

**Avian Species Structure at Loyola University Retreat and Ecology Campus
During the 2012 Summer Breeding Season**

Edgar R. Perez and Stephen F. Mitten
Institute of Environmental Sustainability
Loyola University Chicago



Avian Species Structure at Loyola University Retreat and Ecology Campus During the 2012 Summer Breeding Season

Edgar R. Perez and Stephen F. Mitten
Loyola University Chicago

Abstract:

We undertook a breeding census of the avian community residing on the 98 acre (39.7 hectare) property of Loyola University Retreat and Ecology Campus (LUREC) over a two month period (May 12-July 18) in the summer of 2012. Territory-spot mapping was the primary method used, supplemented by timed counts, opportunistic visual sightings and nest searches. Sixty-nine species were documented: forty species were found breeding or holding territories on the campus with an additional twenty-nine species detected as flyovers or occasional visitors. One hundred and thirty-five nests of thirty-one species were found. Frequency of encounter and relative abundance indices were also calculated. The most frequently encountered species were the Gray Catbird and Northern Cardinal. The Red-winged Blackbird was the single most abundant species in terms of total number of individuals seen; however, Gray Catbirds, American Robins, Northern Cardinals, Black-capped Chickadees, American Goldfinches and Brown-headed Cowbirds were the most abundant (RA) birds across the campus. The American Robin had the most number of breeding territories. Habitat structure and food availability should both be considered important factors in future wetland and woodland restoration. Some recommendations are provided.

Introduction:

While much of the plant community at Loyola University Retreat and Ecology Center (LUREC) has been surveyed and documented (Mackie Consultants, 2009), its fauna has not. Birds can serve as good indicators to plant community health since species richness and distribution of breeding territories are closely linked to the plant communities in which they are dependent on for their food and nesting sites (Chamberlain and Fuller, 1999). Most species also have a well-defined habitat preference (Karr, 1990). The spot-mapping technique can be applied in a perfectly straightforward fashion to census a majority of the avian species that inhabit LUREC (Bibby et.al. 2000). Barb Meding and the McHenry County Conservation District have produced a bird checklist for McHenry County, IL designating birds as whether they are common; uncommon: possible to find in small numbers in suitable habitat and season; rare: unlikely to find even in suitable habitat and season; or occasional: only a few occurrences in some years. Our primary research objective was to get as much detailed information on the avian community structure as time allowed. We specifically wanted to: 1) determine what species could be found at LUREC (species richness); 2) identify which species were using the campus as a breeding site; 3) establish how many of each species were breeding; 4) map their breeding territory if possible so as to identify territory distribution; 5) discover the habitat preferences of the breeding birds; 6) identify what vegetative structure or nest selection sites they were using; and 7) get an estimate on the bird's relative abundance. Our goal of the study was to obtain critical baseline data to aid in evaluating future assessment and monitoring of the wetland and woodland restoration projects. Adequate resources required by avian communities need to be considered and provided for in ongoing restoration deliberations. While this study is only a snapshot of the avian community in the summer of 2012; we hope that it will be of help to those

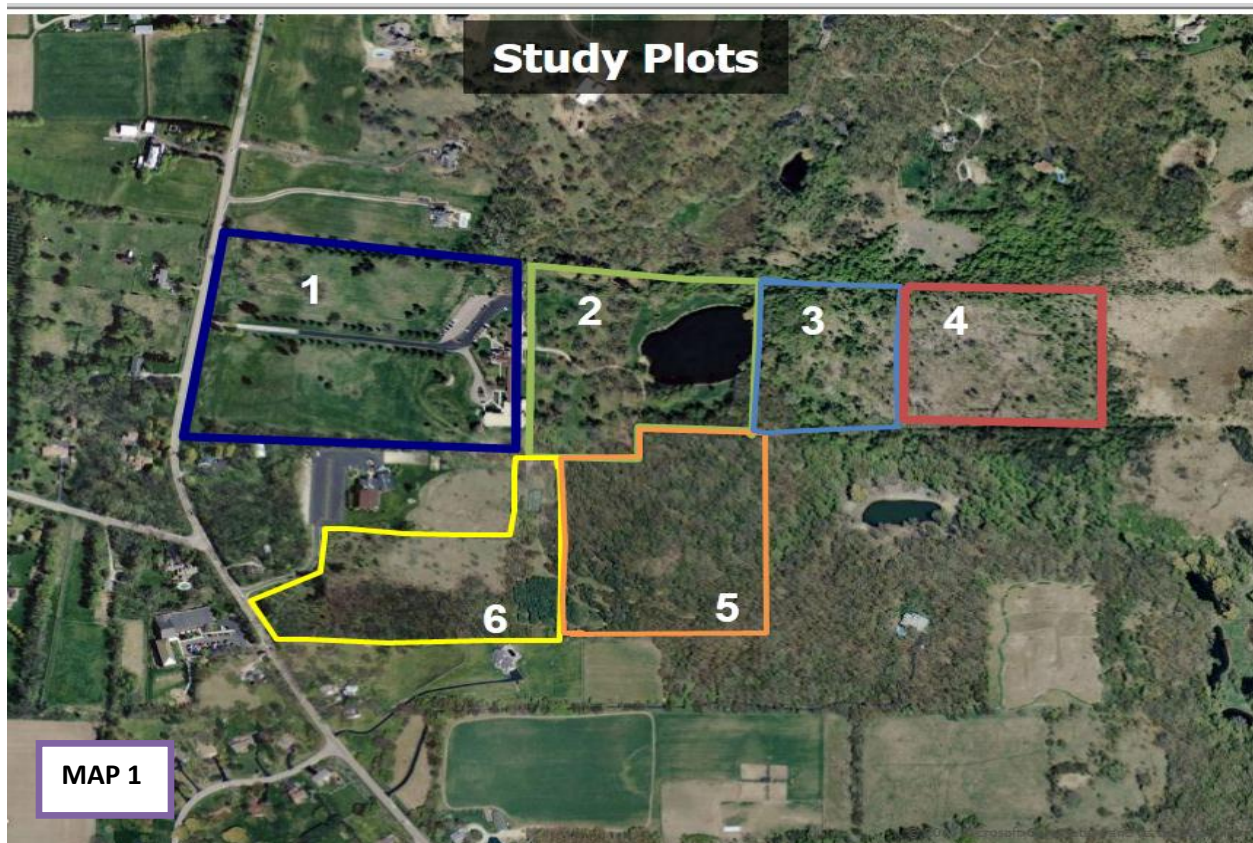
who follow: “The value of systematic bird censuses increases as the years pass” (quoting Dick and Jean Graber, 1963 in Walk et al. 2010. pg. 1). Here we report the results of this census; presenting data on avian species richness on the campus, relative abundance and breeding information linked to geographic information systems (GIS) for thirty-four species.

Study Area and Methods:

We surveyed the avian community in the summer of 2012 at Loyola University Retreat and Ecology Campus (LUREC) in McHenry County, IL during a two month period (May 12-July 18); the main breeding season of most birds so as to obtain species richness number, relative frequency of encounters, and relative abundance. We also GIS mapped the breeding territories of the breeding birds and determined species habitat locations. Territory-spot mapping was the primary method used supplemented by timed counts, opportunistic visual sightings and nest searches. Loyola University’s Retreat and Ecology Campus (LUREC) is situated on 98 acres (39.7 hectares) in Bull Valley, McHenry County, Illinois; formerly owned by the Congregation of the Resurrection who operated it as a novitiate and Retreat Center until 2009. The property was purchased by Loyola in 2010. The property is geographically located in Section 13, Township 44, North, Range 7, and East of the Third Meridian. The southeastern tip of the property is adjacent to Parker Fen, an Illinois Nature Preserve.

The study area contains a large retreat and academic center, a number of out buildings and access roads, parking facilities, landscaped grounds, a small organic farm, hiking trails, and a variety of natural habitats, including a mature dry-mesic to mesic upland oak-hickory woodland, a white pine (*Pinus strobes*) grove, linear forests, shrublands, small patches of grasslands, three small landscape retention ponds, a small lake, and stream ditches feeding into a larger wetland ecosystem. The dominant trees of the forest overstory are white oak (*Quercus alba*), red oak (*Quercus rubra*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), shagbark hickory, (*Carya ovata*), yellowbud hickory (*Carya cordiformis*); of the mid canopy are American elm (*Ulmus americana*), white mulberry (*Morus alba*), honeysuckles (*Lonicera sp.*) common and glossy buckthorns (*Rhamnus species*). The understory includes mostly invasive honeysuckle, buckthorn and multiflora rose (*Rosa multiflora*). The wetland areas consist of a mixture of lower quality, woody and herbaceous plants: the dominant ones are reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), garlic mustard (*Alliaria petiolata*), box elder (*Acer negundo*), giant ragweed (*Ambrosia trifida*), stinging nettle (*Urtica dioica*), and buckthorns (*Rhamnus species*). There are a splattering of native sedges and rushes. Most of the natural ecosystems have become severely degraded due to past anthropomorphic disruptions to the hydrology of the site, the suppression of natural fires, and the introduction of invasive species. Much of the woodlands and wetlands are overgrown with buckthorn and honeysuckle making for travel through it nearly impossible. The ecosystem’s biodiversity is thus greatly reduced. Removal of these undesirable and invasive species began in January 2012. Transect lines were cut through the wetland complex to access piezometers that were installed to study the existing hydrology of the site. These served as convenient transect lines in this study.

The study area (the boundary of the campus) was divided into 6 plots (Map 1) based on ease of travel and vegetative types, each measuring approximately 4-10 hectares. Given the mosaic vegetative patchiness of the campus, plots were not homogeneous. Preliminary visits occasioned each plot prior to beginning of the territory mapping. The aim of territory mapping is to determine how many territories of each species there are on a given plot. Combining all six plots, we were able to survey the entire campus and obtain a good estimate of the breeding bird population at LUREC. Each plot was randomly visited on separate days normally between 6:00am and 10:00am since bird activity was pronouncedly higher during this time. Each was visited at least 4-6 times during the census. Occasional visits were done later in the morning or later in the afternoon since some birds become more active later in the day; i.e. Red-eyed Vireo (*Vireo olivaceus*) (Chimprich et al. 2000). Spot-mapping was not conducted on days of precipitation or high winds (>25 km/h). Following the territory mapping method protocols



outlined in Bibby et al. (2000); all birds seen or heard were recorded during this time, including birds that flew overhead as well as birds seen on neighboring plots while the observer was within the plot. Bird activities were recorded using printed geographical maps of the study area (aerial views) obtained from Google Earth in order to accurately position the birds on the plot (Witham and Kimball. 1996). This method was used in order to observe the clustering of birds, and to

define breeding territories if any. Bird territories were defined using several techniques; these techniques included: (1) observing their flying patterns and behavior (i.e. perching, carrying nesting material and food); (2) the sex and age of the birds, i.e. with fledglings; (3) individuals of the same species recorded simultaneously and the positions of counter singing territorial neighbors were recorded, as these observations provided invaluable information on the location of territorial boundaries; (4) vocalizations (alarm calls, territorial songs); (5) intra-specific and inter-specific conflicts which clearly defined territorial boundaries; (6) how frequently the bird was observed within a plot (clusters); (7) the location of their nests; and (8) GPS of their nests and specific points that defined their territories. All coordinates (waypoints) were entered into GARMIN- Map source software. These individual visits were then transcribed to species-specific sheets at the end of the season and territory boundaries were identified for individual males or pairs whenever possible. Over the entire season, we logged more than 50 hours of spot mapping in the field and many individual birds were seen in the same area day after day.

Not all birds show territorial behavior however. Chimney Swifts (*Chaetura pelagica*), Cedar Waxwings (*Bombycilla cedrorum*) and Tree Swallows (*Tachycineta bicolor*) defend no territory. Baltimore Orioles (*Icterus galbula*) and Blue Jays (*Cyanocitta cristata*) only defend the nest; other species may defend a small area around the nest while others may have large defended areas such as the Cooper's Hawk (*Accipiter cooperii*) (McKernan and Hartvigsen, 2001). For those species that defend no territory, nest searches were the only real way to count them. Therefore we occasionally performed nest searches during the afternoons, and GPS (Global Positioning System) of the bird nesting sites were taken using GARMIN (GPSmap 60CSx). Additional information recorded at the nesting sites were: (i) the tree species or type of vegetation in which the nests were found, and (ii) the height of nests from the ground. Unknown tree species were identified using the tree inventory listing from Mackie Consultants, LLC- CBBEL Project No. 09-477, Sept 14, 2009. Nests that were too high to measure with a measuring tape were measured using a laser finder (Bushnell: YARDAGE PRO, SPORT 450).

Species richness was calculated by recording all species seen or heard throughout the summer including opportunistic observations that fell outside of sampling protocol. To calculate frequency of encounter and relative abundance numbers, we took 24 timed counts; four within each plot throughout the season and counted all birds seen and/or heard as we walked slowly across the plot trying to keep effort the same for each count and trying the best we could to not double count. Transects were established throughout each plot covering all habitats in that plots. While transect counts are at best an estimate and only record seen or heard birds, they do show trends of populations over time and species richness. Surveys were conducted on windless days without precipitation, usually between 6:30–10:00 am; although later in the day counts were done on occasion for the reasons stated above. We determined the frequency of encounter (**cFR**) rate for each species by determining the percent of counts that species was observed considering the total number of counts (N=24). Species relative abundance measurements for each species were calculated two ways: 1) percent of individuals of that species observed per count (**cRA**) and 2) the number of individuals of that species divided by the total number of individuals of all species (**RA**) (Hickey 1981)

Results:

Avian Species Richness, Frequency of Encounter and Relative Abundance at LUREC

The breeding census performed between May 12 and July 18 in the summer of 2012 at Loyola University Retreat and Ecology Campus (LUREC) revealed that a number of avian species utilize the landscape as a breeding ground during that time of year. A total of sixty-nine species were documented: forty species were found breeding or holding territories on the campus with an additional twenty-nine species detected as flyovers, or occasional visitors (see Appendix 1). We recorded 2276 bird observations during the timed counts. Plot 5, (see MAP 1) consisting mostly of oak-hickory forest had on average the least number of species observed per count (10) while Plot 4 in the far back of the fen, which still had inundated wetlands, had the highest number of species recorded on average per count (23). The other four plots ranged between 16-21 species on average. The most frequently encountered species (**cFR**= % of counts the species was observed considering the total # of counts) were the Gray Catbird, Northern Cardinal; both seen on all counts followed by the American Robin, American Goldfinch, (96%), Brown-headed Cowbird (92%), Black-capped Chickadee, Blue Jay and American Crow (all 87.5%). The most frequently encountered woodpecker was the Red-bellied Woodpecker (79%). Interspecific abundance differences increased dramatically as the summer progressed as birds were no longer constrained to a nest site or a fixed territory and in the case of the Red-winged Blackbird and the Black-capped Chickadee, gathered in nomadic flocks to locate to feeding resources. The Red-winged Blackbird was the single most abundant species in terms of total numbers of individual seen or heard during the summer, although it was encountered in 66% of the counts. While there was only 10 breeding territories found for this species (see Table 1), the number of individuals encountered per count was as high as 80 -102 individuals during the latter parts of the summer as flocks congregated in the wetlands, fields and around the large pond. The Canada Goose were occasionally located resting on the property at the large pond, but it's fairly high **cRA** was skewed in comparison to its **cFR** by the number of large flocks that flew overhead. No Canada Goose was found breeding on the property during May-July. Gray Catbirds, American Robins, Northern Cardinals, Black-capped Chickadees, American Goldfinches and Brown-headed Cowbirds were the most abundant (RA) birds across the campus. Nine species were only encountered once during any of the various sampling protocols: the Green Heron, Osprey, Northern Harrier, Sandhill Crane, Great Horned Owl, Belted Kingfisher, Yellow-bellied Flycatcher, Swamp Sparrow, and the Eastern Meadowlark. Five species; Black-crowned Night-heron, Spotted Sandpiper, Eastern Screech Owl, Purple Martin, and the Northern Rough-winged Swallow were opportunistically seen outside of sampling protocols and numbers of individuals were noted (see Appendix 1). The Spotted Sandpiper and Northern Rough-winged Swallow were encountered more than once.

Avian Breeding Populations and Spatial Distribution of Bird Territories

We found forty species breeding or holding territories on the campus. Table 1 shows the findings of our studies. The location and spatial distribution of nests and territories within the study area can be found on Maps 2-12. Due to the small sample size, statistical analysis of habitat preferences and nest placements (i.e. nest substrate, and nest height) were not carried out. One hundred and thirty-five nests of thirty-one species were found. We were unable to find nests of eight species whose breeding territories were established; Ruby-throated Hummingbird, Downy Woodpecker, Eastern Wood Pewee, Willow Flycatcher, Great Crested Flycatcher, Red-eyed Vireo, Common Yellowthroat and Field Sparrow. We found no Ruby-Throated Hummingbird nests but did locate two male hummingbird territories. Males in this species establish territories separate from females. It must be noted that just because a male song bird has established a territory, there may not be an accompanying female in all cases. We made the assumption in this study that there was. Species with the highest established breeding populations were the Northern Cardinals, Gray Catbirds, European Starlings, American Robins, Song Sparrows, and Downy Woodpeckers. Estimated breeding populations for these six species were: 17 pairs, 16 pairs, 15 pairs, approximately 15 pairs, 8 pairs, and at least 8 pairs, respectively. Red-winged Blackbirds established 10 territories. Estimated breeding populations for the remaining 25 breeding species were between 1 to 7 breeding pairs (see Table 1). Eight species had breeding populations of only one established pair. They were the Wood Duck, Wild Turkey, Cooper's Hawk, Tree Swallow, Brown Thrasher, Eastern Towhee, Field Sparrow and Orchard Oriole.

American Robins, Northern Cardinals and Gray Catbirds were amongst the most abundant breeding species documented. They were present in all plots, holding territories on the entire study area. Therefore, nesting sites for these species appeared plentiful, as they made use of the several vegetative structures available to them. A few American Robins nested or established territories in plots 3 and 4, which were highly dominated by buckthorn and honeysuckle, or at the edge of the Oak/Hickory forest. However, their preferred nesting sites were open areas with high visibility, where 85% of their nests were found and 67% of their territories were defined. Furthermore, although Gray Catbirds were found nesting on the entire campus, 50% of their territories were established in plots 3 and 4. Even though Gray Catbird activity was pronouncedly higher in plots 3 and 4, location of their nests was made difficult due to the impenetrable dense buckthorn and honeysuckle. The preferred nesting sites for the Gray Catbird on the campus was at the edge of patches of dense buckthorn and honeysuckle, and on the corridors provided by the transect lines in plots 3 and 4.

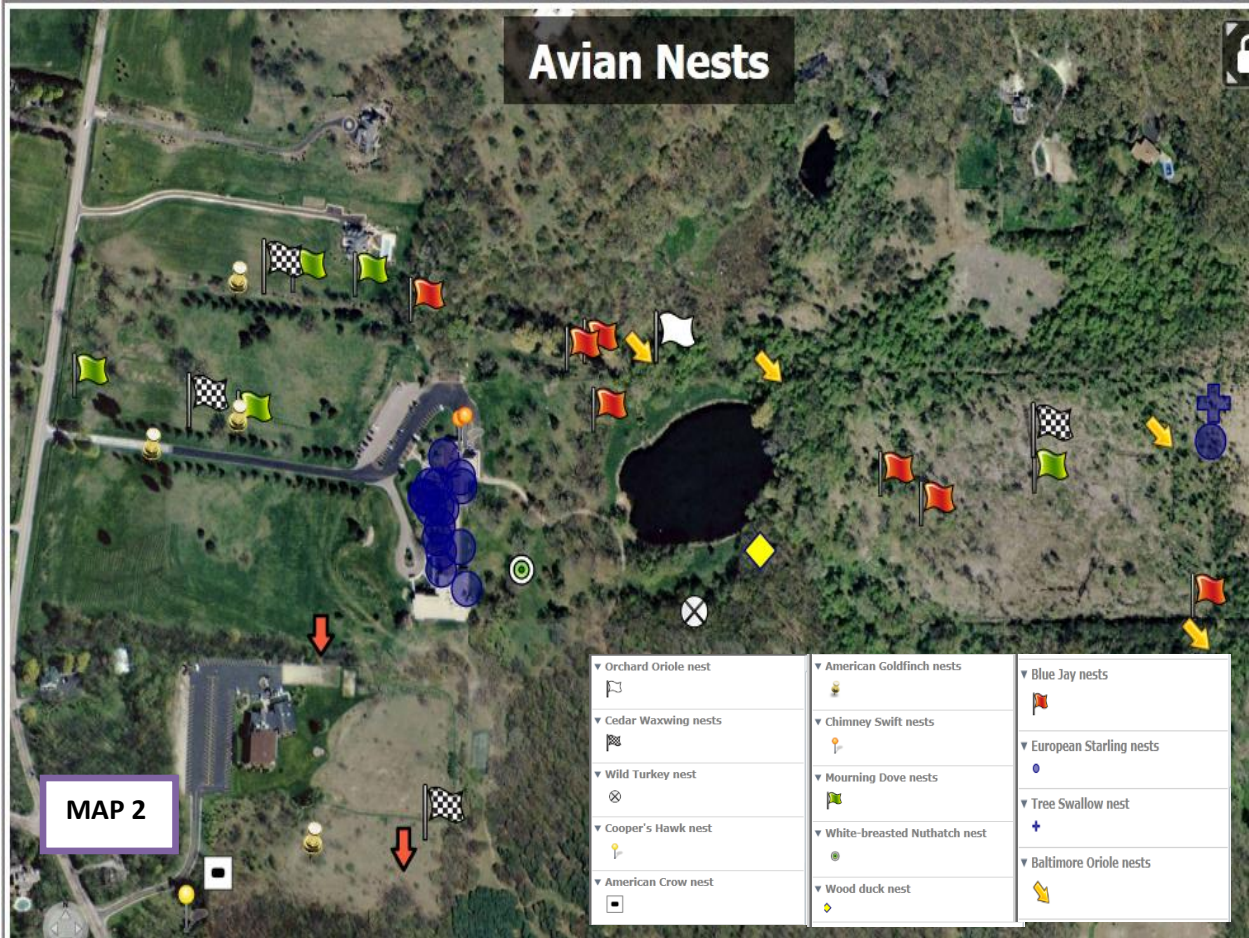
Additional information gathered at the nest site for all breeding species showed that 16 species or 49% of the breeding species placed their nest in invasive vegetation. The invasive vegetations include: common buckthorn, glossy buckthorn, honeysuckle, box elder, Russian olive, cattail and reed canary grass. However, it is essential to note that not all members of the 16 species utilized only that type of vegetation; others placed their nests on native vegetation as well. In addition, out of the 16 species, the Red-winged Blackbird was the only species that we found

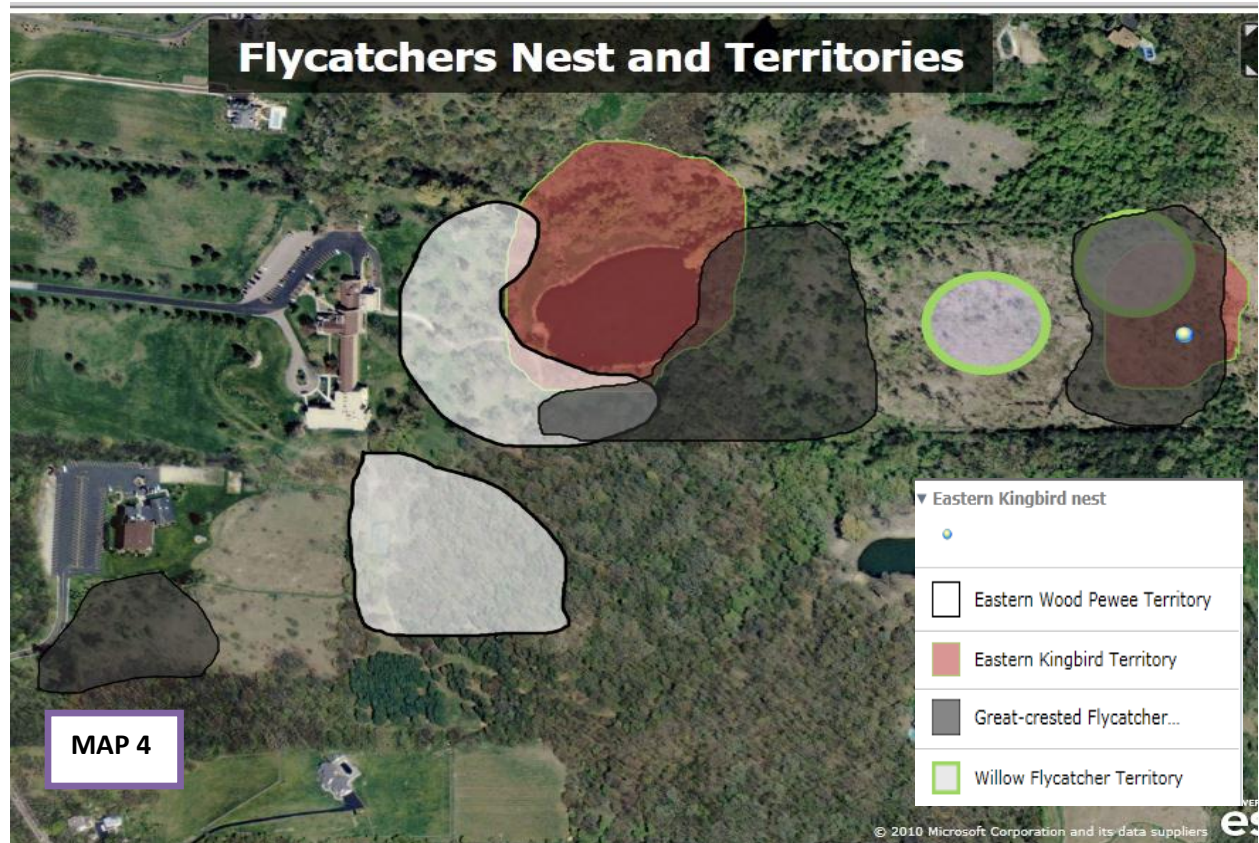
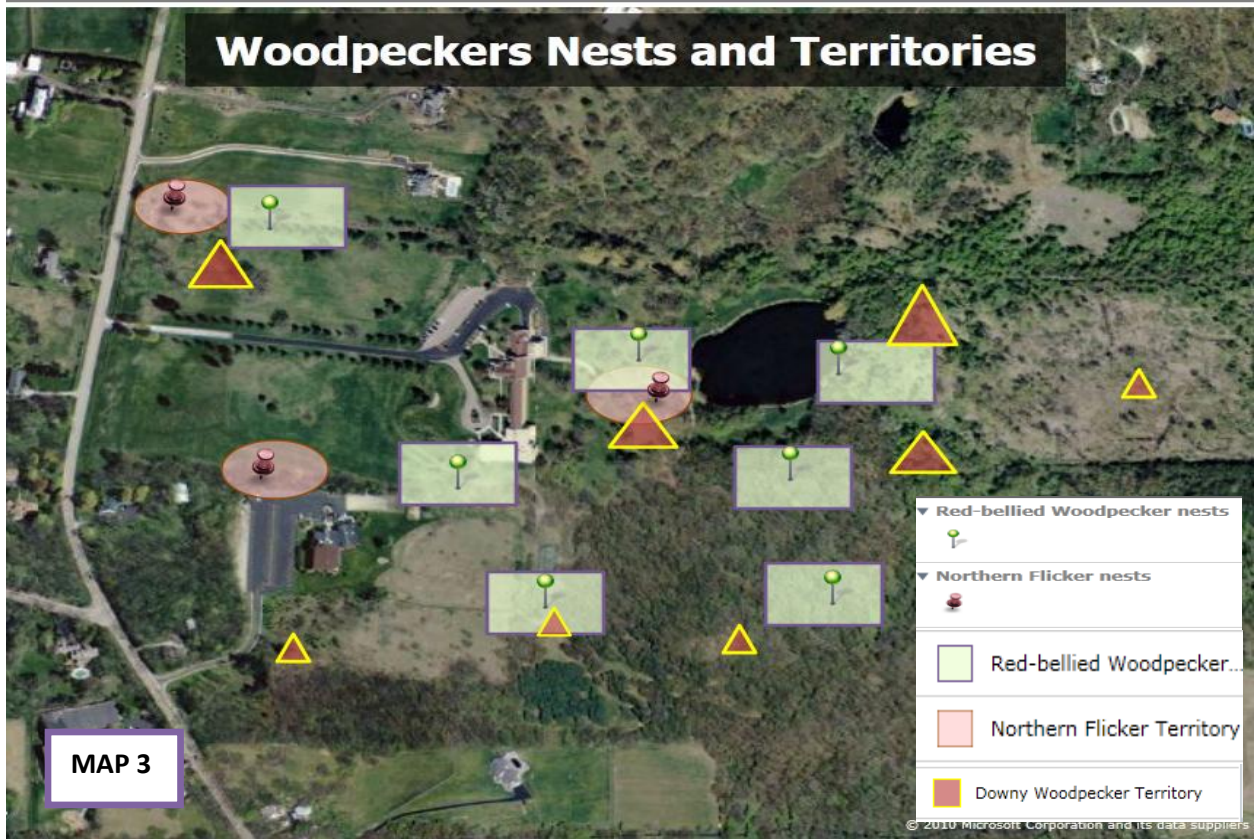
that placed its nest on cattails and reed canary grass. We found no nest of ground nesting birds other than the Wild Turkey. This was in part due to the difficulty of locating them. Two species, the European Starling and the Chimney Swift utilized the building structure for nest placement, not surprisingly. Cavity nesters accounted for 30% of the breeding bird species (12 species).

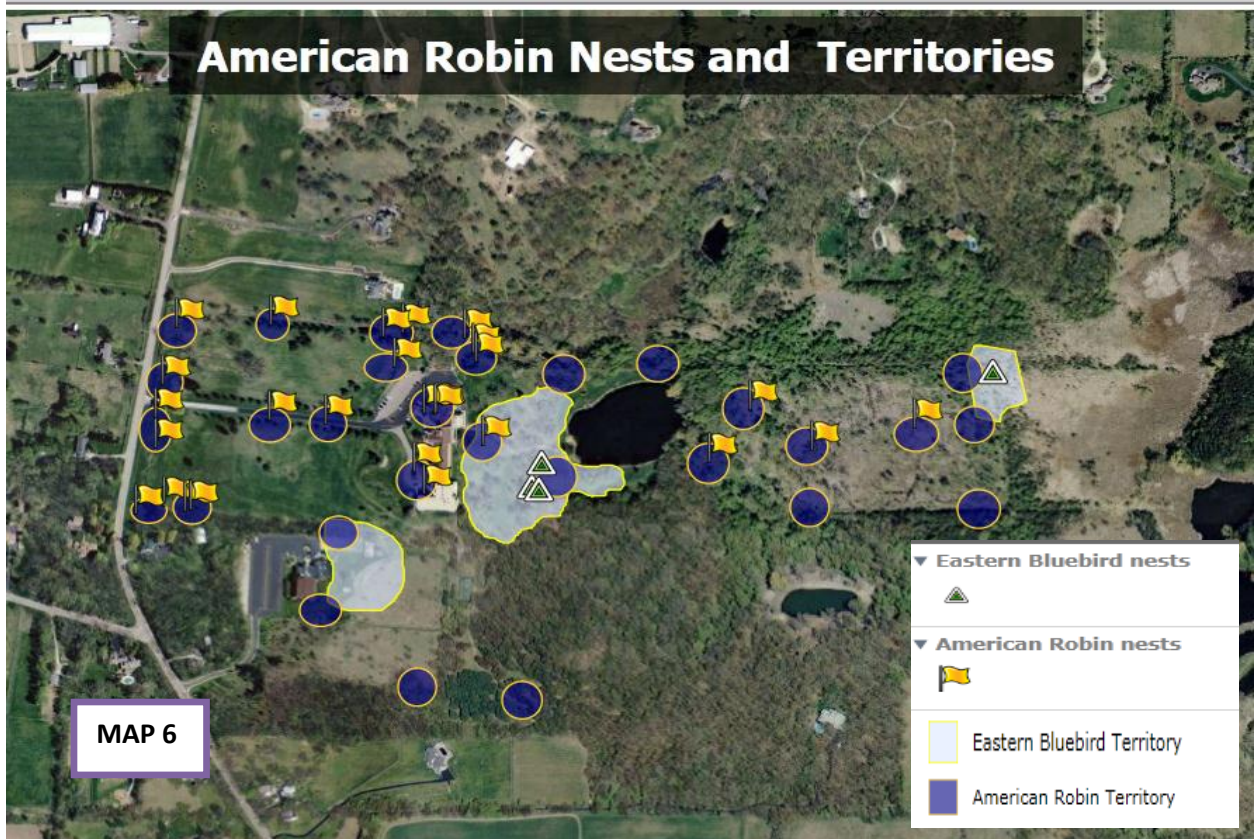
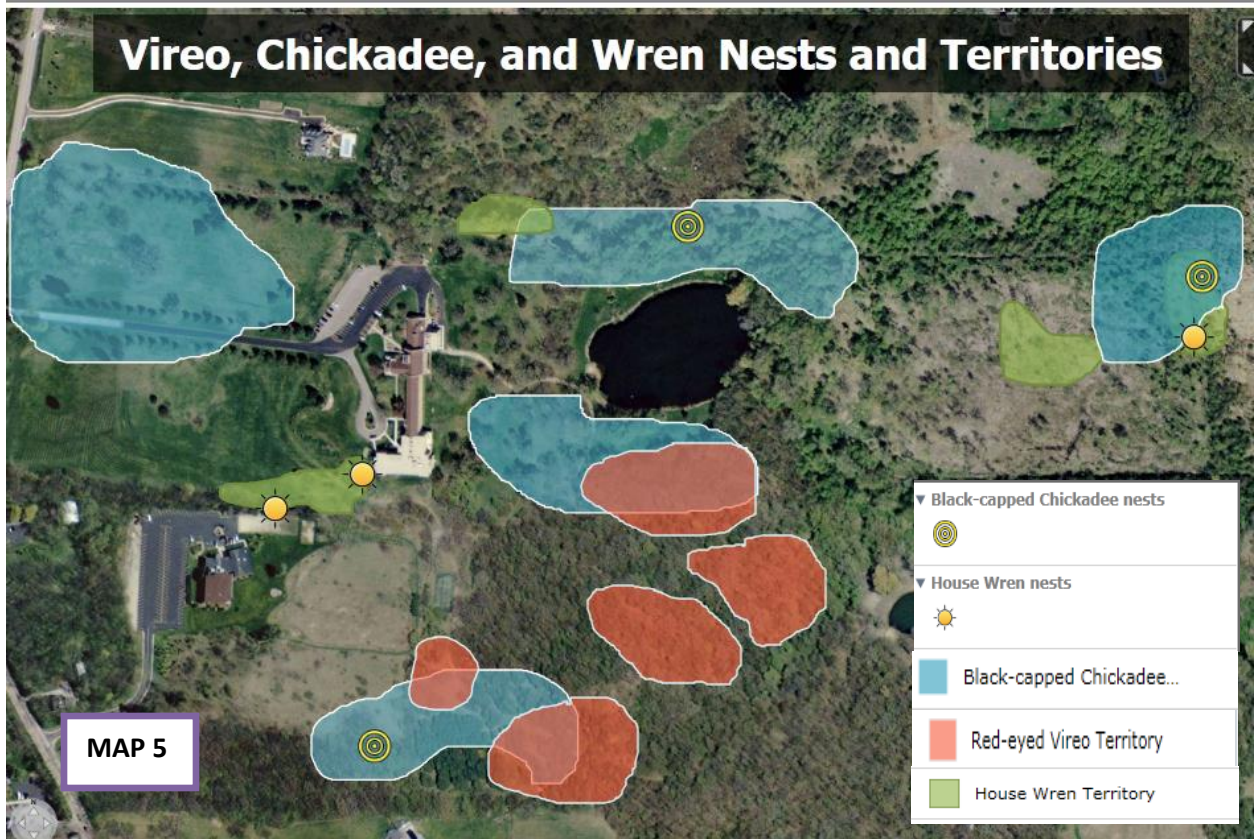
The locations of nests were vital in defining territories in some cases since not all bird species display territorial behavior. Some species only defend the immediate site in which their nests are located. Therefore, no territories were defined for these species (see Map 2). These species include: Blue Jays, Cedar Waxwings, Baltimore Orioles, Orchard Orioles, Mourning Doves, Tree Swallows, European Starlings and Chimney Swifts (see appendix Table 1). In addition, there were also no defined territories for the American Goldfinches as they showed little territoriality. Moreover, some bird species may have very large territories which are difficult to map. Their territory may extend well beyond the study area and may require extensive examination, will-power, and priority focus (Bibby et al.). In this study, because of time constraints, it was impossible to map those species that had relatively large territories which may have fallen outside of our study area. These species include: Cooper's Hawk, American Crow, White-breasted Nuthatch, Red-bellied Woodpecker and Northern Flicker. Even though territories were not defined, territories for these species were still accounted for because their nests were located within our plots (see Table 1).

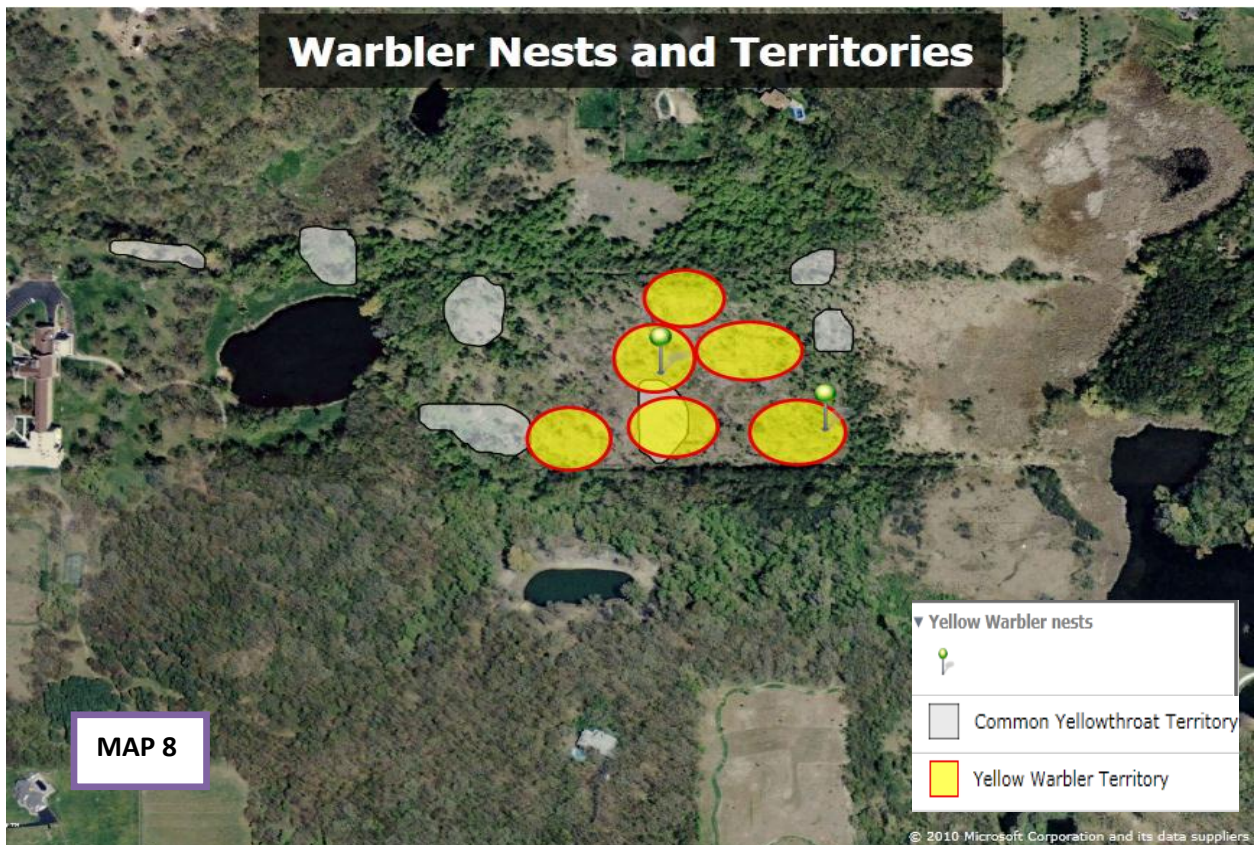
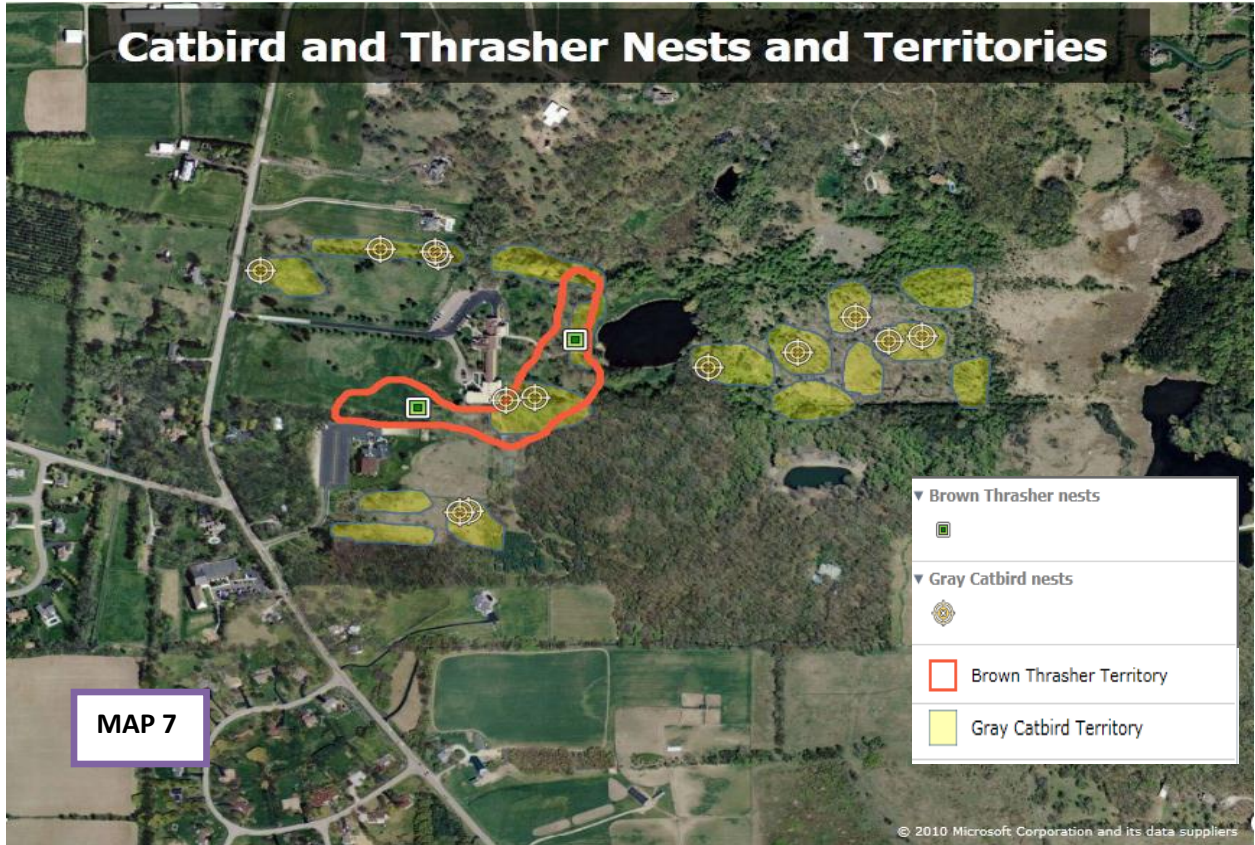
Map 13 shows the main avian hotspots on the campus. These areas are where the most number of bird breeding territories overlap. They may not reflect the location of the highest concentration of bird species however. Avian Hotspots were recorded for all plots in the study area except for Plot 5 (see MAP 1). The hotspot which we called upland prairie savanna in Plot 1 had 10 species of breeding territories overlap. The hotspot for plot 2 had 11 species of breeding territories overlap. Plot 3 had an edge forest hotspot with 9 species of breeding territories overlap. Plot 4 had a wetland hotspot with 13 species of breeding territories overlap, and plot 6 had a shrubland hotspot with 9 species of breeding territories overlap.

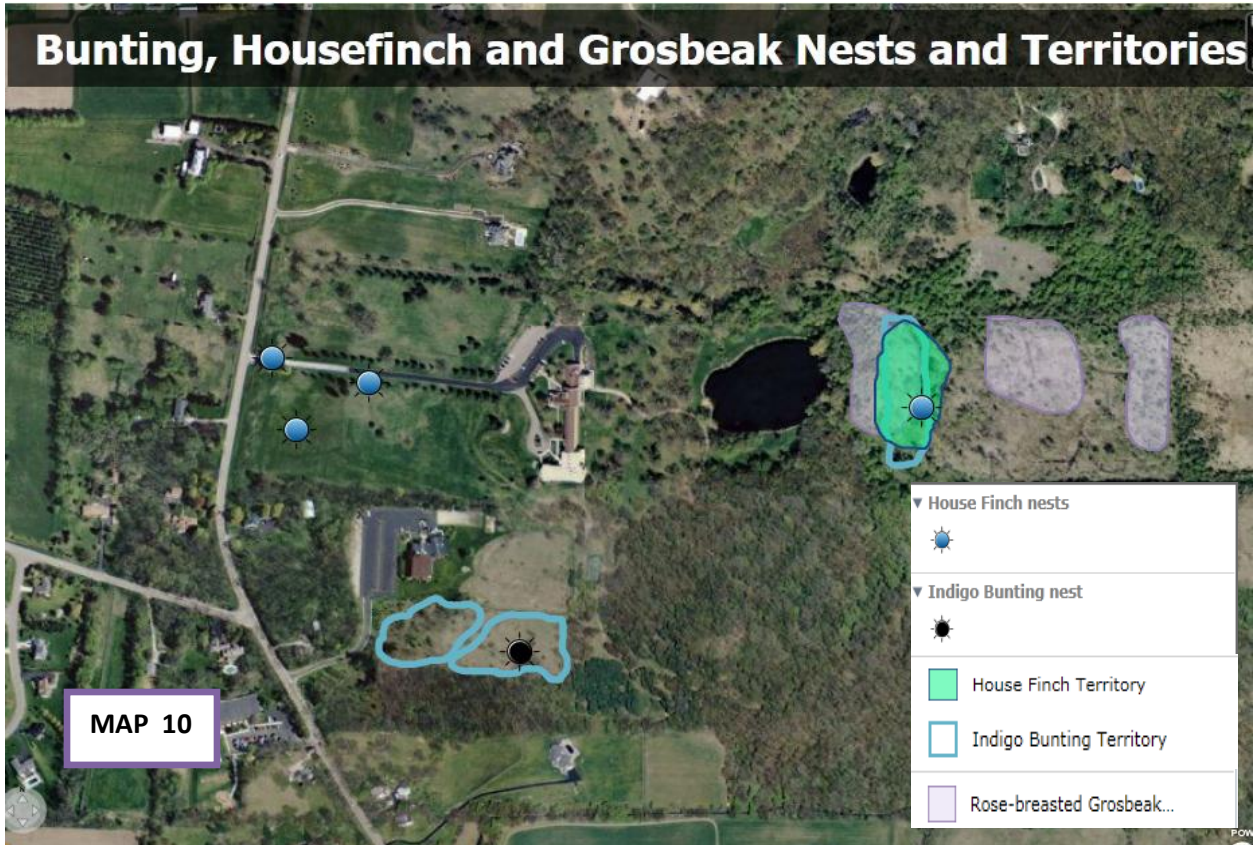
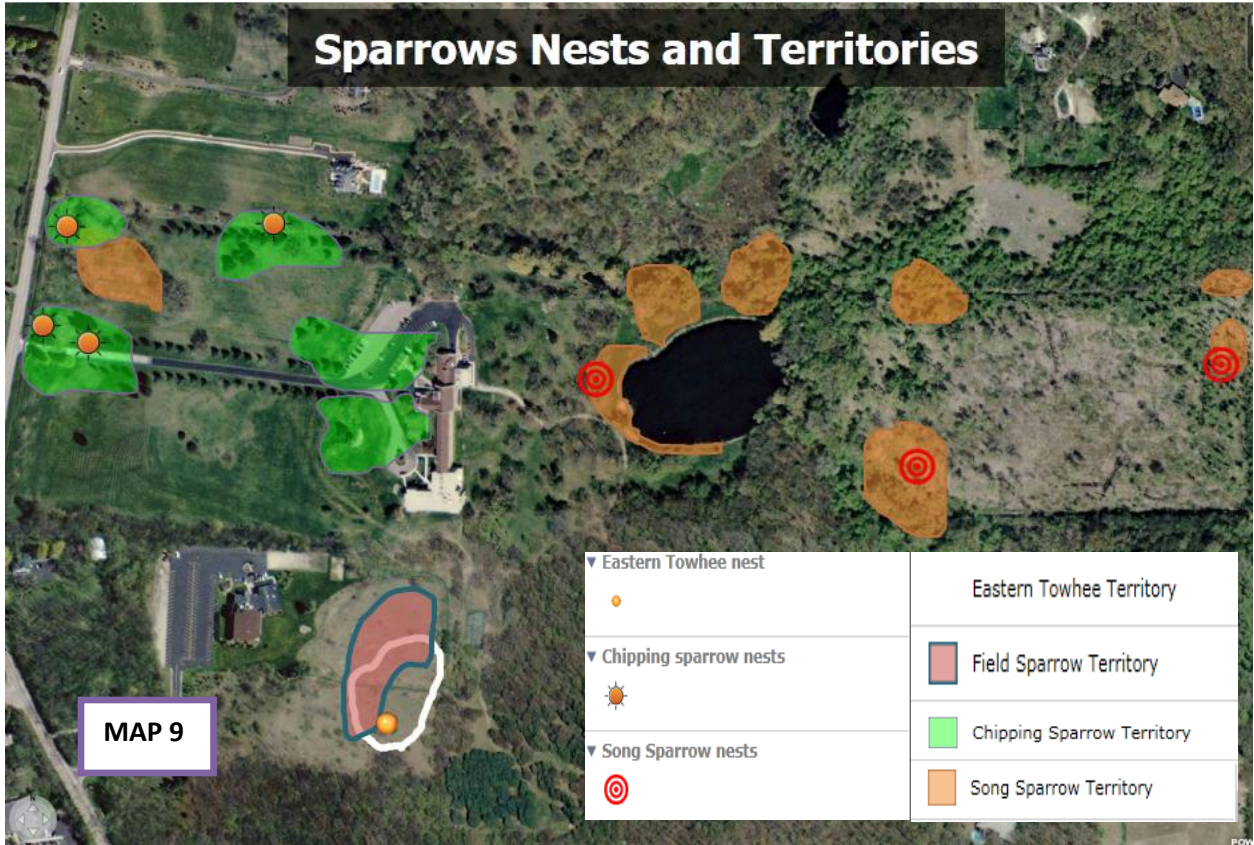
Table 1 Breeding Birds at LUREC in the Summer 2012						
Common name	Scientific name	Number of territories	Number of nests	Est. Breeding Pop.	Nests avg. height from ground (m)	Nest placement
Wood Duck	<i>Aix sponsa</i>	1	1	1 pair	7.2263	Bur Oak
Wild Turkey	<i>Meleagris gallopavo</i>	1	1	1 pair	ground level	Oak/Hickory forest
Cooper's Hawk	<i>Accipiter cooperii</i>	1	1	1 pair	5.3086	Red Pine
Mourning Dove	<i>Zenaida macroura</i>	0	5	at least 5 pairs	3.28676	White Mulberry, Blue Spruce, White Pine, Common Buckthorn
Chimney Swift	<i>Chaetura pelagica</i>	0	3	3 pairs	15.5448	Building-Chimney
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	7	7	7 pairs	10.883	Dead tree, Box Elder, White Oak
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	2 male	0	2 pairs		
Downy Woodpecker	<i>Picoides pubescens</i>	8	0	at least 8 pairs		
Northern Flicker	<i>Colaptes auratus</i>	3	3	3 pairs	9.0128	Dead Bur Oak, Black Cherry, Bur Oak
Eastern Wood Pewee	<i>Contopus virens</i>	2	0	2 pairs		
Willow Flycatcher	<i>Empidonax traillii</i>	2	0	2 pairs		
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	3	0	3 pairs		
Eastern Kingbird	<i>Tyrannus tyrannus</i>	2	1	2 pairs	12.7127	Box Elder
Red-eyed Vireo	<i>Vireo olivaceus</i>	5	0	5 pairs		
Blue Jay	<i>Cyanocitta cristata</i>	0	7	at least 4 pairs	3.3111	River Birch, Common Buckthorn, Box Elder, Honeysuckle, Dead tree
American Crow	<i>Corvus brachyrhynchos</i>	1	1	possibly 2 pairs	13.6271	Scotch Pine
Tree Swallow	<i>Tachycineta bicolor</i>	0	1	1 pair	4.8133	Dead tree
Black-capped Chickadee	<i>Poecile atricapillus</i>	5	3	at least 5 pairs	2.1209	Dead tree, Dying Box Elder
White-breasted Nuthatch	<i>Sitta carolinensis</i>	1	1	at least 2 pair	9.0551	White Oak
House Wren	<i>Troglodytes aedon</i>	4	3	4 males 6 females	1.886	Dead tree, Installed nest
Eastern Bluebird	<i>Sialia sialis</i>	3	4	3 pairs	3.3147	Dead tree, Installed nest
American Robin	<i>Turdus migratorius</i>	30	27	approx. 15 pairs	2.84668	Common Buckthorn, Hawthorn, Box Elder, Blue Spruce, Magnolia tree, Black Cherry, Red Cedar, Red Oak, White Pine, Honeysuckle,
Gray Catbird	<i>Dumetella carolinensis</i>	16	13	approx. 16 pairs	2.2435	Eastern Juniper, Honeysuckle, Blue Spruce, Russian Olive, Common Buckthorn, Glossy Buckthorn
Brown Thrasher	<i>Toxostoma rufum</i>	1	2	1 pair	1.597	Honeysuckle
European Starling	<i>Sturnus vulgaris</i>	0	17	15 pairs	6.5928	Building- down spout, Building- under balcony, Building- Jesus Statue, Silver Maple, Dead tree
Cedar Waxwing	<i>Bombycilla cedrorum</i>	0	4	> than 4 pairs	4.7784	Russian Olive, White Pine, Common Buckthorn
Yellow Warbler	<i>Dendroica petechia</i>	6	2	6 pairs	1.8987	Honeysuckle, Common Buckthorn
Common Yellowthroat	<i>Geothlypis trichas</i>	7	0	7 pairs		
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	1	1	1 pair	1.68275	Honeysuckle
Chipping Sparrow	<i>Spizella passerine</i>	5	4	5 pairs	2.3813	Blue Spruce, White Pine
Field Sparrow	<i>Spizella pusilla</i>	1	0	1 pair		
Song Sparrow	<i>Melospiza melodia</i>	8	3	8 pairs	1.4563	Common Buckthorn, Honeysuckle, Mulberry
Northern Cardinal	<i>Cardinalis cardinalis</i>	17	2	~17 pairs	2.0638	Common Buckthorn, Glossy Buckthorn
Indigo Buntings	<i>Passerina cyanea</i>	3	1	3 pairs	1.64465	Russian Olive
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	10	5	10 males	0.3759	Cattail in pond, Reed Canary Grass, Prairie Grass
Brown-headed Cowbird	<i>Molothrus ater</i>			brood parasite unknown		
Orchard Oriole	<i>Icterus spurius</i>	0	1	1 pair	18.5	Cotton Wood
Baltimore Oriole	<i>Icterus galbula</i>	0	4	4 pairs	16.3703	Box Elder, Cotton Wood
House Finch	<i>Carpodacus mexicanus</i>	1	3	3 pairs	10.3717	White Pine, Sugar Maple, Blue Spruce
American Goldfinch	<i>Carduelis tristis</i>	0	4	>4 pairs	4.5037	White Pine, Western Red Cedar
Total Species: 40			135			

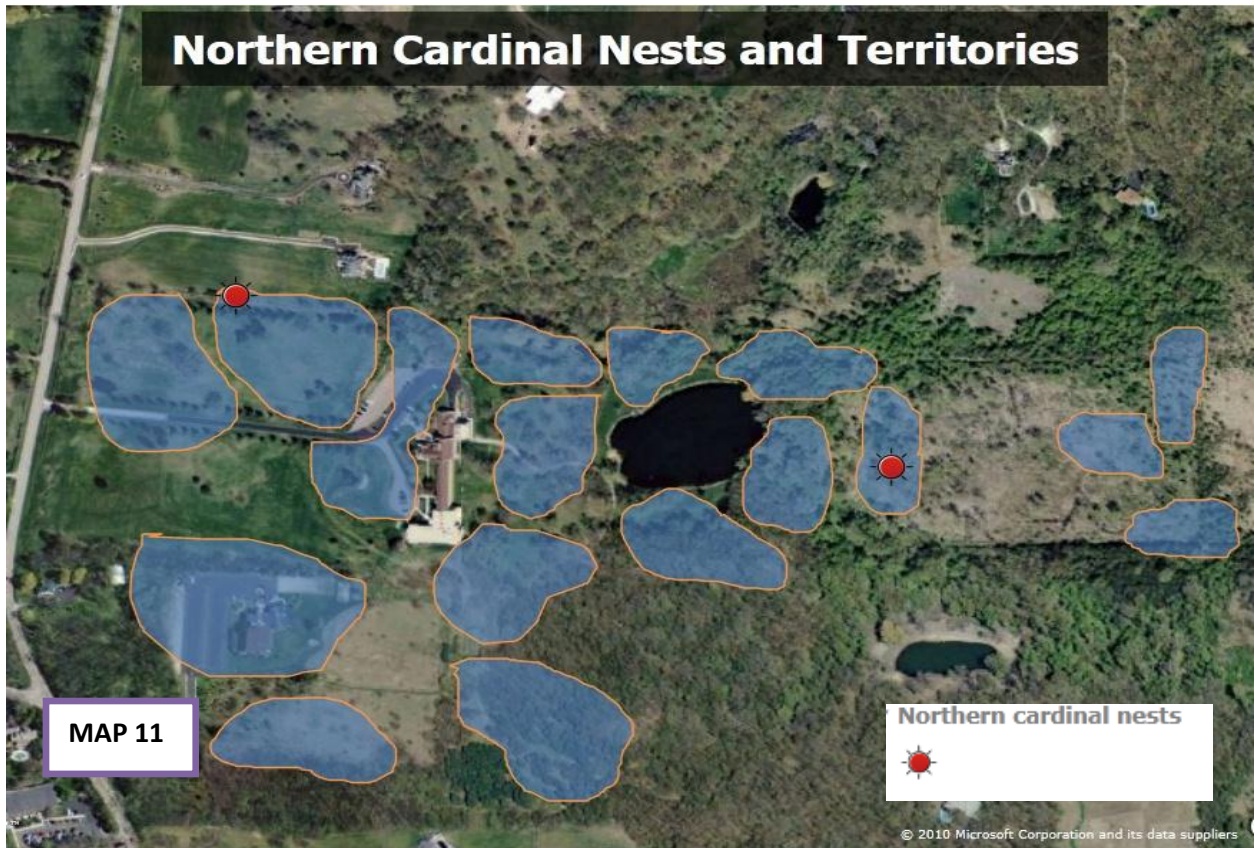


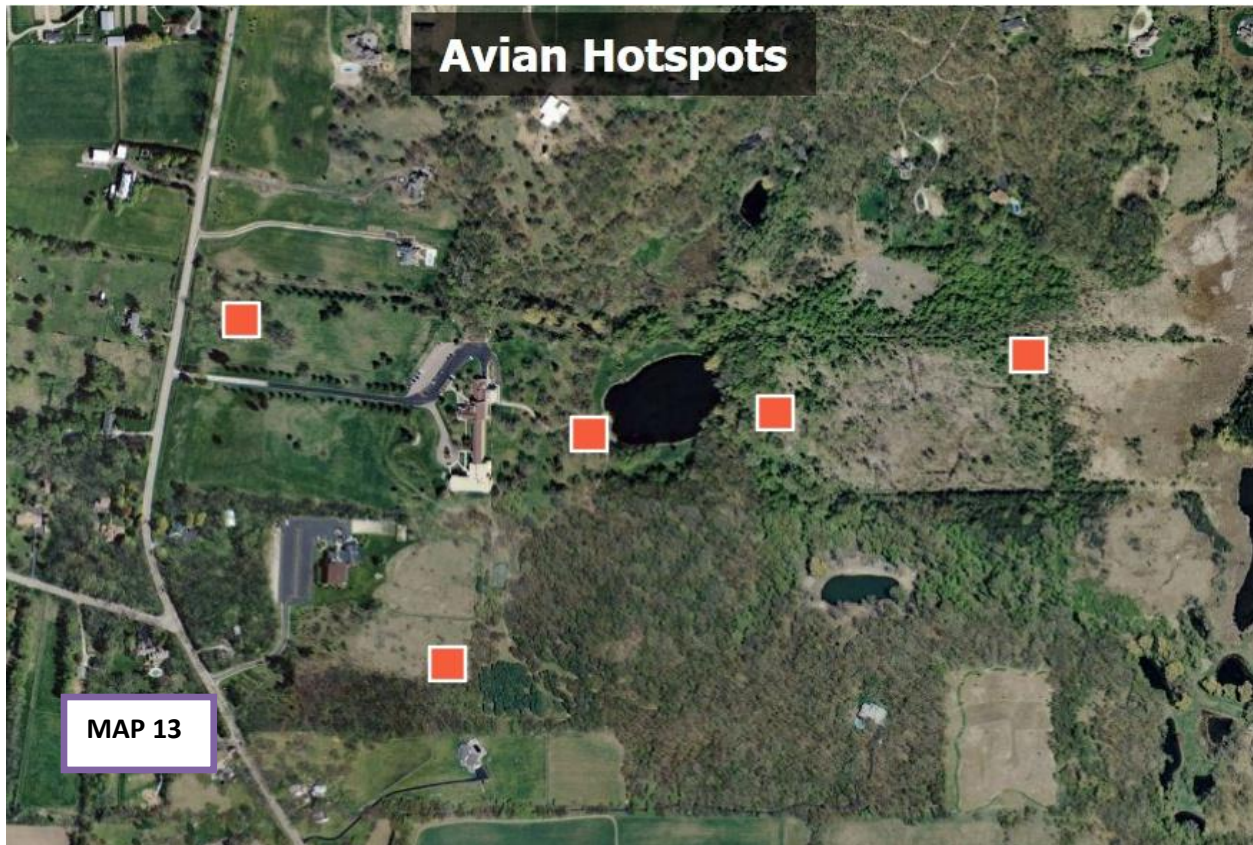












Discussion:

We have documented the presence of forty avian species breeding at LUREC and have produced a detailed map of the distribution and relative size of many of the species' territories. This information can allow us to link bird distribution with habitat. We have not done detailed analysis of habitat in this study other than in broad terms due to time constraints and because much of the various habitats were either small, patchy and/or infested with invasive species; however, such information will be invaluable for future restoration projects and for habitat management. There are some interesting locations on the property that are of particular interest as revealed by the five "avian hotspots." The hotspot in Plot 1 was a grassland/shrubland depression surrounded by mature oak trees. The trees offered nesting sites to woodpeckers and chickadees. The Red-winged Blackbird was found nesting here outside of their preferred habitat (marshes). The nearby spruce and pines offered nesting sites to a variety of bird species, most notably the House Finch, Chipping Sparrow and Mourning Dove (MAPS 3, 9, 10). Plot 2 had the only nesting pair of Brown Thrashers (MAP 7). The pair was occupying the surrounding yard and the linear wooded thickets. It is interesting to note that Walk et al. (2010) recorded no Brown Thrashers in their survey of northern Illinois. Plots 3 and 4 were noted for the two warbler species breeding at LUREC; the Yellow Warbler and the Common Yellowthroat.

The Yellow Warbler preferred the brushier yet semi-open drier areas of the wetland complex while the Common Yellowthroat was found in the more open wetter woody habitats. Plot 3 had a small corridor of sedges and nettle meadows with a woody buffer of smaller invasive buckthorns and honeysuckle framed with larger cottonwoods, box elders and birch. Besides the all capacious American Robin, Gray Catbird and Northern Cardinal, and the two aforementioned warblers; pairs of nesting Rose-breasted Grosbeak, Song Sparrow and House Finch were found nesting in this area. The far back of Plot 4 had a greater concentration of cavity nesting species than elsewhere due to the large number of standing dead trees in the inundated wetlands. This is where the single pair of Tree Swallows nested. Plot 5 constituting most of the oak-hickory mesic forest had the least variety of species, in part due to the thick understory of invasive woody vegetation. The dominate species found there were woodpeckers, chickadees and the Red-eyed Vireo. The Wild Turkey nest was located here. The hotspot in Plot 6 is notable in that it was the only place where the Field Sparrow and Eastern Towhee were found to breed. American Goldfinch, Cedar Waxwing, and Indigo Bunting were also found there. The habitat could be characterized as a mix of idle grasslands and shrublands.

Four species that we encountered need special comment. While we were able to document at least four breeding pairs of both the American Goldfinch and Cedar Waxwing by their nests locations; their frequency of encounters on our timed counts suggests a much higher population of breeding birds than what we could confirm. Both species are not very territorial and thus it made determining the number of breeding pairs very difficult. In addition, their breeding peak is not until late June and July, unfortunately giving us less time in the field. The Black-capped Chickadee was another species whose breeding population was probably underestimated given the frequency of encounters, although many of the birds may have been those in their first year. Finally, we were unable to determine the breeding population of the Brown-headed Cowbird given that they are brood parasites. Nevertheless, LUREC is home to a robust cowbird population and we found cowbird eggs in a few of the Gray Catbird nests.

One striking result of the census was the scarcity of the House Sparrow and Common Grackle, two species that are very common throughout much of Illinois. The House Sparrow was only found at the entrance to the campus. No Common Grackle nests were located although they were searched for extensively. Another is the lack of any Wood Thrush, Red-headed Woodpecker and Hairy Woodpecker in the oak-hickory forest. The Red-headed Woodpecker is according to Walk et al. (2010) the “signature bird of the Midwestern oak savannas.” We surmise that its absence is due in part to the closed canopy of the oak-hickory forest. With restoration of the forest, Red-headed Woodpeckers may be found in the future. The absence of the Hairy Woodpecker is a surprise. It has been documented on the property earlier in the year prior to our study.

Seven species of flycatchers were recorded. The Yellow-bellied Flycatcher and the Least Flycatcher were identified by song and recorded only once, early in the season. These individuals were presumed to be migrant stragglers. While an Eastern Phoebe was occasionally

seen at the edges of the large pond, we were not able to determine if it had established a breeding territory nearby. It displayed no territorial behavior nor was it recorded enough to substantiate such a claim. The Eastern Kingbird, Willow Flycatcher and the Great-crested Flycatcher were all seen in Plot 4, and with the exception of the Willow Flycatcher, were also documented breeding elsewhere on the campus.. Although we were successful in determining the territories of the Great-crested Flycatcher by the clustering of sight records, the precise territorial boundaries are fuzzy. Males are usually quiet on their breeding territory, especially near their nest. They are also cavity nesters, making nest location difficult.

A pair of Red-tailed Hawks were often seen circling overhead on all plots. Whereas they may be nesting on the property and have done so in the past (John Nosalski, personal communication), we were unable to locate their nest on the property during this breeding season and so did not include them on our list. They are definitely using the campus for feeding. One raptor species nest we did locate was the Cooper's Hawk. Below the nest were the distinct white feathers of one of the chickens of the Student Farm.

The Tree Swallow is the only known swallow to breed at LUREC, although the Barn Swallow can often be seen swooping over the yard and the large pond for insects throughout the summer. It is presumed that these swallows are nesting at some nearby bridge. Two small groups of Northern Rough-winged Swallows were encountered in early summer. A pair of Purple Martins visited the erected Purple Martin house in the front lawn in July, hopefully scouts for next year.

While this study has documented forty species of breeding birds, there may be other elusive species breeding at LUREC that were not specifically targeted. We did not for instance use vocalization playback tape surveys for rails or nocturnal species such as owls. We would recommend this for future investigations. Great Horned Owls and Screech Owls were rarely observed during the conducted survey but may in fact breed at LUREC. They have both been observed on campus during the winter and spring. One species of note is the Barn Owl; whereas none were seen or heard during the summer, a lone Barn Owl was observed perched on the Student Farm chicken coop earlier in the spring. Barn Owls are extremely rare in McHenry County, IL.

While spot mapping is the technique of choice given time and resources, it is not without some limitations. Bird territory boundaries and the number of territories can however change during the course of a breeding season as predation and accidental deaths take their toll and alter territories and bird populations. Interpretation of the results can also be difficult and subjective and is not extremely effective for documenting non-territorial species, those that sing for brief periods, or those that are not monogamous, as we have seen. It is also difficult to apply in dense habitats (e.g. thick buckthorn). Finally, it is difficult to estimate within a breeding season standard error related with the number of territories for a given species (Bibby et al., 2000).

We did not in this study examine nesting success. We would recommend such a study in the future. It has been documented that bird species nesting in invasive species like honeysuckle and buckthorn may have lowered reproductive success due to predation (Wear and Gries. 2002, Hitchcock, L.E., 2006).

Given that it appears that multi-structured habitats allow for greater diversity in avian species richness, we suggest that this be considered in restoration plans. Finally we suggest that in developing restoration plans for both the wetlands and the oak-hickory forests, consideration for diverse sites with well developed native shrub zones be considered as Brown and Smith (1998) have argued elsewhere, resulting in higher avian species richness. A shrub vegetation zone can only develop if vegetated buffers are maintained around the wetlands and oak-hickory forest. Invasive shrubs should be replaced by native shrubs such as native serviceberries (*Amelanchier* spp.), American elderberries (*Sambucus canadensis*), native *Ribes* spp. (gooseberries), Pagona (*Cornus alternifolia*) and Gray (*C. racemosa*) Dogwood, Smooth (*Rhus glabra*) and Staghorn (*R. hirata*) Sumac, native *Rosa* spp., Speckled Alder (*Alnus incana rugosa*) and native willows such as Pussy Willow (*Salix discolor*), Prairie Willow (*S. humilis*) and Beaked Willow (*S. bebbiana*) (Salway et al. 1998).

Acknowledgements:

Special thanks are extended to David Treering for his assistance with ArcGIS. Thanks to Eric Rahn for initial field support. In particular, thanks to the wonderful staff at LUREC. Financial support was provided as a biodiversity internship fellowship by Dr. Nancy Tuchman, Vice-Provost Office, Loyola University-Chicago and the Center for Urban Environmental Research and Policy (CUERP).

References:

Aquilani, S. M., D. C. LeBlanc, and T. E. Morrell. 2000. Effects of prescribed surface fires on ground- and shrub-nesting neotropical birds in a mature Indiana oak forest, USA. *Natural Areas Journal* 20:317-324.

Artman, V. L., E. K. Sutherland, and J. F. Downhower. 2001. Prescribed burning to restore mixed-oak communities in southern Ohio: effects on breeding-bird populations. *Conservation Biology* 15:1423-1434.

Brawn, J. D. 2006. Effects of restoring oak savannas on bird communities and populations. *Conservation Biology* 20:460-469.

Bibby, C. J., N.D. Bugess, D.A. Hill, and S.H. Mustoe. 2000. *Bird census techniques*. Second Edition. Academic Press.

- Brown, C.R. and m. Bomberger Brown. 1990. Barn Swallow (*Hirundo rustuica*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/452>
- Brown, S.C., and C.R. Smith. 1998. Breeding season bird use of recently restored vs. natural wetlands in New York. The Journal of Wildlife Management, Vol. 62, No 4: pp.1480-1491
- Cabe, P.R. 1993 European Starling (*Sturnus vulgaris*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/048>
- Carey, M.M. Carey, D.E. Burhans and D.A Nelson. 2008. Field Sparrow (*Spizella pusilla*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/103>
- Cavitt, J.F., and C.A. Haas. 2000. Brown Thrasher (*Toxostoma rufum*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/557>
- Chamberlain, D.E. and R. J. Fuller. 1999. Density dependent habitat distribution in birds: issues of scale, habitat definition and habitat availability. Journal of Avian Biology 30: 427-436.
- Chimprich, D.A., F.R.Moore, and M.P. Guilfoyle. 2000. Red-eyed Vireo (*Vireo olivaceus*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/527>
- Cink, C.L., and C.T. Collins. 2002. Chimney Swift (*Chaetura pelagica*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/646>
- Fletcher, R.J., and R.R. KoFord. 2003. Changes in breeding bird populations with habitat restoration in Northern Iowa. American Midland Naturalist Vol. 150.No.1: 83-94
- Gates, J.E., and L. W. Gyset. 1978. Avian nest dispersion and fledging success in field-forest ecotones. Ecology 59:871-883
- Halkins, S.L., and S.U.Linville. 1999. Northern Cardinal (*Cardinalis cardinalis*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/440>
- Henningsen. J.C., and L. B. Best. 2005. Grassland bird use of riparian filter strips in southeastern Iowa. Journal of Wildlife Management 69:190-210.
- Herkert, J. R., D. W. Sample, and R.E. Warner. 1996. Management of Midwestern grasslands landscapes for the conservation of migratory birds. Pages 89-116 in Managing Midwestern Landscapes for the Conservation of Neotropical Migratory Birds (F.R.Thompson III. Ed.) U.S. Department of Agriculture, Forest Service General Technical Report NC-187.
- Hickey, J.J. 1981. Estimating relative abundance (Part 1). Studies in Avian Biology 6:11.

Hitchcock, L.E., 2006. Temporal variation in the consequences of an exotic shrub on avian nest predation.

https://kb.osu.edu/dspace/bitstream/handle/1811/24250/Lauren_Hitchcock.pdf?sequence=1

Johnson, L.S. 1998. House Wren (*Troglodytes aedon*). The Birds of North America Online. A Poole, editor. Cornell Lab of Ornithology, Ithaca, New York.

<http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/380>

Karr, J.R. 1990. Interactions between forest birds and their habitat: A comparative synthesis. In Biogeography and Ecology of Forest Birds. 379-386. Edited by A Keast. SPB Academic Publishing. The Hague, Netherlands.

Kleen, V.M., L. Cordle, and R.A. Montgomery. 2004. The Illinois breeding bird atlas. Illinois Natural History Survey Special Publication 26

Lowther, P.E. 1993. Brown-headed Cowbird (*Molothrus ater*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York.

<http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/047>

Lowther, P.E., and C. L. Cink. 2006. House Sparrow (*Passer domesticus*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York.

<http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/012>

Mackie Consultants, LLC. 2009. Resurrection Village at Bull Valley woodland restoration and management plan. CBBEL Project No 09-477

McCusker, C.E., M.P. Ward, and J. D. Brawn. 2010. Seasonal responses of avian communities to invasive bush honeysuckles (*Lonicera* spp.). Biological Invasions 12:2459-2470.

McKernan, Pamela and Gregg Hartvigsen. 2001. The territory distribution of breeding songbirds in the Roemer Arboretum, Genesco, NY. SUNY Genesco Journal of Science and Mathematics 2(1), 2001:7-15

Meding, Barb. Birds of McHenry County: A Field Checklist. McHenry County Conservation District. <http://www.mchenryaudubon.org/id12.html>

Middleton, A. L. 1998. Chipping Sparrow (*Spizella passerina*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York.

<http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/334>

Payne, R. B. 2006. Indigo Bunting (*Passerina cyanea*) The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York.

<http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/004>

Powell, Hugh et.al., Cornell Laboratory of Ornithology: All About Birds. Website. Cornell Lab of Ornithology, Ithaca, New York.

Mourning Dove - http://www.allaboutbirds.org/guide/Mourning_Dove/id

Chimney Swift - http://www.allaboutbirds.org/guide/Chimney_Swift/id

Ruby-throated Hummingbird - http://www.allaboutbirds.org/guide/Ruby-throated_Hummingbird/id

Red-bellied Woodpecker - http://www.allaboutbirds.org/guide/Red-bellied_Woodpecker/id

Downy Woodpecker - http://www.allaboutbirds.org/guide/Downy_Woodpecker/id
Hairy Woodpecker - http://www.allaboutbirds.org/guide/Hairy_Woodpecker/id
Northern Flicker - http://www.allaboutbirds.org/guide/Northern_Flicker/id
Eastern Phoebe - http://www.allaboutbirds.org/guide/Eastern_Phoebe/id
Eastern Wood-Pewee - http://www.allaboutbirds.org/guide/Eastern_Wood-Pewee/id
Eastern Kingbird - http://www.allaboutbirds.org/guide/Eastern_Kingbird/id
Red-eyed Vireo - http://www.allaboutbirds.org/guide/Red-eyed_Vireo/id
Blue Jay - http://www.allaboutbirds.org/guide/Blue_Jay/id
American Crow - http://www.allaboutbirds.org/guide/American_Crow/id
Black-capped Chickadee - http://www.allaboutbirds.org/guide/Black-capped_Chickadee/id
White-breasted Nuthatch - http://www.allaboutbirds.org/guide/White-breasted_Nuthatch/id
House Wren - http://www.allaboutbirds.org/guide/House_Wren/id
Eastern Bluebird - http://www.allaboutbirds.org/guide/Eastern_Bluebird/id
American Robin - http://www.allaboutbirds.org/guide/American_Robin/id
Gray Catbird - http://www.allaboutbirds.org/guide/Gray_Catbird/id
Brown Thrasher - http://www.allaboutbirds.org/guide/Brown_Thrasher/id
European Starling - http://www.allaboutbirds.org/guide/European_Starling/id
Cedar Waxwing - http://www.allaboutbirds.org/guide/Cedar_Waxwing/id
Yellow Warbler - http://www.allaboutbirds.org/guide/Yellow_Warbler/id
Common Yellowthroat - http://www.allaboutbirds.org/guide/Common_Yellowthroat/id
Eastern Towhee - http://www.allaboutbirds.org/guide/Eastern_Towhee/id
Chipping Sparrow - http://www.allaboutbirds.org/guide/Chipping_Sparrow/id
Song Sparrow - http://www.allaboutbirds.org/guide/Song_Sparrow/id
Swamp Sparrow - http://www.allaboutbirds.org/guide/Swamp_Sparrow/id
Northern Cardinal - http://www.allaboutbirds.org/guide/Northern_Cardinal/id
Rose-breasted Grosbeak - http://www.allaboutbirds.org/guide/Rose-breasted_Grosbeak/id
Indigo Bunting - http://www.allaboutbirds.org/guide/Indigo_Bunting/id
Red-winged Blackbird - http://www.allaboutbirds.org/guide/Red-winged_Blackbird/id
Common Grackle - http://www.allaboutbirds.org/guide/Common_Grackle/id
Brown-headed Cowbird - http://www.allaboutbirds.org/guide/Brown-headed_Cowbird/id
Baltimore Oriole - http://www.allaboutbirds.org/guide/Baltimore_Oriole/id
American Goldfinch - http://www.allaboutbirds.org/guide/American_Goldfinch/id
House Finch - http://www.allaboutbirds.org/guide/House_Finch/id
Willow Flycatcher - http://www.allaboutbirds.org/guide/Willow_Flycatcher/id
Tree Swallow - http://www.allaboutbirds.org/guide/Tree_Swallow/id
Field Sparrow - http://www.allaboutbirds.org/guide/Field_Sparrow/id
Great Crested Flycatcher - http://www.allaboutbirds.org/guide/Great_Crested_Flycatcher/id
Cooper's hawk - http://www.allaboutbirds.org/guide/Coopers_Hawk/id
Orchard Oriole - http://www.allaboutbirds.org/guide/Orchard_Oriole/id
Wood Duck - http://www.allaboutbirds.org/guide/Wood_Duck/id
Wild Turkey - http://www.allaboutbirds.org/guide/Wild_Turkey/id

Robertson, R. J., B. J. Stuchbury, and R.R. Cohen. 1992. Tree Swallow (*Tachycineta bicolor*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/011>

Sallabank, R., and F. C. James. 1999. American Robin (*Turdus migratorius*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/462>

- Salway, M.K., J.L. Hutchens, T.L. Peterson, K. Kearns, and T. Marty. 1998. So what should I plant? Trees, shrubs, and vines with wildlife values. Publication WM-223-98. Bureau of Wildlife Management, Wisconsin Department of Natural Resources, Madison Wisconsin.
- Walk, J. W., M. P. Ward, T. J. Benson, J. L., Deppe, S. A. Liscka, S. D. Bailey, and J. D. Brawn. 2010. Illinois Birds: a century of change. Illinois Natural History Survey Special Publication. 31.
- Wear, David N.; Greis, John G., eds. 2002. Southern forest resource assessment. Gen. Tech. Rep. SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. Chapter 3, p. 63-89.
- Wiebe, K. L., and W. S. Moore. 2008. Northern Flicker (*Colaptes auratus*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/166a>
- Witham, J.W., A.J. Kimball. 1996. Use of a geographic information system to facilitate analysis of spot-mapping data. *Journal of Field Ornithology* 67:3, 367-375
- Witmer, M. C., D. J. Mountjoy, and L. Elliot. 1997. Cedar Waxwing (*Bombycilla cedrorum*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/309>
- Yasuka, K., and W. A. Searcy. 1995. Red-winged Blackbird (*Agelaius phoeniceus*). The Birds of North America Online. A. Poole, editor. Cornell Lab of Ornithology, Ithaca, New York. <http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/18>

Appendix 1:

<u>Common Name</u>	<u>Scientific Name</u>	<u>cFR</u>	<u>cRA</u>	<u>RA</u>	<u>Incidentals (N)</u>
Canada Goose	<i>Branta canadensis</i>	0.29	4.71	0.05	
Wood Duck	<i>Aix sponsa</i>	0.16	0.33	0.0035	
Mallard	<i>Anas platyrhynchos</i>	0.08	0.083	0.0009	
Wild Turkey	<i>Meleagris gallopavo</i>	0.25	0.33	0.0035	
Great Blue Heron	<i>Ardea herodias</i>	0.33	0.375	0.004	
Great Egret	<i>Ardea alba</i>	0.04	0.083	0.0009	
Green Heron	<i>Butorides virescens</i>	0.04	0.042	0.0004	
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	*	*	*	1
Turkey Vulture	<i>Cathartes aura</i>	0.125	0.125	0.0013	
Osprey	<i>Pandion haliaetus</i>	0.04	0.042	0.0004	
Northern Harrier	<i>Circus cyaneus</i>	0.04	0.042	0.0004	
Cooper's Hawk	<i>Accipiter cooperii</i>	0.125	0.21	0.002	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	0.25	0.33	0.0035	
Sandhill Crane	<i>Grus Canadensis</i>	0.04	0.042	0.0004	
Killdeer	<i>Charadrius vociferus</i>	0.125	0.125	0.0013	
Spotted Sandpiper	<i>Actitis macularius</i>	*	*	*	3
Ring-billed Gull	<i>Larus delawarensis</i>	0.08	0.167	0.0018	
Rock Dove	<i>Columbia livia</i>	0.125	0.167	0.0018	
Mourning Dove	<i>Zenaida macroura</i>	0.625	1.67	0.018	
Eastern Screech Owl	<i>Megascops asio</i>	*	*	*	1
Great Horned Owl	<i>Bubo virginianus</i>	0.04	0.042	0.0004	
Chimney Swift	<i>Chaetura pelagica</i>	0.54	1.92	0.02	
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	0.375	0.42	0.004	
Belted Kingfisher	<i>Ceryle alcyon</i>	0.04	0.042	0.0004	
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0.79	1.33	0.014	
Downy Woodpecker	<i>Picoides pubescens</i>	0.5	0.67	0.007	
Northern Flicker	<i>Colaptes auratus</i>	0.75	1.21	0.013	
Eastern Wood Pewee	<i>Contopus virens</i>	0.5	0.71	0.0075	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>)	0.04	0.042	0.0004	
Willow Flycatcher	<i>Empidonax traillii</i>	0.21	0.33	0.0035	
Least Flycatcher	<i>Empidonax minimus</i>	0.08	0.083	0.0009	
Eastern Phoebe	<i>Sayornis phoebe</i>	0.125	0.125	0.0013	
Great-crested Flycatcher	<i>Myiarchus crinitus</i>	0.33	0.54	0.0057	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	0.42	0.75	0.0079	
Red-eyed Vireo	<i>Vireo olivaceus</i>	0.2	0.58	0.0062	
Blue Jay	<i>Cyanocita cristata</i>	0.875	2.29	0.024	
American Crow	<i>Corvus brachyrhynchos</i>	0.875	1.375	0.015	
Purple Martin	<i>Progne subis</i>	*	*	*	2

Tree Swallow	<i>Tachycineta bicolor</i>	0.41	0.58	0.0062	
Northern Rough-winged Swallow	<i>Stelgidopteryx ruficollis</i>	*	*	*	5
Barn Swallow	<i>Hirundo rustica</i>	0.58	1.9	0.02	
Black-capped Chickadee	<i>Poecile atricapillus</i>	0.875	3.125	0.033	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	0.54	0.83	0.009	
House Wren	<i>Troglodytes aedon</i>	0.58	1.29	0.014	
Eastern Bluebird	<i>Sialia sialis</i>	0.54	1.167	0.012	
American Robin	<i>Turdus migratorius</i>	0.96	5.5	0.06	
Gray Catbird	<i>Dumetella carolinensis</i>	1	5.125	0.054	
Brown Thrasher	<i>Toxostoma rufum</i>	0.21	0.25	0.003	
European Starling	<i>Sturnus vulgaris</i>	0.5	3.375	0.036	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	0.03	3.875	0.04	
Yellow Warbler	<i>Dendroica petechia</i>	0.5	1.21	0.013	
Common Yellowthroat	<i>Geothlypis trichas</i>	0.625	1.83	0.02	
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	0.125	0.21	0.002	
Chipping Sparrow	<i>Spizella passerine</i>	0.42	0.83	0.009	
Field Sparrow	<i>Spizella pusilla</i>	0.125	0.125	0.0013	
Song Sparrow	<i>Melospiza melodia</i>	0.67	2.875	0.03	
Swamp Sparrow	<i>Melospiza georgiana</i>	0.04	0.042	0.0004	
Northern Cardinal	<i>Cardinalis cardinalis</i>	1	3.21	0.034	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	0.29	0.58	0.006	
Indigo Buntings	<i>Passerina cyanea</i>	0.375	0.71	0.0075	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	0.66	16.5	0.174	
Eastern Meadowlark	<i>Sturnella magna</i>	0.04	0.042	0.0004	
Common Grackle	<i>Quiscalus quiscula</i>	0.58	2.875	0.03	
Brown-headed Cowbird	<i>Molothrus ater</i>	0.92	6.71	0.071	
Orchard Oriole	<i>Icterus spurius</i>	0.125	0.125	0.03	
Baltimore Oriole	<i>Icterus galbula</i>	0.5	1.42	0.015	
House Finch	<i>Carpodacus mexicanus</i>	0.125	0.21	0.002	
American Goldfinch	<i>Carduelis tristis</i>	0.96	6.92	0.073	
House Sparrow	<i>Passer domesticus</i>	0.04	0.083	0.0009	
TOTAL: 69 species					

cFR= % of plots the species was observed considering the total # of counts (N=24).

cRA = # Of individual of that species observed per plot

RA= number of individuals of a given species divided by the total number of individuals of all species

* Not found during timed count. Incidentals (N)