequent reports submitted in 2016, 2017, 2018, and 2019. The appendix includes a table of all known monitoring efforts and studies of the Bobolink LWR avian population, and the name and year of the report that contains information about each.

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Executive Summary

At the inception of the Bobolink Meadow LWR project (formerly called Tinley Creek Wetland Restoration (TCW)), the potential for the restoration to significantly benefit bird populations was recognized by the project partners. Research, and experiences elsewhere in the region, suggested that breeding and wintering grassland birds would respond to the reduction of fragmentation of the grassland by removing woody encroachment¹ and eliminating aggressive tall grasses from seed mixes. A prioritization and mapping of habitats for migratory birds suggested that wetland restoration would bring shorebirds to the site². The wetland restoration also offered the possibility of breeding wetland birds. Shrubland restoration had potential to bring another set of birds of concern to the site.

In 2020, after 22 years of monitoring and three rounds of statistical analysis, we can safely say that the promise of the site has been fulfilled, as has its potential to serve as a regional natural resource in years to come. Grassland birds, particularly the Bobolink, Eastern Meadowlark and Dickcissel, and the winter raptors (Northern Harrier and Short-eared Owl) are present in much greater numbers over many more acres. The impacts of climate change on the site's birds are an important question for the future.

Research in 2015 showed how these grassland birds choose habitat based on landscape features of the site, and produced a thorough survey of shorebirds. Research in 2016 and 2017 showed that new bobolinks were attracted to the new restoration, and that the mix of herbaceous species installed is successfully attracting many species of grassland birds. A 2018 study discovered at least 3 state-endangered King Rails using the larger Bartel and Bobolink LWR sites during the breeding season, and detailed other marsh bird territories. The same study repeated in 2019 and 2020, showed that the sites provide habitat for many rare wetland birds such as grebes, rails and bitterns in wet years. The year 2020 saw the sites' first documented Bartel-raised pied-billed grebe, a fitting sign that the wetlands have come of age along with the restoration. The shrubland restoration, though small, has brought additional species of concern to the sites.

Monitoring has increased our knowledge of bird life both within and outside the breeding season. Shorebirds and cranes regularly use the site in spring migration. Three extremely rare birds - the federally-endangered Whooping Crane, the vagrant White-faced Ibis and the secretive Yellow Rail - have paid the project site a visit. Seven species of owl have been recorded in the larger site. Bobolink LWR's emergent wetlands are ephemeral, precluding their use by some wetland-dependent nesters in all but the wettest years. Wilson's Snipe and three species of rail that like wet grassland have been documented in numerous years during nesting season. Thorough monitoring of wetland birds in 2018 - 2020 confirmed that at least 3 King Rails, 1 Pied-billed Grebe, nine Soras and five Virginia Rails were present during the breeding season and likely nested. Wilson's Snipe and King Rail are extremely rare breeding species in Illinois.

This site provides important lessons for other local grasslands.

- Contrary to local lore, grassland birds will use restored grasslands in large numbers – if tall grasses are omitted from the seed mix.

¹ Herkert, Szafoni, et. al. 1993

² Byrne, 1998

- Sites at the tops of watersheds are valuable to consider for restoration. Restoring natural water flow is easier in these sites. Cleaner water and more natural hydrology will benefit wildlife both on site and downstream.
- Large grassland-wetland complexes play an important role in the region's mosaic of wetlands. In dry years, they are used mainly by grassland birds, but in wet years, many wetland birds find nesting habitat here when other sites might be too wet for them.
- When the trees were removed and the site was a big mudflat, the numbers and diversity of shorebirds were great. As the restoration matured, the site became less suitable for shorebirds. This is a common phenomenon in restorations. As a region, we may want to consider whether we have sufficient habitat for shorebirds and if not, we might want to consider artificially manipulating a few sites to create more mudflats.

In 2015, the site was renamed Bobolink Meadow Land and Water Reserve (BMLWR). In combination with the adjacent Bartel Grassland IBA/LWR, the site has the second-highest number of bobolinks in the state. The 2021 update of the Illinois Department of Natural Resources Wildlife Action Plan lists 82 bird species in greatest need of conservation. Fifty-two of them have been recorded using the BMLWR project area; 25 have been recorded during the breeding season. Wetland migrants and grassland and shrubland nesters are most significant. The Bird Conservation Network's 2022 revision identifies 105 species of Conservation Concern in the Chicago region; 59 use the BMLWR restoration. Nine Illinois Endangered (E) and one Illinois Threatened (T) species have used the site as follows:

Short-eared Owl (*Asio flammeus*) E – winters regularly - grassland
 Northern Harrier (*Circus cyaneus*) E – winters regularly; nested one summer - grassland
 American Bittern (*Botaurus lentiginosus*) E – regular migrant; observed in spring 2015 over a few weeks and almost annually thereafter - wetland
 King Rail (*Rallus elegans*) E – present summer 2012, 2015, spring 2016; present throughout breeding season 2014, 2018 - wetland
 Least Bittern (*Ixobrychus exilis*) T – migrant; observed 2015 and almost annually thereafter - wetland
 Osprey (*Pandion haliaetus*) E – likely nesting nearby, first seen April 18, 2020, seen again in April, May and July of 2021 and spring 2022; high count of 2 - wetland.
 Wilson's Phalarope (*Phalaropus tricolor*) E – rare migrant; observed at the site three times: two birds on May 16 2009, a flock of 6 in May of 2010, and one in May of 2018 - wetland
 Upland Sandpiper (*Bartromia longicauda*) E – Rare Migrant; observed 2015 – grassland
 Black-crowned Night-Heron (*Nycticorax nycticorax*) E – one bird observed, August 16, 2020 - wetland
 Swainson's Hawk -observed flying over Bobolink Picnic Area May 20, 2022 - grassland

In summary, monitoring has documented the transformation of the site from an airplane flying field and picnic grove to a rich native habitat for grassland and wetland birds.

Recommendations:

1. Carefully monitor grasslands for weeds, especially tall goldenrod and leafy spurge, and woody invasives to maintain habitat for grassland birds.

2. Avoid fragmentation of grasslands; do not plant trees within grassland restoration and continue to expand treeless areas as possible, while maintaining critical wooded buffers.
3. Maintain a preponderance of short-statured grasses.
4. Continue to carefully monitor wetlands for weeds, especially reed canary grass and phragmites, to maintain habitat for wetland birds.
5. Consider devoting a small acreage around the perimeter of the grassland to contained shrubland. Willows and associates, and hazels and associates in appropriate habitats would add habitat value without sacrificing much grassland habitat.
6. Review ongoing monitoring results for changes in bird species composition and abundance.
7. In conjunction with a regional process, consider whether more management for shorebirds is needed to create seasonal mudflats

2020 Field Work and Results

In 2020, the following assessments took place:

1. The grasslands of both LWRs were thoroughly covered by point counts.
2. eBird visits continued.
3. Three research studies were completed:

How has the bird population changed over the years of the restoration for the Bobolink and Bartel LWR complex?

How many nesting wetland birds are using the site and where are they located (third and final year of this study)?

In what locations are shorebirds found and how do their numbers compare to the previous study?

BIRD SURVEYS

Data about which birds are present on the site comes from two sources.

- Bobolink LWR and Bartel Grassland have each been monitored during the breeding season since before their restorations using the Bird Conservation Network (BCN) point count protocol. This monitoring allows for research questions to be answered, for year-to-year comparisons to be made, and for specific knowledge about which birds are using which sections of the site.
- More and more birders are using eBird, an online data entry portal, to record their sightings. As of June 2022, 987 checklists were entered in to the Killdeer (Tinley Creek) Wetlands hotspot (The main part of Bobolink LWR), 138 into the Bobolink Family Picnic area (the northeast portion of the Bobolink LWR), and 1418 into the Bartel Grasslands hotspot. This information helps to build the site bird list.

Eighteen new species were observed in 2020, 2021, and the first half of 2022 at Bobolink Meadow LWR: Cackling Goose, Ring-necked Duck, American Golden-plover, Osprey, Swainson's Hawk, Black-crowned Night-Heron, Blue-headed Vireo, Willow Flycatcher, Purple Martin, Carolina Wren, Winter Wren, Veery, Pine Siskin, Fox Sparrow, Prothonotary Warbler, Hooded Warbler, Pine Warbler, and Orange-crowned Warbler. Some of these species were added during a final round of observations in the woods on site. Others were added via eBird by birder's visits. A number of these species such as Veery, Fox Sparrow and Winter Wren likely visit the site annually but are not observed because birders rarely visit the woods. Twenty-four species of warbler have now been recorded, but not some fairly common ones like Magnolia, Wilson's or Canada Warbler, or other common migrants such as Least Flycatcher and Red-breasted Nuthatch. All this indicates that the list is still growing.

The total number of checklists entered into eBird for BMLWR went from 489 in 2019 to 873 in 2022, reflecting how beloved by birders this location is.

Current species totals since the project began at **Bobolink Meadow LWR** (see Appendix B for full details):

191 bird species including 14 waterfowl, 16 raptors, 22 shorebirds, 23 waterbirds

89 bird species observed during breeding season, 102 during migration and winter only.

59 BCN bird species of conservation concern including 9 birds that breed in the region's grasslands, 8 in wetlands, 13 in woodlands, and 8 in shrublands; and 21 birds that only migrate through.

51 Illinois Wildlife Action Plan Species in Greatest Need of Conservation (2019 update), 25 of which have been observed on site during the breeding season including 7 that breed in the region's grasslands, 5 in shrublands, 5 in wetlands and 7 in woodlands.

One species was reported from the site before the restoration began and never since: Northern Mockingbird.



LeConte's Sparrow at Bobolink Meadow LWR, May 2018, PC: Matt Iglesias

Bartel Grassland LWR has 204 species recorded in 1425 eBird checklists. Because of its deeper water in the southeast corner, Bartel attracts a greater variety of waterfowl, whereas Bobolink Meadow attracted a broader variety of shorebirds during the early years of the restoration when it had extensive mudflats.

Birds Observed at Bartel Grassland LWR and not at Bobolink Meadow LWR (38 species):

Snow Goose, American Wigeon, Northern Pintail, Redhead, Lesser Scaup, Common Merganser, Ruddy Duck, Mute Swan, American White Pelican, Black-billed Cuckoo, Eastern Whip-poor-will, Common Gallinule, Bona-

parte's Gull, Common Loon, Northern Goshawk, Barn Owl, Eastern Screech-Owl, Snowy Owl, Pileated Woodpecker, Least Flycatcher, White-eyed Vireo, Red-breasted Nuthatch, Gray-cheeked Thrush, Northern Shrike, Common Redpoll, Snow Bunting, Northern Parula, Magnolia Warbler, Yellow-throated Warbler, Wilson's Warbler

Birds observed at Bobolink Meadow LWR and not at Bartel Grassland LWR (21):

Cattle Egret, Dunlin, Long-billed Dowitcher, Semipalmated Plover, Semipalmated Sandpiper, Short-billed Dowitcher, Western Sandpiper, White-faced Ibis, White-rumped Sandpiper, Willet, Blue-headed Vireo, Swainson's Hawk, Ovenbird, Bay-breasted Warbler, Black-throated Blue Warbler, Blue-winged Warbler, Mourning Warbler, Yellow-breasted Chat.

Taking both sites together, 222 species have been recorded at the complex.

BOBOLINK MEADOW POINT COUNTS



Morning in the Bobolink LWR wetlands, July 6, 2021, Vera Leopold, Bird Monitor

Points cover the entirety of the grassland at both LWRs. All points were visited twice during the breeding season. In 2019 and 2018, there were six monitors and all routes were covered. Two routes at TCW North: Vera Miller and Stephanie Beilke; two routes at Bartel: Dan Lory and Judy Pollock; one route at Bartel and TCW East: Libby Keyes; and one route at Bartel Northeast: Lisa Rade. In 2020, the Bartel Northeast route was not covered but the five others were. All routes continued to report a robust presence of grassland birds.

Grassland and Shrubland Birds

In 2019, point count data was used to investigate the persistence of grassland birds at the site since the Bobolink Meadow restoration started. Sometimes as restorations age, the grassland composition changes and bird populations may change.

Monitoring showed most grassland birds to be maintaining steady populations over the last five years or so. A 2016 study showed that bobolink populations expanded into areas that were cleared of woody vegetation during the first years of the restoration and were using all suitable grassland areas on the site. An examination of four routes that were covered in 2018 and 2019 showed that numbers of Bobolinks remained roughly similar between the two years, despite the fact that water levels were significantly different between the years. Eastern Meadowlark, Henslow's Sparrow, and Sedge Wren observations similarly held constant.

One species, Savannah Sparrow, has shown clear declines across both LWRs. There are numerous reports from nearby preserves. These declines may be related to a slow change in vegetation composition, since alfalfa and old fields are a preferred habitat and Bartel LWR has slowly converted from a fescue and alfalfa field to a prairie. Climate change may be another factor as this bird is predicted to move out of our region because of a changing climate. At Bartel Grassland during the 5-year period from 1999-2003, an average of 47 individuals were detected per year at all the point counts at Bartel Grassland. In 2018-2019, the average at Bartel Grassland points was only .5 per year.

The Bobolink, a highlight of this site's avifauna, while currently remaining stable, is also predicted to lose its Illinois habitat due to climate change.

Grasshopper Sparrow numbers fluctuate at the site and are at a low ebb, having been observed at only three points in 2019 and four in 2020 (although its preferred habitat was not surveyed in 2020). This bird prefers drier grassland and may stabilize at low numbers since the site is wetter now than in the early years of monitoring.

Although the Northern Harrier nested at Bartel Grassland in the early years of the restoration, it has not been observed at the site during the breeding season since 2006. This bird is also likely to be affected by climate change, according to the study mentioned above.

Other changes of note in upland bird species:

Red-Headed Woodpecker, a savanna bird of conservation concern, was observed in 2018, 2019 and 2021 in the Bobolink Picnic Area during breeding season, and may be nesting. Observations of two shrubland birds, Brown Thrasher and Gray Catbird, formerly fairly common, have dwindled, likely in response to clearing of dense woody vegetation. Catbird was last reported in 2012. One Brown Thrasher was seen this year,

whereas it was reported 30 times on point counts at Bartel between 1999 and 2002, then never again with the exception of 2 birds in 2012. Brown Thrashers particularly used the hedgerows pre-restoration, according to a study for Openlands done by Jim Herkert. These results are related, as the clearing that encourages the Red-headed Woodpecker discourages the thrasher and catbird.

Wetland Birds

A major difference between 2018 and 2019 – 20 was the wetness of the site, which demonstrated the value of the site to wetland birds in a normal year and in a wet year. Much of the difference showed up in the wetland bird survey described below. However, the point counts rounded out the picture with additional bird species.

Blue-winged Teal - observed at 3 points in 2019; only observed on one point count in all the years before.

Marsh Wren - this bird's song was heard through the site in the summers of 2019 and 2020. At least 27 separate birds were detected at point counts in 2019 and 18 in 2020. Other than three in 2012 (another wet year) and two in 2008, this bird has not been reported from the complex in June or July before this.

In 2019 five different Swamp Sparrows were detected between the two sites, and 10 in 2020. One Swamp Sparrow was reported in 2018 and two in 2012. Those were the only previous reports of this species.

A Wilson's Snipe was reported in summer 2019, although not on a point count. During the summer of 2012, numerous snipes were reported, but those have been the only records of this species during the breeding season.

OTHER OBSERVATIONS

More wetland bird species and many more individuals were observed during the nesting seasons in 2019 and 2020, both wet years. This illustrates the complex's importance as a regional wetland. In drier years, species such as rails that use temporary wetlands are able to find nesting habitat at Bobolink Meadow LWR and Bartel Grassland LWR in smaller numbers. In wetter years, there are many more of those species throughout the site, and species that need deeper pools such as Pied-billed Grebe also can nest. Regions need a variety of types of wetlands so that birds can successfully nest every year despite varying conditions by moving among suitable habitats. These two LWRs provide important habitat for wetland birds that differs in its use during wetter and drier years.

Summary of nesting wetland species that have been detected during the breeding season:

King Rail (*Rallus elegans*) IL Endangered – present summer 2012, 2015, 2018, 2019, spring 2016; breeding confirmed 2014 - BMLWR wetland

Wilson's Snipe - BCN Bird of Conservation Concern Level 2 - observed during breeding season rarely; abundant during spring migration; present summer 2019

Sora - BCN Bird of Conservation Concern Level 3 - observed during breeding season regularly; common during 2019 and 2020

Virginia Rail - BCN Bird of Conservation Concern Level 3 -observed during breeding season uncommonly; three pairs in 2019

Pied-billed Grebe - present throughout summer 2019 for the first time, nesting confirmed 2020

American Bittern - present throughout summer 2019 in both sites; previously only observed during migration 2015, 16, 18 in Bobolink LWR and 2013, 15 and 18 at Bartel LWR

Least Bittern - observed summer 2019 in Bobolink LWR; previously only observed during migration in 2015-6 at Bobolink LWR

American Coot - observed summer 2019 at Bartel Grassland LWR for the first time since the 90's.

Osprey (*Pandion haliaetus*) – likely nesting nearby, first seen April 18, 2020, seen again in April, May and July of 2021 and 2022; high count of 2 - wetland.

In the winter of 2017-8, a pair of Bald Eagles made a nest south of TCW east. In the winter of 2018-9, a pair (presumably the same) nested along the east edge of Bartel Grasslands in the woods. In late 2019, a Bald Eagle pair had again been reported from the edge of Bartel. This same nest fledged young in 2020 and likely in other years as well.

RESEARCH STUDIES 2020

What are the bird population trends at the site from the first year of monitoring to the last?

The BCN Survey protocol of 2 five-minute point counts per point, at least a week apart, completed in the early morning in June or early July was used to monitor trends. 47 points were covered annually across both LWRs, although not all points were visited in all years.

Living Habitats invited Audubon Great Lakes Quantitative Ecologist Sarah Saunders and Senior Manager of Conservation Science Stephanie Beilke to analyze the changes in bird life since the restoration started at Bartel Grassland. This analysis included the entire Bobolink LWR site plus the Bartel Grasslands WMA. The Bartel side has been monitored almost every year since 1999 and the Bobolink side every year since 2008, a year before the restoration began, yielding a total of 5814 breeding season observations (an observation consists of one or more of a single species observed at a point on a specific date and time).

The Audubon ecologists combined the data from the Bartel and Bobolink sites and provided

- raw abundance (Total number of birds observed per year)
- scaled abundance (divides each year's abundance by the number of points surveyed per year.)
- species richness (number of different species observed).

Due to time constraints on the part of the Audubon staff, these analyses varied in their usefulness but the pertinent ones are included here.

Species richness graphs show that the desired result was achieved: grassland bird diversity remained constant and wetland bird diversity improved.

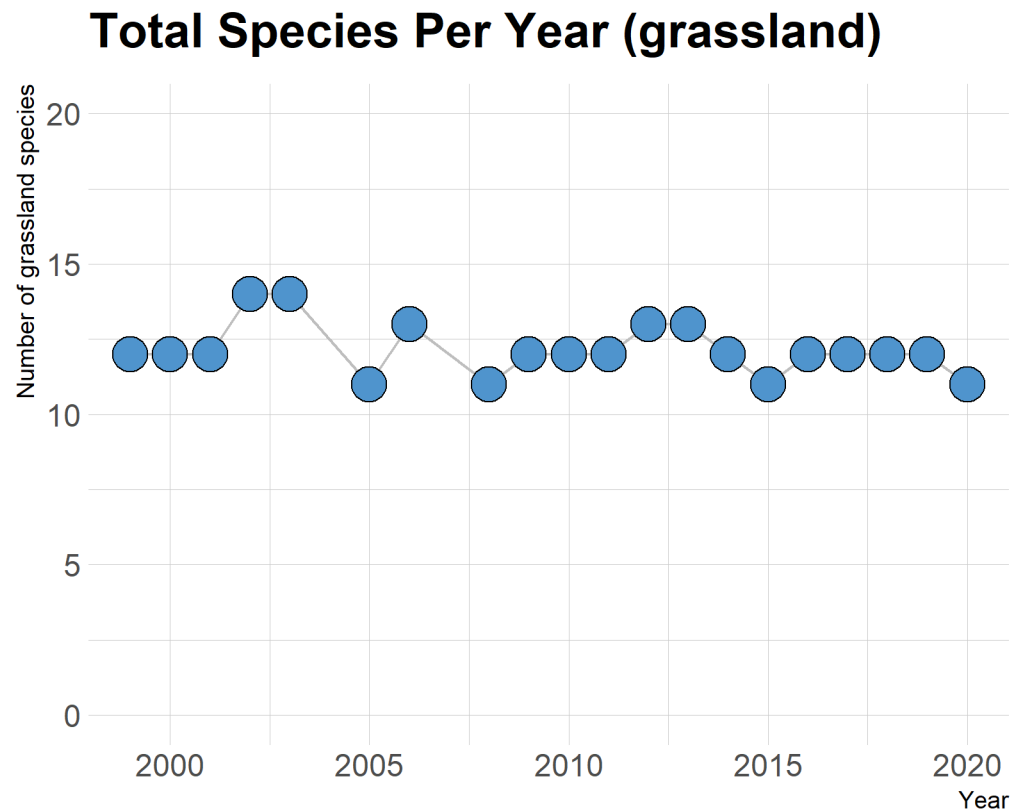


Figure 1. Total Number of Species observed by Monitors Each Year in Grasslands

(Sarah Saunders, Audubon)

Our two grasslands, Bobolink and Bartel, host the suite of grassland birds that are regular in the region. Among the group of grassland birds analyzed, there are a few birds that are infrequent in the region: clay-colored sparrow, northern harrier, northern bobwhite and ring-necked pheasant. Northern harrier did nest at Bartel Grasslands one year and it is the one bird from this list that we could hope would begin to nest more regularly in the future. Horned lark is a bird of agricultural fields that appeared when the site was cleared for restoration. Ring-necked pheasant is a declining introduced species. In addition, dickcissel numbers fluctuate based on conditions in the Great Plains. Any of these birds could account for the yearly variations of one or two birds seen in this graph.

Total Species Per Year (wetland)

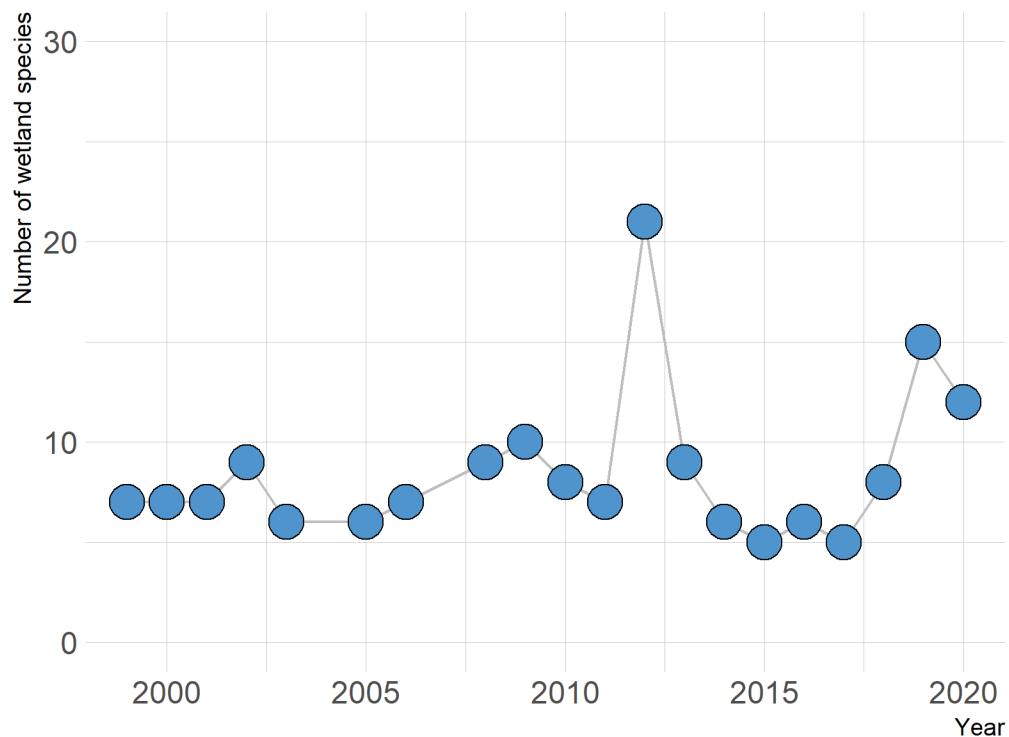


Figure 2. Total Number of Species observed by Monitors Each Year in Wetlands

(Sarah Saunders, Audubon)

The species diversity graph for wetland species shows two things; one positive result of the restoration, and one incidental effect.

1 – The habitat is functioning well as part of a larger network of wetlands in the region. In dry years, there are few ponds and fewer wetland bird species. Conversely, in wet years such as 2019 and 2020, more species use the wetland, for example the pied-billed grebes that were found nesting.

2- In 2010, many trees were removed and sections of herbaceous invasives were treated. The result was a landscape of mudflats, grassy areas and ponds that lasted a few years. This landscape was very appealing to species of waterfowl and shorebirds that used the site in 2012 but have not been seen or have rarely been seen during the breeding season before or since. Green-winged Teal, Northern Shoveler, Spotted Sandpiper, Wilson's Snipe, and Wood Duck are examples.

Other wetland species that regularly use the site may not be picked up on point counts due to their secretive nature. BCN point counts are best at detecting birds that sing frequently. These birds, present on

site during the breeding season, are not adequately surveyed by this method: Blue-winged Teal, Double-crested Cormorant, Green Heron, Pied-billed Grebe, Sora, Virginia Rail. These birds are discussed below.



Recently-hatched Pied-billed Grebe photographed at Bartel Grassland on June 2, 2020.

PC: Dan Lory, Bird Monitor

How many nesting wetland birds are using the site and where were they detected?

2020 saw the third year of effort addressed to this question. These years made for a very interesting contrast, as 2018 had average wetness but 2019 was by far the wettest year since the restoration began and 2020 was also very wet. Even late June 2019 point counts saw many spots with ankle-deep water which are normally dry long before that point.

Point counts do not do the best job at picking up many wetland bird species because they are secretive; they remain hidden and call infrequently. A protocol has been designed to detect these so-called “secretive marsh birds”. This standardized protocol is in common use across the country: *Conway, C. J. 2011. Standardized North American Marsh Bird Monitoring Protocols. Waterbirds*. In 2018, this protocol was employed by 2 observers, Judy Pollock and Daniel Goldberg; in 2019, 1 observer, Judy Pollock, variously accompanied by Dan Lory, Libby Keyes and Antonio Flores; and in 2020, 3 observers, Judy Pollock, Libby Keyes and Dan Lory. Selected wetland locations were visited at dawn or dusk, and a series of taped calls were played as per the protocol. Over the course of the three-year period, unproductive points were not revisited and other wetlands were added, so that the large majority of the site’s wetlands were monitored and we got a good picture of how these secretive wetland birds are using the site.

The studies reveal that rails are using the site during both the migration and nesting period in very good numbers. The first Soras and Virginia Rails show up in our area in early April, and most are on territory by late April. However, birds that nest farther north continue to migrate throughout May (Fink et. al., 2021). Signs of breeding including juvenile birds are observed at our sites in the second half of May, while other individuals are still migrating through. The high number of birds (at least 25 Soras and 18 Virginia rails) observed in both May monitoring periods consists of both nesting and migrating birds.

2020	Early May location (number observed)	Late May location (number observed)	Mid June location (number observed)
Sora	Total observed = 25	Total observed = 9 (incl 1 juvenile)	Total observed = 1
Virginia Rail	Total observed = 18	Total observed = 14	Total observed = 5
King Rail			
Least Bittern			
American Bittern	Total observed = 1		
Pied-billed Grebe		Total observed = 4 (incl 1 juvenile)	
No sightings			
Key *=observed outside of survey period			

Table 1. Points at which wetland birds were detected in 2020 playback surveys

2019	Early May location (number observed)	Late May location (number observed)	Mid June location (number observed)
Sora	Total observed = 11	Total observed = 9	Total observed = 3
Virginia Rail	Total observed = 3	Total observed = 4	Total observed = 3
King Rail		Total observed = 1	Total observed = 3
Least Bittern			
American Bittern	Total observed = 2		
Pied-billed Grebe	Total observed = 1	Total observed = 1	Total observed = 1
Black Rail			
(Coot - observed, playback not used)	Total observed = 1		

Table 2. Points at which wetland birds were detected in 2019 playback surveys

2018	Early May	Late May	Early June	Late June (ARU only)
Sora	Total observed = 3	Total observed = 1		
Virginia Rail	Total observed = 1			
King Rail		Total observed = 3	Total observed = 1	Total observed = 1

Table 3. Points at which wetland birds were detected in 2018 playback surveys

Figures 1 and 2. Points at which rails were detected in 2018 and 2019 playback surveys or on Autonomous Recording Unit (ARU)

King Rails, Virginia Rails and Sora were detected in all three studies (Tables 1, 2 and 3). No target birds were detected at points T23, U20 or Y6 in 2018; these were not surveyed in 2019 or 2020. The calls of Least Bittern and Common Gallinule were also played in both years but never elicited a response.

In addition to the playback surveys, an Autonomous Recording Unit (ARU) left at point N8 between June 8-25, 2018 picked up King Rail calls on June 22 (single bird) and 24 (pair).

The early May sightings and possibly some of the late May sightings are likely migrants (Ariel Fournier, pers. comm.), demonstrating the importance of the site to migrating rails.

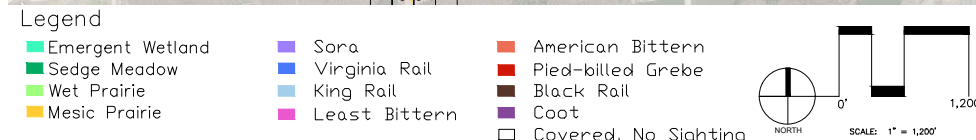
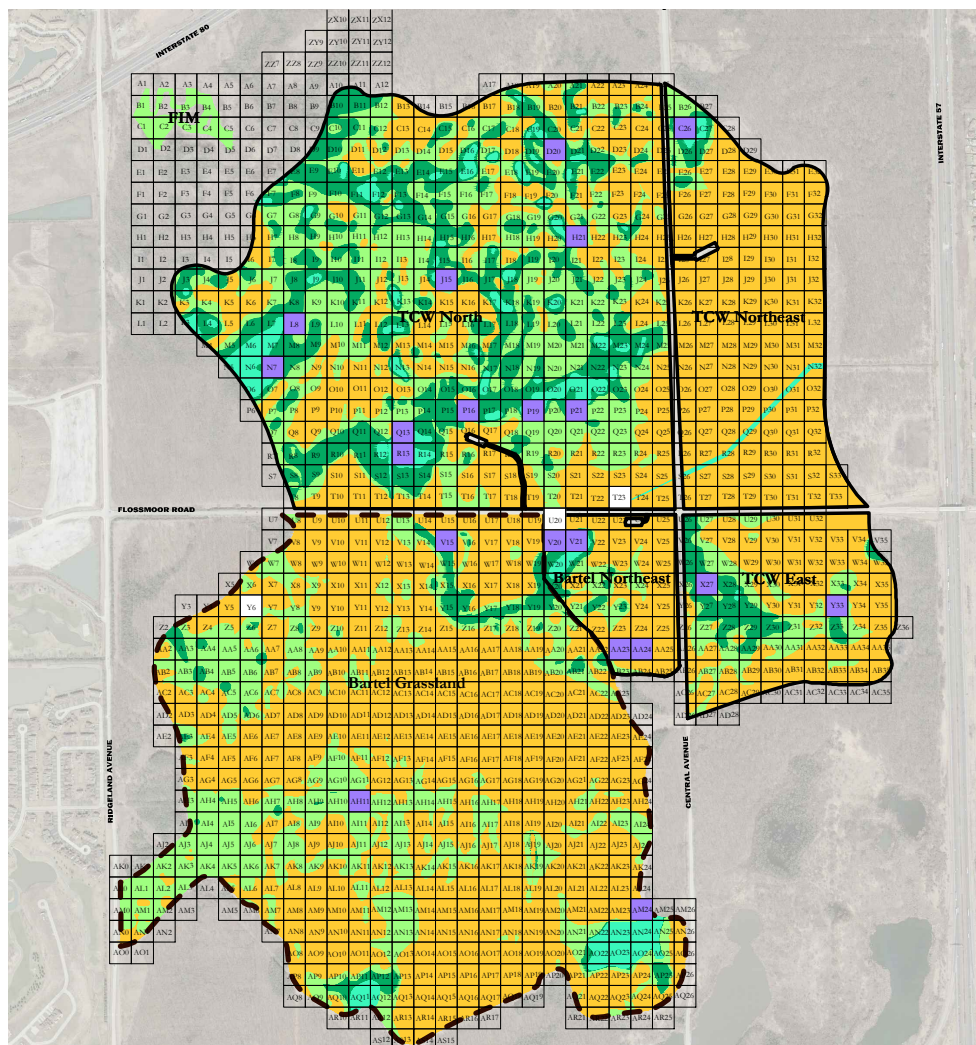
In 2018, it seems quite possible that there were two pairs of King Rails that attempted to nest on the site. This species was observed in three locations: the N8 pond, the Flossmoor Drive drainage ditch at Bobolink, and the wetland at V20 near the ditch. In 2019, King Rails were detected at the east and west ends of the marsh visible from the overlook at Bobolink Meadow. Three birds were heard on June 18, which may indicate a successful nesting. N8 was not surveyed in 2019, so it is possible that last year's pair nested there this year.

It seems likely that at least 3 pairs of Virginia Rails nested on site in 2019 and two in 2020, since they were heard on at least two visits at different locations. One pair may have nested in 2018.

Soras were heard calling from many points throughout the site in May - on the playback survey, while transiting between points, from the car, and on point counts. Every wetland seemed to have one. As many as 10 were heard on survey days. Given the number of wetlands that held water throughout the summer and the frequency of calls heard, it is reasonable to estimate that at least 10-15 pairs are present in wet summers.

In addition to the greater number of Virginia and Sora rails, new wetland species were detected in summer 2019. Pied-billed Grebe was detected for the first time during the nesting season at the lake at the southeast corner of Bartel Grassland, and was present for all three visits. A Coot was observed in that same location on the first and second visits. A Least Bittern was seen from the overlook off the parking lot at Bobolink LWR on the second visit, although it never responded to taped calls. Most spectacularly, a pair of American Bitterns gave their pumping call and peeked out of the grass near the overlook on the first visit.

The study is not designed to detect Wilson's Snipe, although one was observed by one of the monitors. In 2018, Black Rail was detected at a nearby grassland/wetland complex. As a result, in 2019, Black Rail was added to the beginning of the tape sequence played for the Wetland Surveys. However, none answered the call. One of the monitors heard one of the Black Rail calls just east of the G20 pole, but a bird was never located despite repeated effort.



Bartel Grassland Nesting Wetland Birds

Figure 3. Site map showing habitats, section names and locations of Soras detected in callback surveys 2018-2022

Did the shorebirds observed on the 2015 survey persist at the site as the wetland and grassland matured?

The 2015 shorebird survey was repeated in 2020. The site has a grid of numbered poles for use in monitoring. These formed the basis of our site selection. Twelve sites were selected that contained shorebirds based on a preliminary survey in March 2015. An additional 13 squares that lay on the route between the shorebird points were randomly selected.

Spring is the only season when there is significant ponding on the site, so the surveys were done in spring.

- The results showed that the number of shorebirds using the site in spring decreased markedly as the restoration matured. This is a common result in grassland restoration. Shorebirds use bare ground for feeding by probing for insects. As the herbaceous layer takes hold, it reduces shorebird habitat.
- Wilson's Snipe, which migrate early when the grass is still low, continue to use the site in good numbers. These birds were often observed in areas where a prescribed burn had been conducted.
- Note that no Killdeer were observed during the survey in 2020. Although the site was briefly named for them, their dominance on the site was also brief. These birds, and the other shorebirds, were attracted by the mudflat that was created when wooded areas were cleared of vegetation.

2020 Shorebird Survey Results

Survey date	Shorebirds noted	Other wetland birds of interest
4/10	43 Wilson's snipe	3 Wood Duck 2 Sora 1 Virginia Rail 1 Swamp Sparrow
4/27	12 Wilson's snipe 1 lesser yellowlegs	2 Blue-Winged Teal 1 Sora 1 Sandhill Crane 4 Swamp Sparrows
5/6	4 Wilson's snipe	4 Sora

		3 Marsh Wren 2 Sedge Wren
5/22		5 Blue-Winged Teal 2 Sora 1 Virginia Rail 9 Marsh Wren 3 Sedge Wren 1 Swamp Sparrow

2015 Shorebird Survey Results for Comparison

Weekly visits April 29-5/20

Species	Sum of weekly highest counts	Guild
Killdeer	66	Dry-mudflat
Wilson's Snipe	250	Wet-mudflat
Solitary Sandpiper	17	Wet-mudflat
Lesser Yellowlegs	15	Shallow-water
Greater Yellowlegs	17	Shallow-water
Pectoral Sandpiper	5	Wet-mudflat
Spotted Sandpiper	3	Wet-mudflat
Least Sandpiper	3	Wet-mudflat
Dunlin	2	Wet-mudflat

More complete details on the 2015 study can be found in Appendix F, Bird Monitoring Results 2009-2015

Conclusions

Through monitoring efforts, we were able to confirm the expected benefit of the Bobolink Meadow LWR restoration for grassland birds, nesting wetland birds, and some guilds of shorebirds. We gathered a good measure of how many grassland birds are using the site and can describe some of the ways in which they are using the restored habitat. We compiled two years of formal data about shorebird use of the project area and many years of more casual observations. We documented migrant and winter use of the peripheral woodlands, including Rusty Blackbirds in the wet woods, and winter use of the north-east alder woods by winter finches.

As a result of the monitoring, the Bobolink Meadow/Bartel LWR sites take their place as one of the outstanding bird conservation projects in the region. The numbers of Bobolinks and other grassland birds, the nesting season Pied-billed Grebe, Wilson's Snipe, both bitterns, three rail species, the spring shorebirds, the heron and egret rookery, the nesting Bald Eagles and the winter raptors and finches in addition to the prairie and wetland vegetation and other wildlife give the Bobolink Meadow/Bartel LWR sites a unique conservation value.

Using this wealth of bird and environmental data, we have taken the opportunity to generate answers to important regional bird conservation questions, as described in prior years' reports. These studies can help with decisions about adaptive management at this site, and will contribute to regional understanding of how birds use wetland and grassland restorations, with the potential to inform the approach that land owners and managers take to restoration and stewardship.

Appendices

APPENDIX A Summary of Monitoring Efforts

There have been numerous formal monitoring and research efforts at Bobolink Meadow LWR since 2008, plus informal records of birder visits. In 2008, Jim Herkert, an Illinois researcher, used the spot mapping method to describe nesting territories of key grassland birds. The FPCC staff have used the site as a training site in the past and have conducted breeding season transects. During the breeding season, the volunteers of the BCN Survey have done regular point count monitoring. In 2015 and 2016, additional visits to the points by contractors were added, which allowed for three different investigations of bird responses to habitat conditions. In 2018-20, wetlands were surveyed for secretive marsh birds. These and other monitoring, studies and assessments are enumerated below. In addition, the site is very popular with birders, many of whom enter data on the eBird website (eBird.org).

INDEX TO COMPLETE DESCRIPTIONS OF MONITORING EFFORTS AND STUDIES

Study or Monitoring (protocol)	Season	Years	Location of Protocol Description and Results
EBird reports (casual observations)	all	BMLWR and Bobolink: 2001- present Bartel: 1986-present E side Central and Vollmer: 1979-present	Ebird.org
BCN Survey (point count monitoring)	breeding	2008-present	<i>Bird Monitoring Results 2009-2015; Bird Monitoring Results 2016 TCW and Bartel Grasslands; Bird Monitoring Results 2017 TCW and Bartel Grasslands; Bird Monitoring Results 2018 Bobolink Meadow LWR and Bartel Grasslands LWR; Bird Monitoring Results 2019 Bobolink Meadow LWR and Bartel Grasslands LWR</i>
BCN Survey (point count monitoring) changes over time	breeding	2008-present	<i>Bird Monitoring Results 2019 Bobolink Meadow LWR and Bartel Grasslands LWR</i>

Jim Herkert (spot mapping)	breeding	2008-11	<i>Bird Monitoring Results 2009-2015; TCW-Bartel Grassland OMMA Project 2008 and 2011 Monitoring Report</i>
FPCC training (transects)	breeding	2014-15	<i>Bird Monitoring Results 2009-2015</i>
Tinley Creek Wetland Species Report (shorebird area searches)	Spring migration	2015, repeated 2020	<i>Bird Monitoring Results 2009-2015; Bird Monitoring Results 2020 BMLWR and Bartel Grasslands</i>
Tinley Creek Wetlands Breeding Bird Survey Report, 2015 (repeated point counts with statistical analysis)	breeding	2015, 2020	<i>Bird Monitoring Results 2009-2015; Bird Monitoring Results 2016; same for 2017, 18, 19 and 20 BMLWR and Bartel Grasslands</i>
TCW-Bartel Bobolink Analysis	breeding	2016	<i>Bird Monitoring Results 2016 TCW and Bartel Grasslands</i>
Study of Vegetation within Bird Points	breeding	2016, 2017	<i>Bird Monitoring Results 2016 TCW and Bartel Grasslands</i>
Inventory – Shrubland South of Bartel East	breeding	2016	<i>Bird Monitoring Results 2016; Bird Monitoring Results 2017 TCW and Bartel Grasslands</i>
Inventory – areas of preserve not included in TCW project	Migration, breeding	2016, 2017	<i>Bird Monitoring Results 2016 TCW and Bartel Grasslands; Bird Monitoring Results 2017 TCW and Bartel Grasslands</i>
Woodcock Survey	Migration	2017	<i>Bird Monitoring Results 2017 TCW and Bartel Grasslands</i>

Assessment of Volunteer Shrub-land Planting	June	2017	<i>Bird Monitoring Results 2017 TCW and Bartel Grasslands</i>
Wetland Survey: Conway protocol (playback) plus ARU	May, June	2018, 19, 20	<i>Bird Monitoring Results 2018 BMLWR and Bartel Grasslands; Bird Monitoring Results 2019 BMLWR and Bartel Grasslands; Bird Monitoring Results 2020 BMLWR and Bartel Grasslands</i>

The monitoring is designed to generate useful information about birds of conservation concern on the site. Details related to each study can be found in the corresponding year's Monitoring Report.

APPENDIX B Birds Observed at Bobolink Meadow LWR 2008-2022 – Includes point counts, and observations at two eBird hotspots: Killdeer (Tinley Creek) Wetlands and Bobolink Family Picnic Area

Species	Season Observed	Guild	Conservation Concern	Habitat
Alder Flycatcher	s			
American Bittern	s	w	b	e
American Black Duck	s	f	b	m
American Coot	s	w		
American Crow	b			
American Golden-plover	s	s	b	m
American Goldfinch	b			
American Kestrel	b	r		
American Pipit	s			
American Redstart	s			
American Robin	b			
American Tree Sparrow	w		CW	m
American Woodcock	b	s	b	w
Bald Eagle	b	r	i	
Baltimore Oriole	b			
Bank Swallow	s			
Barn Swallow	b			
Bay-Breasted Warbler	s		b	m
Belted Kingfisher	b	w		
Black-and-white Warbler	s		CW	m
Black-bellied Plover	s	s		
Black-capped Chickadee	b			
Black-crowned Night-Heron	f	w	b	e

Species	Season Observed	Guild	Conservation Concern	Habitat
Black-necked Stilt	s	s		
Black-throated Blue Warbler	s			
Black-throated Green Warbler	s			
Blackburnian Warbler	s			
Blackpoll Warbler	s		CW	m
Blue Jay	b			
Blue-headed Vireo	s			
Blue-gray Gnatcatcher	b			
Blue-winged Teal	b	f		
Blue-winged Warbler	s		b	s
Bobolink	b	g	b	g
Brewer's Blackbird	s			
Broad-winged Hawk	s	r	b	w
Brown Thrasher	b		b	s
Brown-headed Cowbird	b			
Bufflehead	s	f		
Cackling Goose	s	f		
Canada Goose	b	f		
Carolina Wren	f			
Caspian Tern	b	w		
Cattle Egret	s	w		
Cedar Waxwing	b			
Chestnut-sided Warbler	s			
Chimney Swift	b		b	w
Chipping Sparrow	s			

Species	Season Observed	Guild	Conservation Concern	Habitat
Clay-colored Sparrow	s			
Cliff Swallow	b			
Common Grackle	b			
Common Nighthawk	s		b	w
Common Yellowthroat	b			
Cooper's Hawk	b	r		
Dark-eyed Junco	s			
Dickcissel	b	g	b	g
Double-crested Cormorant	b	w		
Downy Woodpecker	b			
Dunlin	s	s		
Eastern Bluebird	b			
Eastern Kingbird	b			
Eastern Meadowlark	b	g	b	g
Eastern Phoebe	s			
Eastern Towhee	b		b	w
Eastern Wood-Pewee	b			
European Starling	b			
Field Sparrow	b		b	s
Fox Sparrow	s			
Gadwall	s	f		
Golden-crowned Kinglet	s			
Golden-winged Warbler	s		b	m
Grasshopper Sparrow	b	g	b	g
Gray Catbird	s			

Species	Season Observed	Guild	Conservation Concern	Habitat
Great Blue Heron	b	w		
Great Crested Flycatcher	b			
Great Egret	b	w		
Great Horned Owl	b	r		
Greater White-fronted Goose	w	f		
Greater Yellowlegs	s	s		
Green Heron	b	w		
Green-winged Teal	s	w		
Hairy Woodpecker	b			
Henslow's Sparrow	b	g	b	g
Hermit Thrush	s			
Herring Gull	b	w		
Hooded Merganser	s	f		
Hooded Warbler	s		CW	w
Horned Lark	b			
House Finch	b			
House Sparrow	b			
House Wren	b			
Indigo Bunting	b			
Killdeer	b	s		
King Rail	b	w	b	e
Lapland Longspur	w			
Least Bittern	b	w	i	e
Least Sandpiper	s	s		
LeConte's Sparrow	s		b	m

Species	Season Observed	Guild	Conservation Concern	Habitat
Lesser Yellowlegs	s	s	b	m
Lincoln's Sparrow	s			
Long-billed Dowitcher	s	s		
Mallard	b	f		
Marsh Wren	b		b	e
Merlin	w	r		
Mourning Dove	b			
Mourning Warbler	s		CW	s
Nashville Warbler	s		i	
Northern Bobwhite	b		b	s
Northern Cardinal	b			
Northern Flicker	b		b	w
Northern Harrier	s	r	b	g
Northern Mockingbird	s			
Northern Rough-winged Swallow	f			
Northern Shoveler	s	f		
Northern Waterthrush	s			
Orange-crowned Warbler	s			
Orchard Oriole	b			
Osprey	b	r	b	w
Ovenbird	b		i	
Palm Warbler	s		CW	m
Pectoral Sandpiper	s	s	b	m
Peregrine Falcon	s	r	b	e
Pied-billed Grebe	b	w	b	e

Species	Season Observed	Guild	Conservation Concern	Habitat
Pine Siskin	f			
Pine Warbler	s			
Prothonotary Warbler	s		b	w
Purple Finch	f		CW	m
Purple Martin	s			
Red-bellied Woodpecker	b			
Red-eyed Vireo	b			
Red-headed Woodpecker	f		b	w
Red-shouldered Hawk	s	r	CW	w
Red-tailed Hawk	b	r		
Red-winged Blackbird	b			
Ring-billed Gull	b	w		
Ring-necked Duck	s	f		
Ring-necked Pheasant	b		i	
Rock Pigeon	b			
Rose-breasted Grosbeak	s			
Rough-legged Hawk	s	r		
Ruby-crowned Kinglet	f			
Ruby-throated Hummingbird	b			
Rusty Blackbird	s		b	m
Sandhill Crane	s	w	i	
Savannah Sparrow	b	g		
Scarlet Tanager	b			
Sedge Wren	b	g	b	g
Semipalmated Plover	s	s		

Species	Season Observed	Guild	Conservation Concern	Habitat
Semipalmated Sandpiper	s	s	CW	m
Sharp-shinned Hawk	s	r		
Short-billed Dowitcher	s	s	CW	m
Short-eared Owl	w	r	b	m
Smith's Longspur	s	g	b	m
Solitary Sandpiper	s	s	CW	m
Song Sparrow	b			
Sora	b	w	CW	e
Spotted Sandpiper	b	s		
Swainson's Hawk	s	r	b	g
Swainson's Thrush	s			
Swamp Sparrow	b			
Tennessee Warbler	s			
Tree Swallow	b			
Tufted Titmouse	s			
Tundra Swan	w	w		
Turkey Vulture	b	r		
Upland Sandpiper	s	s	b	g
Veery	s		CW	m
Vesper Sparrow	s			
Virginia Rail	b	w	CW	e
Warbling Vireo	b			
Western Sandpiper	s	s		
White-breasted Nuthatch	b			
White-crowned Sparrow	s			

Species	Season Observed	Guild	Conservation Concern	Habitat
White-faced Ibis	s	w		
White-rumped Sandpiper	s	s		
White-throated Sparrow	s			
Whooping Crane	s	w	b	m
Willet	s	s		
Willow Flycatcher	b		b	s
Wilson's Phalarope	s	s	b	e
Wilson's Snipe	b	s	b	e
Winter Wren	s			
Wood Duck	b	f		
Wood Thrush	b		b	w
Yellow Rail	s	w	b	m
Yellow Warbler	b			
Yellow-bellied Sapsucker	s			
Yellow-billed Cuckoo	b		b	w
Yellow-breasted chat	b		b	s
Yellow-rumped Warbler	s			
Yellow-throated Vireo	b			

Key

Guild: waterfowl (f), grassland birds (g) raptors (r), shorebirds (s), waterbirds (w)

Season: breeding (b), migration (s,f), winter only (w)

Conservation concern: BCN/Chicago Wilderness area (CW); Illinois Wildlife Action Plan species in greatest need of conservation (i); both designations (b):

Habitat (for birds of concern): grassland (g), wetland (e), woodland (w), shrubland (s), passage migrants (m).

Appendix C Bartel Grassland Data Summaries by National Audubon Society

All this material is available on request

Data Summaries

1. Bartel_FullSummary.csv – Full data summary (note that data were filtered to include only May, June and July observations) including columns (left to right):
 - Year
 - Number of points surveyed per year
 - Total count per year
 - Total count scaled by number of points surveyed (to account for variable number of points surveyed per year)
 - Standard deviation of scaled counts
2. Bartel_FullSummary_Grassland.csv – Full data summary for May – July (same columns as above) but for only grassland bird species
3. Bartel_FullSummary_Wetland.csv – Full data summary for May – July (same columns as above) but for only wetland bird species

Figs

There is one plot that is not in a subfolder:

1. Wetness_Yr.png – This shows June wetness per year for the years of data we have, 2008 – 2020. I used June monthly precipitation because the majority of bird surveys took place in June.

Raw Abundance

This folder contains 3 plots of total abundance (unscaled; does not account for variable number of points surveyed per year)

1. Tot_Abund_Yr.png – Total abundance of all species per year
2. Tot_Abund_Yr_Grassland.png – Total abundance of all grassland species per year
3. Tot_Abund_Yr_Wetland.png – Total abundance of all wetland species per year

Scaled Abundance

All the plots in this folder use scaled abundance, which corrects the counts for the number of points surveyed per year.

1. Sc_Abund_Yr.png, Sc_Abund_Yr_Grassland.png, Sc_Abund_Yr_Wetland.png – Scaled abundance of all species, grassland species, and wetland species per year, including +/- SD of scaled counts
2. Sc_Abund_Yr_Trend.png, Sc_Abund_Yr_Trend_Grassland.png, Sc_Abund_Yr_Trend_Wetland.png – Scaled abundance of all species, grassland species, and wetland species per year with the linear trend (and associated 95% confident interval) and linear equation and R² shown to indicate trend

3. ScAbun_Wetness_Corr.png and ScAbun_Wetness_Corr_Wetland.png – Scaled abundance of all species and wetland species shown along with the June precipitation each year. The correlation between abundance and wetness is shown in the title of each plot. Note that we only have wetness data from 2008 – 2020, so the correlations and plots are only based on these years.

Species Richness

Plots in this folder display species richness per year

1. SpRich_Yr.png, SpRich_Yr_Grassland.png, SpRich_Yr_Wetland.png – These plots show species richness (number of species observed) across all species, grassland species, and wetland species per year
2. SpRich_Wetness_Corr_Wetland.png – For the wetland bird species, richness was slightly correlated with June wetness, so I provide the plot of that here.

Grassland species included in grassland grouping:

Bobolink, Brown-headed Cowbird, Clay-colored Sparrow, Common Yellowthroat, Dickcissel, Eastern Kingbird, Eastern Meadowlark, Field Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Horned Lark, Northern Harrier, Red-winged Blackbird, Ring-necked Pheasant, Savannah Sparrow, Song Sparrow

Wetland species included in wetland grouping:

American Bittern, American Coot, Belted Kingfisher, Blue-winged Teal, Canada Goose, Caspian Tern, Common Yellowthroat, Double-crested Cormorant, Great Blue Heron, Great Egret, Green-winged Teal, Green Heron, Killdeer, Mallard, Marsh Wren, Northern Shoveler, Pied-billed Grebe, Red-winged Blackbird, Ring-billed Gull, Sedge Wren, Song Sparrow, Sora, Swamp Sparrow, Spotted Sandpiper, Virginia Rail, Wilson's Snipe, Wood Duck, Willow Flycatcher, Yellow Warbler

Bartel Full Summary of points used for analysis

Year	Pts	Cts	Sc_Cts	SD_Cts	Site
1999	17	509	29.9411764705882	4.2557677581819	Bartel
2000	23	624	27.1304347826087	2.85750710380109	Bartel
2001	23	583	25.3478260869565	2.65095821854751	
2002	47	1276	27.1489361702128	2.24883802378896	
2003	24	633	26.375	2.61300583663923	
2005	23	530	23.0434782608696	2.48957866507582	
2006	13	478	36.7692307692308	2.53641497917544	
2008	23	283	12.304347826087	1.48599145568608	
2009	28	437	15.6071428571429	5.96978557163187	
2010	22	540	24.5454545454545	2.59606024502736	
2011	12	358	29.8333333333333	2.79896495030365	
2012	31	1193	38.4838709677419	2.47658869649641	
2013	22	406	18.4545454545455	1.5971452707481	
2014	9	112	12.4444444444444	0.765993855554068	

2015	10	141	14.1	1.58686977880349	
2016	46	1106	24.0434782608696	2.25002872370334	both
2017	9	152	16.8888888888889	1.05282061686139	
2018	47	945	20.1063829787234	1.92387322593532	both
2019	47	998	21.2340425531915	2.00416393350135	both
2020	38	818	21.5263157894737	1.86613416871976	both