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Upland Bird Communities of Lost Mound Unit
of the Upper Mississippi River National Fish and Wildlife Refuge
and adjacent areas of the former Savanna Army Depot

Illinois Natural History Survey
Center for Biodiversity
Technical Report 2001 (7)

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24 July 2001

Summary

Approximately 9000 acres of the former Savanna Army Depot will be managed by and eventually transferred to the USFWS. Breeding bird censuses focusing on the grassland and savanna areas were conducted in 2000 and 2001 to help develop management plans for the upland areas. These censuses in combination with other surveys not reported here have found 27 bird species listed as Resource Conservation Priority species that use the area. These species include 21 that use upland terrestrial habitats and 6 that use wetlands (both upland and bottomland). The upland species include 5 Illinois state endangered or threatened species of prairie and savanna. The area contains large populations of several grassland bird species that are the focus of national conservation and management efforts. With the cessation of cattle grazing the grassland bird community is shifting from the dominance of species preferring short grass and/or sparsely vegetated areas to a more complete grassland bird community. A management plan including prescribed burning and selective grazing should be implemented as soon as possible. USFWS and IDNR should work with adjacent landowners and landusers to promote conservation of sensitive species in the entire area. The upland areas designated for USFWS will be a critical addition to the refuge system and will help the agency achieve the goal of protecting viable populations of rare and declining species.

Acknowledgments

This paper is the final report for grant 1-5-21276 (agreement #301819G042). Funding from USFWS is gratefully acknowledged. Kate Hunter prepared the habitat map. Ed Anderson, Randy Nýboer, Gus and Debbie Pausz, Rickie Rachuy, Barb Seikowski, Grace Storch, Pam Sullivan (no relation to the grocery store), Laurel Temmen, and Charlie Winterwood helped with the point counts. Pete Goulet helped with the vegetation measurements and data entry. Amy Symstad is generally helpful. Thanks to Illinois Natural History Survey – Center for Biodiversity and IDNR-Division of Natural Heritage (specifically Randy Nýboer and Ed Anderson), and USFWS-Savanna District for logistical support. The last section is the opinion of the author and is not intended to represent the position of IDNR or USFWS or anyone else.

Introduction

Part of the former Savanna Army Depot (SAD) will be added to the Upper Mississippi River National Fish and Wildlife Refuge (UMR). The area will be named Lost Mound Unit and will be managed as an overlay refuge until land transfer. The upland portion of Lost Mound (and SAD) contains a large expanse of native prairie and savanna. Because many species of grassland and savanna/shrubland birds are declining in Illinois, the Midwest region, and nationally (Askins 1993, Herkert 1995, Knopf 1996), bird surveys focusing on the upland areas were undertaken. These surveys were designed to estimate the abundance and distribution of each species within the site. This information in turn will be used (along with results from monitoring plant communities and other groups) to develop habitat management plans to protect, restore, and enhance the native communities of the prairie and savanna areas.

Initial bird surveys from 1994-1997 indicated that several species listed in the USFWS Resource Conservation Priority document (<http://midwest.fws.gov/level1/birds.htm>) occur at Lost Mound. In addition, several species of Illinois State endangered and threatened species occur here (Anderson et al. 1995, Anderson et al. 1996, Anderson and Kirk 1998). UMR is listed by the American Bird Conservancy as a globally important bird area for its waterfowl habitat and migratory pathway. Lost Mound/SAD recently was listed as a nationally important bird area for its grassland bird habitat. Monitoring efforts by IDNR have focused on the grassland and savanna birds in order to develop management guidelines. Access restrictions imposed by the Army prevented most field work in 1998-99. During this same period grazing was reduced in 1998 and then terminated altogether in 1999. The lack of grazing led to noticeable changes in the vegetation. The survey results from 2000-01 reported here include vegetation measurements to examine the extent to which the abundance of different bird species is related to structural features of the habitat.

Study Site

The Savanna Army Depot was established in 1917 along the Mississippi River in Carroll and Jo Daviess counties in northwestern Illinois (Figure 1). Until its closure under the Base Realignment and Closure Act on 18 March 2000 the Depot was used primarily for munitions storage. The site covers 5288 ha (13,062 a). More than 3600 ha (9113 a) of the Depot will be incorporated into UMR and named the Lost Mound Unit (Figure 2). Lost Mound Unit will be managed by the U.S. Fish and Wildlife Service (USFWS) in cooperation with the Illinois Department of Natural Resources (IDNR). An additional 120 ha (300 a) of Depot land will be transferred to IDNR and managed cooperatively with local conservation organizations.

The Savanna Army Depot is recognized as a statewide significant natural area by the Illinois Natural Areas Inventory (IDNR, Division of Natural Heritage). Uplands on the Depot lie within the Mississippi River Section of the Illinois River and Mississippi River Sand Areas Natural Division of Illinois (Schwegman 1973). The uplands support the largest contiguous remnant of native sand prairie and sand savanna in Illinois. The Army's main form of habitat management at the Depot was intensive cattle grazing between May and October to keep the vegetation short and minimize the risk of wildfire.

The upland plant communities are located on an extensive sand terrace that has a northwest to southeast orientation and is nearly 19 km (12 mi) long and up to 2.7 km (1.7 mi) wide (Robertson et al. 1997). Along the Mississippi River the sand has formed high dunes, but the rest of the terrace has gently rolling topography. The sand was originally deposited by glacial melt waters and spread over a wide area by prevailing west winds (Schwegman 1973).

The most prevalent community is dry-mesic sand prairie (Figure 1), much of which is located within a complex of munitions bunkers and storage buildings that includes more than 40 parallel roads spaced at 150-m intervals. These prairie areas are dominated by little bluestem (*Schizachyrium scoparium*), but also contain substantial amounts of Indian grass (*Sorghastrum nutans*), June grass (*Koeleria macrantha*), sand dropseed (*Sporobolus cryptandrus*), needlegrass (*Stipa spartea*), and non-native Kentucky bluegrass (*Poa pratensis*). In drier areas with more patches of bare sand three-awn grass (*Aristida tuberculosa*) and hairy panic grass (*Panicum villosissimum*) tend to be dominant. The shrubs redroot (*Ceanothus herbaceus*) and sand fragrant sumac (*Rhus aromatica* var. *arenaria*) occur throughout the prairie areas. Twelve Illinois state endangered or threatened plant species occur here. For most of these species the only or largest population in Illinois occurs at Lost Mound.

Dry and dry-mesic sand savanna occurs on dunes along the Mississippi River and in the northern part of the bunker complex (Figure 1). These sand savannas contain prairie vegetation with an open overstory of black oak (*Quercus velutina*) and occasional green ash (*Fraxinus pennsylvanica*). The lack of fire has led to considerable encroachment of fire-intolerant species such as black cherry (*Prunus serotina*), honey locust (*Gleditsia triacanthos*), and red cedar (*Juniperus virginiana*). Dry sand forest occurs on the river dunes, and dry-mesic sand forest occurs mostly in the northern part of the Depot. The dry sand forest is dominated by black oak, but white oak (*Q. alba*) is important in dry-mesic sand forest. The forests also contain northern red and bur oak (*Q. rubra* and *Q. macrocarpa*), several hickory species (*Carya*), black walnut (*Juglans nigra*), black cherry, green ash, and black locust (*Robinia pseudoacacia*).

Methods

This report includes bird census data and vegetation measurements from 2000 and 2001 and supplemental information from 1994-2001.

Bird surveys – Birds were counted at 100-m radius point counts during June in both years. At each point all birds seen or heard were counted for 5 minutes. Birds seen within 100 m and beyond 100 m (but less than half-way to the next point) were counted separately. All counts were conducted between 5:00 AM and 11:00 AM local time. Counts were conducted twice each year in June at 64 points in 2000 and 68 points in 2001 (Figure 3). Fifty-five of these points were established in 1994, the rest were added in 2000. Sixty-three of the points were surveyed in both years. Data from within 100m were used in statistical analyses while data from within and beyond were used to compile total species lists for each location.

Vegetation measurements – Structural features of the vegetation at points dominated by prairie and savanna were measured in early June each year. A combined height/density measurement, often referred to as the visual obstruction reading, was taken with a Robel pole (Robel et al. 1970). The Robel pole is 1.5 m tall and marked with 10-cm wide alternating black and white bands. The pole is viewed from 1m above the ground 4m from the pole and the lowest division between black and white bands is recorded as the estimate of visual obstruction. This number is highly correlated with plant biomass between the viewer and the pole and thus represents the amount of vegetation in that area (Robel et al. 1970). Visual obstruction readings are taken from 4 equally spaced points around the pole (roughly north, south, east and west) at 4 randomly-chosen locations in each 100-m radius point count location. These 16 visual obstruction readings were averaged and referred to below as “Robel” values. Leaf litter depth in cm was taken at the

same 16 locations as the visual obstruction readings and averaged. The maximum height of vegetation with 0.5 m of the pole was recorded at each of the 4 random locations used for the Robel measurements. The number of shrubs (defined as woody plants < 3m tall regardless of species) and trees (> 3m) was counted within each 100-m radius point count location. I used a rangefinder to estimate the distance of each shrub and tree to get an accurate count. The numbers of shrubs and trees were similar for both years so only the data from 2001 were used in analyses.

Statistical analyses - Data were analyzed with the Systat 8.0 statistical package (SPSS 1998) and other sources (Zar 1999). Bird count data from the two counts in each year were averaged for each point to estimate the number of birds at each point for each species. Points where no birds of a particular species were recorded within 100-m were listed as 0 in the data sets. Abundance (#birds/pt) was compared between years with analysis of variance tests (ANOVA) for each species separately. A change in abundance was considered statistically significant at the $P = 0.05$ level. Because doing numerous tests increases the probability of finding a significant result at random (1 in 20 would be expected at this level) I only tested the grassland and savanna species and other species of management concern in order to limit the number of tests.

Bird-habitat associations were examined with stepwise multiple linear regression. For each bird species the five habitat variables (Robel, litter, maximum height, #shrubs, #trees) were entered into an initial model as predictors of abundance (#birds/pt). Variables were removed individually until either a significant model was attained or all variables were removed (in which case the variables were not adequate predictors of abundance). All the variables included in a significant model are reported here whether or not they were statistically significant individually at the $P = 0.05$ level. These analyses are intended as an initial examination of the bird/habitat relationship to help guide future research on the topic at Lost Mound.

Results and Discussion

General - Ninety-six species were observed during the point counts; 79 in 2000 and 88 in 2001. Seventy one species were observed in both years (Table 1). During counts 10 species in 2000 and 16 species in 2001 were observed only outside the 100-m radius count areas (abundance 0.0 in Table 1). For 22 species in 2000 and 17 species in 2001 only 1 or 2 individuals were observed within the 100m radius areas (abundance of 0.007 – 0.008 birds/pt in Table 1). Eleven species were observed at 30 or more points in either or both years; 13 at 20-29 points; 23 at 10-19 points and 49 species at fewer than 10 points (Table 2). Thus, the upland bird communities consist of approximately 45 species with an additional 40-50 rare species.

While some of these rare species are indeed uncommon at Lost Mound (Savannah Sparrow, Henslow's Sparrow, Northern Bobwhite, Blue Grosbeak; all scientific names are in Appendix I) many of the apparently rare species are forest birds (Pileated Woodpecker, Kentucky Warbler) or wetland species (Swamp Sparrow) for which little habitat is available. These species are not necessarily rare within their preferred habitats. Other seemingly rare species occur in bottomland forest (Prothonotary Warbler, Wood Duck) which was not covered thoroughly by these point counts. The point count survey method is most appropriate for territorial species that sing (or otherwise make themselves conspicuous) during the morning hours when counts are conducted. Species not counted accurately by the point count method include colonial nesters (Great Blue Heron, Bank Swallow), species typically observed in flight (swifts, swallows, Turkey Vulture, raptors, waterfowl), nocturnal species (owls), relatively non-

vocal species (shrikes, hummingbirds) and wide-ranging species (American Crow). Species for which point count results may be suspect are indicated with an X in Table 1.

Community composition – Savanna and prairie points had similar numbers of bird species and individuals in both years (Table 3). Forest points had fewer species and individuals than the other habitats while wetland points had the most. Prairie and savanna had broadly overlapping sets of species but species characteristic of one habitat occurred in the other at lower density (Table 4). The seven most common species at prairie points were the same in both years but in a slightly different rank by abundance. The savanna points were less consistent between years with the same top three species in both years and considerable change in rank for the other species. The most common species at forest points also occurred at savanna points (but usually not prairie points) while the less common forest species occurred only at the forest points. Species at wetland points varied considerably between years but Red-winged Blackbirds was by far the most common species in both years. American Robin, Red-winged Blackbird, European Starling, Gray Catbird, Northern Cardinal, Blue Jay, and House Wren were among the top 30 most common species in all four habitat types (Table 4).

Grasshopper Sparrow followed by Western Meadowlark were the most abundant species in both years (Table 1). Grasshopper sparrow also occurred at savanna points at less than half the density as at prairie points, but was still the second-most common species at savanna points. Field Sparrow was the third-most common species overall and the most common species in savanna (Tables 1 and 4).

The point count data reported here in combination with other surveys indicate that Lost Mound has a nearly complete grassland bird community. The most notable exceptions are Northern Harrier and Short-eared Owl which have been observed several times at Lost Mound, mainly during spring and fall migration (Appendix II). It is possible that with management to encourage taller vegetation at some sites, these species may breed here in the future. The savanna bird communities are also relatively intact although few species are totally dependent on native savanna remnants (Brawn 1998) and very few such remnants exist.

One community type not discussed in detail in this report is shrubland and early successional areas. Portions of Lost Mound, particularly at the north end of the area, contain shrubland habitat but because few of the point count locations include this habitat it is not possible to separate it from the savanna and forest points. Blue-winged warbler is one species typical of shrublands and is rare at Lost Mound (only at point F17 in 2001, also observed in logged areas of the bottomland forest). Other species that might be expected in shrublands are Bell's and White-eyed Vireo, and Yellow-breasted Chat. Both vireo species have been observed at Lost Mound (in 1998 and 2000, respectively) but breeding has not been confirmed. The chat has not been observed here. Lost Mound is near the edge of the geographic range for all three species (Price et al. 1995).

Vegetation measurements - Point count locations were classified as prairie, savanna, forest or wetland based on the dominant vegetation type in and around the 100-m radius count area. In general, points with more than 25 trees (> 3 m tall) were classified as savanna while those with fewer trees were classified as prairie (Table 5). Exceptions to this arbitrary division (points E11, F1, F2, F6) had many red cedar or other species indicative of woody encroachment of prairie rather than development of black oak savanna that would be expected at this site (Robertson et

al. 1997). Forest points had nearly complete canopy cover of trees. Wetland points contained marsh or ponds but were surrounded by prairie, savanna, or forest.

Savanna points had more trees and shrubs, on average, than prairie points but both habitats had similar average Robel, litter, and maximum height measurements (Table 5). One point, J2, was dominated by crown vetch and thus had unusually high Robel values in both years. Robel, litter, and maximum height were all significantly greater in 2001 than in 2000 (Anova tests: Robel $F_{1,98} = 5.65$, $P = 0.019$; litter $F_{1,96} = 32.16$, $P = 0.000$, maxheight $F_{1,85} = 117.74$, $P = 0.000$). In particular, both litter depth and maximum height nearly doubled from 2000 to 2001 (Table 5).

Bird-habitat relationships – Analysis of the habitat variables as predictors of density (birds/pt) yielded significant models for most species examined (Table 6). In most cases, however, the amount of variation explained by the models was very low (< 25%) suggesting that some important variables were not measured and/or that the relationships between habitat structure and abundance are more complicated than simple linear functions. Future analyses could examine interactions among the variables as well as including additional variables.

Despite the low amount of variation explained by the models, most of the significant variables are concordant with other studies (Sample and Mossman 1997, Johnson et al. 1998, Johnson et al. 1998, Dechant et al. 1999, Dechant et al. 1999, Dechant et al. 1999). For example, previous studies have found that trees between grassland fields was related to lower densities of grassland birds (O'Leary and Nyberg 2000). At Lost Mound, the abundance of four grassland species, Western and Eastern Meadowlark, Grasshopper Sparrow and Dickcissel was negatively correlated with the number of trees. Bobolink and Western Meadowlark abundance were negatively correlated with the number of shrubs. Many of the savanna and shrubland species were positively correlated with number of trees and/or shrubs (Table 6).

Red-winged Blackbird and Common Yellowthroat, species typical of more mesic grasslands with taller vegetation had a positive correlation between abundance and Robel measurements. In contrast, species preferring bare ground, such as Vesper Sparrow, had higher abundance in areas with lower litter.

No significant model was attained for three species typical of relatively short grassland areas with scattered trees (Loggerhead Shrike, Northern Mockingbird, Eastern Kingbird) or for European Starling which was associated with buildings more than the surrounding habitat.

Changes in abundance – The two most common prairie species, Grasshopper Sparrow and Western Meadowlark, were significantly less abundant in 2001 than in 2000. Dickcissel, the third-most abundant species in 2000, decreased by nearly 78% in 2001. Northern Mockingbird and Killdeer are the only other grassland species that had significant declines in abundance. Among forest birds American Crow and White-breasted Nuthatch both declined but point counts probably do not provide accurate estimates of crow abundance because they roam widely in family groups and were more often observed in flight than within the 100-m radius counts.

No species increased significantly. Although Bobolink increased by 147% they were still absent from most points in both years (Table 2). Small sample size is the likely explanation for lack of statistically significant results for other species that had considerable change from one year to the next. Among prairie and grassland species 4 had decreases of more than 25% (Grasshopper Sparrow, Western Meadowlark, Dickcissel, Upland Sandpiper) and 4 increased by more than 25% (Red-winged Blackbird, Bobolink, Common Yellowthroat, and Horned Lark). In

contrast, for species dependent on woody vegetation, 6 decreased by more than 25% while at least 12 increased by over 25% (Table 1). Of nine grassland species preferring relatively short vegetation, 6 declined and 3 increased or had no change in abundance. Of 7 species preferring taller vegetation 1 declined and 6 increased (Table 1). These proportions are significantly different than would be expected if changes in abundance were random with respect to habitat preference (Fisher's Exact Test, $P < 0.05$).

Some of the population changes noted above can be explained by changes in habitat as a result of the elimination of grazing. Grasshopper Sparrow, Western Meadowlark, and Killdeer abundances are negatively correlated with a habitat variable that increased between 2000 and 2001. Thus, the declines of these species (especially the first two) are likely related to a decline in habitat suitability. On the other hand, the substantial (but not statistically significant) increase in Bobolink, a species typical of grasslands with tall vegetation, is probably related to the increase in Robel and maximum height. Similarly, Henslow's sparrow, which is usually found in tall grasslands not recently burned, bred at Lost Mound for the first time in 2001. Thus, the changes in abundance indicate a shift from the dominance of species preferring short grass and/or sparsely vegetated areas to a more complete grassland bird community.

The decline of the Dickcissel (the one species preferring taller vegetation that declined) may be related to factors during the non-breeding season. This species winters in northern South America where it is regarded as an agricultural pest in rice fields (largely because rice has replaced the native habitat). Dickcissels gather in large flocks and are susceptible to lethal control efforts (Basili and Temple 1999, Basili and Temple 1999).

The relatively high densities of species nesting in, or otherwise requiring, woody plants listed in Table 1 and the first section of Table 4 (prairie) illustrate the abundance of woody vegetation invading the grasslands. Most woody-dependent species did not change in abundance to the same degree that grassland species did (Tables 1, 2, 4).

Estimated population sizes – A 100-m radius area is equivalent to 7.76 acres (3.14 hectares). I derived rough estimates of population size for each species by extrapolating the average abundance (birds/pt) in Table 1 to the entire area surveyed (approximately 6500 acres). These estimates are only valid for species that were primarily observed within the 100-m radius point count locations. Furthermore, they are not valid for bottomland forest species (Prothonotary Warbler) and species for which point counts do not accurately estimate abundance (see above and Table 1). Because the point count method relies heavily on singing males the population estimate can be interpreted as the number of pairs of birds assuming that all males have mates. However, some females are observed during the counts so twice the estimated population size in Table 2 should be considered an upper limit to the estimate. Another point of caution is that extrapolating from birds per point tends to overestimate the population size of rare species.

These estimates indicate that despite the declines noted above Grasshopper Sparrow and Western Meadowlark still have substantial populations on site. However, the 2001 population estimates for these two species are about one-half the size of the population estimated by Jim Herkert in 1997 (Herkert, personal communication). In contrast, Dickcissel, Bobolink, and Henslow's Sparrow were not observed during the 1997 point counts (Jim Herkert, unpublished data).

Although it is difficult to predict the fate of a population based on its size alone 50 individuals is a rough estimate of the size necessary to sustain a population in the absence of immigration from other populations (Gilpin and Soulé 1986). At Lost Mound 26 species have an

estimated population size of at least 50 in both years (Table 2). This group of fairly common species includes Grasshopper, Lark, Vesper and Field Sparrows, Eastern and Western Meadowlarks, Dickcissel, and Bobolink. Also in this category were the non-native European Starling and nest parasite Brown-headed Cowbird. An additional 10 species had at least 50 individuals in one year or over 25 in both years, including Upland Sandpiper (although probably an overestimate) and Red-headed Woodpecker. Of the remaining species (excluding those not accurately counted by point counts) 11 had at least 25 individuals in one year but not both and 25 had fewer than 25 in both years. This latter category includes two Illinois state-listed grassland species: Loggerhead Shrike (threatened) and Henslow's Sparrow (endangered). Most of the remaining species in this final category are forest or woodland species while most grassland and savanna species were in the higher population size categories (Table 2).

Because of its large size and central location in the Upper Mississippi River Ecoregion, the Lost Mound Unit is likely to be a critically important addition to the refuge system. For many species of grassland birds Lost Mound likely contains populations large enough to sustain themselves and to provide emigrants for other areas (source populations). Few native sand prairies remain in the Upper Mississippi Tallgrass Ecoregion. The closest are Ayres Sand Prairie Nature Preserve (109 acres, 10 south of Lost Mound) and Thomson-Fulton Nature Preserve (37 acres, 25 miles south) and portions of UMR near Thomson. Grasshopper and Lark Sparrow and Eastern Meadowlark occur on some of these sites but most of the grassland bird species have populations over 50 individuals only at Lost Mound. The savanna areas also contain several species of management concern and should be the focus of additional field work. The upland forests contain several sensitive species (Table 7) but are too small to maintain self-sustaining populations. Conservation of the forest birds should be linked to management efforts at the nearby Hanover Bluff State Nature Preserve (and adjacent state property) as well as cooperation with private landowners in the forested area directly north of Lost Mound.

Research and Management Recommendations

Habitat management - The bird communities present in the upland of Lost Mound are related to past land use. The area was lightly grazed in the years before SAD was established (Gleason 1910). Virtually all of the upland areas were intensely grazed for at least the last 40-50 years to keep the vegetation as short as possible and minimize the risk of wildfire. Grazing pressure was reduced in 1998 (Bob Speaker, personal communication) and then ended in October 1999. The increase in Robel, litter, and maximum height are a direct result of the cessation of grazing. Similarly, the high numbers of trees and shrubs in the grassland areas are the result of fire suppression, and to a lesser extent seed dispersal by cattle (in particular, honey locust). In order to provide the range of habitats required by the bird species present prescribed burns and rotational grazing should be reinstated as soon as possible. If grazing and burning are delayed woody encroachment of the prairie will increase and Robel and especially litter values will increase. These factors greatly increase the risk of wildfire (started by lightning) or accidental fire (started by careless contractors, trespassers, or other visitors). A wildfire would be most likely during a dry year and during the summer when thunderstorms are most common. A summer burn over a large area would likely be detrimental to the dominant warm-season grasses as well as nesting birds and other animals.

In addition to the ecological cost of a wildfire, damage to Army/LRA buildings (even though they should be demolished anyway) would be possible. Contractors at the G-area warehouses have burned trash on several occasions and are careless with trash and cigarettes. A

fire near Whitton gate in the spring of 2000 was apparently started by a passing train. Increased use of the interior rail lines is inadvisable without a fire management plan. The Army and LRA and their tenants and contractors should be advised of the dangers of wildfire and should take adequate precautions to prevent them.

Lost Mound is a large enough area that a replicated design of burning and grazing treatments could be established. An experimental examination of the effects of different combinations of burning and grazing on the plant and animal communities would provide information on management strategies. Such an experiment would not only accomplish the necessary prescribed burns to maintain and enhance the native prairie vegetation and reduce the risk of wildfire, but would also allow an adaptive management approach so that management plans can be changed if certain burn/graze treatments have detrimental effects on sensitive species.

Control of woody vegetation is another management issue that needs attention at Lost Mound. Photographs from 1907 (Gleason 1910) and aerial photos from the 1950's indicate that the prairie areas at Lost Mound have many more trees and shrubs than in the past. Some sensitive species, such as Loggerhead Shrike, require trees in or adjacent to grasslands so removal of trees should take habitat requirements of these species into consideration. Nevertheless, it is probable that a substantial amount of the woody vegetation could be removed without adversely affect most of the woody-dependent grassland species. As with burning and grazing, an experimental approach designed to determine the effects of woody removal on target species would be very beneficial. Management of the savanna areas will need to be a cooperative venture with the LRA because a significant savanna area occurs in LRA territory in the middle of Lost Mound (see Figures 1 and 2). Part of this area is included in a conservation easement (Figure 2) that allows USFWS/IDNR staff access. It would be more efficient for habitat management by USFWS and more cost-effective for the LRA to develop a cooperative management agreement for all the grassland and savanna areas.

Surveys – The bird surveys reported here focused on grassland and savanna areas but other habitats and groups need baseline surveys for a balanced management plan that considers the entire ecosystem. More detailed vegetation measures, including species diversity and functional groups as well as measurements of vegetation structure and composition in forest and wetlands would yield a better understanding of avian habitat selection. In this regard linking plant and animal monitoring would be especially useful. In addition, many birds are dependent upon invertebrates for successful reproduction yet virtually nothing is known of the invertebrate faunas of Lost Mound. Surveys on these groups and their responses to habitat management are urgently needed.

As noted above (Table 1) point counts are not adequate surveys for all bird species, and all habitats were not covered by these points. Surveys for nocturnal species, wetland species (especially bitterns and rails), and bottomland forest are needed. In addition, surveys of birds during migration and winter would provide a better understanding of seasonal trends in bird use of Lost Mound. Many species at Lost Mound are cavity-nesters and several of these are sensitive or declining species (Red-headed Woodpecker, Eastern Bluebird, Prothonotary Warbler). In addition, White-breasted Nuthatch declined between 2000 and 2001 but the reasons for and importance of this decline are not yet understood. Cavity-nesting birds occur in all major habitats and include a variety of species not well surveyed by point counts (Wood Duck, Screech Owl, Tree Swallow). Furthermore, the number of dead trees (snags) is likely to be affected by

prescribed burns. For these reasons, surveys of cavity nesting birds and cavity/snag abundance would be beneficial.

Public access - One of the reasons Lost Mound/SAD has so many rare and interesting species and large concentrations of them is because of the lack of disturbance in recent years. A sudden increase in activity, whether from economic or recreational activities, could be detrimental. Continuing these surveys and accumulating baseline data on other groups will be one way to gauge the impact of increased activity. Proposed public access opportunities, such as hiking trails, observation towers, and bike trails should be planned in consideration of their potential impacts on the resources they are intended to showcase. For example, birdwatching is a popular pastime that will attract many visitors to Lost Mound. Species that are likely to attract people include the grassland specialists such as Upland Sandpiper, Bobolink, Western Meadowlark, and Grasshopper and Henslow's Sparrows, as well as savanna and shrubland species such as Orchard Oriole, Red-headed Woodpecker, Eastern Bluebird, Loggerhead Shrike, and Blue Grosbeak. Appendix II lists the seasonal occurrence of 219 bird species at Lost Mound as an example of the diversity the site offers. A route around the perimeter road would allow visitors to see most of the interesting species and habitats but currently the rail cars block a substantial portion of the area from view. Rail car storage is incompatible with public recreation and the LRA needs to consider the negative impact their activities have on other forms of economic development.

Rare and declining species – The USFWS Resource Conservation Priorities document for Region 3 (<http://midwest.fws.gov/level1/birds.htm>) lists desired outcomes to enhance conservation, obstacles expected, and strategies for achieving the goals for each species of management concern. For grassland and savanna birds of concern at Lost Mound the common outcomes listed are

- (1) provide key information that increases our understanding of limitations to conservation,
- (2) Attain and maintain stable, increasing, or recovering populations, and
- (3) Effectively conserve priority habitats through protection, restoration, and management.

The common obstacles preventing achievement of the outcomes are

- (1) Inadequate information base for effective conservation,
- (2) habitat loss or degradation, and
- (3) lack of public awareness or involvement in the conservation of the species and its habitat.

The strategies intended to overcome the obstacles include

- (1) Acquisition of biological information including population status and trends, habitat availability and quality, and factors related to conservation and best management practices,
- (2) Conservation of habitat through protection, restoration and management,
- (3) coordination, facilitation and implementation of cooperative conservation activities involving stakeholders and partners, and
- (4) Education, outreach, and public involvement in species conservation, planning, and activities.

In order to achieve these goals USFWS and IDNR need to reach agreement on the Memorandum of Agreement and live up to their commitments particularly with regard to staffing and funding levels. Secondly, strategies 3 and 4 are critically important and should not be neglected.

Most of the rare and declining species listed in the RCP document will likely respond positively to management including burning, grazing, and removal of some woody vegetation. In

addition, all species will benefit from cooperation between USFWS and other stakeholders at Lost Mound. Two examples will be mentioned here. Upland sandpiper (a state endangered species), unlike most of the other grassland birds at Lost Mound, tends not to breed in areas with buildings. Because most of the area has structures of one sort or another suitable habitat for upland sandpipers is limited. In the past 3 years they have occurred every year around census point F11 (Figure 3). In 2000 and previous years they occurred at J3 which is in LRA territory (this point was not used in 2001 perhaps because of vegetation growth). After the young hatch they forage in other areas of Lost Mound, including areas with buildings and including both USFWS-designated areas (F and E areas) and LRA areas (A area). The apparent need for different post-fledging foraging areas may explain why Upland Sandpipers require larger areas of grassland than most other grassland species (Herkert et al. 1993). Loggerhead shrike (state threatened) has a small but relatively stable population of about 5 pairs at Lost Mound. In both 2000 and 2001 shrikes nested in G area in LRA territory. Thus, both of these species (which are both interesting and charismatic birds that many people would come here to see) utilize and depend upon areas outside the boundaries of Lost Mound.

Habitat loss is the primary cause of declines of grassland birds and other species (Samson and Knopf 1994). Simply saving a patch of token prairie is not enough. It is well known that large continuous patches of habitat are better ecologically, in terms of higher species diversity, greater habitat heterogeneity, and larger populations protected. Larger reserves are better for habitat management because influence from outside factors is decreased and management can be more efficient at larger scales. And large reserves are better economically because they have a broader range of features that will attract ecotourism (Williams and Diebel 1996). Note that the largest expanse of prairie (from D area on the east side through E area to J area on the west) contains species that nest and forage in a wide range of conditions, from sparsely vegetated areas to taller denser vegetation to grassland with scattered trees. A single patch of prairie selected from this area, even a moderately-sized area of 100 acres, will not provide adequate habitat for all the species that occur in the larger area. Similarly, attempting to justify development because the loss of a few acres is a small percentage of the prairie on site is no longer a tenable position. Considering that over 99.9% of the original prairie in the Midwest has been irreparably destroyed (Steinauer and Collins 1996), each remaining acre that is developed represents an increasingly larger percentage of the remaining prairie.

Non-native species – Another issue requiring cooperation among stakeholders is the management of nuisance species. The quality of the habitat at Lost Mound is apparent when the bird communities (Tables 1, 2, and 4) are compared with those typical of the area. For example, the five most common species recorded on a 24.5 mile Breeding Bird Survey route (3-min counts every 0.5 mile (Robbins et al. 1986)) in Jo Davies county June 2001 were Red-winged Blackbird (222 individuals), European Starling (68), American Robin (60), Song Sparrow (54) and House Sparrow (45). Fortunately, non-native birds species do not appear to be a big problem at Lost Mound but they have not been studied in detail. However, because all four non-native species (Rock Dove, European Starling, House Finch, House Sparrow) occur in association with buildings and many buildings are falling into disrepair, these species should be monitored. In particular, European Starling nests in the vents and door coverings of the A and D area warehouses as well as the abandoned industrial buildings. Starlings also appear to benefit from the rail cars stored throughout the area (including on USFWS-designated land). Many of these have not been moved for many months. The rail cars and waste grain they contain provide

habitat for undesirable species while providing no benefit for native species. House Sparrows are found mostly at the south end of SAD, but also at the former “campground” at the southern end of Crooked Slough (between points B2 and E13 in Figure 3). At this location House Sparrows use nest boxes that have fallen into disrepair. These boxes should be removed. Rock Doves (pigeons) are found especially in abandoned buildings including those near point F7 (which should be demolished) as well as the A, D and G area warehouses (Figure 3). House Finches are found mainly at the south end of SAD but also use the abandoned railroad loading docks on the west side of C and F areas (near points C2 and F19 on Figure 3). These structures should be demolished.

Army cleanup of contaminants – As part of the base closure process the Army has agreed (in theory) to clean up contaminants from Army activities prior to transferring land to other agencies. All parties would benefit if the Army cleaned up the contaminated industrial areas (such as CN, CF, CL plants, H area) and allow those areas to be demolished and redeveloped. Instead the Army continues to try to avoid timely cleanup. These delays force the LRA into conflict with FWS and DNR rather than all three parties working together. Conservation and development can both proceed at Lost Mound but not until the Army stops forcing their agenda upon others.

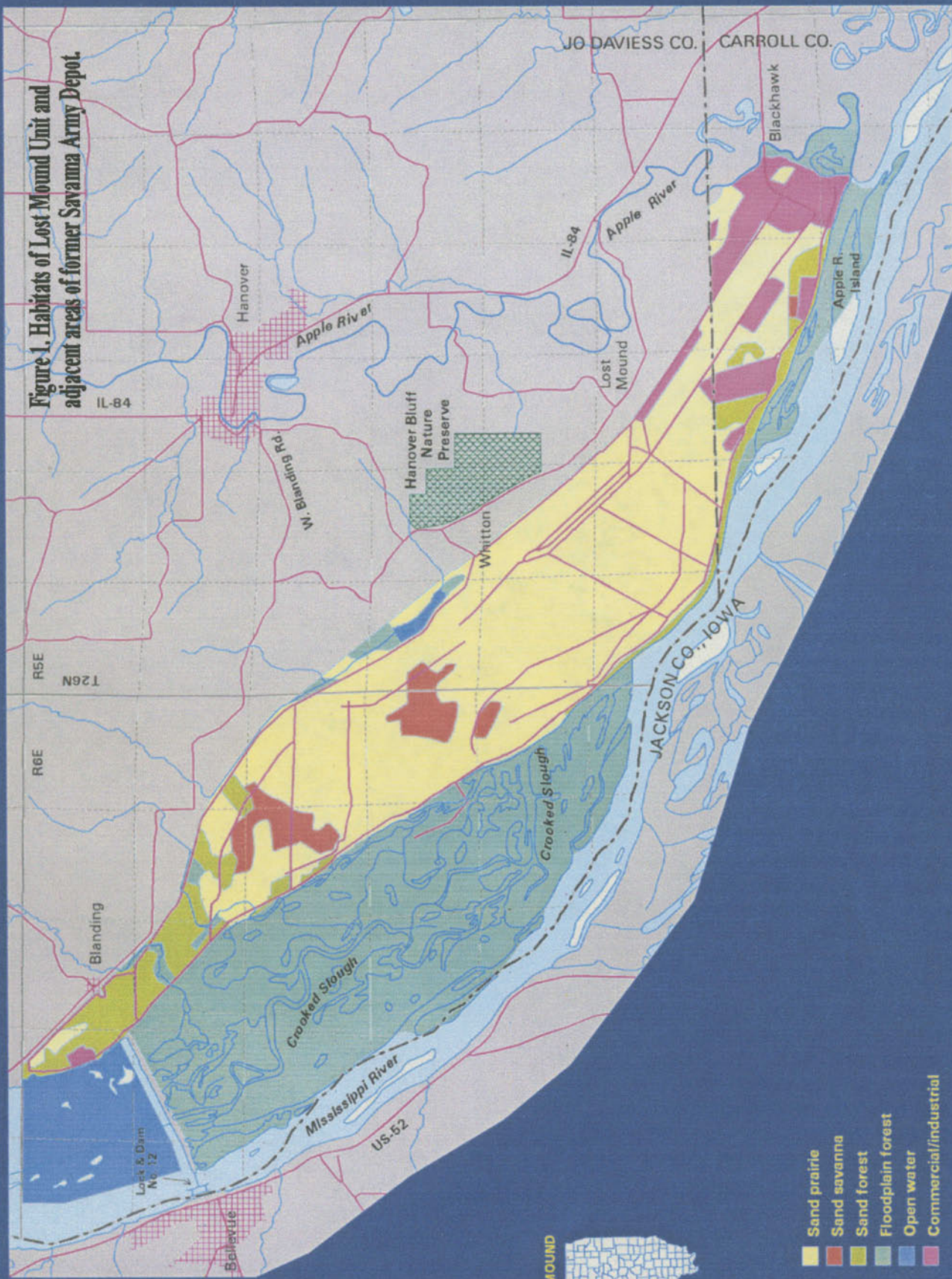
As habitat loss continues in other areas the native habitats at Lost Mound and SAD will become more valuable for the biological resources they contain, for the ecosystem services they provide (Costanza et al. 1997), and for recreational opportunities they promise (Black et al. 1999). It is well known that protected areas alone will not provide adequate habitat for rare and declining species (Margules and Pressey 2000). Similarly, the USFWS refuge system is designed to protect habitat but not to provide all the services needed by outdoor enthusiasts. Therefore, the LRA, USFWS, and IDNR should work together in a way to protect this unique and valuable area. Ecotourism is economic development and in fact tourism is one of the top industries in Illinois. Although the Army policy is to support conservation (Appendix III), thus far the LRA and Base Transition Team have shown little interest in, and considerable antagonism towards, the potential for ecotourism development. If this trend continues the LRA will squander a tremendous opportunity and in the process will contribute to the decline and destruction of natural resources in the Upper Mississippi Ecoregion. Additional habitat loss is totally unjustifiable and can be avoided with foresight. It is much easier to construct a building than a prairie, yet it is all too easy to destroy prairie while constructing buildings. Considering the numerous recent factory closings in the area any substantial new construction seems unnecessary. The LRA needs to break free of the industrial park vision that afflicts them and work to force the Army to live up to its commitment to clean the contaminated areas so that the existing structures can be demolished or remodeled and reused. In 20, 50, or 100 years will we look back at the events of the next few years with admiration for the cooperation among parties with different goals working for the common good or with disgust at narrow-minded attitudes, inflexible agendas, and short-term thinking for the benefit of a few?

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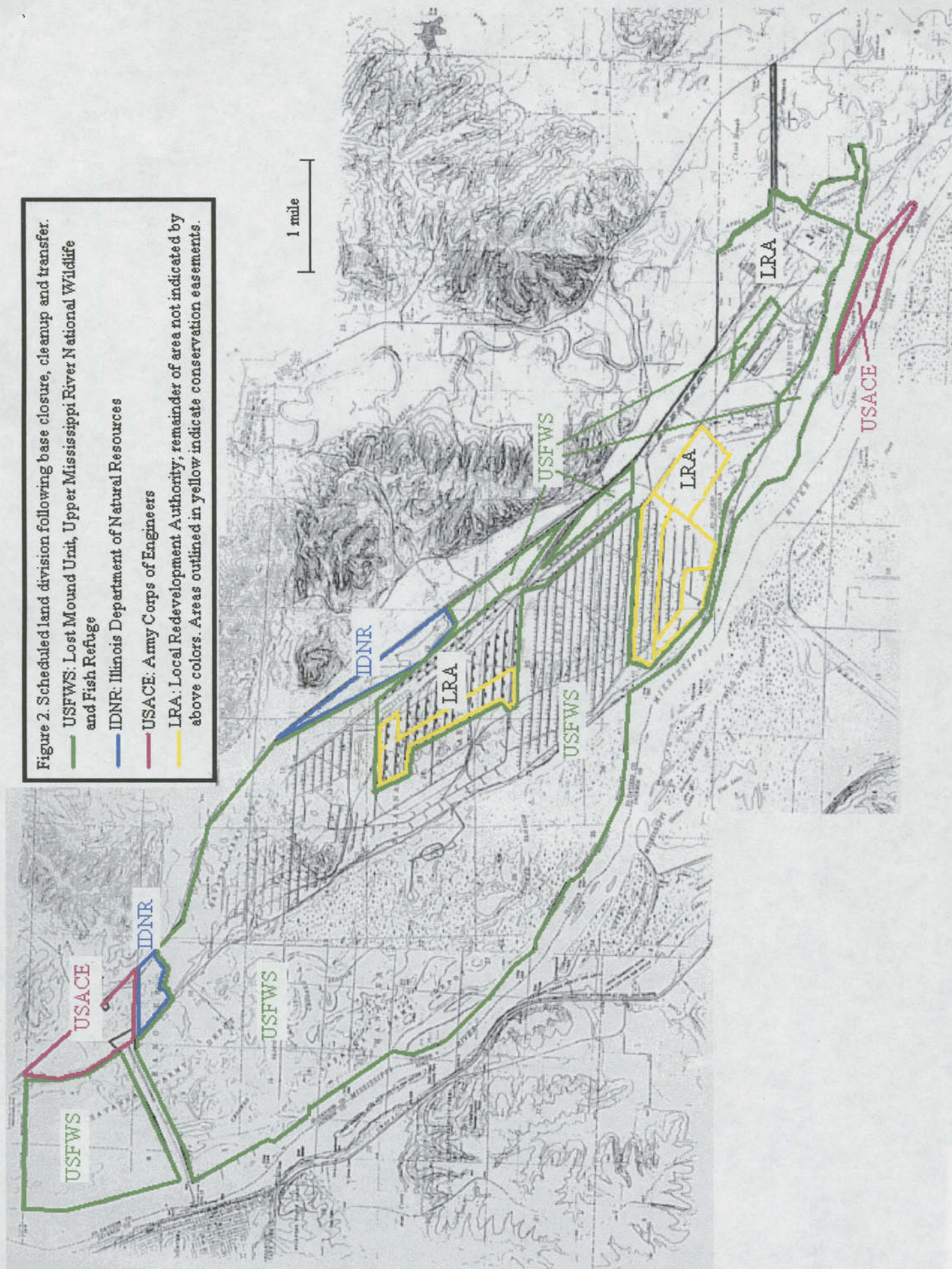
Figure 1. Habitats of Lost Mound Unit and adjacent areas of former Savanna Army Depot.



- Sand prairie
- Sand savanna
- Sand forest
- Floodplain forest
- Open water
- Commercial/industrial

Figure 2. Scheduled land division following base closure, cleanup and transfer.

- USFWS: Lost Mound Unit, Upper Mississippi River National Wildlife and Fish Refuge
- IDNR: Illinois Department of Natural Resources
- USACE: Army Corps of Engineers
- LRA: Local Redevelopment Authority; remainder of area not indicated by above colors. Areas outlined in yellow indicate conservation easements.



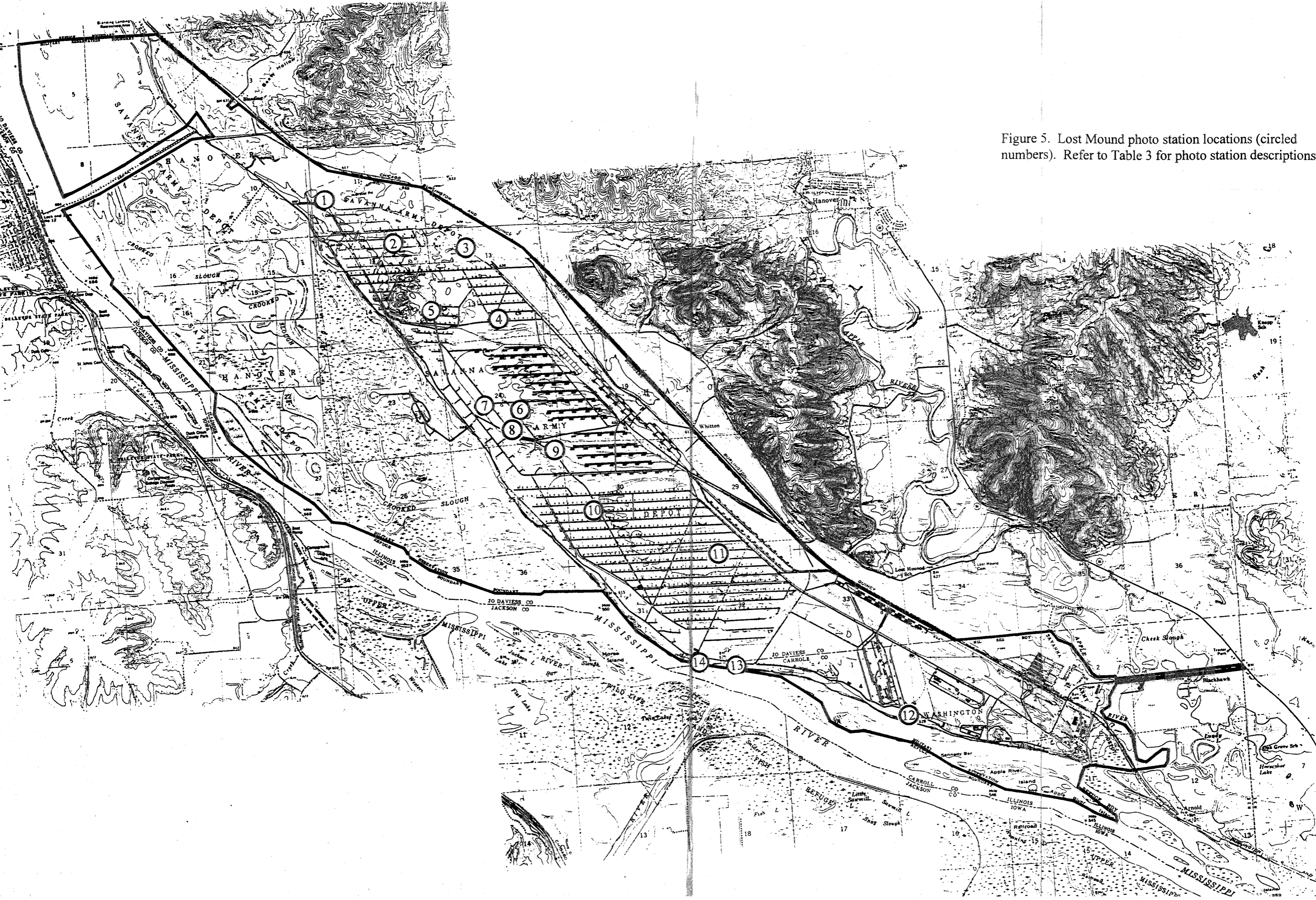


Figure 5. Lost Mound photo station locations (circled numbers). Refer to Table 3 for photo station descriptions.

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Table 1. Bird abundance at Lost Mound in 2000 and 2001. Values are the average number of birds observed during two counts each year at 64 100 m radius points in 2000 and 68 points in 2001. Also listed are the difference between 2001 and 2000 abundance for each species, the percentage change that difference represents and results of ANOV tests for selected species. Bold-faced P-values indicate a significant change in abundance. Species with abundance of 0 were only observed beyond 100 m, and those with no value were not observed during point counts in that year. Species are listed in decreasing order of abundance in 2001. Species codes are listed in Appendix I. An X in the Accuracy column indicates species not accurately surveyed by the point count method (see results).

SPECIES	birds/pt 2000	birds/pt 2001	difference '01 - '00	%change	F-statistic	P-value	Accuracy
GRSP	1.945	1.434	-0.511	-26.29	4.96	0.028	
WEME	1.453	0.757	-0.696	-47.88	8.58	0.004	
FISP	0.484	0.515	0.030	6.26	0.10	0.758	
BAOR	0.219	0.309	0.090	41.18	1.52	0.221	
RWBL	0.234	0.294	0.060	25.49	0.00	0.969	
BHCO	0.203	0.294	0.091	44.80	1.00	0.319	
EAME	0.242	0.287	0.045	18.41	0.03	0.859	
DICK	1.133	0.250	-0.883	-77.93	30.17	0.000	
HOWR	0.172	0.243	0.071	41.18	0.97	0.327	
BLJA	0.227	0.235	0.009	3.85			
MODO	0.320	0.191	-0.129	-40.32	2.52	0.115	
VESP	0.180	0.191	0.011	6.39	0.03	0.864	
EAKI	0.164	0.191	0.027	16.53			
OROR	0.117	0.169	0.052	44.31	0.67	0.414	
GRCA	0.148	0.162	0.013	8.98	0.04	0.846	
CHSP	0.211	0.154	-0.057	-26.80	0.91	0.342	
LASP	0.211	0.154	-0.057	-26.80	0.65	0.421	
AMGO	0.086	0.154	0.068	79.68	1.30	0.256	X
BOBO	0.063	0.154	0.092	147.06	1.87	0.174	
AMRO	0.141	0.140	-0.001	-0.65			
EUST	0.180	0.132	-0.047	-26.34	0.62	0.434	
EABL	0.172	0.132	-0.040	-22.99	0.37	0.542	
BRTH	0.164	0.125	-0.039	-23.81	0.87	0.352	
CEDW	0.070	0.125	0.055	77.78	0.47	0.493	
NOCA	0.094	0.110	0.017	17.65			
GCFL	0.055	0.103	0.048	88.24	2.60	0.105	
RBGR	0.039	0.088	0.049	125.88	2.02	0.157	
SOSP	0.070	0.081	0.011	15.03			
COYE	0.039	0.074	0.034	88.24	0.56	0.455	
TUVU	0.023	0.066	0.043	182.35			X
COGR	0.031	0.059	0.028	88.24			X
TRES	0.016	0.059	0.043	276.47			X
BCCH	0.078	0.051	-0.027	-34.12	0.54	0.465	

Table1. continued.

SPECIES	birds/pt 2000	birds/pt 2001	difference '01 - '00	%change	F-statistic	P-value	Accuracy
INBU	0.055	0.051	-0.003	-5.88			
EAWP	0.023	0.051	0.028	119.61			
NOMO	0.133	0.044	-0.089	-66.78	3.97	0.048	
YSFL	0.031	0.044	0.013	41.18			
BARS	0.008	0.037	0.029	370.59			X
HOLA	0.008	0.037	0.029	370.59			X
WAVI	0.008	0.037	0.029	370.59			
CONI	0.000	0.037	0.037				X
UPSA	0.047	0.029	-0.017	-37.25	1.12	0.292	
AMRE	0.016	0.029	0.014	88.24			
EATO	0.016	0.029	0.014	88.24			
HAWO	0.008	0.029	0.022	276.47			
AMCR	0.203	0.022	-0.181	-89.14	5.29	0.023	X
RHWO	0.063	0.022	-0.040	-64.71	2.02	0.157	
GTBH	0.016	0.022	0.006	41.18			X
RBWO	0.016	0.022	0.006	41.18			
YBSA	0.016	0.022	0.006	41.18			
LOSH	0.008	0.022	0.014	182.35	0.35	0.553	X
OVEN	0.008	0.022	0.014	182.35			
CHSW	0.000	0.022	0.022				X
EAPH	0.000	0.022	0.022				
SCTA	0.000	0.022	0.022				
WBNU	0.078	0.015	-0.063	-81.18	5.57	0.020	
DOWO	0.047	0.015	-0.032	-68.63	2.40	0.123	
REVI	0.031	0.015	-0.017	-52.94			
HESP	-	0.015			2.06	0.153	
MALL	-	0.015	0.015				X
SWSP	-	0.015	0.015				
AMKE	0.047	0.007	-0.040	-84.31	1.31	0.254	
TUTI	0.023	0.007	-0.016	-68.63			
SAVS	0.008	0.007	0.000	-5.88			
WITU	0.008	0.007	0.000	-5.88			X
YBCU	0.008	0.007	0.000	-5.88			
BAOW	-	0.007	0.007				
CAGO	-	0.007	0.007				X
KEWA	-	0.007	0.007				
PROW	-	0.007	0.007				
RODO	0.000	0.007	0.007				
YWAR	-	0.007	0.007				

Table1. continued.

SPECIES	birds/pt 2000	birds/pt 2001	difference '01 - '00	%change	F-statistic	P-value	Accuracy
NRWS	0.055	0.000	-0.055	-100.00			X
KILL	0.039	0.000	-0.039	-100.00	3.95	0.049	
RTHA	0.023	0.000	-0.023	-100.00			X
PIWO	0.008	0.000	-0.008	-100.00			
WOTH	0.008	0.000	-0.008	-100.00			
YTVI	0.008	0.000	-0.008	-100.00			
BAEG	0.000	0.000	0.000				X
AMBI	-	0.000	-				X
BANS	-	0.000	-				X
BBCU	-	0.000	-				
BWHA	-	0.000	-				X
BWWA	-	0.000	-				
CLSW	-	0.000	-				X
HOFI	-	0.000	-				
RTHU	-	0.000	-				X
WODU	-	0.000	-				X
HOSP	0.016	-	-				
COHA	0.008	-	-				
NOBO	0.008	-	-				
WIFL	0.008	-	-				
BLGR	0.000	-	-				
DCCO	0.000	-	-				X
GNHE	0.000	-	-				X
GREG	0.000	-	-				X

Table 2. Total number of birds of each species observed at each point count location in 2000 and 2001. Values include all individuals within 100 m radius and those beyond 100 m but less than half-way to the next point. Also listed are the number of points at which each species was observed and an estimate of the population size extrapolated from the birds/pt value in Table 1. Species with estimated population of 0 were not detected within the 100-m radius count areas. Birds are listed in decreasing order of abundance in 2001. Species codes are in Appendix I.

SPECIES	2000			2001		
	total birds	#points	estimated population	total birds	#points	estimated population
GRSP	294	50	1629	269	54	1201
WEME	318	45	1217	221	37	634
FISP	130	45	406	140	54	431
EAME	57	24	203	111	37	240
BHCO	52	31	170	85	35	246
COGR	20	15	26	81	26	49
RWBL	67	12	196	75	20	246
HOWR	49	23	144	73	35	203
DICK	190	48	949	72	27	209
MODO	93	48	268	72	39	160
EUST	76	27	151	69	28	111
BAOR	45	29	183	66	36	259
BLJA	66	30	190	58	28	197
TUVU	22	11	20	58	9	55
VESP	32	17	151	50	26	160
AMRO	42	28	118	49	32	117
GCFL	15	12	46	47	26	86
AMCR	57	27	170	43	21	18
TRES	42	16	13	41	22	49
EAKI	31	21	137	38	23	160
AMGO	45	25	72	37	19	129
BOBO	18	7	52	36	13	129
CHSP	29	20	177	34	21	129
GRCA	23	14	124	34	20	135
OROR	27	17	98	32	17	142
SOSP	27	16	59	32	17	68
NOCA	17	14	79	31	19	92
BRTH	25	18	137	29	21	105
EABL	38	19	144	28	17	111
BARS	29	15	7	26	14	31
LASP	50	24	177	25	13	129
RBGR	7	6	33	25	19	74
INBU	13	9	46	20	13	43
CEDW	12	7	59	19	7	105
COYE	9	6	33	18	10	62

Table 2. continued.

SPECIES	2000			2001		
	total birds	#points	estimated population	total birds	#points	estimated population
EAWP	9	5	20	16	12	43
NOMO	29	18	111	13	10	37
WAVI	3	3	7	13	9	31
BCCH	13	10	65	12	8	43
YSFL	15	13	26	12	12	37
CHSW	17	14	0	11	5	18
EATO	3	3	13	11	7	25
HOLA	5	3	7	11	9	31
RBWO	6	6	13	11	10	18
CAGO	0	0	0	10	3	6
AMRE	3	1	13	9	5	25
CONI	6	6	0	9	4	31
GTBH	9	6	13	9	3	18
REVI	4	2	26	9	4	12
HAWO	1	1	7	7	6	25
RHOW	14	13	52	7	6	18
RTHA	14	12	20	7	6	0
UPSA	15	9	39	7	5	25
WBNU	14	12	65	7	5	12
EAPH	1	1	0	6	5	18
LOSH	3	2	7	6	3	18
SCTA	1	1	0	6	5	18
WITU	2	2	7	6	5	6
DOWO	11	10	39	5	4	12
MALL	0	0	0	5	3	12
YBCU	5	5	7	5	3	6
YBSA	5	4	13	5	5	18
OVEN	4	2	7	4	2	18
PROW	0	0	0	4	2	6
AMKE	7	3	39	3	2	6
HESP	0	0	0	3	3	12
KEWA	0	0	0	3	3	6
KILL	18	13	33	3	2	0
WODU	0	0	0	3	2	0
YTVI	1	1	7	3	2	0
PIWO	3	3	7	2	2	0
SWSP	0	0	0	2	1	12
TUTI	6	5	20	2	2	6
WOTH	2	2	7	2	1	0
AMBI	0	0	0	1	1	0
BAEG	2	2	0	1	1	0

Table 2. continued.

SPECIES	2000			2001		
	total birds	#points	estimated population	total birds	#points	estimated population
BANS	0	0	0	1	1	0
BAOW	0	0	0	1	1	6
BBCU	0	0	0	1	1	0
BWHA	0	0	0	1	1	0
BWWA	0	0	0	1	1	0
CLSW	0	0	0	1	1	0
HOFI	0	0	0	1	1	0
NRWS	23	10	46	1	1	0
RODO	3	2	0	1	1	6
RTHU	0	0	0	1	1	0
SAVS	1	1	7	1	1	6
YWAR	0	0	0	1	1	6
BLGR	1	1	0	0	0	0
COHA	1	1	7	0	0	0
GREG	1	1	0	0	0	0
HOSP	2	1	13	0	0	0
NOBO	16	15	7	0	0	0
WIFL	1	1	7	0	0	0
DDCO	1	1	0	0	0	0
GNHE	1	1	0	0	0	0

Table 3. Number of species and individual birds observed at each point count location in 2000 and 2001. Species column shows the cumulative number of species recorded during two counts in each year. Individuals column shows the average number of birds. The averages for each major habitat are shown in the last four rows.

POINT	HABITAT	2000		2001	
		SPECIES	BIRDS	SPECIES	BIRDS
A1	Prairie	6	11.5	4	8.5
A2	Prairie	5	14.0	7	9.0
A3	Prairie	4	9.5	8	11.0
A4	Wetland	8	8.0	16	18.5
A5	Prairie	7	8.0	11	12.0
A6	Savanna	11	12.5	13	13.5
A7	Savanna	10	7.0	9	8.0
A8	Savanna	6	5.5	13	11.5
A9	Prairie	10	8.5	10	8.0
A10	Prairie	6	13.5	8	8.5
B1	Savanna	8	14.0	7	6.0
B2	Prairie	20	18.0	14	10.0
B3	Prairie	7	9.0	12	8.0
B4	Savanna	10	8.0	12	12.0
B5	Prairie	8	8.5	17	13.5
C1	Prairie	4	8.0	8	8.0
C2	Prairie	9	8.5	13	10.0
C3	Prairie	13	15.5	9	8.5
D1	Prairie	12	11.5	14	12.0
D2	Prairie	3	5.0	8	10.0
E1	Prairie	6	13.0	7	5.0
E2	Prairie	6	11.5	6	8.5
E3	Prairie	5	10.0	7	9.0
E4	Prairie	7	11.0	5	5.0
E5	Prairie	14	15.0	10	9.5
E6	Prairie	12	14.0	7	8.0
E7	Prairie	6	11.5	7	8.0
E8	Prairie	3	10.0	8	9.5
E9	Prairie	6	13.0	3	6.0
E10	Prairie	10	15.5	4	6.5
E11	Prairie	10	12.5	8	6.5
E12	Prairie	7	11.5	10	8.0
E13	Prairie	6	9.0	6	5.0
E14	Prairie	6	10.0	2	3.0
E15	Prairie	10	12.5	2	6.0
E16	Prairie	10	14.0	6	10.0

Table 3. continued.

POINT	HABITAT	2000		2001	
		SPECIES	BIRDS	SPECIES	BIRDS
F0	Prairie	8	12.0	10	8.0
F1	Prairie	13	9.0	13	14.0
F2	Prairie	13	8.5	14	11.5
F3	Savanna	6	5.5	7	6.5
F3.5	Savanna	7	4.0	7	4.5
F4	Savanna	17	11.5	9	6.5
F5	Savanna	10	8.0	11	8.5
F5.5	Savanna	10	5.5	4	2.0
F6	Prairie	6	7.0	5	6.0
F7	Forest	9	7.5	4	2.5
F8	Forest	10	7.5	7	5.0
F9	Wetland	8	17.0	9	13.5
F10	Savanna	12	9.5	6	4.5
F10.5	Wetland	19	12.5	10	10.0
F11	Prairie	10	8.0	7	6.5
F11.5	Savanna	-	-	13	14.5
F12	Prairie	10	9.5	19	17.5
F14	Forest	-	-	9	5.5
F15	Forest	-	-	7	4.5
F16	Forest	-	-	10	7.0
F17	Savanna	-	-	6	4.0
F18	Forest	12	8.0	-	-
F19	Wetland	10	5.5	15	11.5
G1	Prairie	9	9.0	6	6.5
G2	Prairie	6	10.5	3	3.0
G3	Prairie	10	14.5	11	10.0
G4	Savanna	12	12.5	15	11.5
J1	Savanna	11	10.5	11	11.0
J2	Savanna	14	11.0	10	9.5
J3	Prairie	9	11.0	10	7.0
J4	Prairie	5	7.5	4	2.5
J5	Forest	5	3.0	9	5.0
J6	Forest	6	3.5	6	6.5
AVG	Forest (8)	5.3	3.7	6.5	4.5
AVG	Prairie (41)	8.2	11.0	8.4	8.4
AVG	Savanna (16)	9.0	7.8	9.6	8.4
AVG	Wetland (4)	11.3	10.8	12.5	13.4

Table 4. The 35 most common bird species in each major habitat in 2000 and 2001. Values are birds per point averaged among the 100-m radius points in each habitat (see table 6). Species codes are listed in Appendix I.

PRAIRIE				SAVANNA			
Species	2000	Species	2001	Species	2000	Species	2001
GRSP	2.671	GRSP	2.037	FISP	0.964	FISP	0.781
WEME	2.146	WEME	1.134	GRSP	0.964	GRSP	0.750
DICK	1.659	FISP	0.524	BLJA	0.679	BLJA	0.531
FISP	0.415	EAME	0.415	MODO	0.393	BAOR	0.500
EAME	0.354	DICK	0.366	BAOR	0.357	CEDW	0.469
MODO	0.341	BHCO	0.280	BRTH	0.357	HOWR	0.406
BHCO	0.244	MODO	0.280	WEME	0.357	BHCO	0.375
LASP	0.244	EAKI	0.268	AMCR	0.321	BRTH	0.281
CHSP	0.232	OROR	0.244	EUST	0.321	VESP	0.281
VESP	0.220	BOBO	0.232	GRCA	0.321	EABL	0.250
EAKI	0.207	CHSP	0.220	HOWR	0.321	NOCA	0.250
BAOR	0.183	VESP	0.207	CHSP	0.250	AMRO	0.219
NOMO	0.171	HOWR	0.183	DICK	0.250	LASP	0.219
AMCR	0.159	LASP	0.171	EABL	0.250	RWBL	0.219
EUST	0.134	BAOR	0.134	LASP	0.250	EUST	0.188
HOWR	0.122	EABL	0.122	OROR	0.214	GCFL	0.188
BRTH	0.110	AMRO	0.110	WBNU	0.214	GRCA	0.188
OROR	0.110	TUVU	0.110	AMRO	0.179	WEME	0.188
AMGO	0.098	EUST	0.098	BHCO	0.179	AMGO	0.156
BOBO	0.098	AMGO	0.085	CEDW	0.179	BCCH	0.156
EABL	0.098	BRTH	0.085	VESP	0.179	COGR	0.156
RHWO	0.098	GRCA	0.073	BCCH	0.107	RBGR	0.156
NRWS	0.085	NOCA	0.073	DOWO	0.107	DICK	0.125
UPSA	0.085	RWBL	0.073	EAKI	0.107	EAKI	0.125
AMRO	0.073	CONI	0.061	GCFL	0.107	EATO	0.125
KILL	0.061	HOLA	0.061	INBU	0.107	CHSP	0.094
AMKE	0.049	NOMO	0.061	NOCA	0.107	CHSW	0.094
BLJA	0.049	TRES	0.061	NOMO	0.107	EAWP	0.094
GRCA	0.049	BARS	0.049	AMGO	0.071	OROR	0.094
SOSP	0.049	BLJA	0.049	AMKE	0.071	BOBO	0.063
CEDW	0.037	UPSA	0.049	EAME	0.071	COYE	0.063
COGR	0.037	YSFL	0.049	EAWP	0.071	EAPH	0.063
NOCA	0.037	GCFL	0.037	SOSP	0.071	INBU	0.063
YSFL	0.037	LOSH	0.037	EATO	0.036	MODO	0.063
DOWO	0.024	RBGR	0.037	RBWO	0.036	SOSP	0.063

Table 4. continued.

FOREST				WETLAND			
Species	2000	Species	2001	Species	2000	Species	2001
BLJA	0.600	BAOR	0.857	RWBL	3.250	RWBL	2.375
BCCH	0.500	BLJA	0.571	EABL	0.875	AMGO	1.125
AMCR	0.400	BHCO	0.286	AMRO	0.500	GRCA	0.875
REVI	0.400	INBU	0.286	COYE	0.500	SAVS	0.875
WBNU	0.400	AMRE	0.214	NOCA	0.500	SOSP	0.750
AMRO	0.300	AMRO	0.214	EUST	0.375	COYE	0.625
GCFL	0.300	EAWP	0.214	GRCA	0.375	EAPH	0.625
GRCA	0.300	GCFL	0.214	GRSP	0.375	GTBH	0.500
INBU	0.300	GRCA	0.214	SOSP	0.375	WITU	0.500
RBGR	0.300	HOWR	0.214	TUVU	0.375	BAOR	0.375
AMRE	0.200	BCCH	0.143	BCCH	0.250	BLJA	0.375
BAOR	0.200	COGR	0.143	BRTH	0.250	FISP	0.375
HOWR	0.200	DOWO	0.143	DICK	0.250	GCFL	0.375
NOCA	0.200	HAWO	0.143	MODO	0.250	HAWO	0.375
BHCO	0.100	OVEN	0.143	TUTI	0.250	EUST	0.250
COHA	0.100	RBGR	0.143	AMGO	0.125	INBU	0.250
COYE	0.100	REVI	0.143	BAOR	0.125	RBGR	0.250
DOWO	0.100	WAVI	0.143	CEDW	0.125	SWSP	0.250
EATO	0.100	AMCR	0.071	CHSP	0.125	TUTI	0.250
EAWP	0.100	BAOW	0.071	COGR	0.125	WAVI	0.250
GTBH	0.100	GTBH	0.071	EAKI	0.125	AMRE	0.125
OVEN	0.100	NOCA	0.071	FISP	0.125	BBCU	0.125
PIWO	0.100	PROW	0.071	GCFL	0.125	BHCO	0.125
RBWO	0.100	RBWO	0.071	GTBH	0.125	CEDW	0.125
RWBL	0.100	RHWO	0.071	HAWO	0.125	DICK	0.125
YBSA	0.100	RWBL	0.071	HOWR	0.125	HOWR	0.125
YTVI	0.100	SCTA	0.071	INBU	0.125	NOCA	0.125
		TUTI	0.071	RBGR	0.125	RBWO	0.125
				WIFL	0.125	RTHA	0.125
				WOTH	0.125	WBNU	0.125
				YBCU	0.125	WODU	0.125
						YBSA	0.125
						YWAR	0.125

Table 5. Vegetation characteristics at point count locations in 2000 and 2001. Measurements were made during the first two weeks of June in each year. Robel is an estimate of the height and density of vegetation (see methods). Litter is the depth in cm of dead organic matter on the ground. MAXHT is the maximum height of vegetation within 0.5 m of each Robel reading. Robel and Litter are the average of 16 values and Maxht is the average of 4 values for each point count location (see methods). Shrubs and Trees are the number of woody plants < 3 m or > 3 m, respectively, within each 100 m radius point count location.

POINT	HABITAT	ROBEL		LITTER		MAXHT		SHRUBS	TREES
		2000	2001	2000	2001	2000	2001		
A1	Prairie	1.81	2.44	0.81	2.31	2.50	5.75	19	0
A2	Prairie	3.44	3.31	1.25	3.56	4.00	10.00	25	0
A3	Prairie	1.06	1.44	1.00	0.94	2.50	4.50	41	5
A5	Prairie	2.00	3.13	1.38	2.56	4.00	6.00	40	9
A8	Savanna	1.75	1.81	0.81	2.44	3.00	6.50	54	9
A9	Prairie	1.43	1.38	0.44	1.44	2.00	5.25	90	9
A10	Prairie	0.94	1.38	0.31	1.00	2.25	5.75	56	6
B1	Savanna	1.63	1.25	0.50	2.31	1.50	5.00	88	46
B2	Prairie	1.94	2.13	0.75	2.06	2.75	6.00	104	8
B3	Prairie	1.94	2.06	0.56	2.50	2.25	5.75	84	4
B4	Savanna	1.50	1.25	0.56	0.56	1.00	4.00	90	34
B5	Prairie	1.75	1.94	1.63	2.13	3.50	5.25	54	10
C1	Prairie	1.63	1.69	0.56	2.13	4.00	4.50	31	3
C2	Prairie	1.56	2.00	1.63	2.38	4.00	5.00	57	10
C3	Prairie	1.88	2.19	2.18	2.50	-	5.50	45	20
D1	Prairie	1.50	1.31	1.30	1.38	-	4.75	120	21
D2	Prairie	2.10	2.56	2.20	3.25	-	9.75	15	0
E1	Prairie	1.96	2.38	0.63	1.13	5.00	6.00	18	0
E2	Prairie	1.25	1.88	0.88	1.56	5.00	5.25	10	2
E3	Prairie	1.88	2.81	0.13	2.50	2.75	6.25	3	2
E4	Prairie	1.75	2.44	1.81	2.00	4.50	5.50	21	0
E5	Prairie	1.56	2.25	0.44	1.44	3.00	7.00	31	16
E6	Prairie	1.69	1.94	1.44	2.94	4.25	7.25	8	10
E7	Prairie	2.88	2.81	2.00	3.00	4.50	6.50	42	4
E8	Prairie	1.25	2.25	2.88	2.75	3.75	6.00	46	3
E9	Prairie	1.31	1.88	1.06	2.19	3.75	6.50	46	5
E10	Prairie	2.25	2.31	1.19	2.94	1.25	8.50	32	7
E11	Prairie	1.65	1.56	0.56	0.56	2.25	6.00	115	41
E12	Prairie	1.88	4.56	1.19	3.50	2.50	8.25	68	5
E13	Prairie	1.56	2.00	2.25	2.13	2.00	6.50	36	1
E14	Prairie	2.38	2.06	3.63	4.06	7.25	6.00	70	0
E15	Prairie	1.13	1.81	2.19	1.88	3.75	5.75	33	3
E16	Prairie	1.06	1.06	1.38	1.50	2.75	6.00	74	13

Table 5. continued

POINT	HABITAT	ROBEL		LITTER		MAXHT		SHRUBS	TREES
		2000	2001	2000	2001	2000	2001		
F0	Prairie	1.44	1.50	0.56	0.69	-	6.50	19	12
F1	Prairie	1.69	2.31	0.63	1.75	2.25	6.00	66	35
F2	Prairie	1.31	2.19	1.06	1.69	3.25	7.50	67	74
F3	Savanna	1.56	1.25	0.75	1.38	2.50	5.00	80	63
F4	Savanna	1.88	2.13	2.00	1.81	4.50	7.50	68	27
F5	Savanna	1.44	2.00	0.50	2.63	1.50	5.25	72	101
F6	Prairie	1.69	1.06	0.53	0.56	-	4.00	65	26
F10	Savanna	1.31	1.94	1.38	3.38	3.50	8.25	70	51
F11	Prairie	1.73	1.88	0.88	1.56	3.00	7.75	54	24
F12	Prairie	2.25	2.75	0.69	2.81	4.50	7.00	108	18
G1	Prairie	2.25	2.75	2.00	4.50	-	6.75	27	4
G2	Prairie	1.88	1.94	1.25	2.69	-	7.50	17	11
G3	Prairie	1.05	1.25	0.50	-	-	-	-	-
G4	Savanna	2.24	2.31	1.25	3.56	-	7.00	68	52
J2	Savanna	4.54	5.31	3.20	3.81	-	10.25	68	18
J3	Prairie	2.54	2.69	2.24	3.19	-	8.25	30	7
J4	Prairie	1.88	2.13	-	2.06	-	7.00	39	2
AVG	Prairie	1.76	2.13	1.25	2.19	3.39	6.38	48	11
AVG	Savanna	1.98	2.14	1.22	2.43	2.50	6.53	73	45
AVG	All points	1.80	2.13	1.24	2.24	3.22	6.41	53	17

Table 6. Results of multiple linear regression analysis of habitat variables as predictors of abundance (within 100m radius point count locations) for selected species. For each species the P-values for each variable retained in the significant model are listed along with + or - to indicate the direction of the correlation between abundance (#birds/pt) and that variable. R² indicates the proportion of variance explained by the model. Species are listed according to a habitat gradient from sparsely vegetated grassland to grassland with shrubs and trees to savanna. Species codes are listed in Appendix I.

Species	R ²	Robel	Litter	Maxht	#Shrubs	#Trees
KILL	0.052		-(0.034)			
VESP	0.182		-(0.007)		+(0.001)	
WEME	0.202		-(0.038)		-(0.075)	-(0.028)
UPSA	0.043	+(0.095)	-(0.083)			
GRSP	0.197			-(0.136)		-(0.000)
EAME	0.033					-(0.094)
DICK	0.219		+(0.121)	-(0.001)		-(0.005)
BOBO	0.074				-(0.014)	
RWBL	0.403	+(0.000)				
COYE	0.211	+(0.000)			+(0.122)	
MODO	0.064		-(0.018)			
CHSP	0.153			-(0.037)	+(0.001)	
FISP	0.094					+(0.004)
LASP	0.169	-(0.015)				+(0.004)
AMGO	0.058	+(0.121)	-(0.089)			+(0.123)
EABL	0.049				+(0.039)	
SOSP	0.062		+(0.144)		+(0.094)	
LOSH	0.000					
NOMO	0.000					
EAKI	0.000					
OROR	0.041					+(0.059)
BHCO	0.068	+(0.047)			+(0.139)	
RHWO	0.091	+(0.131)		-(0.041)	+(0.022)	
BRTH	0.071			-(0.108)		+(0.046)
BAOR	0.132	+(0.025)		-(0.069)		+(0.003)
AMCR	0.027			-(0.130)		
HOWR	0.158				+(0.050)	+(0.039)
CEDW	0.284		+(0.018)			+(0.000)
GCFL	0.139					+(0.000)
GRCA	0.244					+(0.000)
BLJA	0.086	+(0.074)		-(0.089)		+(0.022)
AMRO	0.059				+(0.023)	
EUST	0.000					

Table 7. Species of management concern at Lost Mound. Categories include USFWS Resource Conservation Priority species (H - High and L - Lower priority); Illinois, Wisconsin, and Iowa state Endangered Species Acts, US Forest Service Region 9 sensitive species, and Audubon Watch List. Status categories include M – migrant, SR – summer resident, WR – winter resident, R –resident (all year), PB – potential breeder (observed during breeding season but breeding not confirmed). Bald Eagle is the only species listed under the Endangered Species Act.

SPECIES	STATUS	USFWS	Illinois	Wisc.	Iowa	USFS	Audubon
PRAIRIE							
Northern Harrier	M, PB	L	E		E	RFS	
Short-eared Owl	M, PB	L	E		E	RFS	WL
Upland Sandpiper	SR	L	E				
Henslow's Sparrow	SR	H	E	T	T	RFS	WL
Grasshopper Sparrow	SR	H					
Eastern Meadowlark	SR	H					
Dickcissel	SR	H					WL
Bobolink	SR	H				RFS	WL
Field Sparrow	SR	L					
SAVANNA, SHRUBLAND							
Golden-winged Warbler	M	H					WL
Blue-winged Warbler	SR	L					
Bell's Vireo	M, PB	L		T			WL
Red-headed Woodpecker	R	L					WL
Loggerhead Shrike	SR	H	T	E		RFS	
Yellow-billed Cuckoo	SR	L					
Northern Flicker	R	L					
FOREST							
Long-eared Owl	M				T		
Yellow-bellied Flycatcher	M					RFS	
Black-throated Blue Warbler	M					RFS	WL
Bay-breasted Warbler	M					RFS	
Brown Creeper	M, PB		T				
Red-shouldered Hawk	R	H	T	T	E	RFS	
Veery	M, PB	L					
Wood Thrush	SR	H					WL
Yellow-throated Warbler	SR			E			
Cerulean Warbler	SR	H		T		RFS	WL
Prothonotary Warbler	SR						WL
Kentucky Warbler	SR			T			WL
AERIAL							
Peregrine Falcon	M, PB	H	E	E	E	RFS	
Totals	29	21	8	8	6	11	12

Table 7. continued.

SPECIES	STATUS	USFWS	Illinois	Wisc.	Iowa	USFS	Audubon
WETLANDS							
Common Loon	M	L				RFS	
Snowy Egret	M		E	E			
Little Blue Heron	M		E				
American Black Duck	M						WL
Stilt Sandpiper	M						WL
Short-billed Dowitcher	M						WL
Wilson's Phalarope	M		E			RFS	
Caspian Tern	M			E		RFS	
Common Tern	M	H	E	E		RFS	
Forster's Tern	M		E	E			
Black Tern	M	H	E			RFS	
Trumpeter Swan	M	H	extirpated	E	reintroduced	RFS	
Pied-billed Grebe	M, SR		T				
Bald Eagle	R, M	H	T		E		
American Bittern	SR	H	E				
Great Egret	SR			T			
Black-crowned Night-Heron	SR		E			RFS	
Osprey	SR		E	T			
Sandhill Crane	SR		T				
Total	19	6	13	7	2	7	3
Grand Total	48	27	21	15	8	18	15

Appendix I. Common names, scientific names and 4-letter codes for each species listed in tables or text. Species listed alphabetically by code.

code	common name	scientific name
AMBI	American Bittern	<i>Botaurus lentiginosus</i>
AMCR	American Crow	<i>Corvus brachyrhynchos</i>
AMGO	American Goldfinch	<i>Carduelis tristis</i>
AMKE	American Kestrel	<i>Falco sparverius</i>
AMRE	American Redstart	<i>Setophaga ruticilla</i>
AMRO	American Robin	<i>Turdus migratorius</i>
BAEA	Bald Eagle	<i>Haliaeetus leucocephalus</i>
BANS	Bank Swallow	<i>Riparia riparia</i>
BAOR	Baltimore Oriole	<i>Icterus galbula</i>
BAOW	Barred Owl	<i>Strix varia</i>
BARS	Barn Swallow	<i>Hirundo rustica</i>
BBCU	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
BCCH	Black-capped Chickadee	<i>Poecile atricapillus</i>
BHCO	Brown-headed Cowbird	<i>Molothrus ater</i>
BLGR	Blue Grosbeak	<i>Guiraca caerulea</i>
BLJA	Blue Jay	<i>Cyanocitta cristata</i>
BOBO	Bobolink	<i>Dolichonyx oryzivorus</i>
BRTH	Brown Thrasher	<i>Toxostoma rufum</i>
BWHA	Broad-winged Hawk	<i>Buteo platyperus</i>
BWWA	Blue-winged Warbler	<i>Vermivora pinus</i>
CAGO	Canada Goose	<i>Branta canadensis</i>
CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>
CHSP	Chipping Sparrow	<i>Spizella passerina</i>
CHSW	Chimney Swift	<i>Chaetura pelagica</i>
CLSW	Cliff Swallow	<i>Hirundo pyrrhonota</i>
COGR	Common Grackle	<i>Quiscalus quiscula</i>
COHA	Cooper's Hawk	<i>Accipiter cooperii</i>
CONI	Common Nighthawk	<i>Chordeiles minor</i>
COYE	Common Yellowthroat	<i>Geothlypis trichas</i>
DCCO	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
DICK	Dickcissel	<i>Spiza americana</i>
DOWO	Downy Woodpecker	<i>Picoides pubescens</i>
EABL	Eastern Bluebird	<i>Sialia sialis</i>
EAKI	Eastern Kingbird	<i>Tyrannus tyrannus</i>
EAME	Eastern Meadowlark	<i>Sturnella magna</i>
EAPH	Eastern Phoebe	<i>Sayornis phoebe</i>
EATO	Eastern Towhee	<i>Pipilo erythrophthalmus</i>
EAWP	Eastern Pewee	<i>Contopus virens</i>
EUST	European Starling (I)	<i>Sturnus vulgaris</i>
FISP	Field Sparrow	<i>Spizella pusilla</i>
GCFL	Great Crested Flycatcher	<i>Myiarchus crinitus</i>
GNHE	Green Heron	<i>Butorides virescens</i>
GRCA	Gray Catbird	<i>Dumetella carolinensis</i>
GREG	Great Egret	<i>Ardea alba</i>
GRSP	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
GTBH	Great Blue Heron	<i>Ardea herodias</i>

HAWO	Hairy Woodpecker	<i>Picoides villosus</i>
HESP	Henslow's Sparrow	<i>Ammodramus henslowi</i>
HOFI	House Finch	<i>Carpodacus mexicanus</i>
HOLA	Horned Lark	<i>Eremophila alpestris</i>
HOSP	House Sparrow (I)	<i>Passer domesticus</i>
HOWR	House Wren	<i>Troglodytes aedon</i>
INBU	Indigo Bunting	<i>Passerina cyanea</i>
KEWA	Kentucky Warbler	<i>Oporornis formosus</i>
KILL	Killdeer	<i>Charadrius vociferus</i>
LASP	Lark Sparrow	<i>Chondestes grammacus</i>
LOSH	Loggerhead Shrike	<i>Lanius ludovicianus</i>
MALL	Mallard	<i>Anas platyrhynchos</i>
MODO	Mourning Dove	<i>Zenaida macroura</i>
NOBO	Northern Bobwhite	<i>Colinus virginianus</i>
NOCA	Northern Cardinal	<i>Cardinalis cardinalis</i>
NOMO	Northern Mockingbird	<i>Mimus polyglottos</i>
NRWS	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
OROR	Orchard Oriole	<i>Icterus spurius</i>
OVEN	Ovenbird	<i>Seiurus aurocapillus</i>
PIWO	Pileated Woodpecker	<i>Dryocopus pileatus</i>
PROW	Prothonotary Warbler	<i>Protonotaria citrea</i>
RBGR	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
RBHU	Ruby-throated Hummingbird	<i>Archilochus colubris</i>
RBWO	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>
RHOW	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
RODO	Rock Dove (I)	<i>Columba livia</i>
RTHA	Red-tailed Hawk	<i>Buteo jamaicensis</i>
RWBL	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
SAVS	Savannah Sparrow	<i>Passerculus sandwichensis</i>
SCTA	Scarlet Tanager	<i>Piranga olivacea</i>
SOSP	Song Sparrow	<i>Melospiza melodia</i>
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>
TRES	Tree Swallow	<i>Tachycineta bicolor</i>
TUTI	Tufted Titmouse	<i>Baeolophus bicolor</i>
TUVU	Turkey Vulture	<i>Cathartes aura</i>
UPSA	Upland Sandpiper	<i>Bartramia longicauda</i>
VESP	Vesper Sparrow	<i>Poocetes gramineus</i>
WAVI	Warbling Vireo	<i>Vireo gilvus</i>
WBNU	White-breasted Nuthatch	<i>Sitta carolinensis</i>
WEME	Western Meadowlark	<i>Sturnella neglecta</i>
WIFL	Willow Flycatcher	<i>Empidonax traillii</i>
WITU	Wild Turkey	<i>Meleagris gallopavo</i>
WODU	Wood Duck	<i>Aix sponsa</i>
WOTH	Wood Thrush	<i>Hylocichla mustelina</i>
YBCU	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
YBSA	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
YSFL	Northern Flicker	<i>Colaptes auratus</i>
YTVI	Yellow-throated Vireo	<i>Vireo flavifrons</i>
YWAR	Yellow Warbler	<i>Dendroica petechia</i>

Appendix II. The following pages contain a complete list of birds observed at Lost Mound and surrounding areas of former Savanna Army Depot 1994-2001. Columns for each month show presence (x) or absence during each of four 7-8 day "weeks". Abundance (ab) categories: C - common, likely to be seen on every visit to appropriate habitat and season; U= uncommon, seen on half or fewer visits; R - rare, seen on less than 25% of visits. Status (stat) categories (these apply to northwest Illinois): M - migrant, R - resident all year, SR - summer resident (breeding), WR - winter resident, V - vagrant (outside typical range). Habitat (hab) categories: A- aerial, primarily seen in flight; B - bottomland and floodplain forest; F - upland forest; P - prairie or grassland; S - savanna, shrubland, open woodland, prairie with woody encroachment, and/or successional fields, U - urban, W - wetlands, rivers, streams, ponds, shorelines, marsh, temporary pools.

Species	ab	stat	hab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common Loon	R	M	W				xx							xx	
Pied-billed Grebe	U	SR	W			xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Horned Grebe	R	M	W				xx x						xx	x x	
American White Pelican	U	M	W			x	xxxx		x		x	xx	xxx		
Double-crested Cormorant	U	SR	W			x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
American Bittern	R	SR	W					x	x						
Great Blue Heron	C	SR	W			xxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Great Egret	U	SR	W				xx	xxxx	xxxx	xxxx	xxxx	xxxx	xx x	x	
Snowy Egret	R	V	W					x							
Little Blue Heron	R	V	W					x							
Green Heron	U	SR	W					xxxx	xx x	x x	x xx	xx			
Black-crowned Night-Heron	R	SR	W								x	x			
Turkey Vulture	C	SR	A			xxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	
Tundra Swan	R	M	W			xx							x	x	
Mute Swan (I)	R	SR	W				x								
Trumpeter Swan	R	V	W				xx	x	x x						
Snow Goose	U	M	W			x	x x								
Canada Goose	C	R	W	x	xxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx x	xx	xxx
Wood Duck	C	SR	W/B		x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
Green-winged Teal	U	M	W			xxxx	xxxx	xxxx				x	xxxx	xxx	
American Black Duck	R	M	W			xxx	x								
Mallard	C	R	W		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx
Northern Pintail	U	M	W		x	xxxx	x					x	xx	xx	
Blue-winged Teal	C	SR	W/P			xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	
Northern Shoveler	C	M	W			xxxx	xxxx	xx				x	xxxx	xxxx	
Gadwall	U	M	W			xxxx	xxx	x					xx	xxxx	x
American Wigeon	C	M	W		x	xxxx	xx						xx	xxxx	
Canvasback	C	M	W		x	xxxx	xxxx	xxx					xxx	xxxx	xx
Redhead	U	M	W		x	xxxx	xx						x x	x x	
Ring-necked Duck	U	M	W		x	xxxx	xxx	xx					xxx	xxxx	x
Greater Scaup	R	M	W			x xx	xx						x x	xx	x
Lesser Scaup	C	M	W		x	xxxx	xxxx	xxx					xx	xxxx	xx
Long-tailed Duck	R	M	W			x									x
Surf Scoter	R	M	W										x xx		
White-winged Scoter	R	M	W										x	xx	xxx
Common Goldeneye	U	WR	W	x	xx	xxxx	x	xx					x x	x x	
Bufflehead	C	M	W		x	xxxx	xxxx						x	xxxx	x
Hooded Merganser	R	M	W		x	xxxx	x	xx				x		xx x	
Common Merganser	C	WR	W	xx	x xx	xxxx	x								x
Red-breasted Merganser	R	M	W			xx	x								
Ruddy Duck	C	M	W		x	xxxx	xxxx	xx	x				xxxx	xxxx	xx
Osprey SE	R	SR	W/A				x	x		x x	x	xxxx	x		
Bald Eagle	C	R	W/B	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Northern Harrier	R	R	P	x	x	xxxx	xx	xx	xxx		a		xx	xxx	x
Sharp-shinned Hawk	R	M	F			x	xx				x	xx	xxx		
Cooper's Hawk	U	R	F	x	xxx	xx	x x	xx	xxxx	x	x x	x xx	xxxx	x	x
Red-shouldered Hawk	R	R	F		xx	xxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Broad-winged Hawk	R	M	F									x			
Red-tailed Hawk	C	R	S	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Rough-legged Hawk	C	WR	P	xxxx	xxxx	xxxx							x	x	x x
Golden Eagle	R	WR	P	xx									x		
American Kestrel	C	R	P/S	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Merlin	R	M	S									xxx	xx		
Peregrine Falcon	R	M	S/A				x				x	x			
Wild Turkey	C	R	F/S	xx	x xx	xx x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	x
Northern Bobwhite	R	R	P/S					x	x xx	x					

Species	ab	stat	hab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American Coot	C	M	W		x	xxxx	xxxx	xxx				x	xxxx	xxxx	x
Sandhill Crane	U	SR	W			xx	xxxx	xxxx	xxx	x	x	x	x		
Black-bellied Plover	R	M	W								x	x		x	
Semipalmated Plover	R	M	W					xxxx			x				
Killdeer	C	SR	P/W		x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	
Greater Yellowlegs	U	M	W				xxxx	xx		x	x	xx	x	x	
Lesser Yellowlegs	U	M	W				xxxx	xxx		x	xxxx	x	x	xxx	x
Solitary Sandpiper	C	M	W				x	xxxx	x	xx	xxxx	x	x		
Spotted Sandpiper	C	M	W				x	xxxx	x	x	xx	xxxx	xxxx	x	
Upland Sandpiper	U	SR	P				xx	xxxx	xxxx	xxxx					
Semipalmated Sandpiper	R	M	W							xx	xx	x	xx		
Western Sandpiper	R	M	W										x	x	
Least Sandpiper	U	M	W					xx		x	xx				
Pectoral Sandpiper	C	M	W				xxxx	x		x	x	xxxx	xxxx	x	xx
Stilt Sandpiper	R	M	W					x		x					
Short-billed Dowitcher	R	M	W					x		x	x				
Long-billed Dowitcher	R	M	W										xxx		
Common Snipe	U	M	W				xxx				x			x	xx
American Woodcock	R	M	F			x									
Wilson's Phalarope	R	M	W								x				
Bonaparte's Gull	U	M	W			x	xx	x					x	xxxx	
Ring-billed Gull	C	WR	W	xxxx	xxxx	xxxx	xx	x	x		x	xx	xxxx	xxxx	xxxx
Herring Gull	U	WR	W		x	x	xxxx	x					xxx	x	x
Caspian Tern	R	M	W					x				xx			
Common Tern	R	M	W							x			x		
Forster's Tern	R	M	W					xxx			x		x		
Black Tern	U	M	W					xxx		x	xx				
Rock Dove (I)	C	R	U	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	x
Mourning Dove	C	R	S	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	x	x
Black-billed Cuckoo	R	SR	F/B					x	x	x	x				
Yellow-billed Cuckoo	C	SR	S					xxxx	xxxx	xxxx	xxxx	xxxx			
Eastern Screech-Owl	R	R	S		x										
Great Horned Owl	C	R	F			xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	x	xx	x
Barred Owl	C	R	F			x	xxxx	xx	x		x	xxx	x		
Long-eared Owl	R	M	F		x										
Short-eared Owl	R	M	P			x							xx		
Common Nighthawk	C	SR	S					xxx	xxxx	xxxx	xxxx	x	x		
Whip-Poor-Will	R	SR	F						x						
Chimney Swift	C	SR	A				x	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Ruby-throated Hummingbird	U	SR	S					x	x	x	x	x	xx		
Belted Kingfisher	U	R	W		x	xx	x	xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx
Red-headed Woodpecker	C	R	S	x	x	x	x	xxxx	xxxx	xxxx	xxxx	xxxx	xx	x	xxxx
Red-bellied Woodpecker	C	R	F/B	x	x	x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx
Yellow-bellied Sapsucker	U	SR	F			x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	x	xx
Downy Woodpecker	C	R	S/F	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Hairy Woodpecker	U	R	B	x	x	x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx
Northern Flicker	C	R	S	xx	x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	x
Pileated Woodpecker	U	R	B/F	x		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	x
Eastern Pewee	C	SR	F/S					xxxx	xxxx	xxxx	xxxx	xxxx			
Yellow-bellied Flycatcher	U	M	B					x				x			
Alder Flycatcher	R	M	S						x						
Willow Flycatcher	R	SR	B					x	x						
Least Flycatcher	U	M	F				x	xxx		x		x			
Eastern Phoebe	C	SR	S			xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx		
Great Crested Flycatcher	C	SR	S/F				x	xxxx	xxxx	xxxx	xxxx	xxxx			
Western Kingbird	R	M	S					x							

Species	ab	stat	hab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eastern Kingbird	C	SR	P/S				x	xxxx	xxxx	xxxx	xxxx	xxxx			
Scissor-tailed Flycatcher	R	V	S						x						
Northern Shrike	U	WR	S	xxxx	xxxx	xxx								xxx	x
Loggerhead Shrike	U	SR	P/S				xxx	xxxx	xxxx	xxxx	xx				
White-eyed Vireo	R	M	S					x			x				
Bell's Vireo	R	M	S					x	x						
Blue-headed Vireo	U	M	F				x	x				xxx	x		
Yellow-throated Vireo	U	SR	S/F					xxxx	xxxx	xxxx	xxxx	xx			
Warbling Vireo	C	SR	S/B				x	xxxx	xxxx	xxxx	xxxx	xxx			
Philadelphia Vireo	U	M	F									xxx	x		
Red-eyed Vireo	C	SR	F					xxxx	xxxx	xxxx	xxxx	xxx			
Blue Jay	C	R	S/F	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
American Crow	C	R	all	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Horned Lark	C	R	P	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	x	xx	xxxx	xxx	xxx
Purple Martin	U	SR	S/A				x	x	x	x	xx	x	x		
Tree Swallow	C	SR	all			x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
Northern Rough-winged Swallow	C	SR	S/A				xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Bank Swallow	U	SR	S/A				xx	xxxx	xxxx	xxxx	xxxx	xxxx			
Cliff Swallow	U	SR	S/A					x		x	x	xx	x		
Barn Swallow	C	SR	S/A				xxx	xxxx	xxxx	xxxx	xxxx	xxxx			
Black-capped Chickadee	C	R	S/F	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Tufted Titmouse	C	R	F	x	xxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	x	x
Red-breasted Nuthatch	R	M	F										x	x	
White-breasted Nuthatch	C	R	F/S	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	x	xxx
Brown Creeper	U	M	B/F				x	x				xx	x	x	x
House Wren	C	SR	S				xx	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Golden-crowned Kinglet	C	M	S				xxx						x	xx	x
Ruby-crowned Kinglet	C	M	S				xxxx	x				xxxx	xxxx	x	
Blue-gray Gnatcatcher	C	SR	S/F				x	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Eastern Bluebird	C	SR	S/P		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	
Veery	R	M	F					x							
Gray-cheeked Thrush	U	M	F					x	x			x			
Swainson's Thrush	U	M	F					x				xxx			
Hermit Thrush	C	M	F				x	x					x	x	
Wood Thrush	U	SR	F					xxxx	xxxx	xxxx	xx				
American Robin	C	SR	S/F		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	
Gray Catbird	C	SR	S/F					xxxx	xxxx	xxxx	xxxx	xxxx	x		
Northern Mockingbird	U	SR	S/P				xxx	xxxx	xxxx	xxxx	xxxx	xxxx	x		
Brown Thrasher	C	SR	S				xxx	xxxx	xxxx	xxxx	xxxx	xxxx			
European Starling (I)	C	R	U	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx
Cedar Waxwing	U	R	S			x	x	xx	xxxx	xxxx	xxxx	xxxx	xxxx	x	
Blue-winged Warbler	U	SR	S					xx	xx			x			
Golden-winged Warbler	R	M	S					xx							
Tennessee Warbler	C	M	F					xxx				xxxx			
Orange-crowned Warbler	U	M	S					x				x	x	x	x
Nashville Warbler	C	M	S				x	x			x	xx	x		
Northern Parula	U	M	F					x				xxx			
Yellow Warbler	C	SR	S					xxxx	xx		x	x			
Chesnut-sided Warbler	U	M	S/F					x				xxx			
Magnolia Warbler	U	M	F					x				xxx			
Cape May Warbler	U	M	F					xx			x	xx			
Black-throated Blue Warbler	R	M	F					x				x			
Yellow-rumped Warbler	C	M	S/F				xxxx	xxx				xxx	xxxx		
Black-throated Green Warbler	C	M	F					xx				xxx			
Blackburnian Warbler	U	M	F					x				xx			
Yellow-throated Warbler	R	M	F					x							

Species	ab	stat	hab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Pine Warbler	R	M	F				x									
Palm Warbler	C	M	F				x	xx				xxxx	xx			
Bay-breasted Warbler	R	M	F									x				
Cerulean Warbler	R	SR	B/F					x	x							
Black-and-white Warbler	U	M	F				xx	x				xxxx				
American Redstart	C	SR	F/B					xxxx	xxxx	xxxx	xxxx	xxx				
Prothonotary Warbler	C	SR	B				x	xxxx	xxxx	xxxx	xxxx					
Ovenbird	U	SR	F					xxxx	xxxx	xxxx	xxxx	xxxx	x			
Northern Waterthrush	C	M	B				x	xx				xx				
Louisiana Waterthrush	R	M	B					x								
Kentucky Warbler	R	SR	F					x	x	xxxx						
Mourning Warbler	R	SR	F						x							
Common Yellowthroat	C	SR	S/P					xxxx	xxxx	xxxx	xxxx		x			
Wilson's Warbler	U	M	F					x				x	x			
Scarlet Tanager	U	SR	F					xxxx	xxxx	xxxx	xxxx	xxx				
Eastern Towhee	C	SR	F/S				x	xxxx	xxxx	xxxx	xxxx	xx	xx	x		
American Tree Sparrow	C	WR	S	xxxx	xxxx	xxxx								xx	x	xxx
Chipping Sparrow	C	SR	S				xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx			
Field Sparrow	C	SR	S/P				xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			
Vesper Sparrow	C	SR	P			x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	xx		
Lark Sparrow	C	SR	S				xx	xxxx	xxxx	xxxx	xxxx	xx				
Savannah Sparrow	R	SR	P				xxxx	xxxx	xxxx	xx						
Grasshopper Sparrow	C	SR	P				xx	xxxx	xxxx	xxxx	xxxx					
Henslow's Sparrow	R	SR	P				x	xxxx	xxxx	xx						
Fox Sparrow	C	M	S			x	xx						xxxx			
Song Sparrow	C	R	W/S	xx	x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx		
Lincoln's Sparrow	U	M	S					x					x			
Swamp Sparrow	U	SR	W				x	x	x					x		
White-throated Sparrow	C	M	S				xxx	xx				x	xxxx			
White-crowned Sparrow	C	M	S				x	xxx					x			
Dark-eyed Junco	C	WR	S	xxxx	xxxx	xxxx	xxxx						xxxx	xxxx	xxxx	
Lapland Longspur	U	WR	P													xx
Snow Bunting	R	WR	P	x										x		x
Northern Cardinal	C	R	S/F	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Rose-breasted Grosbeak	C	SR	S/F				x	xxxx	xxxx	xxxx	xxxx	xxx				
Blue Grosbeak	R	SR	S					xxxx	xxxx	x	x	x	x			
Indigo Bunting	C	SR	S					xxxx	xxxx	xxxx	xxxx	xx				
Dickcissel	C	SR	P					xxx	xxxx	xxxx	x					
Bobolink	U	SR	P					x	xxxx	xxxx						
Red-winged Blackbird	C	SR	W/P		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx	x	
Eastern Meadowlark	C	SR	P		x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx		
Western Meadowlark	C	SR	P		x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxx		x
Rusty Blackbird	U	M	W			xx	x							xxx		
Common Grackle	C	SR	S		x	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			
Brown-headed Cowbird	C	SR	S/F			xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx			
Orchard Oriole	C	SR	S					xxxx	xxxx	xxxx	xx	x				
Baltimore Oriole	C	SR	S/F				x	xxxx	xxxx	xxxx	xx	x				
Purple Finch	R	M	F					x							x	
House Finch	U	R	U		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	x	xx		
American Goldfinch	C	R	S		xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx	
House Sparrow (I)	U	R	U		x	x	x	xxxx	xxxx	xxx			xx	x		
count	219	219	219	33	57	85	133	163	113	110	116	132	121	76	49	

Appendix III. Highlights from Army Regulation 200-3
(<https://www.denix.osd.mil/denix/Public/Policy/Army/ar200-3.html>)

It is an Army goal to systematically conserve biological diversity on Army lands within the context of its mission. Natural ecosystems can best be maintained by protecting the biological diversity of naturally occurring organisms and the ecological processes that they perform and with which they interact. The Army also recognizes the importance of habitat management, the key to effective conservation of biological diversity, in the protection of listed proposed, and candidate species. Conserving native species in number and distributions that provide a high likelihood of continued existence is crucial element of biological diversity. Conserving and restoring biological diversity minimizes the number of species that must be protected as threatened and endangered.

And:

Army installations must be sensitive to those species listed as endangered or threatened under State law. Whenever feasible, installations should cooperate with State authorities in efforts to conserve these species.

Thus, someone somewhere in the Army, or at least whoever wrote this document for the Army, understood that conservation is more than setting aside a few acres. The complexity of protecting ecological interactions requires large-scale efforts to be successful. Unfortunately, that information has not been passed on to, or was ignored by the power structure at SAD.