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Livestock Research

Monitoring Birds in Rotationally Grazed Pasture, 2017 Update

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Web Link:

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In a Nutshell

- Wild bird populations can thrive in properly managed working landscapes.
- Cattle activity changes grassland structure; creating areas with short and tall vegetation, which provides habitat that is less available in conservation areas.
- For some species, rotationally grazed pastures have the capacity to support greater bird population sizes compared to conservation areas that are not grazed.
- Prairies and pastures complement one another to protect a wider range of birds then either habitat alone.

Key findings

- Restored prairie in a conservation area supported 285 birds (21 species) in 2016 and 230 birds (25 species) in 2017.
- Rotationally grazed perennial pasture supported 553 birds (22 species) in 2016 and 468 birds (23 species) in 2017.
- Rotationally grazed perennial + annual pasture supported 524 birds (28 species) and supported 545 birds (21 species) in 2017.
- Pastures better supported some birds that are considered in decline than the restored prairie.

Project Timeline:
May 2016 - September 2016
May 2017 - September 2017

Cowbirds and swallows following Bruce's cattle herd as they move through pastures

Background

Grassland bird populations in Iowa have been in decline due to the homogeneous landscape created by Iowa's predominant corn and soybean cropping system and the loss of conservation areas on private land. Grassland obligate bird species like the bobolink, dickcissel, grasshopper sparrow, Henslow's sparrow, and the eastern bluebird, all have declining population trends that have followed the conversion of nesting habitat to cropland (Marquardt, 2008). Pasture and hayfields are more attractive to some grassland birds than row crop fields, and studies have shown that conservation of birds and wildlife can be facilitated in landscapes by introducing grazing disturbances at appropriate stocking densities (Marquardt, 2008 and Elmer, et al. 2012). Thus, the use of controlled grazing is a way to engage cattle producers in the process of ecosystem management in working landscapes (Vallentine, 2001).

For the last several years, Bruce Carney, a cattle grazier in Maxwell, IA has been observing diverse bird populations in his pastures. Bruce lives near Chichaqua Bottoms Greenbelt, a wetland and prairie conservation area, and wondered if his pastures provide adequate bird habitat, similar to that of the restored prairie area down the road. In addition, Bruce has pastures comprised of perennial plant species, and pastures comprised of perennial plus annual plant species. The objectives of this project were to determine if 1) properly managed pasture can replicate the bird habitat of a restored prairie and 2) how pasture with perennial plus annual plant species affects bird populations.

Methods

Practical Farmers of Iowa partnered with Drake University to conduct bird monitoring research. Student researchers, Grace Baumgartner and Conner Willis, conducted birds counts in three habitat types; a restored prairie (Chichaqua Bottoms), Bruce's perennial pastures, and Bruce's perennial pastures interseeded with annual species. By road, Bruce's farm is located four miles from Chichaqua Bottoms Greenbelt. Flying distance is less than a mile.

In 2016, bird counts were conducted weekly between May 20 and September 22. Nine counts were taken each week (three in each habitat type). The counts were conducted over 18 consecutive weeks, for a total of 162 counts during the study. In 2017, counts were conducted between May 31 and September 30. Ten counts were taken each week (four in the prairie and three in the other habitat areas). The counts were conducted over 16 consecutive weeks, for a total of 160 counts.

In both years, counts recorded all bird sightings and bird calls during 10 minute intervals that took place between 7:00 and 10:30 a.m. After arriving to each plot, an acclimation period of 2 minutes was given before counts were started. The species of particular interest, which have conservation implications, are the bobolink, dickcissel, grasshopper sparrow, Henslow's sparrow and the eastern bluebird.

Data were analyzed by Keith Summerville, Environmental Science professor at Drake University. Analysis used general linear models with a Poisson error distribution in PC SAS for Windows (v. 9.3). Significance was determined using pairwise comparisons of means between treatments with a Bonferroni correction. Because of limited replication of treatments, our tests were relatively low power (beta = 0.75).

Results and Discussion

A total of 59 bird species in 2016 and 48 species in 2017 were present in at least one of the three treatment areas. **Table 1** and **Table 2** list each species present in 2016 and 2017, listed from most to least abundant. Eleven fewer species were spotted in 2017, but some species were spotted for the first time, such as the rose-breasted grosbeak, house wren and northern harrier. "The northern harrier was always there, and that's because it's a territorial bird," said Grace. This is a bird of prey and its presence could be attributed to the flock of chickens in a nearby pasture.

In both years, cowbirds, swallows, dickcissels, starlings, meadowlarks and red-winged blackbirds were most abundant. Grace noted there were more sandhill cranes in 2017, moving from 49th most abundant to 18th. The five species in bold are the species of conservation interest; the eastern bluebird was not spotted in 2017.

A bobolink perches in an Iowa pasture in June 2017.

Table 1

Bird Species Ranked From Most Abundant to Least Abundant in 2016

1	Brown-Headed Cowbird	21	Field Sparrow	41	Yellow-Throated Vireo
2	Cliff Swallow	22	Ring-Necked Pheasant	42	Broad-Winged Hawk
3	**Dickcissel**	23	Turkey Vulture	43	Eastern Wood Pewee
4	Red-Winged Blackbird	24	Rock Pigeon	44	Northern Cardinal
5	European Starling	25	Warbling Vireo	45	Great Blue Heron
6	Barn Swallow	26	American Crow	46	American Tree Sparrow
7	Eastern Meadowlark	27	Song Sparrow	47	Bald Eagle
8	**Grasshopper Sparrow**	28	Gray Partridge	48	Lark Sparrow
9	Sedge Wren	29	Le Conte's Sparrow	49	Sandhill Crane
10	Canada Goose	30	Northern Flicker	50	Fox Sparrow
11	Common Yellowthroat	31	Rusty Blackbird	51	Great-Crested Flycatcher
12	**Bobolink**	32	Common Grackle	52	Nelson's Sparrow
13	Mourning Dove	33	Red-Headed Woodpecker	53	Yellow-Headed Blackbird
14	Killdeer	34	House Finch	54	Baltimore Oriole
15	American Goldfinch	35	House Sparrow	55	Bank Swallow
16	Northern Mockingbird	36	Gray Catbird	56	Cedar Waxwing
17	Tree Swallow	37	Chipping Sparrow	57	**Eastern Bluebird**
18	Eastern Kingbird	38	Mallard	58	Lincoln's Sparrow
19	American Robin	39	American Kestral	59	Red-Tailed Hawk
20	**Henslow's Sparrow**	40	Vesper Sparrow		

Species of special interest in this study listed in **bold**.

Table 2

Bird Species Ranked From Most Abundant to Least Abundant in 2017

1	Cliff Swallow	17	American Robin	33	American Crow
2	European Starling	18	Sandhill Crane	34	Great Blue Heron
3	Brown-Headed Cowbird	19	Common Grackel	35	Baltimore Oriole
4	**Dickcissel**	20	**Henslow's Sparrow**	36	Song Sparrow
5	Eastern Meadowlark	21	Ring-Necked Pheasant	37	Yellow-Headed Blackbird
6	Red-Winged Blackbird	22	Savannah Sparrow	38	Bald Eagle
7	Barn Swallow	23	Tree Swallow	39	Blue Jay
8	Mourning Dove	24	Field Sparrow	40	Cedar Waxwing
9	American Goldfinch	25	House Wren	41	Northern Harrier
10	**Bobolink**	26	Mallard	42	Gray Catbird
11	Sedge Wren	27	Turkey Vulture	43	Red-Tailed Hawk
12	**Grasshopper Sparrow**	28	Eastern Kingbird	44	Rose-Breasted Grosbeak
13	Canada Goose	29	Vesper Sparrow	45	House Sparrow
14	Rock Pigeon	30	Gray Partridge	46	Lincoln's Sparrow
15	Common Yellowthroat	31	Le Conte's Sparrow	47	Northern Cardinal
16	Killdeer	32	Nelson's Sparrow	48	Orchard Oriole

Species of special interest in this study listed in **bold**.

Bird Species Richness

Figure 1 shows the amount of bird species present in each habitat type over the two years of the study. In 2016 and 2017, 21 and 25 species were present in the restored prairie, 22 and 23 species in the perennial pasture and 28 and 21 species in the perennial + annual pasture, respectively.

No significant differences in the number of unique bird species were observed in each habitat type in 2016, but in 2017, significantly more bird species were spotted in the prairie and significantly fewer bird species were spotted in the perennial + annual pasture, compared to the prior year.

In 2017, more species were spotted in the prairie than in the pastures. Keith attributes the additional species spotted in the prairie to "tourist species," which are species that don't rely on prairie as their specific habitat; simply occupying it for short periods of time. In the perennial + annual pasture, the fewest species were identified, which is the inversion from year one. "There were less tourist species in the perennial + annual pasture in 2017. There will always be annual variation in which species colonize certain habitats as they return from migration," stated Keith.

Figure 1

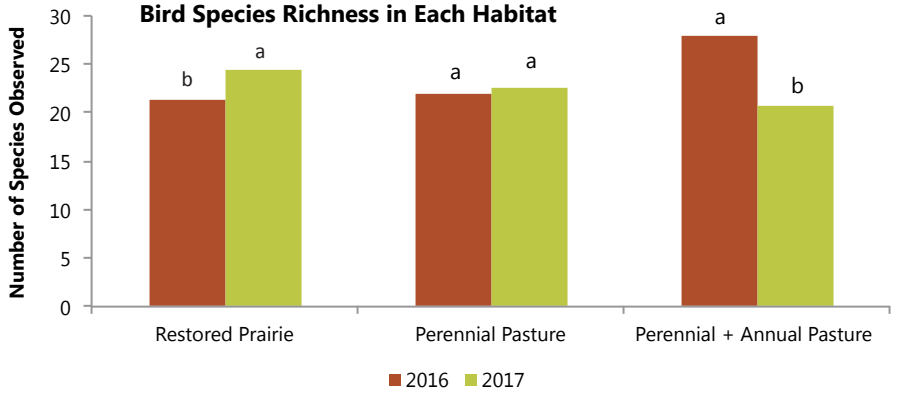


Figure 1. Number of different bird species observed in each habitat type each year. By habitat, columns labeled with different letters are significantly different. At $P < 0.10$, the Restored Prairie had significantly more diverse species than the year prior and the Perennial + Annual Pasture had significantly less diverse species than the year prior.

Bird Abundance

A drought in the summer of 2017 may have affected bird abundance and departure date. Total monthly precipitation is reported in **Table 3**. During the months of July, August and September, Carney Family Farms received a total of 5 inches of rain in 2017, compared to 17.4 inches in 2016. "It was drier in 2017, but the drought hit post-breeding season," explained Keith. Breeding and nesting season is in the spring.

Figure 2 reports the total number of birds observed in each habitat type on a log scale over the two years of the study. In 2016 and 2017, 285 and 230 birds were present in the restored prairie, 553 and 468 birds in the perennial pasture and 524 and 545 birds in the perennial + annual pasture, respectively. There were significantly more birds counted in both of Bruce's pastures than in the restored prairie both years.

Years ago Bruce started noticing bobolinks in his pastures, but never knew what they were or that they had any importance. He then started reading about them in conservation publications and Bruce said, "That's when I realized I must be doing something right." Bruce then became interested in knowing why the bobolinks were visiting.
"I thought, 'Why are they coming to my 300 acres when there are 10,000 acres in a wildlife conservation area a quarter of a mile away?'" recalled Bruce.

Figure 2

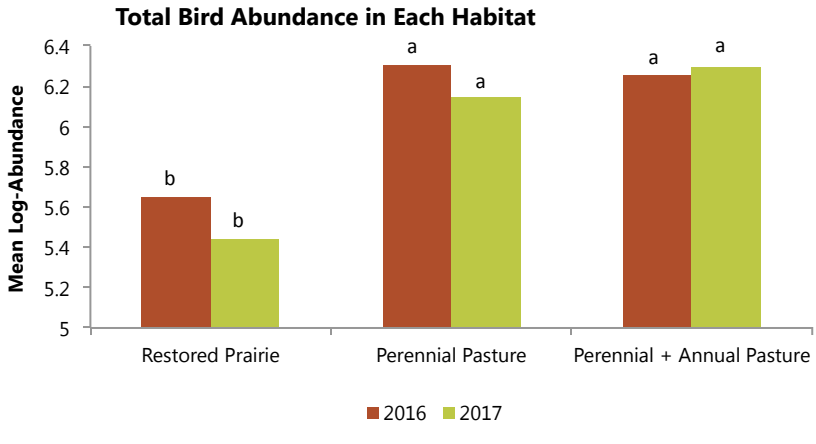


Figure 2. Total number of all bird species observed in each habitat type reported on a log scale. For each habitat type, columns labeled with different letters are significantly different. At $P < 0.05$, more birds were observed in the Perennial Pasture and Perennial + Annual Pasture than Restored Prairie, both years.

Table 3

Total monthly precipitation for 2016 and 2017[a]

	Rainfall/Snow (in)	
Month	*2016*	*2017*
May	2.2	5.8
Jun	2.8	2.9
Jul	5.4	1.8
Aug	4.9	1.9
Sep	7.1	1.3
Oct	0.0	5.8
Nov	2.0	0.40
Dec	0.7+6.0 snow	N/A
Jan	2.0 snow	0.75 + .30 snow
Feb	7.0 snow	0.50 + 3.5 snow
Mar	1.7	2.3 + 3.0 snow
Apr	3.6	3.0

[a]Precipitation at Carney Family Farms (measured by Bruce Carney).

Figure 3a

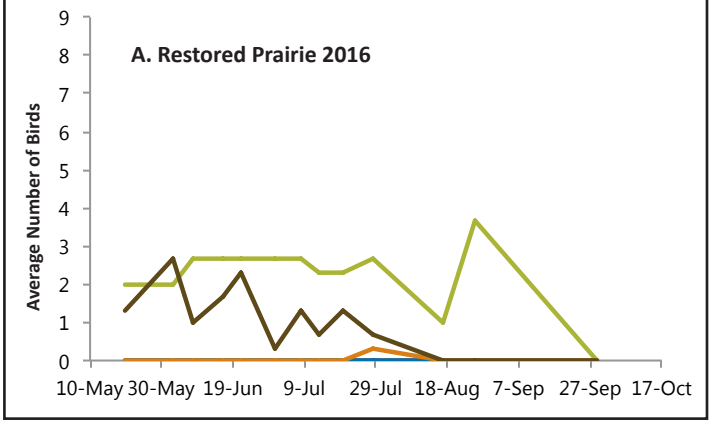


Figure 4a

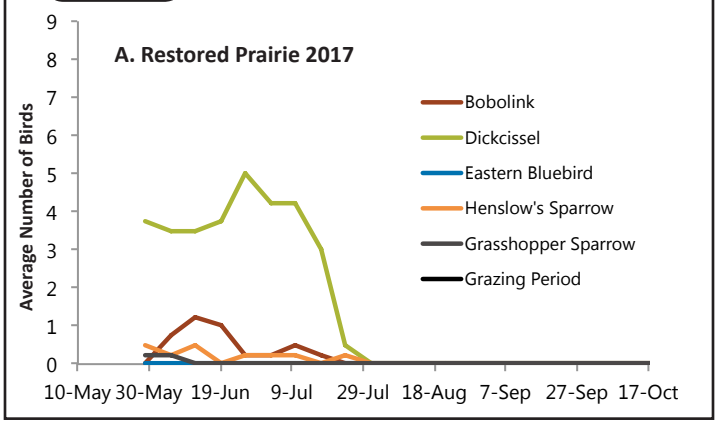


Figure 3b

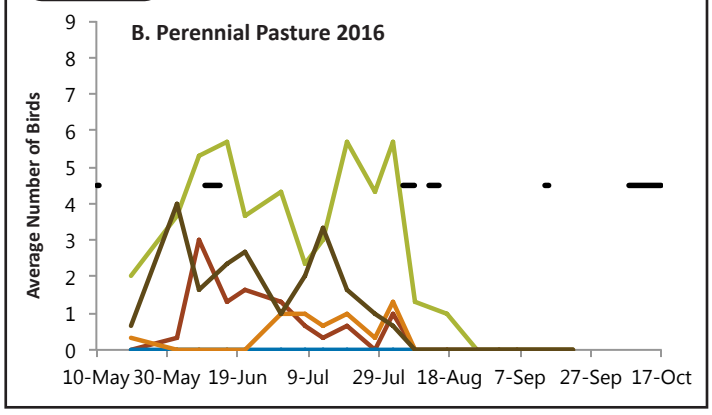


Figure 4b

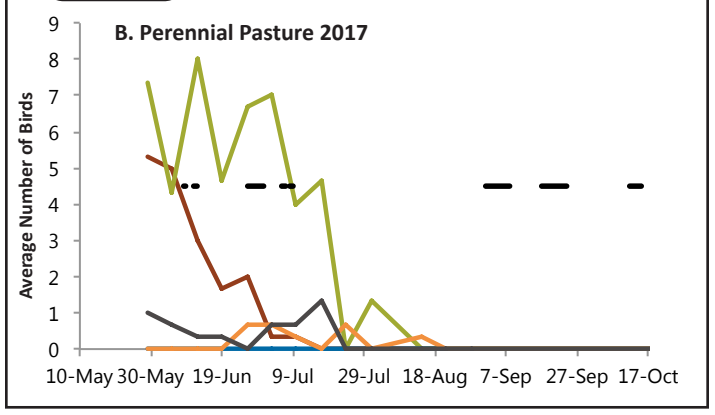


Figure 3c

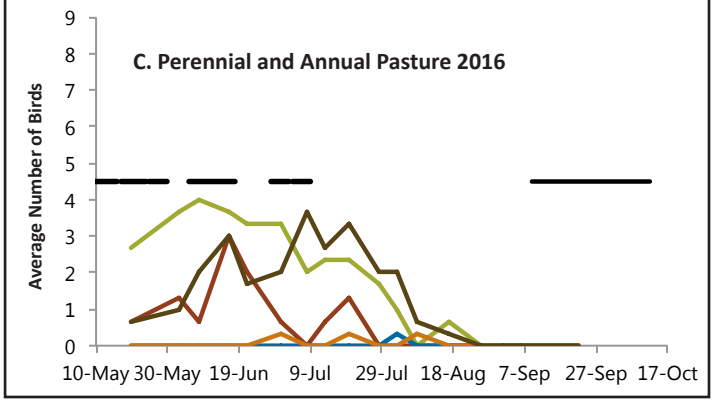
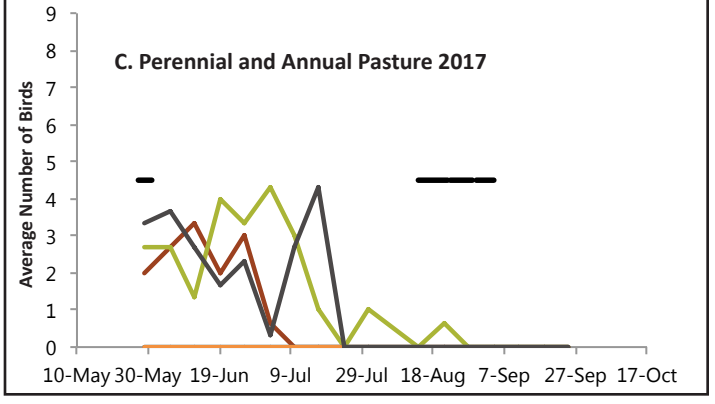


Figure 4c



Figures 3 and 4. 2016 and 2017 average bird abundance, for the five species of conservation interest, in **A**. restored prairie, **B**. perennial pasture, **C**. perennial + annual pasture. Cattle grazing periods in the pastures are designated by horizontal black lines.

Figures 3 and **4** display the abundance of the five bird species of interest observed in the three habitats over two years. Bobolinks were present in the pastures both years and present in the prairie in 2017, showing they preferred Bruce's grazed pastures over the restored prairie that has never been grazed. "Grazed areas are much more favorable for bobolinks," said Keith. Bobolinks are ground-nesting birds and seem to prefer grassland that has been grazed, over tall and dense vegetation (Love, 2015). Some farmers regard bobolinks as an indicator species for a healthy, working-farm grassland ecosystem.

The Dickcissel, a species which experienced a dramatic decline in the 1970s, now has a more stable population in North America (Cornell, 2017). Out of the five species with conservation interest, it was the most prevalent in all three habitats, with the greatest numbers in the perennial pasture, both years. Only one eastern bluebird was spotted during the study and that was in the perennial + annual pasture in 2016 (**Figure 3C**). Eastern bluebirds build nests in natural cavities, commonly in dead trees, and have a population that has been increasing since the 1960s (Cornell, 2017). The Henslow's sparrow was most prevalent in perennial pasture both years (**Figure 3B** and **4B**). Henslow's sparrow populations have been in decline and are listed as "near threatened." They are ground-nesting, grassland birds

that have suffered from habitat loss (Cornell, 2017). The grasshopper sparrow was most prevalent in the perennial + annual pasture both years (**Figure 3C** and **4C**), in comparison to other habitats. It is a ground-nester and forager, mostly eating grasshoppers, and prefers open grasslands (Cornell, 2017).

The weather affects bird migration patterns. Keith explained that when habitat becomes undesirable, perhaps due to drought, birds tend to search for more desirable habitat. Both Bruce and Grace think the bobolinks left early compared to the year prior. "There seemed to be a bunch of bobolinks early in the season and then they tapered off. They weren't here for long," stated Bruce. The last date bobolinks were spotted in 2017 was July 19, compared to August 2 in 2016. The majority of the bobolinks left two weeks earlier in 2017 than in 2016. "We can infer that drought initiates early migration, as most birds left by the end of July in 2017 versus August and September of 2016," said Keith, "The only birds spotted after July 24 were the dickcissel and grasshopper sparrow."

Grazing Management

Cattle were turned out into the perennial and perennial + annual pastures throughout the study period. Grazing dates were determined by Bruce and were not correlated with bird monitoring dates; each grazing period is designated by black horizontal lines in **Figures 3** and **4**.

The results showed there was no significant difference between bird abundance in the two pastures types in either year, although the perennial pasture supported the most birds (553) in 2016 and the perennial + annual pasture supported the most birds (545) in 2017. There was a notable difference in the growth of the annual forage species between the two years. "In 2016, the annual species established well and comprised 50 to 60% of the pasture. They grew up to eight feet tall," explained Bruce, "and I think it's hard for ground birds to forage in plants that get so tall." In 2017, Bruce said there was an establishment rate of 5% or less. "I drilled them in late May, during cool, wet weather and then the drought hit, so there weren't many annuals in that pasture." Essentially, the perennial + annual pasture was only a perennial pasture in year two of the study.

Bruce and Grace observed that certain birds followed the cattle as they grazed. Cowbirds and swallows were the most abundant birds counted in the study and could be found in great quantity in the pastures when cattle were present. "They eat flies and insects off the cows' backs," noted Bruce. Both species eat insects; grasshoppers are a staple food for both cowbirds and swallows, which are stirred up by cattle as they move through pastures (Cornell, 2017).

Bruce rotationally grazes, so his cattle are never in one place for a long period of time. Thus, at any given time, there is always habitat absent of cattle. Bruce's farm also includes eleven acres enrolled in the Conservation Reserve Program, seven acres of tree plantings, seven acres of forest reserve, and many feet of perimeter fence lines. "There are plenty of areas to nest without disturbance," said Bruce.

"Multi-year assessments are needed in order to make grazing recommendations that support bird habitat, but we know that grazing later in the season is better for the birds," explained Keith. "Farmers have to decide what their goals are. If the goal is to manage for nesting birds, any disturbance that clips the forage to the ground will make non-viable nesting habitat." Outside of the nesting season, disturbance from grazing inherently attracts different bird species. "Some species depend on grazing, subsets of species are grazing tolerant and some are not tolerant at all, but you're never going to be able to manage for everything," stated Keith.

The results from this study showed that grazed pastures supported some bird populations just as well, or better than, a restored prairie area. "Both pastures supported larger population sizes of birds in general, as well as several species of conservation interest. This is because [non-grazed] prairies tend to lack the heterogeneous structure of grazed grasslands," explained Keith. The difference between the bird populations in the habitat types come down to the cattle. "Cow activity does two things; changes vegetation structure and exposes more ground. Some birds like short and tall grass mixtures, and exposed insects, which attracts insectivorous birds. Prairies are shown to support different groups of bird communities, and it's important to remember that prairies and pastures complement one another to protect a larger population of birds then either habitat alone. Co-dependent conservation strategies are needed," added Keith.

Cattle grazing perennial + annual plant species.

Conclusion and Next Steps

Two years of data shows that a properly managed, pasture-based grazing operation can provide habitat for a diverse set of birds and support large bird populations, effectively serving a similar purpose to the conservation prairie area nearby. It is important to note that stocking densities and frequency of cattle rotation are critical components of a properly managed system.

"I learned that you don't have to have thousands of acres to conserve wildlife. At first, I assumed Chichaqua would have more birds than my farm, but it really comes down to management. Smaller parcels of land, managed properly, can create favorable habitats and support birds," stated Bruce.

The conversion of row crop land into grassland is an important step in creating a working landscape that can provide wildlife habitat along with agriculture practices that generate profit. "It's not a matter of farms versus prairies; it's a matter of working together to support bird communities. This work demonstrates this practice is viable," concluded Keith.

As a next step, Bruce may become certified by Audubon Society's Conservation Ranching program. This market-based conservation approach offers incentives for good grassland stewardship through a certification label on beef products. By purchasing beef from Audubon-certified farms and ranches, consumers will contribute to grassland and bird conservation efforts (Audubon, 2017).

Audubon Society's Conservation Ranching certification label for grass-fed beef products.

Cattle grazing perennial pasture.

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