

A Pilot Study Examining the Avian Diversity on a Managed Prairie Fragment
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Introduction

A prairie ecosystem consists of perennial grasses and forbs and very few trees. Missouri prairies are considered tallgrass prairies due to the warm season grasses that dominate the upland and bottomland sites (Nelson 2005). Historically, Missouri tallgrass prairies were part of a bigger tallgrass prairie region that reached as far north as southern Manitoba down to southern Texas and from central Nebraska out to Ohio. Missouri's prairie's covered nearly 15 million acres or 1/3 of the state during the time of European settlement. Today, only 70,000 acres remain and 22,000 acres of fragmented prairie is protected (Nelson 2005). Most of the prairie habitat has been destroyed for agricultural purposes and continued threats include fragmentation, over seeding with non-native forage plants, overgrazing, road building and fire suppression (Nelson 2005).

The populations of birds that forage, find shelter and nest primarily in the prairie have suffered serious declines during the last half of the century. Habitat loss is often cited as the major cause of decline (Nelson 2005). Current data trends from North American Breeding Bird Surveys indicate that grassland birds are the most imperiled birds in North America (Rich 2006). 71% of the grassland bird species have significant declining populations while 7% of the grassland bird species have increasing numbers. In comparison, only 17% of the population of forest dwelling bird species have decreased and 32% are increasing (Rich 2006).

Litzinger Road Ecology Center, (LREC) under the direction of the Missouri Botanical Garden has been restoring 12 acres of tallgrass prairie in St. Louis county since 1989 through planting native prairie forbs and grasses and periodic burns to destroy non-native plants. After spending time at Litzinger, I wanted to learn whether or not a small piece of restored prairie was beneficial to migrating and nesting songbirds. Are frequent burns beneficial to the birds? Does the small size of the prairie

greatly impact the birds in terms of predation? How many different migrating birds use the prairie as a rest stop and who nests in this habitat during the summer? Studies on prairie burns found that most birds preferred those areas that were burned less often than every 2 years (Reinking 2005). One study found that smaller tracts of prairie supported less diversity and incidents of predation were higher (Winter et. Al 2000). Several studies on avian prairie ecology have been performed on study sites larger than 12 acres. However, the results from these studies may still prove useful in my ongoing research. 2008 was the pilot year in examining the diversity and population trends of the birds living on the prairie at LREC. The objectives of this study were to begin monitoring the migrant, resident and summer birds on the prairie, observe the dynamic changes prescribed burning has on the avian community, begin monitoring the longevity of bird lives with the use of federal bands and obtain a baseline on the nesting success of those birds using nestboxes to raise young. Methods employed were mistnetting, census and checking the site's nestboxes.

Procedure

The study took place on the north and south prairie at LREC (N 38.6213540° W 90.3741410°). LREC is located 10 miles west of downtown St. Louis and sits on 34 acres of combined bottomland forest, restored prairie and urban creek (Litzinger Road Ecology Center 2009).

Mistnetting involved placing two 12-meter nets at the SE woodland edge of the south prairie and two 12-meter nets at the SE side of the burn line facing the north prairie. Mistnetting was done weekly during the months April – July and again in September. Mistnetting was suspended in mid-July through August due to the lack of activity at the nets. Each session began at dawn during the peak of bird activity and lasted approximately 4 hours. The nets were checked every 15-30 minutes depending on the volume of birds at the nets. Each bird was aged, sexed and banded with a federal band. Banding is helpful in determining migratory habits, lifespan and survival rate, reproductive success and population growth of songbirds (USGS Bird Banding Laboratory 2003). Mistnetting is helpful in

capturing those birds that forage quietly within the grasses and may have been overlooked during weekly census periods.

A weekly census was performed May through August. The North and South Prairie were divided into a grid pattern with each census point approximately 45 meters apart. Five minutes was spent at each point and all birds seen, heard and observed flying overhead was recorded. Each census began around dawn at the peak of bird activity and the start times alternated between the North and South prairie.

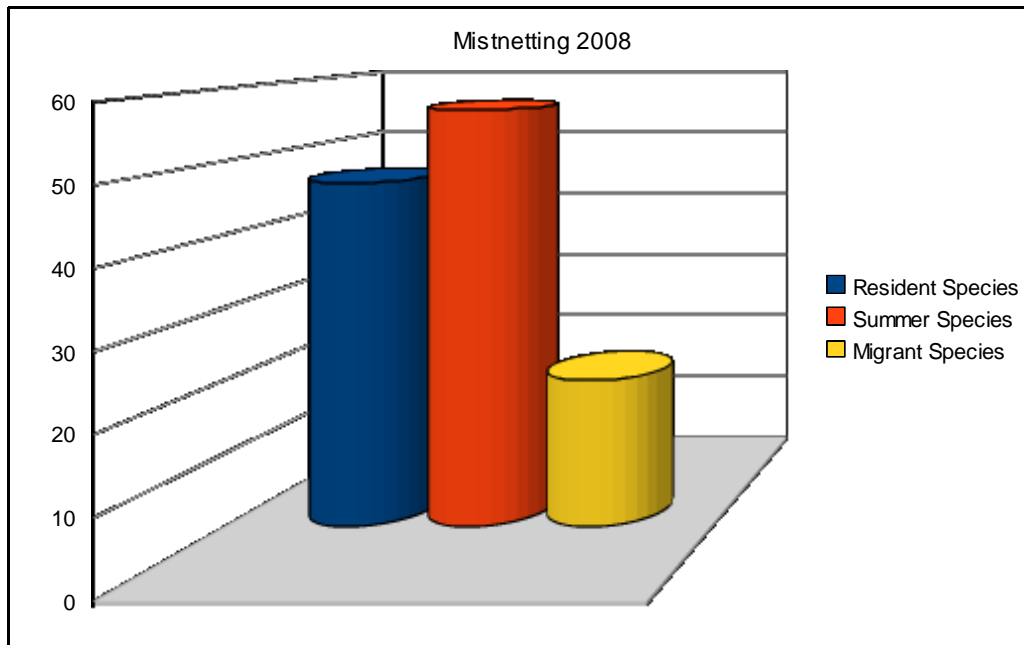
Monitoring the site's nest boxes was another aspect of the project. Nest boxes were checked weekly April through July. Nestlings were banded between 7-10 days approximate age to minimize the risk of the chicks prematurely fledging and adults were banded if they were sitting on the nest.

Results

Birds were categorized as Migrating, Resident and Summer species. Migrating birds are defined as those birds who travel from their wintering grounds and stop in St. Louis for a brief time in the spring before resuming their trek to their breeding grounds in another part of the country. Because I was not monitoring birds over the winter, any “winter birds” tallied fell into this category. It is not uncommon for birds to migrate through St. Louis during the late winter and spring when they theoretically spend the cold months in our city. For example, White Crowned Sparrows (*Zonotrichia leucophrys*) and Swamp Sparrows (*Melospiza georgiana*) have been reported to spend their winters in St. Louis but are spotted more often during spring migration than the winter months. Resident bird species are those birds found in the St. Louis area year round. Birds that are considered “resident species” may be short distant migrants, traveling a short distance elsewhere for the winter, but the species itself is found in St. Louis all year. For example, an American Robin (*Turdus migratorius*) may fly up to Minnesota for the spring, but return to St. Louis in the winter or vice versa, but American Robins are found in the St. Louis area all year. Summer bird species are the birds that breed and raise

their young in St. Louis during the summer months but travel to a different location for the winter.

Mistnetting

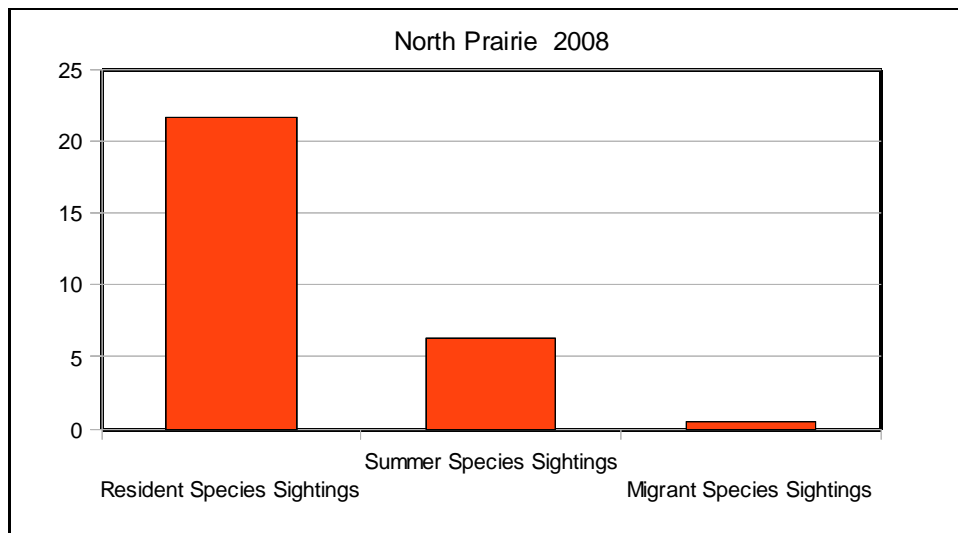


Mistnetting produced 6 migrating, 8 resident and 8 summer songbird species. The migrating songbirds were Least Flycatcher (*Empidonax minimus*), Mourning Warbler (*Oporornis philadelphia*), Palm Warbler (*Dendroica palmarum*), Swamp Sparrow (*Melospiza georgiana*), Tennessee Warbler (*Vermivora peregrina*) and White Crowned Sparrow (*Zonotrichia leucophrys*). The summer species caught included Acadian Flycatcher (*Empidonax virescens*), Common Yellowthroat (*Geothlypis trichas*), Eastern Phoebe (*Sayornis phoebe*), House Wren (*Troglodytes aedon*), Indigo Bunting (*Passerina cyanea*), Prairie Warbler (*Dendroica discolor*), Red-eyed Vireo (*Vireo olivaceus*) and Ruby-throated Hummingbird (*Archilochus colubris*). While the Prairie Warbler does spend the summer in the St. Louis region, this bird did not appear to use the Litzsinger prairie as a breeding ground. Only one Prairie Warbler was caught in the nets and no sightings were noted during the census portion of the study. The resident bird species caught were American Goldfinch (*Carduelis tristis*), American Robin (*Turdus migratorius*), Carolina Chickadee (*Poecile carolinensis*), Carolina Wren (*Thryothorus ludovicianus*), Cedar Waxwing (*Bomycilla cedrorum*), Eurasian Tree Sparrow (*Passer montanus*), Song

Sparrow (*Melospiza melodia*) and Tufted Titmouse (*Baeolophus bicolor*). While these birds represent only a portion of the total species observed during the study, 46% of the birds caught in the nets were summer species, 38% were resident species and 16% were migrating bird species.

Census

The Litzsinger staff burned the south prairie November 30, 2007 and it appeared some bird species preferred the South Prairie over the North prairie, and vice versa. Figures 2 and 3 represent the



total sightings in the North and South Prairies.

Figure 2

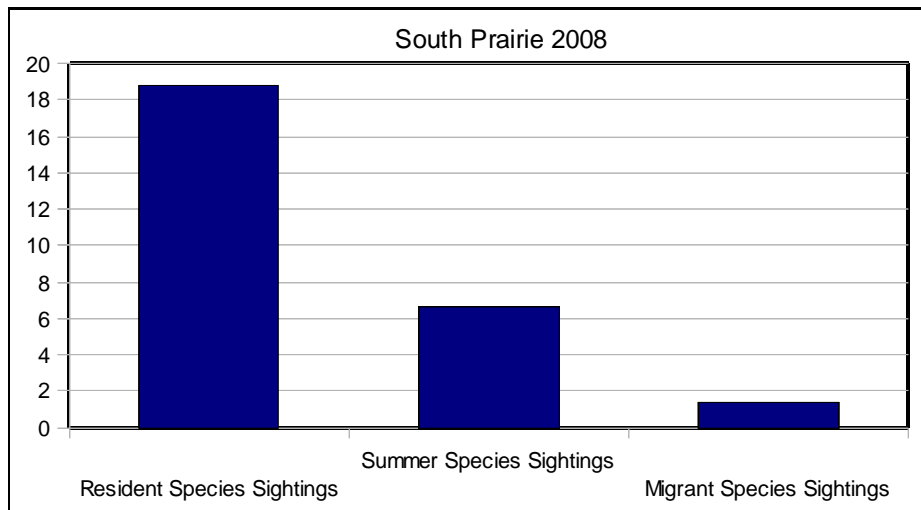


Figure 3

According to the census surveys, species that appeared to prefer the unburned North Prairie were resident species American Goldfinch (7.2 sightings per census point in North Prairie and 2.28 resident sightings per census point in South Prairie), summer species Indigo Bunting (1.65 sightings per census point in North Prairie and 0.86 sightings per census point in South Prairie), and the migrant Swamp Sparrow (0.25 sightings per census point in North Prairie and 0.07 sightings per census point in the South Prairie). There were also birds that seemed to prefer the burned South Prairie, although the preferences don't appear to be as strongly demonstrated. Resident species American Robin (6.43 sightings per census point in South Prairie and 4.65 sightings per census point in North Prairie), Song Sparrow (2.07 sightings per census point in South Prairie and 1.15 sightings per census point in North Prairie), and the migrant species Least Flycatcher (0.5 sightings per census point in South Prairie and 0.05 sightings per census point in the North Prairie) appeared to favor the South Prairie. Overall, there were 48 species sighted in the North Prairie (15 summer, 6 migrant and 27 resident species) and 43 species found in the South Prairie (13 summer, 8 migrant and 22 resident species) For specific bird species found on the prairies, please see the appendix.

Nest Boxes

Eurasian Tree Sparrow was the species predominantly using the boxes although a pair of Eastern Bluebirds (*Sialia sialis*) successfully raised two clutches of chicks in a box located on the North Prairie. Another pair of Bluebirds attempted to build a nest in a box on the pasture prairie, but a pair of Eurasian Tree Sparrows built a nest over the existing Bluebird nest. Two pairs of House Wrens built nests in boxes on the South Prairie. In one instance (box 4) the wrens built but did not use the nest. However this is common behavior for wrens (Sibley 2001) to build several nests before deciding to use a particular nest. The nest was removed after 3 weeks of inactivity and a pair of Eurasian Tree Sparrows immediately occupied the box. In another case, (box 6) a pair of House Wrens began to build a nest but the following week a pair of Eurasian Tree Sparrows built over the existing nest.

For 2008, overall hatching success was 52%. All chicks that hatched from eggs were considered a hatching success and did not take into account those chicks that were predated or died of unknown causes. 36% of the total nests were predated and 15% of all the chicks hatched died from unknown causes. A nest was considered predated if all or a portion of a nest containing eggs or young chicks was gone when either was present during the previous week's visit. Three of the eleven boxes checked had a high predation rate. Boxes 5 and 10 were predated 2 out of 3 nesting attempts and box 6 was predated 2 out of 2 nesting attempts. All of these boxes are located in the midst of dense or tall vegetation and this could be a factor in the depredation events.

Several boxes also had high fledgling success rates. A total of nine bluebird chicks from 9 eggs (2 clutches) fledged from Box 11, seven Eurasian Tree Sparrow chicks fledged from box 8 (clutch one produced 4 offspring from 6 eggs and clutch two produced 3 offspring from 5 eggs) and six Eurasian Tree Sparrow chicks fledged from boxes 7 (clutch one produced 3 offspring from 5 eggs, clutch 2 produced 4 offspring from 6 eggs but all chicks died and the third clutch produced 3 chicks from 4 eggs) and 9 (clutch one produced 3 offspring from 4 eggs and clutch two produced 3 offspring from 6

eggs. The third clutch with 3 eggs was predated). The remaining boxes fledged 2-3 chicks for the season. Incidentally, box 11 harbored the site's first pair of Eastern Bluebirds since nestbox monitoring began.

The studies done on the nesting success of grassland birds in fragmented habitats had conflicting results and the differences in local predator communities and interacting effects of vegetation and predator type have complicated the interpretation of field data (Dion et al 2000). One study suggested birds nesting in smaller prairie fragments or near an edge have lower nesting success rates than those nesting in larger habitat fragments (Winter et al 2000). Activity patterns of both small and mid-sized carnivores were significantly higher within 50m of a forested edge than at greater distances (Winter et al 2000). Other studies have shown that distance to edge seemed to be of less importance to the survival of nests than fragment size and vegetation characteristics at the nest (Winter 2000 et al).

Discussion

2008 was the pilot year in examining the diversity and population trends of the birds living on the prairie as well as obtaining a baseline on the nesting success of those birds using nestboxes to raise young at Litzsinger Road Ecology Center. Mistnetting produced a good snapshot of the birds that use LREC as a stop over point during spring migration, as well as identifying those that nest in the prairie during the summer. While the nets caught predominantly resident and summer birds (38% and 46% respectively) 16% of the birds captured were migrating birds and this underscores LREC as an important resting place for these birds that are in route to their breeding grounds. However in order to obtain a more accurate count of those birds who spend their summer on the prairie, it would be beneficial to mistnet the entire length of the summer. Consistent banding will not only provide a more accurate count of the birds present on the prairie, but will increase the chances of capturing a bird that has been previously banded. None of the birds caught in 2008 were previously banded and it will be

interesting to note the percentage caught this summer that carry a band from last year's session. Last year one of the 4 nets was in a low traffic area bird-wise and will need to be relocated in 2009.

In the census portion of the study I divided and counted the birds separately on each prairie to see whether or not they favor the burned portion of the prairie or if the tract of land is too small for them to demonstrate a preference. One of the long-term objectives of this project is to observe the changes prescribed burning may have on the avian community. Fire affects both the composition and the structure of vegetation and can affect birds in a variety of ways (Reinking 2005). Some studies suggest that the new vegetation growth resulting from a fire provide increased foraging opportunities for insects and consequently offer better foraging for insect predators, including birds and other vertebrates (Reinking 2005). Fire may also affect nest success through changes in vegetation height and density, potentially providing nest predators with either easier or harder access to nests (Reinking 2005). Other factors such as the intensity and completeness of the burn, availability of nearby refuge habitats (Reinking 2005) and timing of the burn (Heikert 2009) may influence grassland bird response to prescribed burns. Some studies suggest that nesting success rates may be greater in grassland areas burned in the fall than in spring burned areas (Heikert 2009). Several species of grassland birds are also more common in unburned prairie because of their dependence on woody vegetation, which tends to be more common in unburned prairie. These species include Common Yellowthroat and American Goldfinch (Askins et al 2007). Prairies burned more often than every two years are structurally simpler than unburned grasslands, and consequently support fewer bird species (Reinking 2005). Even though a few bird species exhibited a consistent preference for unburned or burned portions of the prairie, the majority of species were evenly distributed across the North and South prairie. This could be due to the fact that the prairie is too small for the birds to develop an inclination for burned or unburned habitat or a few more years' worth of observation is needed before drawing a conclusion. Numerous studies cite the benefits of managed burns that occur less often than every 2 years (Reinking

2005) while other studies have proved certain species rely on those prairie habitats that are burned at least every other year (Reinking 2004). My hypothesis is that the LREC prairie habitat is too small for the birds to pick one fragment over the other but I will reiterate the need for additional years of census before a suitable conclusion can be reached.

Overall nest box fledging success rate was 48.50%, predation was 36.50% and chick mortality rate was 15% in 2008. Per personal communication with Douglas Johnson, the expected nest box predation rate can be as high as 40%. One study points to habitat edge and vegetation density affecting nest box predation (Winter et al 2000). Several studies have found nests located in taller vegetation are lost to medium-sized mammals (Dion et al 2000). Dense vegetation may harbor more small mammals which predate nests, therefore concluding that nests located in dense vegetation may have higher predation rates than nests found in sparse vegetation (Dion et al 2000).

Vegetation height and proximity to the affected nest box were not measured after a predation event in 2008, but will be recorded in 2009. After the 2008 nesting season, LREC staff and volunteers placed raccoon baffles on each nest box in attempts to negate predation. The baffles should decrease, if not eliminate raccoon predation. It is unclear if the baffles will deter snakes. As stated in the results section of this paper, Eurasian Tree Sparrows were the dominant bird inhabiting the boxes. It is my hypothesis that Eurasian Tree Sparrows are not the docile nest builders as written in text books (Sibley 2001) but do aggressively compete with other cavity nest builders. There were 2 incidents in 2008 when I found a Tree Sparrow nest built over an existing Bluebird nest and House Wren nest. Carolina Chickadees and Eastern Bluebirds begin nest building within the same time frame as Eurasian Tree Sparrows (Baicich and Harrison 1997) and all 3 species are found at LREC. To test my hypothesis, I plan to remove Eurasian Tree Sparrow nests from the nest boxes on the North Prairie and leave the South Prairie untouched in 2009.

In conclusion, 2008 provided the baseline data needed in determining whether or not the birds

preferred the burned or unburned portion of the prairie, the diversity of avian species on the prairie, the number of cavity nesting bird species using the nest boxes and the success rate of these birds using the nest boxes.

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