Summary Report For The 2003 Breeding Season Avian Point Count Survey At The Long Island Complex, Mississippi River Pool 21

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ABSTRACT

During the 2003 breeding season, a point count survey project was conducted in Pool 21 of the Upper Mississippi River, Adams County, Illinois. The study area was the Long Island Complex (river miles 332.5 to 340.5), which included Long, Shandrew, and Flannigan Islands, along with associated sloughs, backwaters, and side channels. This study area included approximately 4,084 acres which was primarily comprised of mature floodplain bottomland forest, except for approximately 681 acres which were active agricultural fields until the early to mid 1990's, after which agriculture was abandoned. Since then, this acreage has been undergoing ecological succession and is now comprised of old field and early successional floodplain forest. Additionally, this study area included several associated sloughs, wetlands, and backwaters. During this project, we established 48 point count locations along six transects. One transect (12 survey points) was located in the old field/early successional forest habitat. The remaining five transects (36 survey points) were established within the mature floodplain forest habitat. Each point was sampled two times during the breeding season (early June through early July). Ten-minute unlimited radius point counts were conducted, resulting in 96 sampled points. Additionally, "species of interest" identified between points (i.e. interpoint data) were also recorded. A cumulative total of 87 species were identified during this project. Of these, 82 species were recorded at one or more points, while 56 species were encountered at interpoints. The 87 species consisted of 17 Permanent Residents, 31 North American Migrants, and 39 Neotropical Migrants. Overall, 5,169 individual birds were identified at points, with an additional 477 tallied at interpoints. Among data from the point locations, the 10 most abundant species included: Common Grackle, Northern Cardinal, Indigo Bunting, Great Crested Flycatcher, Red-bellied Woodpecker, Eastern Wood-Pewee, American Robin, Black-capped Chickadee, American Crow, and Red-winged Blackbird. These species also had the highest relative densities. The 10 most frequently encountered species were similar, except the Brown-headed Cowbird and Red-eyed Vireo replaced the American Robin and Red-winged Blackbird, respectively. The 11 most widely distributed species included: Indigo Bunting, Northern Cardinal, Red-bellied Woodpecker, Great Crested Flycatcher, Common Grackle, Black-capped Chickadee, Red-headed Woodpecker, American Crow, Chimney Swift, Eastern Wood-Pewee, and Brown-headed Cowbird. This project provides preliminary baseline data regarding breeding season avian use of the mature and early successional forest habitats which are found within the Long Island Complex study area.

INTRODUCTION

During the past several decades, there has been steadily growing concern regarding the declining populations of many avian species across North America, especially among the long distance or Neotropical Migrants and short distance or North American Migrants. (Robbins et al. 1989; Askins et al. 1990; Finch 1991; Robinson et al. 1995; Sherry and Holmes 1995). Long-term monitoring programs such as the Breeding Bird Survey (Peterjohn et al. 1995; Price et al. 1995) and the Christmas Bird Count (Root 1988) have documented the general trend of declining avian populations. Research has also begun to document the decline of many avian species during migration periods (Cox 1985; Askins et al. 1990; Moore et al. 1990; Moore and Simons 1992; Moore et al. 1993; Ewert and Hamas 1996). Additionally, considerable research has illustrated the plight of many decreasing avian populations throughout all major habitat types in the Midwest Region (Donovan et al. 1996; Herkert et al. 1996; Howe et al. 1996; Johnson 1996; Knutson et al. 1996; Koford and Best 1996; Robinson 1996; Thompson et al. 1996).

The causes of these overall declines in avian numbers are not well understood, primarily since standardized long-term avian monitoring and research is still in its relatively early stages of development (McKay et al. 1999). Nevertheless, a considerable amount of research appears to be demonstrating two key components involved with avian population declines throughout North America, but particularly in the East and Midwest (Droege and Sauer 1990), to be habitat loss and habitat fragmentation (Galli et al. 1976; Whitcomb et al. 1981; Lynch and Whigham 1984; Temple and Cary 1988; Terborgh 1989; Wilcove and Robinson 1990; Robinson et al. 1995). Furthermore, these two factors seem to be impacting avian populations in the breeding range (Freemark and Collins 1992; Robinson et al. 1995), wintering range (Petit et al. 1993; Faaborg et al. 1996), as well as the migrational range (Thompson et al. 1993; Moore et al. 1995).

Habitat loss and fragmentation appear to have particularly negative effects on forest interior birds, as well as those species requiring larger “patches” of habitat (Whitcomb et al. 1981; Lynch and Whigham 1984; Robbins et al. 1989; Peterjohn and Sauer 1994; Robinson et al. 1995). Evidence exists suggesting that these habitat interior and area-sensitive species experience substantially higher rates of both nest predation and brood parasitism (i.e. by the Brown-headed Cowbird) when nesting in fragmented forest patches, which include proportionally larger amounts of edge habitat (Gates and Gysel 1978; Brittingham and Temple 1983; Wilcove 1985; Small and Hunter 1988; Paton 1994). As a consequence, there is a direct link between habitat fragmentation and decreased reproductive success among many avian species (Whitcomb et al. 1981; Lynch and Whigham 1984; Robbins et al. 1989).

Within the Upper Midwest, floodplain forests and forested wetlands along the Mississippi River and its major tributaries provide some of the largest tracts of forested habitat remaining in the region (Grettenberger 1991). Although much of the Mississippi River floodplain has been leveed, drained, and cleared for agriculture, urban uses, and other human activities, a relatively large portion of forest and wetland habitat remains in public ownership (Grettenberger 1991; Treiterer 1996). This land, largely part of the Upper Mississippi River National Wildlife and Fish Refuge and Mark Twain National Wildlife Refuge, is not greatly threatened by land use activities which result in large-scale habitat loss. Nevertheless, various activities such as logging, forest regeneration practices, road and pipeline construction, recreational facility development, and levees for fish and wildlife management projects continue to cause fragmentation of these habitat tracts (Grettenberger 1991; Treiterer 1996).

Furthermore, changes in the natural hydrologic patterns which have resulted from increased human activity and development along with impoundment of the Upper Mississippi River, threatens to substantially alter the relatively large tracts of remaining forest and wetland habitats (Yin and Nelson 1996). For example, comparisons between Upper Mississippi River floodplain forests of the past and present reveal a substantial decrease in tree species diversity (i.e. oak, hickory, pecan, elm, willow, and cottonwood), along with a significant increase in the flood-tolerant Silver Maple (*Acer saccharinum*) (Yin and Nelson 1996). Additionally, the proportion of mature, later successional forest has been greatly reduced (Yin and Nelson 1996).

Unfortunately, limited information is available regarding avian use and importance of these floodplain forests to Midwestern bird populations (Treiterer 1996). Consequently, the impacts of fragmenting these forests to Midwestern avian species are also not well understood or even researched (Grettenberger 1991). Emlen et al. (1986) documented a diverse avian community within these bottomland forests, including the presence of many species which were uncommon or absent in the adjacent uplands. Nevertheless, basic information such as avian population densities and composition along the Mississippi River have only been investigated to a limited extent. Additionally, the habitat requirements of many bottomland forest bird species have not been well described and are largely unknown (Samson 1979). Without these important pieces of information, it will be impossible to develop effective management strategies for floodplain bottomland forest birds (Grettenberger 1991). As a result, this project was initiated with the following objectives.

OBJECTIVES

1) To document breeding season avian diversity within the Long Island Complex study area.

2) To record the relative abundance of each species identified within the study area during the breeding season.

3) To determine the frequency of occurrence of each species recorded during the study.

4) To estimate the relative density of each species encountered during the breeding season.

5) To document the breeding season distribution of species occurring within the Long Island Complex study area.

6) To preliminarily examine avian use of various successional stages of forest within the floodplain of the Upper Mississippi River.

7) To provide a basis for the establishment of long-term avian monitoring within the floodplain of the Upper Mississippi River.

ACKNOWLEDGEMENTS

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STUDY AREA

The study area for this project was the Long Island Complex, located along the Illinois side of the Mississippi River (river miles 332.5 to 340.5), just north of Quincy, Illinois (Figure 1). This entire area is part of the Mark Twain National Wildlife Refuge. The Long Island Complex study area includes Long, Shandrew, and Flannigan Islands, along with associated wetlands, sloughs, backwaters, and side channels. As a result, this study area includes approximately 4,084 acres which is composed largely of mature floodplain bottomland forest. However, approximately 681 acres were active agricultural fields until the early to mid 1990’s, when agriculture was abandoned. This acreage has since been undergoing ecological succession, and is now composed of old field and early successional floodplain forest. In addition to the forested habitat, this area includes a diversity of associated wetlands, sloughs, backwaters, and side channels.

Figure 1. Long Island Complex study area during the 2003 breeding season avian survey project.

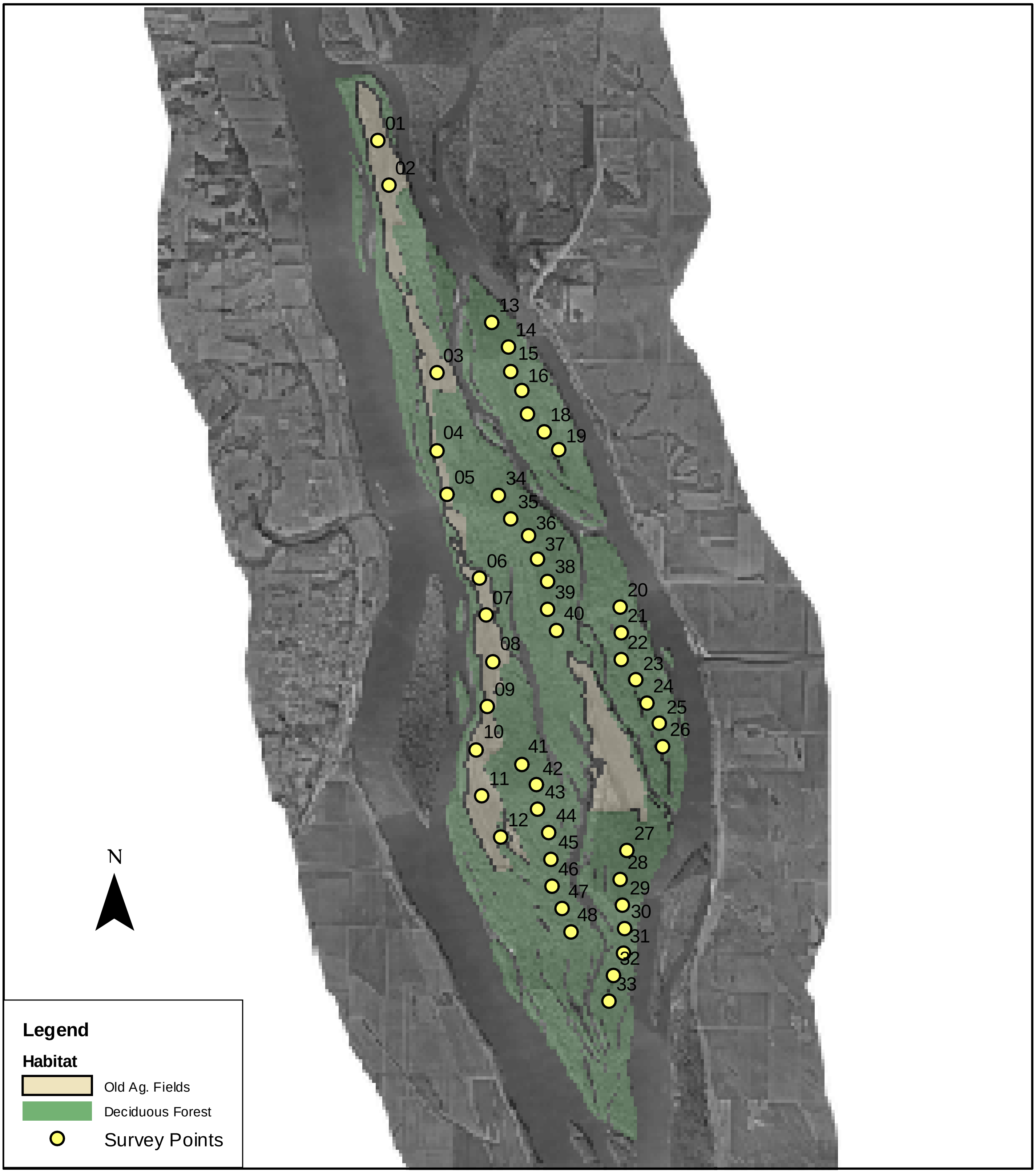
The topography of this area ranges from 475 to 485 feet above msl. Although the hardwood forest community (i.e. oak, hickory, and walnut) has been greatly reduced from presettlement abundance, this study area still maintains some of the largest, most mature, as well as diverse floodplain forest habitat within the Midwest (Birkenholz 1992; Treiterer 1996). The dominant tree species in the lower, wetter sites include Silver Maple and Eastern Cottonwood (*Populus deltoides*). In addition to the previous two species, the slightly higher, drier areas are also characterized by Green Ash (*Fraxinus pennsylvanicus*), American Elm (*Ulmus americana*), American Sycamore (*Platanus occidentalis*), Northern Pecan (*Carya illinoensis*), Bur Oak (*Quercus macrocarpa*), Pin Oak (*Quercus palustris*), Shellbark Hickory (*Carya laciniosa*), Honey Locust (*Gleditsia tricanthos*), and Kentucky Coffeetree (*Gymnocladus dioicus*) (Birkenholz 1992; Treiterer 1996).

Throughout most of the study area, ground cover and understory vegetation was dominated by Wood Nettle (*Laportea canadensis*), and Poison Ivy (*Toxicodendron radicans*) (Birkenholz 1992; Treiterer 1996). However, the old agricultural fields and smaller woodland openings were characterized by an abundance of Giant Ragweed (*Ambrosia trifida*) and Bur Cucumber (*Echinocystis lobata*) (Treiterer 1996). Other species characteristic of the ground cover and understory included: Clearweed (*Pilea pumila*), Spotted Touch-Me-Not (*Impatiens biflora*), Moonseed (*Menispermum canadense*), Trumpet Creeper (*Campsis radicans*), Common Elderberry (*Sambucus canadensis*), Tartarian Honeysuckle (*Lonicera tartarica*), grape (*Vitis* spp.), and grasses which were mostly Woodlane Brome (*Bromus* spp.) and Wild Rye (*Elymus* spp.) (Birkenholz 1992; Treiterer 1996).

During the course of this project, 48 avian survey point count locations were established along six individual transect routes within the Long Island Complex study area (Figure 2; Appendix A). Photographic documentation of each point count location is provided in Appendix B. Additionally, specific vegetative characteristics present at each point count location is available in Appendix C. Following, is a general vegetative habitat description of each of the six transect routes (Joseph Lundh, pers. comm.).

<u>Transect 1: Points 1-12 (Long Island – Old Field)</u> - These represent the 12 points which sampled the old field and early successional forest habitat within the study area (Figure 2). These 12 points were placed in the two old fields located along the west side of Long Island. The fields comprised 511 total acres and were extremely linear (approximately 8.8 kilometers long and approximately 400 meters wide at the widest point). The two fields were actively cropped until 1995. In 1996, 300 acres were planted with trees (i.e. bare root seedlings, direct seeding with acorns, and containerized stock). Most of the trees planted in the south field did not survive. Therefore, this field is dominated by herbaceous growth. The north field had marginal tree survival, particularly on the west side and north end. However, natural seeding is providing a considerable amount of tree regeneration in this field. Seven of the 12 points were dominated by very dense sapling growth, 10 to 20 feet in height and mostly canopied. The principal species included Silver Maple, Eastern Cottonwood, and willow (*Salix* spp.). The remaining 5 points were dominated by herbaceous vegetation. The characteristic species at these points included Giant Ragweed, Wood Nettle, Stinging Nettle (*Urtica dioica*), various amaranth species (*Amaranthus* spp.), Trumpet Creeper, several smartweed species (*Polygonum* spp.), and various species of grasses. Only scattered trees were present at these points.

Figure 2. Avian point count locations duing the 2003 Long Island Complex bird survey.



Transect 2: Points 13-19 (Shandrew Island) - This island is approximately 3.2 kilometers long and up to 0.8 kilometers wide. It is east and separated from Long Island by a slough 100 meters wide (Figure 2). Shandrew Island is immediately north of Flannigan Island. This, and the remaining four transects, are predominantly forested. Although the forested habitat throughout this study area consists of typical floodplain bottomland species, which tend to be flood tolerant (i.e. Silver Maple, Eastern Cottonwood, and Green Ash), the 1993 flood did significantly impact the forest habitat throughout the region (Yin and Nelson 1996). Tree mortality associated with the 1993 flood resulted in considerable forest canopy openings within the study area. However, the canopy coverage was still visibly estimated at 60% for the majority of points. The overall canopy coverage for this transect averaged 71%. The secondary canopy layer was 10 to 20 feet tall. These saplings, which were closely associated with the canopy openings, included Silver Maple, Green Ash, American Sycamore, and American Elm. Saplings of these species were also the dominant canopy layer in the understory on approximately half of the points. The herbaceous ground cover was dominated by Wood Nettle, Poison Ivy, and Giant Ragweed.

Transect 3: Points 20-26 (Flannigan Island) - This island is approximately 3.2 kilometers long and up to 0.6 kilometers wide. It is east and separated from Long Island by a slough 60 meters wide (Figure 2). Flannigan Island is also dominated by typical flood tolerant trees including Silver Maple, Green Ash, and Eastern Cottonwood. Although similar to Shandrew Island, the forest canopy on Flannigan Island was substantially more intact. Additionally, there was a significant subcanopy layer of younger trees averaging about 10 feet in height. This subcanopy covered about 50% of the transect. Within this transect, the herbaceous ground layer was dominated by Wood Nettle and Poison Ivy.

Transect 4: Points 27-33 (Long Island – Southeast) - This transect is located on the lower southeast end of Long Island (Figure 2). The transect was placed through the center of an area delineated by the eastern old field to the north, Long Island Chute to the east, and Long Island Lake to the west. This transect contained the most intact overstory canopy within the study area. The average canopy cover was visibly estimated at 71%. Among the points of this transect, the average basal area was 161. Though there were canopy gaps, they were significantly less numerous than at the other transects. The dominant overstory canopy was Silver Maple and Green Ash, mainly in the 18-24 inch dbh size class, with some sparse Northern Pecan. Silver Maple saplings, approximately 15 feet in height, occurred over 25% of the transect. The herbaceous layer was dominated by Silver Maple seedlings, Wood Nettle, Bur Cucumber, Poison Ivy, and other species.

Transect 5: Points 34-40 (Long Island – Northeast) - This transect occurred near the middle of Long Island across from the lower end of Shandrew and upper end of Flannigan Islands (Figure 2). It was located approximately in the middle of an area bordered by the Shandrew and Flannigan Island sloughs to the east, Long Island Lake and the western old fields to the west, and the eastern old field to the south. This transect possessed greater forest diversity than either the Shandrew or Flannigan Island transects. In addition to the typical Silver Maple, Green Ash, Eastern Cottonwood component, the overstory forest along this transect was also characterized by Shellbark Hickory, Bur Oak, and Honey Locust. This overstory averaged 58% canopy coverage. A substantial number of canopy openings occurred along this transect, presumably resulting from the 1993 flood. Consequently, a moderately dense understory canopy, which covered less than 40% of the transect, supported a diversity of species including Green Ash, Silver Maple, Kentucky Coffeetree, and Northern Hackberry (*Celtis occidentalis*). These understory saplings averaged about 15 feet in height. The herbaceous ground layer was dominated by Giant Ragweed, Wood Nettle, and Poison Ivy.

Transect 6: Points 41-48 (Long Island – Southcentral) - This transect was located on Long Island west of Long Island Lake and east of the southern portion of the western old fields (Figure 2). The forest along this transect proved to be among the most diverse, supporting species like Bur Oak and Shellbark Hickory at many of the points. However, Silver Maple was still the dominant overstory species. This transect also contained a significant number of overstory canopy openings, which supported dense stands of saplings averaging approximately 20 feet in height. The herbaceous ground cover was also diverse, consisting of various species of dense grasses, Wood Nettle, Bur Cucumber, grape, Poison Ivy, and many other species.

METHODS

During this project, the breeding season avian community within the Long Island Complex study area was documented using point count methodology. Point counts have proven to be an extremely efficient and effective method for estimating avian species richness and relative abundance (Reynolds et al. 1980; Bibby et al. 1992; Ralph et al. 1993; Ralph et al. 1995). This is particularly useful for projects designed to monitor avian population trends (Verner 1985; Hutto et al. 1986; Ralph et al. 1993; Petit et al. 1995). Additionally, point counts are repeatable which permits the population trends to be monitored over time (Verner 1985). Because our emphasis was to provide a preliminary baseline documentation of the avian community utilizing the study area during the breeding season, we used unlimited-radius point count techniques. This allowed all birds identified at a point to be recorded, regardless of distance. Furthermore, “species of interest” detected between points (i.e. interpoint data) were also opportunistically recorded. Consequently, a greater proportion of the overall avian community within the study area was recorded. However, since interpoint data was collected in a non-standardized and non-repeatable fashion, it was treated as a supplement to the point count data (Bibby et al. 1992). As a result, point and interpoint data were separated during analysis. Although this represents one of the most widely used methods for avian monitoring (Blondel et al. 1981; Ralph et al. 1993), unlimited-radius point counts do not permit absolute population densities or species – habitat relationships to be determined (Petit et al. 1995). Therefore, during our analysis, we only examined relative densities. Species – habitat relationships were not assessed.

Prior to the initiation of surveys, 48 point count sampling locations were established along six transects. Of these six transects, one (12 points) sampled the old field and early successional forest habitats, while the remaining five transects (36 points) sampled the older more mature forest habitat. Each point was permanently marked with a Trimble Geoexplorer 3 GPS unit (Figure 2; Appendix A), as well as a Garmin 12 GPS unit. Additionally, each point count location was also marked with fluorescent pink flagging tape, in order to more easily relocate points during the project. All sampling points were placed at least 150 meters from the habitat edge (Birkenholz 1992; Treiterer 1996). To prevent duplication of data between points, those in the mature forest were placed a minimum of 250 meters apart, while those in the more open early successional habitat were separated by at least 500 meters (Ralph et al. 1993), except points 6 and 7 which were 400 meters apart. During the project, each point was sampled twice between early June and early July (96 total points of data). All points were sampled once during the first half of June, and again during the latter half of June through the first two days of July. Surveys were not conducted during periods of steady precipitation or on days with a sustained wind in excess of 15 mph (Ralph et al. 1993). All points were sampled in a five-hour period between sunrise and 10:30 AM (i.e. between 0530 and 1030 hours CDT), during the peak period of avian activity and singing (Ralph et al. 1993).

Throughout the project, each point was sampled for ten minutes. This has proven to be the most efficient survey duration when working in difficult terrain or exceptionally avian-rich habitat (Ralph et al. 1993; Buskirk and McDonald 1995; Lynch 1995; Ralph et al. 1995; Smith et al. 1995; Robinson and McKay 2001). All point count data collected were recorded in the 0-3, 3-5, 5-6, 6-8, and 8-10 minute subsamples. However, analysis based on these subsamples was beyond the scope of this project. Consequently, data were analyzed for the cumulative 10-minute survey. Since unlimited-radius point counts were utilized, all birds identified by sight or sound, including fly-overs, were recorded into a tape recorder. Additionally, "species of interest" observed between points (i.e. interpoint data) were also recorded. Eventually, all data were transcribed from cassette tape to survey data sheets (Appendix F). On each data sheet, species were recorded using a four-letter species code (Appendix D). A complete list of all species identified during this project can be found in Appendix D (American Ornithologists' Union 1998; Illinois Ornithological Records Committee 1999).

Each species was assigned to one of three migratory classes (Appendix D) (Bonney et al. 1995; National Geographic Society 2002). Avian species in which the majority of the population is non-migratory are classified as Permanent Residents (RES). Those which migrate from breeding grounds to a wintering range in North America are referred to as North American Migrants (NAM). Those species in which the majority of the population breeds in North America and winters in the Caribbean, Central, or South America are classified as Neotropical Migrants (NTM). During this project, the total number of birds recorded represented the number of individuals detected rather than the actual number of birds present. This is a sampling artifact resulting from surveying the same points repeatedly. As a consequence, various numbers of the same individuals may have been recorded during both sample periods. For this reason, we regarded the total number of individuals tallied for each species as a measure of relative abundance rather than an actual abundance or density estimate. Due to the non-standardized, non-repeatable nature of interpoint data, it was treated separately from point count data. During analysis, we examined five parameters of the breeding season avian community. First, we documented overall species richness as the diversity of species recorded throughout the project.

Second, we determined the relative abundance for each species as the total number of individuals recorded. Third, we examined the frequency of occurrence for each species as the percentage of points at which each species was encountered. Fourth, we determined the relative density for each species as the number of individuals recorded per point. Fifth, we documented the overall distribution for each species in terms of which points the species occurred (Appendix E).

RESULTS

During the 2003 breeding season, two survey periods were conducted at the Long Island Complex. As a result, a total of 96 points of data were collected (16 hours of total sampling effort). Each sampling period required six days to complete. The first survey period was conducted on 3-5 and 9-11 June, while the second period occurred on 23-25 and 30 June and 1-2 July.

Overall, a cumulative total of 87 avian species were identified during the course of this project (Table 1; Appendix D). Of these, 82 species were recorded at point locations while 56 were opportunistically observed within interpoints. Five species were only encountered at interpoints. These included the Double-crested Cormorant (*Phalacrocorax auritus*), Hooded Merganser (*Lophodytes cucullatus*), American Coot (*Fulica americana*), American Woodcock (*Scolopax minor*), and Olive-sided Flycatcher (*Contopus cooperi*). The total of 87 species consisted of 17 (19%) RES, 31 (36%) NAM, and 39 (45%) NTM. Noteworthy species which were expected, but not observed, within the study area during this project included: Great Egret (*Ardea alba*), Yellow-crowned Night-Heron (*Nyctanassa violacea*), Mississippi Kite (*Ictinia mississippiensis*), Red-shouldered Hawk (*Buteo lineatus*), Rock Dove (*Columba livia*), Black-billed Cuckoo (*Coccyzus erythropthalmus*), Willow Flycatcher (*Empidonax traillii*), Bank Swallow (*Riparia riparia*), Black-and-white Warbler (*Mniotilta varia*), Field Sparrow (*Spizella pusilla*), House Sparrow (*Passer domesticus*), and Eurasian Tree Sparrow (*Passer montanus*).

The 16 hours of cumulative sampling effort yielded 5,169 individual birds identified (Table 1). Of these, 1,470 (28%) were RES, 1,449 (28%) were NAM, and 2,250 (44%) were NTM (Table 1). Consequently, an average of 5.4 birds were tallied during each minute of sample effort and the average number of individuals recorded at each survey point was 53.8. This certainly demonstrates the overall abundance of birds within the study area during the breeding season. Additionally, we also recorded 477 individual birds at interpoints (Table 1). Considering only data from point locations, the 10 most relatively abundant species included: Common Grackle (*Quiscalus quiscula*) (315 birds), Northern Cardinal (*Cardinalis cardinalis*) (314 birds), Indigo Bunting (*Passerina cyanea*) (310 birds), Great Crested Flycatcher (*Myiarchus crinitus*) (280 birds), Red-bellied Woodpecker (*Melanerpes carolinus*) (236 birds), Eastern Wood-Pewee (*Contopus virens*) (221 birds), American Robin (*Turdus migratorius*) (195 birds), Black-capped Chickadee (*Poecile atricapilla*) (169 birds), American Crow (*Corvus*

TABLE 1. Species richness, relative abundance, frequency of occurrence, and relative density of the avian community present at the Long Island Complex during the 2003 breeding season.

Species*	Mig. Class.**	# Ind. Pts.+	# Ind. Interpts.^	# Ind. Total	# Pts. (%)++	# Ind. / Pt.+++
DCCO	NAM	0	1	1	0 (0)	0.00
GBHE	NAM	138	70	208	40 (42)	1.44
GRHE	NAM	1	0	1	1 (1)	0.01
BNHE	NAM	1	1	2	1 (1)	0.01
TUVU	NAM	8	10	18	5 (5)	0.08
CAGO	NAM	3	19	22	3 (3)	0.03
WODU	NAM	46	121	167	18 (19)	0.48
MALL	NAM	2	0	2	1 (1)	0.02
HOME	NAM	0	3	3	0 (0)	0.00
COHA	NAM	3	0	3	2 (2)	0.03
RTHA	NAM	4	1	5	3 (3)	0.04
WITU	RES	1	1	2	1 (1)	0.01
NOBO	RES	1	1	2	1 (1)	0.01
AMCO	NAM	0	1	1	0 (0)	0.00
KILL	NAM	1	13	14	1 (1)	0.01
AMWO	NAM	0	1	1	0 (0)	0.00
MODO	NAM	36	0	36	20 (21)	0.38
YBCU	NTM	66	12	78	40 (42)	0.69
GHOW	RES	4	0	4	3 (3)	0.04
BAOW	RES	13	3	16	10 (10)	0.14
CHSW	NTM	143	0	143	55 (57)	1.49
RTHU	NTM	23	0	23	21 (22)	0.24
BEKI	NAM	1	1	2	1 (1)	0.01

TABLE 1. Continued.

Species*	Mig. Class.**	# Ind. Pts.+	# Ind. Interpts.^	# Ind. Total	# Pts. (%)++	# Ind. / Pt.+++
RHWO	NAM	142	3	145	63 (66)	1.48
RBWO	RES	236	0	236	80 (83)	2.46
DOWO	RES	73	3	76	47 (49)	0.76
HAWO	RES	39	2	41	29 (30)	0.41
NOFL	NAM	20	2	22	16 (17)	0.21
PIWO	RES	91	10	101	54 (56)	0.95
OSFL	NTM	0	1	1	0 (0)	0.00
EWPE	NTM	221	4	225	76 (79)	2.30
ACFL	NTM	38	18	56	26 (27)	0.40
ALFL	NTM	7	0	7	5 (5)	0.07
LEFL	NTM	2	0	2	2 (2)	0.02
EAPH	NAM	2	0	2	1 (1)	0.02
GCFL	NTM	280	12	292	81 (84)	2.92
EAKI	NTM	1	2	3	1 (1)	0.01
WEVI	NTM	1	1	2	1 (1)	0.01
BEVI	NTM	4	0	4	2 (2)	0.04
YTVI	NTM	61	6	67	38 (40)	0.64
WAVI	NTM	83	6	89	36 (38)	0.86
REVI	NTM	145	7	152	64 (67)	1.51
BLJA	RES	75	6	81	41 (43)	0.78
AMCR	RES	167	0	167	64 (67)	1.74
FICR	RES	2	3	5	2 (2)	0.02
PUMA	NTM	1	0	1	1 (1)	0.01
TRSW	NAM	16	1	17	10 (10)	0.17
NRSW	NTM	10	9	19	8 (8)	0.10
CLSW	NTM	1	0	1	1 (1)	0.01

TABLE 1. Continued.

Species*	Mig. Class.**	# Ind. Pts.+	# Ind. Interpts.^	# Ind. Total	# Pts. (%)++	# Ind. / Pt.+++
BASW	NTM	7	0	7	4 (4)	0.07
BCCH	RES	169	4	173	65 (68)	1.76
TUTI	RES	73	1	74	44 (46)	0.76
WBNU	RES	98	0	98	51 (53)	1.02
BRCR	NAM	6	0	6	4 (4)	0.06
CAWR	RES	83	5	88	54 (56)	0.86
HOWR	NTM	111	5	116	45 (47)	1.16
BGGN	NTM	110	7	117	48 (50)	1.15
EABL	NAM	1	0	1	1 (1)	0.01
WOTH	NTM	33	4	37	19 (20)	0.34
AMRO	NAM	195	0	195	59 (61)	2.03
GRCA	NTM	46	3	49	19 (20)	0.48
BRTH	NAM	4	1	5	3 (3)	0.04
EUST	RES	31	9	40	7 (7)	0.32
CEWA	NAM	59	0	59	19 (20)	0.61
NOPA	NTM	31	21	52	21 (22)	0.32
YEWA	NTM	32	0	32	17 (18)	0.33
CSWA	NTM	1	0	1	1 (1)	0.01
YTWA	NTM	31	10	41	22 (23)	0.32
CRWA	NTM	14	3	17	12 (13)	0.15
AMRE	NTM	125	8	133	50 (52)	1.30
PRWA	NTM	122	18	140	47 (49)	1.27
KEWA	NTM	2	0	2	2 (2)	0.02
COYE	NTM	65	1	66	24 (25)	0.68
YBCH	NTM	7	5	12	6 (6)	0.07
SUTA	NTM	1	0	1	1 (1)	0.01

TABLE 1. Continued.

Species*	Mig. Class.**	# Ind. Pts.+	# Ind. Interpts.^	# Ind. Total	# Pts. (%)++	# Ind. / Pt.+++
SCTA	NTM	1	0	1	1 (1)	0.01
EATO	NAM	3	0	3	3 (3)	0.03
CHSP	NTM	3	0	3	3 (3)	0.03
SOSP	NAM	33	1	34	19 (20)	0.34
NOCA	RES	314	0	314	92 (96)	3.27
RBGR	NTM	28	2	30	18 (19)	0.29
INBU	NTM	310	0	310	94 (98)	3.23
RWBL	NAM	158	7	165	31 (32)	1.65
COGR	NAM	315	3	318	68 (71)	3.28
BHCO	NAM	146	0	146	65 (68)	1.52
BAOR	NTM	83	2	85	45 (47)	0.86
AMGO	NAM	105	2	107	47 (49)	1.09

* Taxonomic order of species (American Ornithologists' Union 1998; Illinois Ornithological Records Committee 1999).

** Bonney et al. (1995) and National Geographic Society (2002).

^ Data not used to calculate relative abundance since interpoint data was non-standardized and non-repeatable.

+ Relative abundance estimate.

++ Frequency of occurrence estimate.

+++ Relative density estimate.

brachyrhynchos) (167 birds), and Red-winged Blackbird (*Agelaius phoeniceus*) (158 birds). Of these, 4 were RES, 3 were NAM, and 3 were NTM. These 10 species accounted for 46% of all the birds recorded at survey points. Other species occurring in noteworthy abundance at points included the Great Blue Heron (*Ardea herodias*) (138), Yellow-billed Cuckoo (*Coccyzus americanus*) (66), Chimney Swift (*Chaetura pelagica*) (143), Red-headed Woodpecker (*Melanerpes erythrocephalus*) (142), Pileated Woodpecker (*Dryocopus pileatus*) (91), Acadian Flycatcher (*Empidonax virescens*) (38), Red-eyed Vireo (*Vireo olivaceus*) (145), Carolina Wren (*Thryothorus ludovicianus*) (83), House Wren (*Troglodytes aedon*) (111), Blue-gray Gnatcatcher (*Polioptila caerulea*) (110), Northern Parula (*Parula americana*) (31), Cerulean Warbler (*Dendroica cerulea*) (14), American Redstart (*Setophaga ruticilla*) (125), Prothonotary Warbler (*Protonotaria citrea*) (122), Brown-headed Cowbird (*Molothrus ater*) (146), and American Goldfinch (*Carduelis tristis*) (105). This abundance of birds, among many species, demonstrates the importance of the study area to breeding avian communities. Nevertheless, several species occurred in lower than expected numbers. Some of these included: Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Northern Flicker (*Colaptes auratus*), Brown Creeper (*Certhia americana*), European Starling (*Sturnus vulgaris*), Song Sparrow (*Melospiza melodia*), and Rose-breasted Grosbeak (*Pheucticus ludovicianus*) (Table 1). During our surveys, we encountered several species which are generally associated with upland habitats. This further illustrates the importance of the Long Island Complex for birds. Included with this group was the Bell's Vireo (*Vireo bellii*), Wood Thrush (*Hylocichla mustelina*), Chestnut-sided Warbler (*Dendroica pensylvanica*), Kentucky Warbler (*Oporornis formosus*), Yellow-breasted Chat (*Icteria virens*), Eastern Towhee (*Pipilo erythrophthalmus*), and Chipping Sparrow (*Spizella passerina*) (Table 1).

During this analysis, we calculated the frequency of occurrence for each species. In other words, how often the species was encountered. This involved determining the total number and percentage of points at which a species was observed (Table 1). Throughout the 2003 breeding season, the 10 most frequently encountered species included: Indigo Bunting (94 points; 98%), Northern Cardinal (92 points; 96%), Great Crested Flycatcher (81 points; 84%), Red-bellied Woodpecker (80 points; 83%), Eastern Wood-Pewee (76 points; 79%), Common Grackle (68 points; 71%), Black-capped Chickadee (65 points; 68%), Brown-headed Cowbird (65 points; 68%), Red-eyed Vireo (64 points; 67%), and American Crow (64 points; 67%). Among these 10 species, 4 were RES, 2 were NAM, and 4 were NTM. In addition to these 10 species, 8 others were recorded on at least 50% of the points. Among these were the Chimney Swift (57%), Red-headed Woodpecker (66%), Pileated Woodpecker (56%), White-breasted Nuthatch (*Sitta carolinensis*) (53%), Carolina Wren (56%), Blue-gray Gnatcatcher (50%), American Robin (61%), and the American Redstart (52%).

Additionally, we examined the relative density which each species occurred in throughout the study area. This parameter was determined as the average number of individuals per point (Table 1). During the course of this project, the 10 species encountered in the greatest density included: Common Grackle (3.28 per point), Northern Cardinal (3.27 per point), Indigo Bunting (3.23 per point), Great Crested Flycatcher (2.92 per point), Red-bellied Woodpecker (2.46 per point), Eastern Wood-Pewee (2.30 per point), American Robin (2.03 per point), Black-capped Chickadee (1.76 per point), American Crow (1.74 per point), and Red-winged Blackbird (1.65 per point). These 10 species included 4 RES, 3 NAM, and 3 NTM. Overall, 11 other species had relative densities which exceeded 1.00 per point. These species included: Great Blue

Heron, Chimney Swift, Red-headed Woodpecker, Red-eyed Vireo, White-breasted Nuthatch, House Wren, Blue-gray Gnatcatcher, American Redstart, Prothonotary Warbler, Brown-headed Cowbird, and American Goldfinch (Table 1).

We also documented the distribution of each species throughout the Long Island Complex study area. Avian distributions within the early successional habitats (Table 2), as well as the more mature forested habitat (Table 3), are illustrated graphically by the species distribution maps in Appendix E. During the 2003 breeding season, the 11 most widely distributed species included: Northern Cardinal and Indigo Bunting (each recorded at all 48 locations), Red-bellied Woodpecker, Great Crested Flycatcher, and Common Grackle (all observed at 46 locations), Black-capped Chickadee (45 locations), Red-headed Woodpecker (44 locations), American Crow (42 locations), Chimney Swift, Eastern Wood-Pewee, and Brown-headed Cowbird (each identified at 41 locations). Of these 11 species, 4 were RES, 3 were NAM, and 4 were NTM. Additionally, 18 other species were distributed over 24 or more (i.e. at least half) of the sampling locations (Tables 2 and 3; Appendix E). Again, this suggests the importance of the study area to breeding birds. This group includes the Great Blue Heron, Yellow-billed Cuckoo, Downy Woodpecker, Hairy Woodpecker, Pileated Woodpecker, Yellow-throated Vireo (*Vireo flavifrons*), Red-eyed Vireo, Blue Jay (*Cyanocitta cristata*), Tufted Titmouse (*Baeolophus bicolor*), White-breasted Nuthatch, Carolina Wren, House Wren, Blue-gray Gnatcatcher, American Robin, American Redstart, Prothonotary Warbler, Baltimore Oriole (*Icterus galbula*), and the American Goldfinch. Overall, 15 species were only encountered in the early successional habitats (points 1-12), while 17 species were only recorded at forested locations (points 13-48) (Tables 2 and 3; Appendix E).

DISCUSSION

Although the floodplain forests of the Upper Mississippi River and its tributaries provide some of the largest contiguous tracts of forest habitat remaining in the Midwest Region (Grettenberger 1991), these forests are predominantly linear and highly fragmented by side channels, sloughs, and backwaters (Knutson et al. 1996). Nevertheless, these "naturally" fragmented forests appear to function as larger units of contiguous forest habitat, more so than upland forests which have been highly fragmented by human activity throughout the Midwest (i.e. residential, commercial, industrial, and agricultural development) (Blake and Karr 1987; Temple and Cary 1988; Droege and Sauer 1990; Freemark and Collins 1992; Faaborg et al. 1993; Robinson et al. 1995; Robinson 1996). Furthermore, Knutson et al. (1996) found that these linear and fragmented floodplain forests were not negatively impacted in terms of avian diversity and relative abundance.

The limited research conducted within these relatively large tracts of floodplain forest have demonstrated their importance to a diverse and abundant avian community (Emlen et al.

TABLE 2. Avian distribution at the 12 early successional points during the 2003 breeding season.

Point #	Total # Species	Species Present
1	27	MODO, YBCU, CHSW, RHWO, RBWO, DOWO, NOFL, YTVI, WAVI, BLJA, AMCR, TRSW, BCCH, HOWR, AMRO, GRCA, CEWA, YEWA, AMRE, COYE, NOCA, RBGR, INBU, RWBL, COGR, BAOR, AMGO
2	26	GBHE, WODU, RTHA, MODO, RHWO, RBWO, DOWO, GCFL, WAVI, REVI, BLJA, AMCR, BASW, BCCH, WOTH, AMRO, GRCA, CEWA, COYE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR
3	32	GBHE, TUVU, CHSW, RHWO, RBWO, PIWO, EWPE, GCFL, BEVI, WAVI, REVI, BLJA, AMCR, BCCH, CAWR, BGGN, AMRO, GRCA, BRTH, EUST, CEWA, NOPA, YEWA, COYE, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, AMGO
4	34	MODO, YBCU, BAOW, CHSW, RHWO, RBWO, DOWO, NOFL, PIWO, GCFL, YTVI, WAVI, REVI, BLJA, BASW, BCCH, TUTI, WBNU, CAWR, HOWR, WOTH, AMRO, GRCA, CEWA, YEWA, AMRE, COYE, EATO, NOCA, RBGR, INBU, RWBL, COGR, BAOR
5	30	GBHE, MODO, YBCU, CHSW, RHWO, RBWO, NOFL, PIWO, EWPE, GCFL, EAKI, WAVI, BLJA, AMCR, NRSW, BCCH, WOTH, AMRO, BRTH, EUST, CEWA, YEWA, COYE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR
6	33	GBHE, TUVU, CAGO, MODO, YBCU, CHSW, RHWO, RBWO, DOWO, NOFL, PIWO, EWPE, GCFL, WAVI, BLJA, AMCR, NRSW, TUTI, BGGN, WOTH, AMRO, GRCA, EUST, CEWA, YEWA, COYE, SOSP, NOCA, INBU, RWBL, COGR, BAOR, AMGO

TABLE 2. Continued.

Point #	Total # Species	Species Present
7	33	GBHE, GRHE, TUVU, CAGO, YBCU, RHWO, RBWO, DOWO, GCFL, YTVI, WAVI, BLJA, AMCR, BCCH, HOWR, WOTH, AMRO, GRCA, EUST, CEWA, YEWA, CSWA, COYE, YBCH, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
8	35	KILL, MODO, CHSW, RTHU, RHWO, DOWO, PIWO, ALFL, LEFL, EAPH, GCFL, YTVI, WAVI, BLJA, AMCR, BASW, BCCH, TUTI, WBNU, HOWR, WOTH, AMRO, GRCA, CEWA, YEWA, COYE, YBCH, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR
9	25	MODO, BAOW, CHSW, RHWO, RBWO, EWPE, GCFL, REVI, BLJA, AMCR, BCCH, WOTH, AMRO, GRCA, CEWA, YEWA, COYE, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, AMGO
10	37	GBHE, CHSW, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ALFL, GCFL, BLJA, AMCR, CLSW, BCCH, TUTI, CAWR, WOTH, AMRO, GRCA, EUST, CEWA, YEWA, AMRE, COYE, YBCH, EATO, CHSP, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
11	28	GBHE, MODO, YBCU, CHSW, RHWO, RBWO, DOWO, NOFL, PIWO, ALFL, GCFL, BLJA, AMCR, BCCH, WBNU, AMRO, GRCA, COYE, YBCH, CHSP, SOSP, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
12	31	GBHE, WODU, CHSW, RBWO, DOWO, HAWO, PIWO, ALFL, GCFL, WEVI, REVI, BLJA, AMCR, NRSW, BASW, BCCH, EABL, WOTH, AMRO, GRCA, BRTH, COYE, EATO, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BAOR, AMGO

TABLE 3. Avian distribution at the 36 forested points during the 2003 breeding season.

Point #	Total # Species	Species Present
13	28	GBHE, MODO, YBCU, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, WAVI, REVI, BLJA, AMCR, BCCH, WBNU, HOWR, BGGN, AMRO, NOPA, CRWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR
14	32	GBHE, WODU, MODO, YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, GCFL, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, WOTH, AMRO, CRWA, AMRE, PRWA, NOCA, INBU, RWBL, COGR
15	31	GBHE, MODO, YBCU, CHSW, BEKI, RHWO, RBWO, HAWO, NOFL, PIWO, EWPE, GCFL, WAVI, REVI, BCCH, WBNU, CAWR, HOWR, BGGN, AMRO, NOPA, YTWA, AMRE, PRWA, SOSP, NOCA, INBU, COGR, BHCO, BAOR, AMGO
16	27	GBHE, MODO, YBCU, GHOW, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, WAVI, REVI, AMCR, TRSW, BCCH, CAWR, HOWR, BGGN, AMRO, NOPA, AMRE, PRWA, NOCA, INBU, COGR, BHCO
17	32	GBHE, BNHE, WODU, MODO, YBCU, BAOW, CHSW, RHWO, RBWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, WBNU, CAWR, HOWR, AMRO, YTWA, AMRE, PRWA, COYE, NOCA, INBU, COGR, BHCO, BAOR
18	30	GBHE, WODU, MODO, BAOW, RHWO, RBWO, HAWO, NOFL, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, YEWA, YTWA, PRWA, SUTA, NOCA, INBU, COGR, BHCO, BAOR

TABLE 3. Continued.

Point #	Total # Species	Species Present
19	29	GBHE, WODU, MODO, YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, REVI, AMCR, TRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, PRWA, SOSP, NOCA, INBU, COGR, BHCO, BAOR
20	28	TUVU, MODO, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, YTVI, WAVI, REVI, AMCR, BCCH, TUTI, WBNU, CAWR, WOTH, AMRO, AMRE, NOCA, RBGR, INBU, COGR, BHCO, BAOR, AMGO
21	29	GBHE, BAOW, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, CAWR, HOWR, AMRO, AMRE, PRWA, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
22	29	GBHE, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, AMRO, YEWA, YTWA, CRWA, AMRE, SOSP, NOCA, INBU, COGR, BHCO, AMGO
23	32	GBHE, MODO, YBCU, GHOW, CHSW, RTHU, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, TRSW, BCCH, TUTI, WBNU, HOWR, AMRO, YTWA, AMRE, PRWA, NOCA, RBGR, INBU, COGR, BHCO, AMGO
24	27	YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, REVI, BLJA, AMCR, NRSW, BCCH, TUTI, WBNU, CAWR, WOTH, AMRE, PRWA, SOSP, NOCA, INBU, RWBL, COGR, BHCO, AMGO

TABLE 3. Continued.

Point #	Total # Species	Species Present
25	35	GBHE, WODU, MALL, BAOW, CHSW, RHWO, RBWO, DOWO, HAWO, EWPE, ALFL, LEFL, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, NRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, EUST, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
26	30	GBHE, WODU, COHA, YBCU, RTHU, RHWO, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, HOWR, BGGN, AMRO, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
27	34	GBHE, YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, REVI, AMCR, PUMA, TRSW, BCCH, TUTI, WBNU, BRCR, CAWR, HOWR, BGGN, AMRO, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
28	27	GBHE, YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, YTWA, PRWA, NOCA, INBU, COGR, BHCO
29	28	GBHE, WODU, YBCU, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, BRCR, CAWR, HOWR, BGGN, YTWA, PRWA, NOCA, INBU, COGR, AMGO
30	32	GBHE, WODU, YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, REVI, BLJA, TRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, CEWA, NOPA, YTWA, AMRE, PRWA, SOSP, NOCA, INBU, COGR, BHCO

TABLE 3. Continued.

Point #	Total # Species	Species Present
31	34	YBCU, BAOW, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, BLJA, AMCR, TRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, NOPA, YTWA, PRWA, SOSP, NOCA, INBU, COGR, BHCO, BAOR, AMGO
32	27	GBHE, WODU, RTHU, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, YTVI, REVI, AMCR, FICR, BCCH, TUTI, WBNU, CAWR, BGGN, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
33	34	GBHE, WODU, COHA, NOBO, YBCU, CHSW, RTHU, RHWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, AMCR, FICR, BCCH, TUTI, WBNU, BRCR, CAWR, BGGN, AMRO, CEWA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
34	34	TUVU, WITU, CHSW, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, WAVI, REVI, BLJA, BCCH, TUTI, WBNU, BRCR, CAWR, HOWR, BGGN, WOTH, AMRO, NOPA, CRWA, AMRE, KEWA, NOCA, INBU, RWBL, BHCO, BAOR, AMGO
35	25	CHSW, RTHU, RHWO, RBWO, HAWO, PIWO, EWPE, GCFL, YTVI, REVI, BCCH, TUTI, WBNU, CAWR, BGGN, AMRO, YTWA, CRWA, AMRE, PRWA, NOCA, INBU, BHCO, BAOR, AMGO
36	32	GBHE, YBCU, GHOW, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, EWPE, ACFL, GCFL, REVI, AMCR, TRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO

TABLE 3. Continued.

Point #	Total # Species	Species Present
37	26	GBHE, YBCU, BAOW, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, YTVI, REVI, TUTI, WBNU, CAWR, HOWR, BGGN, YTWA, CRWA, AMRE, PRWA, NOCA, INBU, COGR, BAOR, AMGO
38	24	RBWO, HAWO, PIWO, EWPE, ACFL, GCFL, REVI, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, WOTH, AMRO, NOPA, CRWA, AMRE, NOCA, INBU, COGR, BHCO, AMGO
39	29	GBHE, MODO, YBCU, CHSW, RTHU, RHWO, RBWO, NOFL, PIWO, EWPE, GCFL, YTVI, BLJA, AMCR, BCCH, WBNU, CAWR, HOWR, BGGN, AMRO, CRWA, AMRE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR
40	27	MODO, CHSW, RTHU, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, WAVI, REVI, AMCR, NRSW, BCCH, WBNU, CAWR, BGGN, AMRO, GRCA, AMRE, NOCA, INBU, COGR, BHCO, BAOR, AMGO
41	22	GBHE, YBCU, CHSW, RHWO, RBWO, HAWO, EWPE, GCFL, REVI, AMCR, BCCH, TUTI, WBNU, BGGN, AMRO, AMRE, NOCA, INBU, COGR, BHCO, BAOR, AMGO
42	25	WODU, RTHA, YBCU, CHSW, RBWO, EWPE, ACFL, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, WOTH, AMRO, CEWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO

TABLE 3. Continued.

Point #	Total # Species	Species Present
43	26	YBCU, CHSW, RTHU, RHWO, RBWO, NOFL, EWPE, ACFL, GCFL, YTVI, REVI, AMCR, BCCH, TUTI, WBNU, HOWR, BGGN, AMRO, CEWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
44	29	YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, TRSW, NRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRE, COYE, NOCA, INBU, RWBL, COGR, BHCO, AMGO
45	31	GBHE, YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, CEWA, NOPA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
46	31	GBHE, YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, REVI, AMCR, BCCH, TUTI, WBNU, CAWR, BGGN, WOTH, NOPA, YTWA, AMRE, PRWA, KEWA, NOCA, INBU, RWBL, COGR, BHCO, AMGO
47	34	GBHE, WODU, YBCU, BAOW, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, NOPA, YTWA, CRWA, PRWA, SCTA, NOCA, INBU, COGR, BHCO, AMGO
48	28	CHSW, RHWO, RBWO, DOWO, EWPE, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, TRSW, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRE, PRWA, SOSP, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO

1986; Grettenberger 1991; Mossman 1991; Birkenholz 1992; Schumacher 1993; Best et al. 1995; Knutson 1995; McKay et al. 1995; Knutson et al. 1996; Treiterer 1996; Robinson and McKay 2001). In fact, Best et al. (1995) and Knutson et al. (1996) found greater avian diversity and relative abundance in floodplain forests as compared to upland forests. The floodplain of the Upper Mississippi River provides forest, wetland, and aquatic habitats, but has very little scrub/shrub or grassland habitat (Bellrose 1976; Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Knutson et al. 1996). Nevertheless, the Upper Mississippi River floodplain supports an impressive avifaunal diversity during migrational seasons as well as the breeding season (Emlen et al. 1986; Grettenberger 1991; Mossman 1991; Schumacher 1993; Knutson 1995; McKay et al. 1995; Knutson and Klaas 1997; Robinson and McKay 2001).

Previous avian surveys at the Long Island Complex study area documented a diverse breeding season avian community. Birkenholz (1992) identified 76 species in 22 hours of sampling effort, while Treiterer (1996) recorded 55 and 60 species in 1994 and 1995, respectively. Treiterer (1996) logged in a minimum of 40 hours of observation effort each year. Birkenholz (1992) did not separate species by migratory class. Treiterer (1996) reported 38% RES, 23% NAM, and 39% NTM species. By comparison, during the 2003 breeding season, we recorded a total of 87 species in 16 hours of sampling effort. NAM and NTM species composed a larger proportion of the 2003 avian community (36% and 45%, respectively), while only 19% were RES. Typically, RES species are not of high management concern, whereas several NAM and NTM species are (Robbins et al. 1989; Askins et al. 1990; Finch 1991; Robinson et al. 1995; Sherry and Holmes 1995). Consequently, in fewer hours of observation effort, we recorded 11 species more than Birkenholz (1992) and 27-32 species more than Treiterer (1996). Additionally, a substantially larger portion of the 2003 avian community consisted of species of higher management concerns.

The early successional habitats in 2003 (i.e. points 1-12) were still in active agricultural production in 1992. As a result, the nearly 700 acres of old field and early successional floodplain forest habitat available in 2003 was almost completely cropland in 1992 (Birkenholz 1992). This increase in habitat diversity may explain the greater avifaunal diversity encountered in 2003 as compared to 1992. The field work for Treiterer (1996) was conducted in 1994 and 1995 immediately following the record flood of 1993. The habitat throughout the study area was considerably altered. Ground cover and most of the understory were gone, while canopy tree mortality ranged from 24% to 59% and averaged 39% throughout the study area (Treiterer 1996). Yin et al. (1994) indicated that major floods of prolonged duration cause large-scale disturbances which can substantially change vegetative characteristics within floodplain habitats. These dramatic habitat changes can alter avian communities (Hunter et al. 1987; Knutson and Klaas 1997). Various research has documented declines in avian diversity and abundance during and immediately following major flood events (DeSante and Geupel 1987; Hunter et al. 1987; Knopf and Sedgwick 1987; McKay et al. 1996; Knutson and Klaas 1997). Consequently, this may explain the substantially fewer number of species recorded by Treiterer (1996) as compared to 1992 and 2003.

Ground nesting and low shrub nesting species tend not to be abundant in floodplain systems, perhaps because of the frequent flooding threat (Birkenholz 1992; Knutson and Klaas 1997). Treiterer (1996) indicated that ground nesters such as the Wood Thrush and Kentucky Warbler were almost completely absent. However, once again, this may have been due to the loss of ground cover vegetation resulting from the 1993 flood. Robinson and McKay (2001) also found very few ground nesting species within the Milan Bottoms study area. However, during the 2003 project, various portions of the Long Island Complex study area had enough elevation to support substantial ground cover and understory vegetation. As a result, several species of ground and shrub nesters, more typically associated with upland habitats, were encountered in 2003.

During our project, a fairly large number of expected species were not observed. The objectives of this project emphasized documenting the breeding bird community within the forest and early successional habitats. As a consequence, our surveys were biased against the more aquatic species. In fact, most of these species were only observed during interpoints. This may be the reason why species like the Great Egret, Yellow-crowned Night-Heron, and Bank Swallow were not recorded. The Rock Dove and House Sparrow, although extremely abundant throughout the Midwest, tend to avoid floodplain habitats. The Eurasian Tree Sparrow appears to prefer the floodplain periphery, while the Black-billed Cuckoo and Field Sparrow are more abundant in upland habitats. The Long Island Complex study area is at the extreme edge of the breeding range for both the Mississippi Kite and Black-and-white Warbler (National Geographic Society 2002). Therefore, it is not surprising that these species are present in some years and not in others. In contrast, we certainly expected to document the Red-shouldered Hawk and Willow Flycatcher and can offer no definite explanation for why they were missed, other than random chance. However, the habitat may not be quite right for the Willow Flycatcher since neither Birkenholz (1992) nor Treiterer (1996) identified this species. Additionally, the Red-shouldered Hawk does not appear to be perennially present at this site. Birkenholz (1992) also failed to record this species, while Treiterer (1996) only identified it in 1995. This species was encountered within the study area in 2002 (Jon Stravers, pers. comm.).

This, along with other avian survey projects, have demonstrated the diversity of the breeding season avian community within the floodplain of the Upper Mississippi River (Emlen et al. 1986; Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Knutson et al. 1996; Treiterer 1996; Knutson and Klaas 1997; Robinson and McKay 2001). However, in addition to being diverse, this community also possesses an abundance of birds. We recorded an average of approximately 54 individuals during each 10-minute sample. Given that most detections are made during the first 5 minutes (Lynch 1995; Petit et al. 1995), our results were similar to McKay et al. (1995) which recorded nearly 45 individuals during each 5-minute sample. Overall, “higher priority” NAM and NTM species accounted for 72% of the total individuals identified (28% and 44%, respectively). This differed from McKay et al. (1995) which recorded approximately 91% NAM and NTM birds (56% and 35%, respectively). The large increase in the proportion of NAM observed by McKay et al. (1995) was partially due to the fact that many points were located at forest – backwater edges, which resulted in more waterfowl and large numbers of Tree Swallows (*Tachycineta bicolor*) being recorded (i.e. NAM species). Furthermore, this project occurred immediately following the 1993 flood which resulted in a more open-canopied forest. This permitted groups of more “edge-oriented” NAM birds to be more visible (i.e. American Robin, Song Sparrow, Red-winged Blackbird, and Common Grackle). McKay et al. (1995) and Knutson and Klaas (1997) documented substantial declines in the numbers of RES following a major flood event.

The 2003 Long Island Avian Survey concentrated on sampling primarily the forest and early successional habitats. However, a considerable portion of the forest within the study area experienced substantial tree mortality as a result of the 1993 flood (Yin et al. 1994). As a consequence, much of the forest had large canopy openings and extensively dense secondary growth and ground cover in 2003 (Appendices B and C). Therefore, in essence, a relatively large amount of the mature closed-canopied forest throughout this study area had been "naturally fragmented." The same situation had occurred on other studies following 1993 (McKay et al. 1995; Treiterer 1996; Robinson and McKay 2001). The canopy openings which created these "fragments," by 2003, now had a secondary canopy of successional growth well established, along with a dense ground cover (Appendices B and C). This situation resulted in a greater diversity of successional habitats, which may account for a certain portion of the diversity and abundance of the avian communities both at Long Island during this project and at Milan Bottoms (Robinson and McKay 2001).

However, this increased avian diversity and relative abundance may have some potentially negative impacts. Of the 10 most abundant species, as well as those with the highest relative densities in 2003, 8 were considered to be habitat generalist and/or habitat edge species. These included the Common Grackle, Northern Cardinal, Indigo Bunting, Red-bellied Woodpecker, American Robin, Black-capped Chickadee, American Crow, and Red-winged Blackbird (Table 1). Likewise, the most frequently encountered species were largely habitat generalists and/or edge species. Similar results were found at other study sites within the Upper Mississippi River floodplain (McKay et al. 1995; Robinson and McKay 2001). The concern is that greater abundance and density of generalist and edge species may be indicative of lower numbers of habitat specialist and forest interior species within these floodplain forest systems (Robinson et al. 1995; Robinson 1996; Robinson and McKay 2001).

Nevertheless, during this project, several area-sensitive species and species of higher management concern were found to occur in relatively abundant numbers. For example, 14 Cerulean Warblers (among the highest priority NTM species) were recorded at 13% of the points, along with 3 others at interpoints (Table 1). Three NTM species of high management concern (i.e. Yellow-billed Cuckoo, Acadian Flycatcher, and Prothonotary Warbler) were encountered in relatively large numbers and frequencies: 66 birds (42% of points), 38 birds (27% of points), and 122 birds (49% of points), respectively (Table 1). The area-sensitive Pileated Woodpecker was also relatively abundant (91 birds at 56% of the points) (Table 1). The Red-headed Woodpecker population has been in serious decline across its range (Price et al. 1995). However, within this study area, 142 were recorded at 66% of the points (Table 1). The robust populations of these species, encountered within the study area, demonstrate the importance of the Long Island Complex to breeding season avian communities. Furthermore, the presence of relatively large amounts of both mature forest and early successional habitats function to support this diverse community. For instance, 15 species (17% of the total community) were found only at early successional points (Tables 2 and 3; Appendix E). Among this group was the Green Heron (*Butorides virescens*), Canada Goose (*Branta canadensis*), Killdeer (*Charadrius vociferus*), Eastern Phoebe (*Sayornis phoebe*), Eastern Kingbird (*Tyrannus tyrannus*), White-eyed Vireo (*Vireo griseus*), Bell's Vireo, Cliff Swallow (*Petrochelidon pyrrhonota*), Barn Swallow (*Hirundo rustica*), Eastern Bluebird (*Sialia sialis*), Brown Thrasher (*Toxostoma rufum*), Chestnut-sided Warbler, Yellow-breasted Chat, Eastern Towhee, and Chipping Sparrow. Similarly, 17 species (20% of the total community) were only encountered at forested points (Tables 2 and 3; Appendix E). The species within this group included: Black-crowned Night-Heron (*Nycticorax nycticorax*), Mallard (*Anas platyrhynchos*), Cooper's Hawk (*Accipiter cooperii*), Wild Turkey (*Meleagris gallopavo*), Northern Bobwhite (*Colinus virginianus*), Great

Horned Owl (*Bubo virginianus*), Belted Kingfisher (*Ceryle alcyon*), Acadian Flycatcher, Fish Crow (*Corvus ossifragus*), Purple Martin (*Progne subis*), Brown Creeper, Yellow-throated Warbler (*Dendroica dominica*), Cerulean Warbler, Prothonotary Warbler, Kentucky Warbler, Summer Tanager (*Piranga rubra*), and Scarlet Tanager (*Piranga olivacea*).

Additionally, the brood parasitic Brown-headed Cowbird, which flourishes in fragmented forest and grassland habitats, was also extremely abundant (146 individuals) and occurred in a relatively high density (1.52 per point). This species was also one of the 10 most frequently encountered during the project (68% of all points). Additionally, this was one of the most widely distributed species (41 of 48 locations). Brown-headed Cowbirds were much more abundant and widespread at the Long Island Complex than at Milan Bottoms (Robinson and McKay 2001), which may be too wet for them. The "fragmented" forest, including the old field and early successional forest acreage, along with the higher elevation at Long Island appears to be benefitting cowbirds. The impact of cowbirds on the reproductive success of many avian species, especially NTM, has been well documented (Brittingham and Temple 1983; Temple and Cary 1988; Robinson et al. 1995; Robinson 1996).

During this project, we encountered an impressively diverse NTM community. A total of 39 species (45% of the total avifauna) were composed of NTM. Thompson et al. (1993) classified all Midwestern NTM according to management concern for the population. In this classification system, a species with a mean score ≥ 4.00 is of highest management concern (Level 4), those from 3.00 to 3.99 are of high concern (Level 3), 2.00 to 2.99 are of intermediate concern (Level 2), while species with a score below 2.00 are of low management concern (Level 1) (Thompson et al. 1993). The Cerulean Warbler was the only "highest management concern" species recorded within the study area (Table 4). However, this represents 25% of all Level 4 species (Thompson et al. 1993). Additionally, the Cerulean Warbler was relatively abundant (Table 4). Certainly, more were recorded in 2003 than in previous studies (Birkenholz 1992; Treiterer 1996). Seventeen species of "high management concern" were documented in 2003 (Table 4). This represents 32% of all Level 3 species (Thompson et al. 1993). Several of these species ranged from fairly to extremely abundant (Table 4), especially the Eastern Wood-Pewee, Great Crested Flycatcher, and Prothonotary Warbler. Eighteen "intermediate management concern" species were observed (Table 4). This accounts for 36% of all Level 2 species (Thompson et al. 1993). Once again, many of these species were abundant throughout the study area (Table 4). Species of noteworthy abundance included the Chimney Swift, Red-eyed Vireo, Blue-gray Gnatcatcher, American Redstart, and Indigo Bunting (Table 4). All 3 species of "low management concern" (100% of Level 1 species) were identified in 2003 (Table 4). Of these, the House Wren was very abundant, the Yellow Warbler (*Dendroica petechia*) was somewhat abundant, and the Chipping Sparrow was scarce (Table 4). Once again, the abundance of the NTM community further demonstrates the overall importance of the Long Island Complex to breeding avian populations.

In conclusion, this project has certainly documented the importance of this particular site to an abundant breeding avian community. Furthermore, we believe it also provides evidence suggesting the importance of the Upper Mississippi River floodplain to a richly diverse and abundant Midwestern avifauna.

TABLE 4. Status and relative abundance of the Neotropical Migrant community present at the Long Island Complex during the 2003 breeding season.

Species*	Status**	# Ind. Pts.	# Ind. Interpts.	# Ind. Total
CRWA	4.29	14	3	17
WOTH	3.57	33	4	37
CSWA	3.57	1	0	1
PRWA	3.57	122	18	140
ACFL	3.43	38	18	56
BEVI	3.43	4	0	4
YBCU	3.29	66	12	78
EWPE	3.29	221	4	225
GCFL	3.29	280	12	292
OSFL	3.14	0	1	1
WEVI	3.14	1	1	2
KEWA	3.14	2	0	2
RBGR	3.14	28	2	30
YTVI	3.00	61	6	67
PUMA	3.00	1	0	1
YBCH	3.00	7	5	12
SUTA	3.00	1	0	1
SCTA	3.00	1	0	1
CHSW	2.86	143	0	143
ALFL	2.86	7	0	7
GRCA	2.86	46	3	49
YTWA	2.86	31	10	41
AMRE	2.86	125	8	133
INBU	2.86	310	0	310
BAOR	2.86	83	2	85
LEFL	2.71	2	0	2
RTHU	2.57	23	0	23
WAVI	2.57	83	6	89
NOPA	2.57	31	21	52
EAKI	2.43	1	2	3
BGGN	2.43	110	7	117
CLSW	2.29	1	0	1
COYE	2.29	65	1	66
REVI	2.14	145	7	152
NRSW	2.14	10	9	19

TABLE 4. Continued.

Species*	Status**	# Ind. Pts.	# Ind. Interpts.	# Ind. Total
BASW	2.14	7	0	7
CHSP	1.86	3	0	3
HOWR	1.57	111	5	116
YEWA	1.57	32	0	32

* Species listed in order of management concern (Thompson et al. 1993). Multiple species with identical scores are placed in taxonomic order (American Ornithologists' Union 1998; Illinois Ornithological Records Committee 1999).

** Mean score of management concern (Thompson et al. 1993).

RECOMMENDATIONS

Habitat Management

Much of the forested habitat within the Long Island Complex study area consists of "fragments" or "patches" of mature bottomland forest interspersed with areas of younger forest and dense herbaceous growth. This earlier successional growth is found within the forest canopy openings and stands of dead trees resulting from the 1993 flood (Yin et al. 1994). This forest regeneration has created a more diverse habitat. As a consequence, avian diversity is also relatively high. However, this has resulted in relatively abundant populations of habitat generalist and habitat edge species, including nest predators like the American Crow and Common Grackle, and brood parasites like the Brown-headed Cowbird.

Therefore, we recommend "passive" management of the forest habitat, by allowing forest regeneration to continue. In areas where regeneration is not occurring, we suggest planting trees in order to re-establish as much contiguous forest habitat as possible. We believe the best management option within the forested areas is to eventually have a closed-canopied mature forest, which is periodically inundated and altered by flood events. Although this will reduce habitat heterogeneity, and most likely avian diversity, it will provide a relatively large tract of forest for habitat interior and area-sensitive species (Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Treiterer 1996; Robinson and McKay 2001). This management option will benefit a multitude of high priority species such as the Red-shouldered Hawk, Pileated Woodpecker, Eastern Wood-Pewee, Acadian Flycatcher, Great Crested Flycatcher, Yellow-throated Vireo, Brown Creeper, Veery (*Catharus fuscescens*), Wood Thrush, Northern Parula, Cerulean Warbler, Black-and-white Warbler, American Redstart, Prothonotary Warbler, Ovenbird (*Seiurus aurocapillus*), Kentucky Warbler, Scarlet Tanager, and Rose-breasted Grosbeak (Robbins et al. 1989; Grettenberger 1991; Robinson et al. 1995; Knutson et al. 1996; Robinson and McKay 2001).

The approximately 700 acres of prior cropland, which now consists of old field and early successional forest, provides valuable habitat for several high priority scrub/shrub species such as the Black-billed Cuckoo, Willow Flycatcher, White-eyed Vireo, Bell's Vireo, Chestnut-sided Warbler, Prairie Warbler (*Dendroica discolor*), and Yellow-breasted Chat. Maintaining this acreage in earlier stages of ecological succession will require intensive management (McKay et al. 1995). Additionally, this management option may contribute to the overall fragmentation of the forest habitat at this site (Birkenholz 1992).

Therefore, we recommend allowing this acreage to continue to undergo ecological succession. Eventually, it will contribute an additional 700 acres of forested habitat. According to Birkenholz (1992), the old cropland has some of the highest elevation within the study area. Consequently, forest habitat here may take on some upland characteristics. If so, this would provide critical habitat for several species which prefer drier conditions (i.e. Veery, Wood Thrush, Ovenbird, Kentucky Warbler, and Scarlet Tanager). Also, a tree planting effort could be used to establish some greater forest diversity in these slightly higher and drier areas (i.e. oaks, hickorys, pecans, walnuts, and sycamores). In conclusion, we recommend that no timber harvesting be conducted within this study area, since this would fragment an otherwise relatively large forest tract.

Future Research

Given the size of this fairly contiguous floodplain forest tract, we recommend establishing a permanent long-term avian monitoring project here. This would provide an ideal study site for examining and monitoring long-term floodplain forest avian communities. Additionally, as this "fragmented" forest regenerates into a closed-canopied forest, researchers will be able to document the dynamic changes within the avian community. Furthermore, we suggest that future avian research within the Long Island Complex should include migration periods as well as the winter season. Little information is available regarding the importance of the Upper Mississippi River floodplain to avian populations during migrational and wintering seasons (McKay et al. 1995; McKay et al. 1999). Eventually, it will be important to monitor the reproductive success of species breeding within these floodplain habitats (Treiterer 1996; Robinson and McKay 2001).

During future avian surveys, we recommend using a fixed-radius point count method incorporating multiple distance bands. This methodology permits species – habitat relationships to be assessed (Cyr et al. 1995). Additionally, researchers can estimate actual densities, instead of relative densities, for each species over the entire study area and within each habitat type (Bibby et al. 1992; Ralph et al. 1993; Petit et al. 1995). The only disadvantage of fixed-radius point counts is that they are more labor intensive to conduct and analyze (Bibby et al. 1992).

INDIVIDUAL SPECIES ACCOUNTS

Double-crested Cormorant (DCCO) - A single individual was detected at the interpoint between survey Points 35 and 36. This species was not observed at any point location. This NAM species is a potential breeder within the study area.

Great Blue Heron (GBHE) - During this project, we identified 138 individuals at points and another 70 at interpoint locations. The GBHE was recorded at 40 total points (42%). Overall, this bird was distributed over most of the study area (33 of the sampling locations). The relative density for this species was 1.44 per point. A fairly large rookery was present within the study area. Therefore, this NAM species is a confirmed breeder.

Green Heron (GRHE) - A single individual was recorded at 1 point (1%). The only location that this bird was encountered at was the early successional Point 7. Consequently, the relative density was only 0.01 per point. The GRHE (NAM) is a possible breeder within the study area.

Black-crowned Night-Heron (BNHE) - One bird was recorded at a single point (1%), along with 1 individual at an interpoint. The only sampling location that this species was detected at was Point 17 (forested). The relative density was only 0.01 per point. The BNHE (NAM) is a potential breeder at this site.

Turkey Vulture (TUVU) - We identified 8 birds at points and 10 at interpoints. This species was recorded at 5 total points (5%), and was distributed over a limited portion of the complex (5 survey locations). The relative density of the TUVU was 0.08 per point. However, an active nest was discovered, which confirms this NAM species as a breeder.

Canada Goose (CAGO) - Three birds were detected at points and 19 were recorded at interpoints. The CAGO occurred at 3 total points (3%), which included only 2 early successional locations (Points 6 and 7). This produced a relative density of only 0.03 per point. This species is a NAM, which is certainly a possible breeder within the study area.

Wood Duck (WODU) - During the course of this project, 46 WODU were tallied at points and 121 were counted at interpoints. This species was present at 18 total points (19%), which were distributed over 14 locations. The relative density for the WODU was 0.48 per point. Several broods of young for this NAM species were encountered. Therefore, this confirms breeding by the WODU.

Mallard (MALL) - Two birds were recorded at a single point (1%), which was located in forested habitat (Point 25). This resulted in a relative density of 0.02 per point. The MALL (NAM) is definitely a potential breeding species.

Hooded Merganser (HOME) - Three individuals were encountered at 2 interpoint locations, between Points 5 and 6 as well as 13 and 26. The HOME was not observed at any point locations. This species (NAM) is a possible breeder within the study area.

Cooper's Hawk (COHA) - A total of 3 birds were identified at 2 points (2%), which were both located in forest habitat (Points 26 and 33). This produced a relative density of 0.03 per point. The COHA is a NAM which potentially breeds at this location.

Red-tailed Hawk (RTHA) - Overall, 4 birds were recorded at 3 total points (3%), along with 1 at an interpoint. The relative density for this raptor was 0.04 per point. This species had a very limited distribution, occurring at only 2 point locations (Points 2 and 42). The RTHA, which is a NAM, is a possible breeding species. Although very adaptable, the RTHA tends to prefer upland habitats.

Wild Turkey (WITU) - A single individual was recorded at 1 point (1%), and 1 was observed at an interpoint. This bird was only observed at a single forested point (Point 34). The relative density of the WITU was 0.01 per point. This species is a RES. Although very scarce within the study area, an active WITU nest was observed. Therefore, this species was a confirmed breeder within the study area.

Northern Bobwhite (NOBO) - One bird was recorded at a single point (1%), and 1 was encountered at an interpoint location. The relative density was therefore 0.01 per point. This species occurred at only 1 forested sampling location (Point 33). The NOBO is a RES, and a possible breeder within the study area. However, this species is much more common in upland habitats.

American Coot (AMCO) - One individual was detected at the interpoint between survey Points 40 and 41. The AMCO was not identified at any survey point locations. This is a NAM species, which is a possible breeder within the study area.

Killdeer (KILL) - We identified 1 individual at a single point (1%), and 13 birds at interpoints. Point 8, an early successional location, was the only survey point where this species was observed. The relative density was only 0.01 per point. This shorebird is a NAM, and a potential breeding species.

American Woodcock (AMWO) - We identified only 1 bird at the interpoint between Points 2 and 3. This species was not encountered at any survey locations. The AMWO is a NAM which could possibly breed within the study area.

Mourning Dove (MODO) - A total of 36 individuals were tallied at 20 overall points (21%). This species had a relative density of 0.38 per point. The MODO was distributed across 19 separate points. This NAM species is a possible breeder at this location. However, MODO tend to prefer more open and upland habitats.

Yellow-billed Cuckoo (YBCU) - During this project, 66 birds were recorded at points and 12 were tallied at interpoints. Overall, this species was detected at 40 total points (42%). The relative density was therefore 0.69 per point. The YBCU was fairly widely distributed over 31 of the sampling points. This species is certainly a potential breeder. The YBCU is a NTM species of high management concern (3.29 mean score according to Thompson et al. 1993).

Great Horned Owl (GHOW) - We observed 4 birds at 3 total points (3%). This resulted in a relative density of 0.04 per point. This species was detected at only 3 individual forest points (Points 16, 23, and 36). This RES raptor is definitely a potential breeding species.

Barred Owl (BAOW) - A total of 13 birds were recorded at 10 overall points (10%), along with 3 individuals at interpoints. The BAOW was distributed over 9 sampling locations. The relative density for this species was 0.14 per point. The BAOW is a RES, and definitely a possible breeder.

Chimney Swift (CHSW) - We encountered 143 individuals at 55 total points (57%). This produced a relative density of 1.49 per point. This species was distributed over most of the study area (41 survey points). This is certainly a potential breeding species. The CHSW is a NTM species of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

Ruby-throated Hummingbird (RTHU) - During the course of this project, 23 birds were observed at 21 total points (22%). This species was distributed over 17 individual survey points, of which all but one were in forest habitat. The relative density was 0.24 per point. The RTHU is a possible breeding species. This NTM species is of intermediate management concern (2.57 mean score based on Thompson et al. 1993).

Belted Kingfisher (BEKI) - A single bird was recorded at 1 point (1%). This point was in forest habitat (Point 15). Also, 1 individual was encountered at an interpoint. As a consequence, the relative density was 0.01 per point. This species is a NAM and a possible breeder.

Red-headed Woodpecker (RHWO) - We identified 142 birds at points and another 3 at interpoints. This species was reported at 63 total points (66%), and was distributed over virtually the entire study area (44 survey points). The relative density for this species was 1.48 per point. The RHWO is a NAM species. At least 1 active nest was observed, which therefore confirmed this species as a breeder.

Red-bellied Woodpecker (RBWO) - During our surveys, 236 RBWO were identified at 80 total points (83%). Consequently, this was one of the most abundant and frequently encountered species during the project. The relative density was an impressive 2.46 per point. This species was distributed throughout nearly every point (46 sampling locations). The RBWO is a RES species. At least 1 active nest was located, thereby confirming this as a breeding species.

Downy Woodpecker (DOWO) - A total of 73 individuals occurred at points, along with 3 others at interpoints. Overall, the DOWO was recorded at 47 total points (49%). This species was widely distributed throughout the study area (35 survey points). The relative density was 0.76 per point. This is a RES species. We observed at least 1 active nest, which confirms breeding by the DOWO.

Hairy Woodpecker (HAWO) - We observed 39 birds at 29 total points (30%). Additionally, 2 individuals were encountered at interpoints. This species was distributed over half of the sampling locations (24 points), of which all but two were in the forested habitat. The relative density of this bird was 0.41 per point. The HAWO is a RES, and certainly a potential breeding species.

Northern Flicker (NOFL) - Overall, 20 individuals were tallied at 16 points (17%), and 2 others were found within interpoints. This resulted in a relative density of 0.21 per point. The NOFL was distributed among 16 of the survey locations. This is a NAM species, which could possibly breed within the study area.

Pileated Woodpecker (PIWO) - During this project, 91 birds were recorded at 54 total points (56%). Furthermore, 10 others were observed at interpoints. This species was found to occur over much of the study area (38 sampling points). The observed relative density was 0.95 per point. The PIWO is a RES, and a likely potential breeding species.

Olive-sided Flycatcher (OSFL) - One individual was detected at the interpoint between Points 3 and 4. This species was not observed at any points. This study area does not occur within the breeding range of the OSFL. Therefore, this bird is a migrant only and not considered a possible breeder. The OSFL is a NTM species of high management concern (3.14 mean score as indicated by Thompson et al. 1993).

Eastern Wood-Pewee (EWPE) - As a result of this project, we recorded 221 EWPE at 76 total points (79%). Consequently, this species was one of the most abundant and frequently encountered. Additionally, 4 birds were recorded at interpoints. The relative density was a fairly remarkable 2.30 per point. This species occurred over most of the study area (41 survey locations). We observed at least 1 active nest, which confirms this species as a breeder. The EWPE is a NTM of high management concern (3.29 mean score according to Thompson et al. 1993).

Acadian Flycatcher (ACFL) - We encountered 38 birds at points and another 18 at interpoints. This species was recorded at 26 total points (27%), all of which were in forest habitat. The resulting relative density was 0.40 per point. This bird was distributed over 16 separate sampling locations. The ACFL is a possible breeding species. This species is a NTM of high management concern (3.43 mean score as determined by Thompson et al. 1993).

Alder Flycatcher (ALFL) - During our surveys, 7 individuals were identified at 5 total points (5%). Therefore, the relative density was 0.07 per point. The ALFL was distributed among 5 survey points, of which all but one were located in early successional habitats. This study area does not occur within the breeding range of the ALFL. As a result, this species was only a migrant and not considered to be a potential breeder. The ALFL is a NTM species of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Least Flycatcher (LEFL) - Two individuals were observed at 2 total points (2%). The relative density was 0.02 per point. The distribution of this bird was restricted to 2 locations (Points 8 and 25). The study area occurs just outside of the breeding range for this species. Therefore, this is also considered a migrant only, and not a potential breeding species. The LEFL is a NTM of intermediate management concern (2.71 mean score according to Thompson et al. 1993).

Eastern Phoebe (EAPH) - We identified 2 individuals at a single point (1%), which was located in early successional habitat (Point 8). The relative density for this species was 0.02 per point. This NAM species is certainly considered a possible breeder.

Great Crested Flycatcher (GCFL) - A total of 280 birds were observed at points, along with 12 at interpoints. This species was detected at 81 total points (84%). Consequently, this was one of the most abundant and frequently encountered species throughout the project. This bird had a substantially large relative density of 2.92 per point. The GCFL occurred at nearly every sampling location (46 sites). This species is a possible breeder within the study area. The GCFL is a high management concern NTM (3.29 mean score as determined by Thompson et al. 1993).

Eastern Kingbird (EAKI) - Overall, we identified 1 bird at a single point (1%), along with 2 at interpoints. The only point that this species occurred at was in early successional habitat (Point 5). The relative density was 0.01 per point. This species is a potential breeder within the study area. The EAKI is a NTM of intermediate management concern (2.43 mean score according to Thompson et al. 1993).

White-eyed Vireo (WEVI) - One bird was observed at a single point (1%), which was in early successional habitat (Point 12). A single bird was also encountered at an interpoint. The resulting relative density was 0.01 per point. This species potentially breeds within the study area. This NTM species is of high management concern (3.14 mean score as indicated by Thompson et al. 1993).

Bell's Vireo (BEVI) - Four individuals were recorded at 2 points (2%). This species was only detected at the early successional Point 3. The relative density for this bird was 0.04 per point. This species is a possible breeder. The BEVI is a NTM and a species of high management concern (3.43 mean score according to Thompson et al. 1993).

Yellow-throated Vireo (YTVI) - Overall, 61 birds were tallied at 38 total points (40%). Additionally, 6 were recorded at interpoints. The relative density of this species was 0.64 per point. This species was fairly widely distributed over 26 survey locations. The YTVI potentially breeds within the study area, and is a NTM of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Warbling Vireo (WAVI) - We identified 83 WAVI at points, and 6 at interpoints. This species was recorded at 36 total points (38%). As a result, the relative density was 0.86 per point. The WAVI was distributed among 21 individual sampling locations. This is a possible breeding species. This NTM is a species of intermediate management concern (2.57 mean score as indicated by Thompson et al. 1993).

Red-eyed Vireo (REVI) - During the course of this project, 145 birds were recorded at points, along with 7 at interpoints. This species was encountered at 64 total points (67%), making it one of the most frequently identified. Overall, the relative density was 1.51 per point. This species occurred over most of the study area (39 locations). The REVI is a NTM species which possibly breeds within the study area. This is a species of intermediate management concern (2.14 mean score according to Thompson et al. 1993).

Blue Jay (BLJA) - A total of 75 birds were identified at 41 total points (43%). Also, 6 BLJA were encountered at interpoints. This species was fairly widely distributed, occurring at 32 survey points. The relative density for this species was 0.78 per point. The BLJA is a RES species, which is definitely a possible breeder at this site.

American Crow (AMCR) - We identified 167 AMCR at 64 total points (67%), making this one of the most abundant and frequently encountered species. This also produced a notable relative density of 1.74 per point. This species occurred at a large proportion of the survey points (42 locations). The AMCR (RES) is certainly a possible breeder.

Fish Crow (FICR) - We recorded 2 birds at points, and 3 at interpoints. This bird was observed at 2 total points (2%), both of which were in forest habitat (Points 32 and 33). The relative density was 0.02 per point. This RES species could possibly breed within the study area.

Purple Martin (PUMA) - We recorded 1 bird at a single point (1%), which occurred at the forested Point 27. This yielded a relative density of 0.01 per point. This species is a potentially breeding NTM. The PUMA is a species of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Tree Swallow (TRSW) - During this project, 16 TRSW were recorded at 10 total points (10%). Only 1 bird was observed at an interpoint. The relative density was 0.17 per point. This bird occurred at 10 of the survey points, of which all but one were in forested habitat. This NAM species is definitely a possible breeder.

Northern Rough-winged Swallow (NRSW) - A total of 10 birds were identified at 8 points (8%), along with 9 individuals at interpoints. This resulted in a relative density of 0.10 per point. The distribution of this species was limited, as it occurred at only 7 sampling locations. This species possibly breeds within the study area. The NRSW is a NTM species of intermediate management concern (2.14 mean score as indicated by Thompson et al. 1993).

Cliff Swallow (CLSW) - A single individual of this species was detected at 1 point (1%), which was located in early successional habitat (Point 10). Consequently, the relative density was 0.01 per point. This NTM species is a potential breeder. This is a species of intermediate management concern (2.29 mean score according to Thompson et al. 1993).

Barn Swallow (BASW) - Overall, 7 individuals were recorded at 4 total points (4%). This resulted in a relative density of 0.07 per point. The BASW occurred at 4 individual sampling points which were all located in early successional habitat (Points 2, 4, 8, and 12). Within the study area, this species is a possible breeder. This is a NTM of intermediate management concern (2.14 mean score as determined by Thompson et al. 1993).

Black-capped Chickadee (BCCH) - During this project, 169 birds were encountered at 65 total points (68%). Consequently, the BCCH was one of the most abundant and frequently encountered birds throughout this study. Four birds were recorded at interpoints. This created a notable relative density of 1.76 per point. This species was distributed over virtually the entire study area (45 survey locations). The BCCH is a RES species, which is certainly a possible breeder.

Tufted Titmouse (TUTI) - We tallied 73 TUTI at points, and a single bird at an interpoint. This bird was observed at 44 total points (46%). The relative density for this species was 0.76 per point. Although not a tremendously abundant species, the TUTI was widely distributed among 34 survey points. This RES is a potential breeder.

White-breasted Nuthatch (WBNU) - We recorded 98 individuals at 51 total points (53%). This resulted in a relative density of 1.02 per point. This species was also widely distributed throughout the study area (37 sampling locations). The WBNU is a RES species, which is definitely a possible breeder.

Brown Creeper (BRCR) - A total of 6 BRCR were observed at 4 overall points (4%), which were all located in forest habitat (Points 27, 29, 33, and 34). The relative density for this species was 0.06 per point. The BRCR is a NAM which may possibly breed within the study area.

Carolina Wren (CAWR) - Overall, 83 birds were detected at points and 5 were recorded at interpoints. This species occurred at 54 total points (56%). As a result, the relative density was 0.86 per point. The CAWR was widely distributed throughout the study area, occurring at 34 of the survey points. This species is a RES, and a possible breeding species.

House Wren (HOWR) - During this project, 111 individuals were tallied at points, along with 5 others at interpoints. The HOWR was identified at 45 overall points (47%). The relative density for this bird was 1.16 per point. This species experienced a substantial distribution, occurring at 31 sampling locations. This is definitely a likely breeding species. The HOWR (NTM) is a species of low management concern (1.57 mean score as indicated by Thompson et al. 1993).

Blue-gray Gnatcatcher (BGGN) - We encountered 110 birds at 48 total points (50%), along with an additional 7 at interpoints. This resulted in a substantial relative density of 1.15 per point. This species was distributed over much of the study area (31 survey points). Of these, all but two locations were in forest habitat. This species is certainly considered a possible breeder. The BGGN is a NTM of intermediate management concern (2.43 mean score according to Thompson et al. 1993).

Eastern Bluebird (EABL) - Only 1 individual was observed at a single point (1%), which was located in early successional habitat (Point 12). Consequently, the relative density was 0.01 per point. This species, which is more common in relatively open upland habitats, is a NAM which could potentially breed within the study area.

Wood Thrush (WOTH) - Overall, 33 birds were identified at points, and 4 others were encountered at interpoints. In total, the WOTH was reported at 19 points (20%). Therefore, the relative density that this species occurred in was 0.34 per point. Although typically considered to be much more of an upland forest species, the WOTH was distributed throughout 16 sampling points. This is a possible breeding species. The WOTH is a NTM of high management concern (3.57 mean score as determined by Thompson et al. 1993).

American Robin (AMRO) - We recorded 195 birds at 59 total points (61%), making this one of the most abundant species encountered during the course of this survey. This species exhibited a high relative density of 2.03 per point, and was distributed throughout much of the study area (37 survey locations). The AMRO (NAM) is definitely a potential breeding species at this site.

Gray Catbird (GRCA) - During this study, 46 individuals were encountered at 19 total points (20%). Three birds were also reported at interpoints. The relative density was 0.48 per point. The GRCA was reported from 12 sampling locations, of which all but one were in the early successional habitat. This species is a possible breeder, although it is much more common in upland habitats. This NTM is of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Brown Thrasher (BRTH) - Four birds were observed at 3 total points (3%), along with a single individual at an interpoint. This species only occurred at 3 early successional locations (Points 3, 5, and 12). The relative density was 0.04 per point. This NAM could potentially breed within the study area, but it is far more common in upland shrub habitat.

European Starling (EUST) - We recorded 31 birds at points and 9 at interpoints. This species was only encountered at 7 total points (7%). The resulting relative density was 0.32 per point. Only 6 individual survey points yielded this species. Of these 6, all but one was an early successional point. Although much more common throughout various upland habitats, this RES species could possibly breed within this site.

Cedar Waxwing (CEWA) - A total of 59 individuals were tallied at 19 overall points (20%). The resulting relative density was 0.61 per point. This species was distributed among 15 separate points. The CEWA is a NAM which may certainly breed at this location.

Northern Parula (NOPA) - Overall, 31 birds were reported at 21 total points (22%). Additionally, 21 individuals were recorded at interpoints. The relative density of this species was 0.32 per point. The NOPA occurred among 14 survey locations, of which all but one were in forest habitat. This is certainly a possible breeding bird within the study area. The NOPA is a NTM species of intermediate management concern (2.57 mean score according to Thompson et al. 1993).

Yellow Warbler (YEWA) - A total of 32 birds were detected at 17 cumulative points (18%). This yielded a relative density of 0.33 per point. The YEWA occurred at 11 distinct points. Of these, all but two were early successional sites. Although a potential breeding species here, the YEWA is somewhat more common in upland shrub habitat. This NTM is a species of low management concern (1.57 mean score as determined by Thompson et al. 1993).

Chestnut-sided Warbler (CSWA) - One bird was identified at a single point (1%), which was in the early successional habitat (Point 7). Consequently, the relative density was 0.01 per point. Our study area does not occur within the breeding range of the CSWA. Additionally, this species tends to occur more often in upland shrub habitat. Therefore, this bird is considered to be a migrant only and not a possible breeder. The CSWA is a NTM of high management concern (3.57 mean score as indicated by Thompson et al. 1993).

Yellow-throated Warbler (YTWA) - We recorded 31 birds at 22 overall points (23%), and 10 others at interpoints. As a result, the relative density was 0.32 per point. This species was distributed among 19 separate sampling points, all of which were located in the forested habitat. The YTWA is definitely a possible breeder here. This NTM species is one of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

Cerulean Warbler (CRWA) - A total of 14 CRWA were observed at 12 cumulative points (13%), along with 3 birds at interpoints. This produced a relative density of 0.15 per point. Overall, the CRWA occurred at 9 individual locations. Of these, all were found in forest habitat. This abundance, frequency of occurrence, and distribution was substantially greater than documented previously (Birkenholz 1992; Treiterer 1996). This species is certainly a potential breeder within the study area. The CRWA is a NTM species of highest management concern (4.29 mean score as determined by Thompson et al. 1993).

American Redstart (AMRE) - During the course of this project, 125 birds were encountered at points and 8 were recorded at interpoints. This species was detected at 50 total points (52%), and yielded a substantial relative density of 1.30 per point. The AMRE was fairly widely distributed throughout the study area (33 survey points). Among these points, all but three occurred in forest habitat. This is certainly a likely breeding species. The AMRE is a NTM of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Prothonotary Warbler (PRWA) - During this study, we recorded 122 PRWA at 47 total points (49%), as well as 18 birds at interpoints. This produced a notable relative density of 1.27 per point. This species was distributed over 28 individual sampling locations. Among these sites, all were located in forested habitat. We documented at least 2 active nests, thereby confirming this as a breeding species within the study area. The PRWA is a NTM of high management concern (3.57 mean score according to Thompson et al. 1993).

Kentucky Warbler (KEWA) - Two birds were observed at 2 total points (2%), of which both were in forest habitat (Points 34 and 46). The relative density was only 0.02 per point. Although this species is a possible breeder, KEWA tend to be found much more frequently in upland forests. This is a NTM species of high management concern (3.14 mean score as determined by Thompson et al. 1993).

Common Yellowthroat (COYE) - Overall, 65 individuals were tallied at points and 1 was recorded at an interpoint. This bird was encountered at 24 cumulative points (25%). As a result, the relative density was 0.68 per point. This species was detected at 14 separate locations, of which all but two were in early successional habitat. This is certainly a potential breeding species. The COYE is a NTM of intermediate management concern (2.29 mean score as indicated by Thompson et al. 1993).

Yellow-breasted Chat (YBCH) - Seven individuals were observed at 6 total points (6%), while 5 were recorded at interpoints. The relative density was therefore 0.07 per point. This species was identified at 4 individual early successional sites (Points 7, 8, 10, and 11). Although the YBCH is a potential breeding bird, this species tends to prefer upland shrub habitat. This NTM is a high management concern species (3.00 mean score according to Thompson et al. 1993).

Summer Tanager (SUTA) - We recorded 1 bird at a single point (1%), which was in forested habitat (Point 18). Therefore, the relative density was only 0.01 per point. This species is a possible breeder within the study area, however it occurs much more commonly in upland woodlands. The SUTA is a NTM species of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Scarlet Tanager (SCTA) - One bird was recorded at a single point (1%). This site (Point 47) was in forest habitat. The relative density was a mere 0.01 per point. This is also a possible breeding species, which is more abundant in upland forests. The SCTA is a NTM species of high management concern (3.00 mean score as indicated by Thompson et al. 1993).

Eastern Towhee (EATO) - Overall, 3 individuals were detected at 3 total points (3%). These 3 sites were all located in the early successional habitat (Points 4, 10, and 12). The resulting relative density was 0.03 per point. This NAM species is definitely a potential breeder, however it is far more common in upland woodlands.

Chipping Sparrow (CHSP) - Three birds were identified at 3 cumulative points (3%). This resulted in a relative density of 0.03 per point. The CHSP occurred at 2 distinct early successional locations (Points 10 and 11). Although a possible breeder, this species is considerably more numerous in open upland and shrub habitats. The CHSP is a NTM which is of low management concern (1.86 mean score according to Thompson et al. 1993).

Song Sparrow (SOSP) - During the course of this study, 33 birds were recorded at points and 1 was observed at an interpoint. Overall, we encountered this bird at 19 total points (20%), which yielded a relative density of 0.34 per point. The distribution of this species occurred among 15 separate locations. The SOSP is a NAM species which definitely could breed within the study area.

Northern Cardinal (NOCA) - Overall, we recorded 314 individuals at 92 total points (96%), making this one of the most abundant and frequently encountered species during the project. The NOCA had an impressive relative density of 3.27 per point. This species was distributed throughout the entire study area, occurring at all 48 sampling points. The NOCA is a RES species, which is a very likely breeder within the study area.

Rose-breasted Grosbeak (RBGR) - A total of 28 RBGR were identified at points, along with 2 others at interpoints. This species was encountered at 18 cumulative points (19%). This produced a relative density of 0.29 per point. The distribution of this species occurred among 14 separate sampling locations. Although certainly a possible breeder, the RBGR tends to occur more frequently in upland habitats. This is a NTM species of high management concern (3.14 mean score as determined by Thompson et al. 1993).

Indigo Bunting (INBU) - During this project, a total of 310 individuals were recorded at 94 overall points (98%). Therefore, this is another of the most abundant and frequently encountered species. The INBU also had a substantially large relative density of 3.23 per point. As with the NOCA, this species was also distributed among all 48 sampling locations. This species is most likely a breeder within the study area. The INBU is a NTM of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Red-winged Blackbird (RWBL) - We encountered 158 birds at points and 7 others at interpoints, making this species one of the most abundant during the project. This species was observed at 31 total points (32%). The relative density was a noteworthy 1.65 per point. However, this species only occurred among 20 different survey points. The RWBL is a NAM which most likely is a breeder within the study area.

Common Grackle (COGR) - A total of 315 COGR were identified at 68 total points (71%), along with 3 recorded at interpoints. Therefore, this was one of the most abundant and frequently occurring species over the course of the project. This produced a substantially large relative density of 3.28 per point. The COGR occurred over virtually the entire study area (46 survey locations). This NAM is most definitely a potential breeding species at this site.

Brown-headed Cowbird (BHCO) - We encountered 146 birds at 65 total points (68%). Therefore, this was one of the most frequently occurring species over the entire study. The relative density was a notable 1.52 per point. This was also a widely distributed species, occurring among 41 distinct points. This NAM is a possible breeder. Although one of the most abundant and widespread species throughout the study area, the BHCO tends to prefer semi-open upland habitats.

Baltimore Oriole (BAOR) - Overall, 83 individuals were detected at 45 cumulative points (47%), along with another 2 birds at interpoints. This yielded a relative density of 0.86 per point. This species was fairly widely distributed throughout the study area (29 sampling locations). We observed at least 1 active nest, thereby confirming this as a breeding species. The BAOR is a NTM species of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

American Goldfinch (AMGO) - During this project, 105 birds were recorded at 47 total points (49%), along with 2 individuals at interpoints. As a result, the relative density for this species was 1.09 per point. The AMGO was widely distributed over a substantial portion of the study area (34 survey points). This NAM is certainly a possible breeder, although the species prefers more upland habitats.

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