

and to John Farrand, Jr., for a typically perceptive critical reading of the manuscript

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POPULATION

The breeding birds of Minnehaha County, South Dakota: then (1907-1916) and now (1971-1975)

A comparison shows substantial changes in the breeding status of at least 35 species

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IT IS GRATIFYING to note that in recent years the general public has become increasingly aware of and sensitized to various aspects of the natural environment. In particular, large numbers of people have become actively involved in amateur ornithology and spend many hours in the field observing birds. As the number of competent field observers increases, it should be possible to get better information about the way bird populations change in time and space (see, for example, Weydemeyer 1975).

For five years (1971-1975) the authors took almost-weekly field trips, from May to August inclusive, into the countryside surrounding the city of Sioux Falls in Minnehaha County, South Dakota (Table 1). In addition to these automobile trips, we made less frequent visits to a number of woodland habitats in other parts of the county. During each trip we made careful notes of the bird species and numbers we sighted. The body of information we collected is important for two reasons. First, we always drove along the same route, approximately 50 miles in length, so that the same general habitats were monitored repeatedly and systematically. Second, there is available, for precisely this same restricted geographical area, a similar body of information collected many years ago (1907-1916) by Larson (1925).

In this paper we compare breeding bird populations for these two periods and attempt to explain some of the observed differences.

HABITATS

ALTHOUGH IN GROSS detail, the landscape still fits the description given by Larson, the following is included to describe the habitats more precisely as they exist today. The linear extents of the various habitat types along the field trip route in 1974 are presented as percentages in Figure 1.

Land under cultivation

Principal crops along the route were corn, soybeans, alfalfa and small grains, *i.e.*, oats, rye and wheat. In general, row crops such as corn and soybeans do not support populations of breeding birds while small grains and alfalfa often do, at least until they are harvested. Also included in this category are Kentucky Bluegrass (*Poa pratensis*) pastures used for grazing. Although these pastures are usually cropped quite short they do support breeding bird populations.

Farmsteads

As is true for most of the Upper Mid-

dwest, the landscape in eastern South Dakota is blocked out in square-mile sections, most of which are separated by graded, gravel-surfaced roads. It is along these roads that the farmsteads are located. The farmsteads usually consist of the owner's or tenant's residence and a number of out-buildings used for crop and equipment storage and to house livestock. These buildings are often protected from the north and west by a planted grove of trees. Important tree species in these groves are Cottonwood (*Populus deltoides*), American Elm (*Ulmus americana*), Silver Maple (*Acer saccharinum*), Green Ash (*Fraxinus pennsylvanica*) and Box-elder (*Acer negundo*).

Marshes

West of the city of Sioux Falls, the poorly-drained, rolling, glacial topography supports a large number of marshes or pot holes, many of which become dry after successive years of drought. Dominant species of emergent vegetation in these marshes include Cat-tails (*Typha* spp.), Bulrushes (*Scirpus* spp.) and Burreed (*Sparganium* spp.). At the marsh perimeters, Sedge, *Carex* spp., are often found.

¹Deceased September 22, 1976

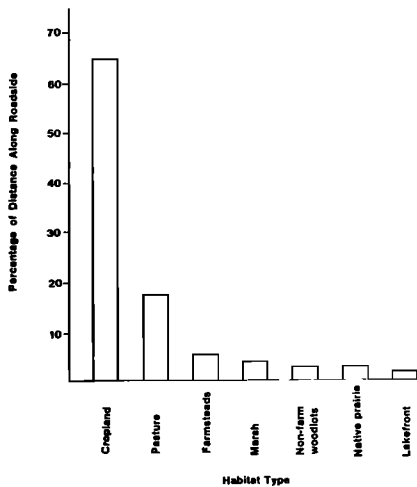


Figure 1. Percentages of the various habitat types found along the automobile survey route.

Non-farm woodlands

The only natural woodlands in eastern South Dakota occur along various streams that dissect the prairie. The principal tree species that grows on the bluffs bordering the floodplains of these streams is Bur Oak (*Quercus macrocarpa*) while the floodplains themselves typically support such species as Cottonwood, Willow (*Salix* spp.), Silver Maple, Hackberry (*Celtis occidentalis*) and Basswood (*Tilia americana*). In addition to natural woodlands, there are a number of planted woodlots whose tree species are similar to those described earlier for farmsteads.

Native prairie

Eastern South Dakota is at the western edge of the tallgrass prairie province and a few small remnants of this once-extensive ecosystem still occur in Minnehaha County. Principal grass species in the drier upland portions are the native Green Needlegrass (*Stipa viridula*), Porcupine Grass (*S. spartea*), Big Bluestem (*Andropogon gerardi*), Little Bluestem (*A. scoparius*), Switchgrass (*Panicum virgatum*), and the introduced perennials, Smooth Brome (*Bromus inermis*) and Kentucky Bluegrass. At the lower, wetter sites, Prairie Cordgrass (*Spartina pectinata*), is dominant.

Lakefront

The lakefront that occurs along the route is mostly free of man-made structures and affords a clear view of the water's surface.

Roadside ditches

Since the countryside is under such intensive cultivation, the roadside ditches provide important habitats supporting breeding bird populations. Although a wide variety of grass and forb species grow in these ditches, perennial Smooth Brome is highly dominant; at many ditch locations this species is essentially the only one present. Also present along these ditches are widely scattered thickets of shrubby vegetation comprised most often of Wild Plum (*Prunus americana*).

HABITAT CHANGES

IN THIS SECTION we describe and in some cases, document, habitat changes which have taken place since Larson completed his observational work in the early part of the present century. For documentation, we have used U.S. Censuses of Agriculture for the years 1900-1970. Since, in some cases, statistics from the various censuses are not strictly comparable, the trends described are general ones.

Marsh habitat reduction

In Minnehaha County (as well as elsewhere in eastern South Dakota) there has been a significant reduction in both the number and areal extent of marsh ecosystems. Over the years many miles of tile have been put into place to drain low-lying areas. For the larger, deeper marshes, the practice is to construct drainage ditches during times of drought (Figure 2). The effect of these drainage practices is that many locations which once supported marsh habitats are now used as cropland each year (Figure 3). In addition, farmers

have often expanded their croplands almost to the water's edge so that the important strip of vegetation which once surrounded the marsh is almost totally gone.

Changes in the practice of agriculture

As is well known, individual farms in the United States have been decreasing in number and increasing in size in recent decades. In 1910, the average farm in South Dakota comprised 213 acres while in 1970 the figure was 283. This trend has resulted in a number of important habitat changes. First, a large number of farmsteads, once associated with individual, small farms, have been vacated and their associated buildings and groves of trees removed. The removal of these groves has reduced the number of small woodland oases on the prairie. The number of woodland acres on farms in the county has been reduced from 9262 acres in 1920 to 2410 acres in 1970. Second, the removal of boundary fences and their associated and herbaceous vegetation in highly agricultural areas, represents the removal of a significant portion of the habitat available to breeding birds. Not only have boundary fences been removed but fences in general have been removed. This is for two reasons: (1) operators of large farms tend to be less interested in keeping livestock so that confining fences are no longer required; (2) the efficient use of modern farm machinery requires that individual fields be of large size.

The tendency towards even more intensive cropping has resulted in a reduction of the acreage devoted to pastures. In 1930 there were 51,237 acres of plowable pasture in Minnehaha



Figure 2. A marsh in the survey area showing the presence of a drainage ditch.



Figure 3. A marsh habitat supporting a crop of corn during a year of low rainfall.

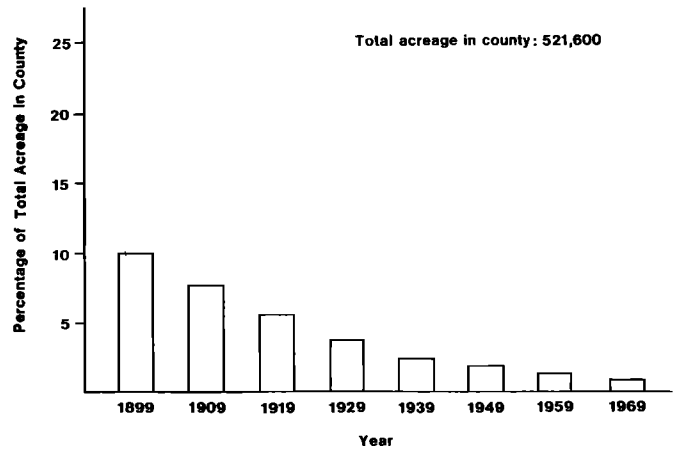


Figure 4. Changes in acreage of native prairie grassland in Minnehaha County, South Dakota, from 1899 to 1969.

County while in 1964 there were 17,613 acres. There has also been a reduction in the number of native prairie ecosystems (Figure 4), most of which are mowed for hay. Not only has the areal extent of native prairies decreased, but there also has been a qualitative change; most of the native prairie remnants have been substantially invaded by Kentucky Bluegrass and Smooth Brome.

A final consequence of changes in the practice of agriculture, although not producing a habitat change, *per se*, involves the present widespread and almost indiscriminate use of herbicides and pesticides. Scarcely any vegetation-supporting surface, cropland or otherwise, escapes contact with these synthetic chemicals.

Increased human population

Figure 5 illustrates the increase in human population size in Minnehaha County since the year 1900. The potentially negative influence of increased human population size on the breeding populations of birds of non-urban habitats is intuitive and obvious. There has been, for example, a marked increase in urban sprawl (Figure 6) with an increase in populations of species preferring that type of habitat. The most preferred country homesites today are on prairie remnants, near marshes, or within existing groves of trees. Also important is an increase in the general level of disturbance. We doubt that there are any places left in the county that are not regularly visited by man and/or animals. The use of noisy all-terrain vehicles has made ac-

cess easier and the effect more negative.

SPECIES ACCOUNTS

FOR EACH SPECIES showing a significant change we first quote Larson's description (*italics*) of the breeding status of that species in 1907-1916 and then describe the breeding status as we found it in 1971-1975. As is true for most efforts to describe frequency of occurrence, the words used are subjective and not open to precise interpretation, although in our description of recent status, we have tried to include the number of actual records whenever possible. We have also included comments, in many cases admittedly speculative interpretations of the causes of population changes.

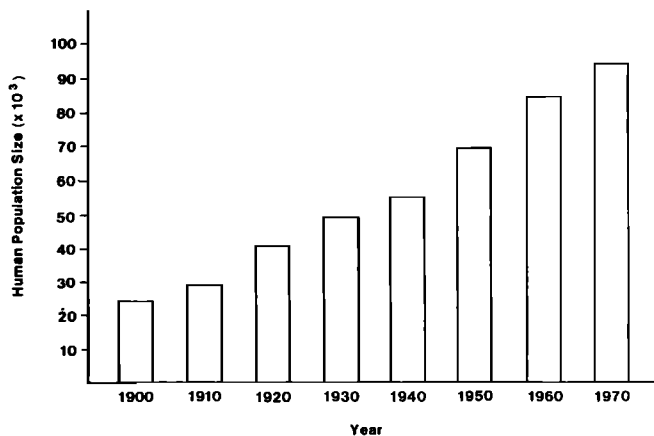


Figure 5. Changes in human population size in Minnehaha County, South Dakota, from 1900 to 1970.



Figure 6. Part of a housing development which now exists along the survey route.

Species whose numbers apparently were fewer in 1907-1916

Western Grebe (*Aechmophorus occidentalis*)

Rare transient; I have seen one in a local collection.

Uncommon summer resident; breeds. Many June and July records each year, breeding records for 1971 and 1973. May be expanding its breeding range in a southward direction.

Eared Grebe (*Podiceps nigricollis*)

Common on the sloughs during migration.

Uncommon summer resident; breeds. (4) June and July records and (2) additional breeding records. Larson implies that this species did not breed in Minnehaha County. This is surprising since the Eared Grebe prefers large, open ponds (Faaborg 1976) of the sort that very likely were more prevalent in Larson's time than they are now.

Least Bittern (*Ixobrychus exilis*)

Rare summer resident of the marshes; not common.

Probably fairly common summer resident. (4) June and July records including a breeding record in 1972. Since this species spends most of its time on deeper water, it often goes unnoticed. Weller (1961) found 89 nests in marshes in central and northwestern Iowa during 1958-1960. Cink (1974) cites only 3 breeding records for the state of North Dakota.

Gadwall (*Anas strepera*)

Common transient.

Uncommon summer resident; breeds. Many June and July records, including breeding records. Since the prairie pothole region of the north-central United States and southern Canada is the principal breeding area for the Gadwall, one might have expected breeding Gadwalls in Larson's time when potholes were more numerous and of better quality. Gadwall occurrence in 1971-1975 may reflect a general increase in its population during the last 2 decades (Bellrose 1976).

Wood Duck (*Aix sponsa*)

Rare. I have seen this duck only twice.

Common summer resident; breeds along rivers and creeks. In the early 1900s the numbers of this species had been severely reduced owing to hunting pressure. After the Migratory Bird Treaty Act of 1918, the species began to recover (Bellrose 1976). In recent years, the Wood Duck appears to be expanding its range westward along the watercourses of the plains region.

Redhead (*Aythya americana*)

Common transient.

Uncommon summer resident; breeds. Many June and July records, including several breeding records. Although the highest Redhead breeding density is in the Canadian parklands, large numbers also breed in the prairie pothole region and so this species should be expected as a breeder. This species should have been more common in Larson's time; the Redhead prefers larger and deeper marshes of the sort which must have been more common in the county then.

Canvasback (*Aythya valisineria*)

Transient.

Uncommon summer resident; (9) June and July records and one breeding record. This species, too, prefers large, deep ponds, especially for feeding, resting and courting. Although the Canvasback utilizes the prairie pothole region less often than does the Redhead, there should have been some breeding birds in 1907-1916.

Ring-necked Pheasant (*Phasianus colchicus*)

A few were liberated about 1910, are met with occasionally south of the city.

Common resident; breeds. This species has been successfully introduced although in recent years its numbers have declined owing to lack of suitable habitat.

Gray Partridge (*Perdix perdix*)

Not reported.

Fairly common resident; breeds. This is another successfully introduced species and appears to be increasing. It apparently does not require woody and brushy cover (Johnsgard 1975) and is especially suited to areas that are highly cultivated. It is also able to survive severe northern winters.

Short-billed Marsh Wren (*Cistothorus platensis*)

Rare summer resident of the marshes.

Fairly common summer resident. (10) June and July records.

Since this bird prefers moist sedgy or grassy marsh margins, it should have been more common in Larson's time than it is now

Starling (*Sturnus vulgaris*)

Not reported.

Abundant resident; this exotic species was not yet established in 1907-1916. At present, it continues to expand its range (Smith 1975).

Cardinal (*Cardinalis cardinalis*)

Not reported.

Fairly common resident. The expansion of the Cardinal's range into South Dakota has been documented by Krause and Froiland (1954). Increase in urban habitats may be responsible for its presence.

Blue Grosbeak (*Guiraca caerulea*)

Not reported.

Uncommon summer resident; breeds. Many June and July records, including one breeding record. This species appears to be expanding its range northward.

Swamp Sparrow (*Melospiza georgiana*)

Transient.

Fairly common summer resident; breeds. (10) June and July records. It is surprising that Larson did not report this inhabitant of marsh edges as a breeding species.

Species whose numbers apparently were greater in 1907-1916

Great Blue Heron (*Ardea herodias*)

Summer resident along the rivers and creeks.

Uncertain; one record in early June and (4) records in July but no breeding records. Although he does not say so explicitly, Larson's statement implies that there were breeding birds in 1907-1916. It is highly unlikely that there were breeding birds in 1971-1975. This species is a colonial nester and typically builds its conspicuous nests in tall trees, often on isolated, wooded islands. It is reasonable to conclude that this species no longer breeds in Minnehaha County because of the absence of "wild", undisturbed areas along the rivers and creeks.

Black-crowned Night Heron (*Nycticorax nycticorax*)

Summer resident; breeds in colonies along the river and creeks and around sloughs in favorable localities.

Uncertain; one record in early June and four records in July but no breeding records. This species is also a colonial nester and its disappearance can probably be attributed to the reduction in the number of marshes and the absence of undisturbed "wild" areas

Marsh Hawk (*Circus cyaneus*)

Common summer resident of the prairies; breeds.

Uncertain; one June record and six July records. This open-country harrier should have been much more common than we found it to be; it appears to be a rather common breeder elsewhere in the area.

Sharp-shinned Hawk (*Accipiter striatus*)

Common summer resident; breeds.

Uncertain. No June or July records. This species appears to be virtually absent during the summer. Its disappearance may be due to the loss of suitable, woodland habitat and/or increased human disturbance. In addition, its disappearance may be related to a general, possibly pesticide-related decrease in population size (Synder *et al.*, 1973).

Greater Prairie Chicken (*Tympanuchus cupido*)

Common summer resident (formerly), nesting in favorable localities.

Absent. Evidently, even in 1907-1916 this species was no longer as common as it once had been. Its absence is associated with the disappearance of large tracts of native grassland.

Bobwhite (*Colinus virginianus*)

Nearly every grove on the prairie has its family of quail in the summer.

Rare to absent. No records. Johnsgard (1975) describes suitable habitat for this species as including grassy cover for nesting, brushy cover for escape and a natural or cultivated crop food source. Among the factors which may have contributed to its decline is the reduction in number and size of woodland oases on the prairie.

Wilson's Phalarope (*Steganopus tricolor*)

Common summer resident of the marshes; breeds.

Uncertain Six July records mostly in the last half of the month but no breeding records. These late July birds probably were post-breeding vagrants and so there is a strong likelihood that this species breeds only rarely in Minnehaha County. Hohn (1967) describes preferred breeding habitat as consisting of shallow lakes or sloughs with margins of short grasses and sedges. The virtual disappearance of this species as a breeding bird in Minnehaha County is probably related to the substantial loss of wet native grass meadows.

Black Tern (*Chlidonias niger*).

Common summer resident of the marshes; breeds.

Uncertain. Nineteen June and July records but no breeding records. It is possible that a few breeding birds escaped our attention but it is not likely that this species was a common breeder in 1971-1975. Since this species was a breeder in northwestern Iowa in 1966-1968 (Bergman *et al.*, 1970), its virtual disappearance from Minnehaha County can be most reasonably related to the loss of suitable marsh habitat.

Burrowing Owl (*Athene cunicularia*)

A common summer resident in suitable localities; breeds.

Absent or rare. No records. The reduction in acreage devoted to pasture may be a factor here as well as increased human disturbance.

Long-eared Owl (*Asio otus*).

Resident; breeds.

Rare or absent. No June or July records. This species prefers to roost in undisturbed dense woodland (Randle and Austing 1952) and over the years the activities of man and his domesticated animals have virtually destroyed all such habitat in Minnehaha County.

Short-eared Owl (*Asio flammeus*).

Resident; breeds.

Rare or absent. No June or July records. Among the preferred nesting sites are the grassy margins which surround marshes (Clark 1975), a habitat which is much reduced in Minnehaha County.

Common (Red-shafted) Flicker (*Colaptes auratus cafer*).

Occasionally seen during the summer.

Rare or absent. No records. Anderson (1971) suggests that eastward gene flow in this western subspecies may have been severely restricted since the building of mainstem dams on the Missouri River.

Wood Thrush (*Hylocichla mustelina*).

Summer resident; breeds.

Rare or absent. No records. Preferred habitat for this species is mesic woodland with much sapling growth and a well-developed understory (Dilger 1956). The activities of man and especially of his domesticated animals have caused this type of habitat to be virtually absent.

Veery (*Catharus fuscescens*).

There is a veery to be found here in summer.

Rare or absent. No June or July records. This species is found in moist, bottomland forests (Dilger 1956) and probably never was very common in Minnehaha County. The practice of running livestock in river bottomlands has destroyed what little such habitat there was.

Eastern Bluebird (*Sialia sialis*)

Summer resident; breeds.

Uncertain. No June or July records. Although this species probably breeds occasionally in out-of-the-way places along the river and creeks, it is certainly very uncommon. Often cited as contributing to the general decline of this species is the fact that it often loses in competition for nest holes, especially to Starlings (Pinkowski 1976).

Loggerhead Shrike (*Lanius ludovicianus*).

Common summer resident; breeds.

Rare; one June breeding record and one other July record. This species appears to have declined in numbers over the entire area for reasons which are not yet clear. In some areas pesticide residues in prey species has been a suspected cause.

Yellow-breasted Chat (*Icteria virens*).

Uncommon summer resident; breeds.

Rare or absent. No records. Since this species prefers low, dense brushy and weedy vegetation (Thompson and Nolan 1973), the reduction in the number and size of woodland thicket areas may mean that suitable habitat is rare.

Eastern Meadowlark (*Sturnella magna*).

Common summer resident; breeds.

Rare or absent. No records. In general, the Eastern Meadowlark prefers low moist grassland sites while the Western Meadowlark (*Sturnella neglecta*) tends to be found on dry, upland sites with shorter grass. It may be that widespread drainage practices and the tendency towards even more intensive agriculture and grazing have reduced suitable habitat for the Eastern Meadowlark to the point that it has been supplanted by the eastward-expanding western short-grass species (Lanyon 1956).

Scarlet Tanager (*Piranga olivacea*).

Rare summer resident; breeds.

Rare or absent. No June or July records. Once again, little of its preferred woodland habitat remains.

Rufous-sided Towhee (*Pipilo erythrophthalmus*).

Common summer resident of the woodland and along the river, breeds.

Rare or absent. No June or July records. Not only is this species virtually absent from Minnehaha County but it is also rare in the general area where it was formerly abundant. Certainly, removal of brushy areas and dense woodland undergrowth by man and livestock has been a major factor in its disappearance.

Henslow's Sparrow (*Ammodramus henslowii*).

Summer resident; breeds.

Rare or absent. No June or July records. For this species, preferred habitat includes grassland with patches of dense, herbaceous vegetation and protruding dead weed stalks at sites that are intermediate in moisture condition (Robins 1971). This is the sort of habitat which in earlier times was represented by weedy pastures and moist native-grass haylands.

Lark Sparrow (*Chondestes grammacus*).

A common summer resident of open woodland and thickets.

Rare or absent. No June or July records. This species occupies a wide variety of habitats and formerly was quite common in the general area. The loss of open woodland and thicket habitats is probably important in explaining the Lark Sparrow's decline as is the loss of patches of grassland which are favorite foraging locations.

DISCUSSION

ASSUMING THAT the species status descriptions for both periods of time are reasonably accurate, the general conclusion one can draw is that 35 species and one subspecies have undergone significant changes in status; 14 of these have become more common while 22 have become less common. In the present study, causal factors which underlie reductions in species numbers can be speculated about with some reason and logic. For the majority of these species, the combined influence of hu-

man-caused habitat degradation and increased human disturbance has undoubtedly been of primary importance. It should be noted, though, that a species' disappearance from a given locality is not necessarily related to habitat variables. For a given year, total population size in a species may not be large enough to enable it to utilize all of the available suitable habitat. This is one reason some species are sporadic breeders.

Explanations for increases in species numbers are speculated about less easily. Some of the increases appear to be

rather clear cases of range extension, either of exotics introduced elsewhere or of native species whose principal ranges in the past lay elsewhere. Examples include the Western Grebe, Wood Duck, Ring-necked Pheasant, Gray Partridge, Starling, Blue Grosbeak, and Cardinal. The phenomenon of range extension is not well understood. At the risk of oversimplification, it can be said that a species can extend its range into a new area only if that area has an open niche. The open niche may always have existed or it may have been newly created by some change in the ecology

of the area. (In the present context, man-caused habitat changes are of particular interest.) The actual extension of range often requires a prior build-up in total species population size. Stepney and Power (1973) have described a number of intrinsic and extrinsic factors involved in range extension.

There do remain, however, a number of species in the present study for which range extension is not a plausible explanation and whose increase in numbers has occurred despite the fact that pertinent, man-caused habitat changes would appear to be detrimental. Examples here are the Eared Grebe, Least Bittern, Gadwall, Redhead, Canvasback, Short-billed Marsh Wren, and Swamp Sparrow. In some others increased occurrence in 1971-1975 may reflect an increase in total population while in others, individuals of the species may simply have escaped detection in Larson's study. Larson's work, however, gives the impression of having been carefully done, even to the extent that he collected specimens, later identified by the U.S. Biological Survey, of individuals whose subspecific identity he wished to verify.

SUMMARY

DURING 1971-1975, frequent and regular field trips made it possible to determine the status of a number of bird species then breeding in Minnehaha County, South Dakota. Descriptions of breeding status based on these field trips were compared with those given by Larson (1925) who made extensive observations of birds in the same county during 1907-1916. Thirty-five species and one subspecies showed significant changes in breeding status. Of these 14 became more common while 22 became less common, or disappeared as breeding species. An attempt is made to relate these changes to alterations in the environment or specific habitat changes which have occurred in the 50 years since Larson's survey.

ACKNOWLEDGMENT

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