A Survey of Winter Birds at the Atchison State Fishing Lake and Benedictine Bottoms

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Introduction:

The natural wealth of wildlife that exists in northeast Kansas along the Missouri River lends itself well to biological research. This is particularly true of birds, which are by nature conspicuous and relatively easy to survey. We chose to survey two locations with similar habitats: Benedictine Bottoms Wildlife Area (BB) and Atchison State Fishing Lake (SFL). The similar grasslands in each of the two sites make for a good research opportunity, since they share some similarities and some differences. The BB lie in the lowland/floodplain of the Missouri River, while the SFL rests in the upland region. Both habitats are composed of native grassland surrounded by deciduous woodland, with water playing a large role (more so at the SFL than at the BB).

Fig. 1a: Benedictine Bottoms

Fig. 1b: Fishing Lake

Fig. 1c: Benedictine Bottoms After Controlled Burning

Our goal for this project was to survey the birds present looking for any differences (or similarities) that exist between the two habitats, noting other trends and patterns in the numbers and species observed.

Methods:

We utilized a point transect method of data collection in order to survey the number of species present at the grassland portions of each site, allowing us to directly measure the amount of time spent in observation and remain consistent as possible. In the case of our project, we spent 5 minutes at each point, noting the species and number of individuals identified by sight or sound. Points were spaced 100-200 meters apart in order to avoid double counts.

At the BB, there was enough space to plan a linear transect with ample distance between each point. At the SFL, however, we were limited to a small portion of true grassland, resulting in a less linear and more circular transect with only about 100-150 meters between each point. Nonetheless, the hilly terrain of that portion of grassland made it unlikely that double counts occurred, resulting in a reliable count. The following figures are our satellite images of our transects at the SFL (Figure 3) and the BB (Figure 4):

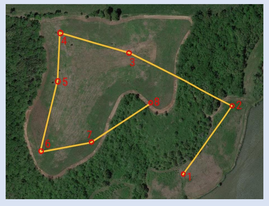

Fig. 2a: Benedictine Bottoms Transect Route

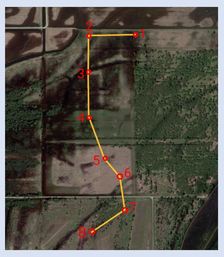

Fig. 2b: Benedictine Bottoms Transect Route

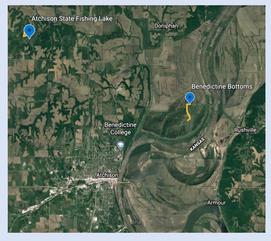

Fig. 2c: Position of Transects in Relation to Benedictine

Other factors that certainly have an impact on data are time of day and weather. We made every attempt to conduct this study in consistent weather. This meant avoiding days with significant precipitation or other extreme weather, such as winds over 20 kmph. Regarding time of day, we collected most of the data in the early evening. We collected a few sets of data in the mid-morning, and, nearing the end of the project timeline, in the early morning. Thus, time of day was the biggest inconsistency present in this project. Finally, the BB also underwent controlled burning through a portion of the transect from 3/1/21 to 3/4/21.

Data Analysis:

In order to compare the diversity of each site, we used two indices: the Shannon Index, and the Simpson Index. The Shannon Index is calculated as follows:

$$H' = -\sum_{i=1}^{R} p_i \ln p_i$$

Where H represents diversity and *p* represents the total individuals of one species divided by the total number of individuals across all species observed. This unitless index quantifies the unlikelihood of being able to predict the species of an individual selected at random. Thus, the higher the value, the more diverse the sample. The Simpson Index is similar, and calculated as follows:

$$\lambda = \sum_{i=1}^{R} p_i^2$$

Where λ represents diversity and *p* again represents the total individuals of one species divided by the total number of individuals across all species observed. Unlike the Shannon Index, the Simpson Index quantifies the likelihood that two individuals chosen at random belong to the same species on a scale from 0 to 1. Thus, it places more emphasis on dominant species, ignoring those that appear less. A higher number implies a lower diversity.

Results:

Overall, we took 5 sets of data at the BB, and 6 at the SFL. We observed a total of **21** species at the BB, compared to **24** at the SFL. The total number of individual birds was also higher at the SFL, **871** to **474**.

Ring-necked Pheasant	Downy Woodpecker	American Tree Sparrow
Mourning Dove	Northern Flicker	Field Sparrow
Killdeer	Blue Jay	Song Sparrow
Turkey Vulture	American Crow	Fox Sparrow
Northern Harrier	Black-capped Chickadee	Harris' Sparrow
Rough-legged Hawk	Eastern Bluebird	Dark-eyed Junco
Red-tailed Hawk	American Robin	Northern Cardinal
Short-eared Owl	European Starling	Eastern Meadowlark
Belted Kingfisher	House Finch	Red-winged Blackbird
Red-bellied Woodpecker	American Goldfinch	Common Grackle

Table 1: Comprehensive Species List. Species in blue were sighted at both, yellow for the BB, red for the SFL

The following tables (2a and 2b) note the average numbers of species and individuals observed at each point within the transects. This shows whether certain points were more productive than others, or if some points were simply badly placed and underperformed.

Benedictine Bottoms		
Point No.	Avg. # Birds	Avg. # Species
1	7.4±6.2	2±2.3
2	10.0±10.3	2±1
3	6.0±6.8	1.6±0.5
4	6.6±9.4	1.8±0.8
5	5.4±8.4	1.4±1.3
6	3.4±1.8	1.8±0.8
7	53.8±109.7	2.8±1.3
8	3.5±3.8	1±1.2

Table 2a: Average Number of Individuals and Species Sighted Per Point at the SFL

State Fishing Lake		
Point No.	Avg. # Birds	Avg. # Species
1	4.3±7.4	1.2±1.2
2	5.3±4.4	1.8±1.7
3	21.7±27.8	1.5±0.8
4	22.0±39.8	2.8±2.1
5	1.8±2.8	1.0±1.3
6	65.7±142.8	2.5±1.6
7	5.2±4.6	2.3±0.8
8	25.3±52.5	1.3±1.0

Table 2b: Average Number of Individuals and Species Sighted Per Point at the BB

As for the calculated diversity of each site, the BB and SFL yielded Shannon Index values of **1.27** and **1.33** respectively. On the other hand, the BB and SFL yielded Simpson Index values of **0.54** and **0.47** respectively.

At both the SFL and the BB, we observed a steady decline in the numbers of American Tree Sparrows (Figure 3). By 3/4/21, no individuals were observed at either site.

Similarly, we consistently observed Dark-eyed Juncos in numbers of 20 at the SFL, while seeing few or none at the BB. These numbers dropped at the SFL on 3/4/21 and stayed low throughout the rest of the study (Figure 4). At the BB, numbers jumped sharply on 3/19/21 before dropping back to 0.

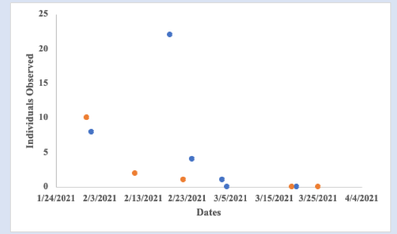

Fig. 3: American Tree Sparrows Sighted Over Time

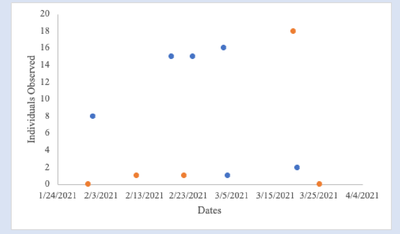

Fig. 4: Dark-eyed Juncos Sighted Over Time

The appearance of Red-winged Blackbirds (RWBB) followed a trend opposite to that of the juncos. Although we observed a flock at the bottoms in early January, few RWBB were sighted until 3/3/21 and 3/4/21, when we observed large flocks on each day (Figure 5). Then, after 3/19/21, we consistently observed RWBB individuals at the BB, but none at the SFL.

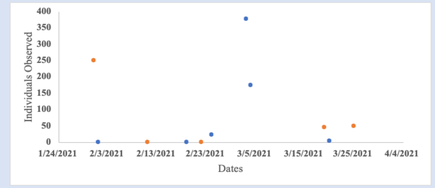

Fig. 5: Red-winged Black Birds Sighted Over Time

SFL

BB

Fig. 6: (Right) BB Area Often Occupied by RWBB

Discussions:

Overall, most of the same species were present at the two sites. This was expected since both transects ran through grasslands bordered by forests. However, we observed more species at the SFL, meaning it was most likely the more diverse of the two. Both indices confirm this, as the SFL had a higher Shannon Index value and a lower Simpson Index value than those of the BB. Many of the differences in species we observed can be attributed to habitat. For instance, at the SFL, we observed Belted Kingfishers, which are highly unlikely to appear in lowland floodplains. Similarly, we observed three species of raptors (Northern Harrier, Rough-legged Hawk, and Short Eared Owl) at the BB which were not present at the SFL. Such raptors prefer the open spaces provided by the BB and are thus unlikely to appear in the upland terrain of the SFL.

Three species stood out in the data for interesting trends they showed throughout the project. As seen in the Results section, the American Tree Sparrow, the Dark-eyed Junco, and the Red-winged Blackbird all underwent some changes. First, in the case of the tree sparrow, the data clearly shows the disappearance of the individual birds as they departed on their northward migration. We saw a similar pattern of disappearance in the juncos. This can also be attributed to the spring migration; however, whereas the tree sparrows were completely gone, lesser numbers of juncos continued to be present the BB, implying that they paused at the BB before leaving.

Finally, the blackbird data was the most interesting of all. In the early stages of this study, the evening sessions at the SFL turned up large flocks of blackbirds, while similar sessions at the BB noted very few blackbirds. As the study progressed, we noticed a shift. We began to find more black birds at the BB rather than at the SFL. This turnaround was most clear when we returned to the BB after it had been burned. We found numerous blackbirds singing individually, when similar sessions beforehand had yielded few to none. This can be explained by the newly created wide-open flat habitat created by the fire, which gave the blackbirds a large area to display and attract potential mates (Figure 6). Thus, aspects of property management, such as the controlled burning can affect the types of species present.

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