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SUMMER BIRD LIFE IN THE VICINITY OF HAVANA, ILLINOIS, IN ITS RELATION TO THE PROMINENT PLANT ASSOCIATIONS.

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EDITOR'S NOTE.—Upon the earnest solicitation of the author the simplified spelling has been allowed to stand in the body of the text, but the spelling of the vernacular names of the birds corresponds to the A. O. U. Check-List.

While the editor is personally in entire sympathy with the movement for reform in the spelling of English words, he does not believe that the movement has yet gained such impetus that he is warranted in adopting it in the Bulletin.

INTRODUCTORY.

While attending summer school during the latter part of June and the entire month of July, 1910, at the biological station of the University of Illinois, graduate work in ornithology was taken under Professor Frank Smith of that Institution. To him I am indebted particularly for helpful criticism of this paper.

LOCATION AND GENERAL DESCRIPTION OF THE REGION.

Havana, Illinois, is located on the east bank of the Illinois River, about forty miles south of Peoria, in the west central part of Illinois. Altho geografically located in this position

the region is not typical of central Illinois in general, for, as it is well known, the greater part of central Illinois is occupied by crops of one sort or another, but principally corn in black prairie soil.

This city, on the other hand, lies in about the center of the broad valley of a post-glacial stream, which was some fifteen to eighteen miles wide in this vicinity. The soil is either nearly pure sand or a sandy loam, yellowish in color, very different from the character of the average soil of Central Illinois. There are extensive bottom lands in the immediate vicinity of the Illinois River of the present day which flows thru the center of this sandy area. In these situations there is usually a coating of muck laid down over the sandy bottom of the original stream.

The present river in this vicinity is about $\frac{1}{8}$ miles wide, but taken together with the overflowed area it is from 0.5 to 3.5 miles from shore to shore. The bluffs which mark the original valley in post-glacial times are, of course, often farther apart. The water and the bottomlands furnish a typical avian environment, which is populated by its usual associations of birds. The east shore of the river is a modified dune surmounted by oak woods. The sandy uplands stretching back from this dune are quite largely under cultivation, but scattered here and there are areas of bunchgrass, blowouts, black oak and blackjack oak woods. Drainage is almost entirely subterranean and consequently creeks and swamps are a very minor part of the sum total of avian environments.¹

¹ For a fuller and more extended discussion of the general character of this region, together with its history, consult the following:

- Forbes, S. A. The Biological Station in the Biennial Report of the Director 1893-1894. Illinois State Laboratory of Natural History, pp. 14-26, with excellent illustrations.
- Forbes, S. A. Biennial Report of the State Laboratory and Special Report of the University Biological Experiment Station 1895-1896, with map and illustrations.
- Kofoed, C. A. The Plankton of the Illinois River 1894-1899, with introductory notes upon the hydrography of the Illi-

SOME GENERAL FACTORS.

Most important for maintaining an avian population is the food problem. This region is especially prolific in food supply for insectivorous birds. Insects are present in vast numbers, especially in the various bayous and lakes, which are part of the river system. Among the most plentiful insects were dragonflies, mayflies, beetles, flies, caddis flies, and chironomids.

An idea of the abundance of insects, especially of the mayflies, may be gathered from the fact that during their period of emergence, the adult mayflies (or as they are called in this region, "willow flies") collect so thickly around the lights of Havana during the night that the following morning these insects must be swept up and carted away to avoid the stench from their decaying bodies. On the morning of July 7, 1910, the second day of the emergence of *Hexagenia bilineata*¹ three piles of insects 3.5 feet in diameter and 1.5 feet high were seen on Main street in Havana. Around the lights at the foot of the bluff the street and part of the shore was carpeted with these insects to a depth of four to eleven inches.

Herbivorous birds do not fare so well in the region during summer. In but very little of the area can ruderal plants grow and form weed patches. Most of the plants whose seeds are eaten by birds mature their seeds during late summer and autumn and in consequence are of little attraction to summer birds. The town, itself, is surprisingly free from weed patches of more than a very limited extent. For this reason, perhaps, the English sparrows which are naturally attracted to the

nois River and its basin. Bulletin Illinois State Laboratory of Natural History, 6:98-251.

Hart, C. A. and Gleason, H. A. On the Biology of the Sand Areas
1907 in Illinois. Bulletin, Illinois State Laboratory of
Natural History, 7:139-148.

Gleason, H. A. The Vegetation of the Inland Sand Deposits of Illi-
1910. nois. Bulletin, Illinois State Laboratory of Natural
History, 9:23-174.

¹ Determination furnished thru the kindness of Mr. Chas. A. Hart of the summer session staff.

dwelling places of man, not finding sufficient food there, flock in groups of 25 to 150 and invade the wheat and clover fields. It was noticed repeatedly that whenever English sparrows invaded crop lands it was virtually always in good sized flocks.

Aside from food there are other factors in the environment which favor an abundant bird population. The large number of protected nesting sites is an important factor in this region, which has seemed to increase the number of individuals within a given species. The general climate is favorable and the duration of the warm weather is such that two or even three broods may be raised each year.

Altho there would seem to be plenty of sustenance for birds of prey, their general absence was conspicuous. This is probably due to the many gunners in this region, both in and out of season, but particularly during the early spring. By the end of the hunting season the hawks that would have nested here have found nesting sites elsewhere and their occurrence in this vicinity seems to be merely accidental.

One might easily judge from the forgoing description of the region that, containing as many varied environments as it does, the bird population would be conspicuous both for number of species and for abundance of individuals. The region is indeed well populated with many individuals of a comparatively few species, but the total number of species is not so large as might be expected, since the region lies a little ways north of the northern limit of the southern avifauna and quite a ways south of the southern limits of a large number of northern species. However, the bird life is rich in comparison with the rest of central Illinois.

In this paper the plant associations form the basis for division. By such a method a much better idea of the relationships of the avifauna is brought out than an annotated list of the species, tho it is recognized that this analytical method does not necessarily yield the ecological avian associations. They are the product of a more thoro synthetic insight into avian relationships. It is highly probable that avian associations will be correlated with plant associations or groups of

them, altho that can not be deduced from this paper since the plant associations, themselves, formed the basis of division in obtaining the avian groups.

The plant life of the region is representativ of two biotic provinces, the southwestern prairie province and the deciduous forest province, the former of which will be taken up first.

THE PRAIRIE PROVINCE.

In this area the prairie province is represented, on the plant side, most extensively by crops, fairly well by the bunchgrass and blowout associations and to a slight degree by eight or ten of the more hydrofitic associations along ditches and streams and at the heds of lakes.

The larger part of the available land is under cultivation in corn, rye, oats, wheat, or clover. Other open land is used for pastur and in it occur the bunchgrass associations. Where pasturing becomes too intensiv blowouts usually originate, develop and finally are recapturd by the vegetation. To a limited extent the prairie swamp associations are present along sloughs and ditches, of which there are very few in this region. The best developd examples of prairie swamp occur in two abandond and partly draind mill ponds in Quiver Creek, between the Quiver and Topeka stations of the Chicago, Peoria and St. Louis Railroad.

BUNCHGRASS PRAIRIES. In the xerofytic prairie areas there seems to be plenty of small animal life, but bird life is rather scarce. Only a few typical prairie birds are present, and most of these both in point of number of species and of individuals are sparrows. In order of abundance these are dickcissels, vesper sparrows and lark sparrows. They may be termd the dominant species of the bunchgrass prairie association. Nests of the vesper and lark sparrows were discoverd in the bunchgrass. The dickcissel is a typical prairie bird which, however, is much more frequently seen along the roadside on fence posts, wires or hedges, from which elevated positions it makes known its presence to any intruder.

The meadowlark, normally a dominant species on the prairies of Illinois, is, this year at least, merely a secondary species in this vicinity. It occurs very sparingly in the prairie swamp near Topeka, but prefers the crop areas to the bunchgrass prairies. On two occasions there was good evidence that the meadowlark in the bunchgrass was the western meadowlark (*Sturnella neglecta*), a thoroly typical form of such habitats, but as the birds did not sing and were very wary of approach, it was impossible to settle the question absolutely.

Aside from the dominant species which make up the greater number of individuals, there are but few secondary species occurring in the bunchgrass and blowouts. Of these the most frequent is the mourning dove, which is quite often flushed from the bunchgrass, but no chances were afforded of determining whether these birds were feeding or not. The remaining birds occurring in this association are more typical of other associations and their occurrence in the bunchgrass is more or less accidental. Such are the bob-whites, English sparrows and the crows, especially in the vicinity of the oak woods. Others such as the brown thrasher and mockingbird are purely accidental in such locations.

In the following tables the avian composition of each plant group is shown, together with the status of each bird in it. Preceding the name of the bird is a letter indicating the ecological status of the bird in that association.

d = of primary importance or abundance—a dominant species.

s = of secondary importance or abundance.

t = of tertiary abundance but frequently associated with successions in the plant associations.

a = of accidental occurrence.

Following the name of the bird is a symbol indicating the life activities and a statement of the abundance of the bird in the plant group under consideration. The summer life activities of the birds are classified under three heads, which are indicated as follows:

n = nesting activities,

f = feeding activities,

r = other activities, such as resting, sleeping, playing, etc.

SUMMER BIRDS OF THE BUNCHGRASS PRAIRIE ASSOCIATION.

s Bobwhite	f r small flocks
s Mourning Dove	f r twos or threes.
a Kingbird	f singly (2 records)
s Crow	f r singly
s Meadowlark	f r very few
d Western Meadowlark	n f r pairs
d Vesper Sparrow	n f r flocks
d Lark Sparrow	n f r small flocks
t English Sparrow	f flocks
d Dickcissel	n f r flocks or pairs
a Mockingbird	r one record
a Brown Thrasher	f singly now and then.

SUMMER BIRDS OF THE CROP AREAS.

Bob-white.	Clover wheat
Mourning Dove.	Clover wheat corn rye oats
Crow.	wheat corn
Vesper Sparrow.	wheat rye
English Sparrow.	Clover wheat rye oats
Lark Sparrow.	wheat
Dickcissel	Clover wheat rye
Meadowlark.	Clover wheat

PASTURS AND MEADOWS. The development of either of these two types of vegetation is very meager in this vicinity and the characteristic birds—at best limited in numbers—are virtually indiscernable as such. Those birds that are usually to be found associated with these plant groups are the mourning dove, cowbird, meadowlark, English sparrow and the pigeon.

PRAIRIE SWAMPS. Prairie swamps are not of general occurrence in this territory as the rapid drainage in the sandy soil does not favor the concentration of water necessary to their development. Before the opening of the Chicago drainage canal such swamps were far more abundant, but most of them have been converted into open water. On the plant side small prairie swamps can very easily be detected, but usually they are so limited in extent that they do not attract their normal bird population. Such areas form the minor avian envi-

ronments of Adams. (Isle Royal Report 1908:133.) Along Quiver creek in the vicinity of Topeka, however, there are two fair sized prairie swamps, which were a few years ago mill ponds. The principal plant associations represented are the *Scirpus validus* (Bulrush) association; the cattail, the arrow-leaf, the *Calamogrostis* (a meadow grass), the *Lythrum* consociates of the blazing star prairie, and the redtop-bluegrass pastur associations. The birds noted there during the early part of July before the return migration had set in were as follows: one pair of bobolinks, three pairs of meadowlarks, about fifteen pairs of red-winged blackbirds, a few indigo buntings and a half dozen short-billed marsh wrens. Additional species were noted toward the end of July after the beginning of the fall migration. All of these birds which occurred here during the summer proper are dominant species of this association where it occurs in other parts of the state. Altho they are not abundant in this locality, they illustrate a distinct avian group. The bobolink and short-billed marsh wren are index birds of this group. This is especially true of the bobolink, which is here nesting rather south of its usual southern limit. The other birds are as typical, but they are not so limited in distribution to this particular prairie swamp area.

SUMMER BIRDS OF THE PRAIRIE SWAMP.

d Great Blue Heron	f	one record
s Green Heron	f	one record
d Bobolink	n f r	one pair
d Red-wing Blackbird	n f r	15 pairs, later large flocks
d Meadowlark	n f r	few
s Bronzed Grackle	f r	flocking with the redwings preliminary to the fall migration.
d Indigo Bunting	n?f r	few
t Dickcissel	r	two records
t Northern Yellow-throat	f r	one record
d Short-billed Marsh Wren	n f r	half a dozen birds
a Robin	f r	one record

THE FOREST PROVINCE.

The associations of the deciduous forest province cover more than half of the area in the vicinity of the Biological Station. This province falls naturally into two groups of associations, those of the bottomlands and those of the uplands. The former is composed largely of hydrophytic plants and the latter of those of mesophytic and xerophytic tendencies.

AQUATIC ASSOCIATION. Arranging the associations in a normal genetic series, the aquatic association comes first into consideration. It consists of the waters of the Illinois River, together with the numerous lakes, bayous and creeks that drain directly or indirectly into it. The area is relatively very large in comparison to the number of birds by which it is populated during the summer. Even as it is, many of its present members are purely accidental, as it is not uncommon for wounded migrating ducks to remain in the lakes all summer. The population at present is very much smaller than formerly, for which hunters are mostly responsible.

Birds which are found associated with the water may be divided into two groups, those that are naturally in or on the water and those that are usually in the air above it. Treating of those whose essential element is water rather than air alone, the double-crested cormorant and the pied-billed grebe were the only members noticed breeding within the vicinity, altho the wood duck is known to have bred there in 1909. The breeding range of the cormorant, as usually given, is from Minnesota northward. This remarkable southern extension of this bird's breeding range is described in detail by Frank Smith (*Auk*, 1911: 16-19).

Other members of this group which are very irregular in number and distribution are the ducks, of which the following were noted during July, 1910: a red-breasted merganser, mallard, lesser scaup and a blue-winged teal. Altho occasionally seen in the open river they are more abundant in the north end of Thompson's Lake. This region is south of the present

limits of the breeding ranges of most of our aquatic birds and this explains the absence of many water birds which one might well expect to find in such country as this.

Speaking in the strict sense of the term, the summer's work revealed but two members of the group of aquatic birds which spend most of their time in the air over the water, namely, the black and the common terns, of which the former was by far the more abundant. Apparently they spent most of their time in the northern part of Thompson's Lake, but two or three birds were liable to be seen almost any time in the vicinity of the Biological Station, over Flag Lake or the Illinois River and following every brisk northerly wind flocks of 25-40 birds would come down the Illinois River to Havana Lake.

Aside from the strictly aquatic birds which have been treated of above, there are several other birds whose association with water is determined by the location of their food. But one of these birds, the kingfisher, obtains food in the water. The others, all of which are insectivorous birds, obtain their food by flying back and forth over the water. In respect to their other activities these birds are, however, land birds. The swallows are the most conspicuous members of this group. Little need be said of these birds as they are insectivorous and must obtain their food from the haunts of the insects. The presence of grackles and red-headed woodpeckers in the group seems somewhat peculiar to one used to them in other portions of central Illinois. The red-headed woodpecker belongs rather to the bottomland forests, but these birds were quite often seen flying back and forth over the water and were observed catching insects with an agility that would do credit to one of the flycatchers. The grackles were quite fond of flying back and forth across the river, especially in the early dawn and in the twilight. They did not display market flycatching ability, but they took what insect food they could obtain in flying in a course which was not characterized by flycatcher-like antics.

SUMMER BIRDS OF THE AQUATIC ASSOCIATION.

Normal or strictly aquatic species—

Water Inhabitants—

d Pied-billed Grebe	n f r	one pair in 1910.
d Double-crested Cormorant	n f r	Two flocks of 7 and 26 birds in Mud Lake and in Flag & Thompson's Lakes respect- ively.
(d Wood Duck	n f r	irregularly, not present in 1910)
d Red-breasted Merganser	f r	two birds seen three times.
d Mallard	f r	one seen a few times.
d Lesser Scaup Duck	f r	one bird seen twice
d Blue-winged Teal	f r	one bird seen once.

Air Inhabitants—

d Black Tern	n f r	a colony of about 70 birds
d Common Tern	n? f r	a few birds with the above.

Semiaquatic species—

Food Submerged

d Belted Kingfisher	f	common
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Food above water

d?Mississippi Kite		two birds in the air over the Illinois River, June 29, 1910.
s Red-headed Woodpecker	f	several
s Nighthawk	f	scarce
d Chimney Swift	f r	not common
s Kingbird	f	one pair
s Phoebe	f	common
s Bronzed Grackle	f	common
s Purple Martin	f	scarce
d Cliff Swallow	f	rare
d Tree Swallow	f	abundant
d Bank Swallow	f	few
a Robin	f	scarce
a Bluebird	f	rather scarce

THE STRAND ASSOCIATIONS.

The strand is not well represented in this region on account of the persistent high water in the Illinois River and adjacent lakes, following the opening of the Chicago drainage canal. Wherever it occurs it is of either a muddy or sandy texture.

The sand strand that was under observation formed the east bank of Quiver Lake and parts of the shore of Lake Matanzas. It was not extensive in area, even tho it was developed linearly for quite a distance. It did not support much of a bird population, altho along it there was an abundance of food materials, consisting largely of fish, insects, clams, snails, and plants, left on the beach by the slowly subsiding river. The summer bird population did not contain a single species typical of this bird association. The birds noted were mostly birds coming to the shore to bathe. Toward the end of July the fall migration set in with the inroad of various kinds of sandpipers. This increase was added to the bird life of the strand and made it seem more natural. Following each north wind the sandpipers began to appear singly and in small flocks all along the river. These flocks continually worked southward. Most of the flocks kept at such a distance that specific determination was well nigh impossible. Those identified were, for the most part, solitary, spotted, pectoral and semipalmated sandpipers and the killdeer plover.

There was a much greater expanse of mud strand, which is submerged during the high waters of spring. When emerged it occurs as mud flats or as muddy strips within the willows. As it is not exposed during the time of the spring migration of mud strand birds, its avian population is very small in comparison with what it might otherwise have been. As not many of the mud strand birds range this far south during the summer, the population is further reduced. However, there are a few typical species each represented by a few individuals. As in the case with the sand strand, the mud strand bird population is largest during the migrations, which is outside of the scope of this article.

SUMMER BIRDS OF THE SAND STRAND.

d Green Heron	f r	occasional
d Phoebe	f	bathing not uncommon
s Bronzed Grackle		bathing common
s Robin		bathing fairly common

AFTER THE FALL MIGRATION HAD COMMENCED.

d Spotted Sandpiper	f r abundant
d Semipalmated Sandpiper	f r fairly common
d Solitary Sandpiper	f r abundant
d Pectoral Sandpiper	f r common
d Killdeer Plover	f r several

SUMMER BIRDS OF THE MUD STRAND.

d Bittern	f one record
d Great Blue Heron	f r common
d Green Heron	n f r common
d Coot	f one record
d Wilson Snipe	f one flock seen once
d Solitary Sandpiper	n?f r one or two families in the summer, but abundant in the fall migration .
d Pectoral Sandpiper	f r common in the migration
d Semipalmated Sandpiper	f r fairly common in the fall migration
d Spotted Sandpiper	f r abundant in migration
d Killdeer Plover	f r several in migration.

THE THICKET ASSOCIATIONS.

No real mesofytic or xerofytic thickets are present in this region. A few birds which are elsewhere typical of such thickets have adapted themselves to the more or less similar conditions which do exist in this vicinity, that is to say, to the hedges and the small orchards in the vicinity of houses.

With the exception of three or four of locust (*Robinia pseudo-acacia*) hedges are of osage-orange (*Maclura pomifera*), which not only fulfills the ordinary purpose of a hedge but also serves as a wind break, preventing excessive wind action on the mobil sand. To accomplish the latter purpose the osage orange must be allowed to develop to good size, which incidentally furnishes ample protection to many birds.

SUMMER BIRDS OF THE HEDGES(=THICKET ASSOCIATION).

s Bluebird	r not common and most often seen on wires near hedges.
s Robin	n f r not common away from man
d Carolina Chickadee	n f r a few in several different hedges

s Tufted Titmouse	f r a very few in hedges
d Brown Thrasher	n f r quite common
s Catbird	n f r a few especially near houses
d Mockingbird	n f r not many individuals, but almost universally in hedges
s Warbling Vireo	f r a few in hedges near woods
d Migrant Shrike	n f r a very few in this region
s Dickcissel	r This bird quite commonly uses the hedges as a point of vantage from which to look and to sing. Wires are, however, preferred to a noticeable extent when the wires are near the hedges.
s Rose-breasted Grosbeak	r few and only occasionally
d Cardinal	n f r quite common
t Towhee	r one record
s Indigo Bunting	f r few
d Field Sparrow	n f r common
s Lark Sparrow	r rarely
s Vesper Sparrow	r rarely
s Goldfinch	r not common
s Bronzed Grackle	r occasionally
s Baltimore Oriole	f r frequent
d Orchard Oriole	n f r frequent
t Cowbird	r occasionally
s Crow	r seldom
t Blue Jay	r infrequent
s Kingbird	r occasionally
s Northern Flicker	f r occasionally
s Red-headed Woodpecker	f r not infrequent
s Downy Woodpecker	f r very few
s Hairy Woodpecker	f r two pairs and their young
s Black-billed Cuckoo	f r occasionally
s Yellow-billed Cuckoo	f r not infrequent
d Mourning Dove	n f r common

From the length of the list of hedge birds one might think that hedges were favorite places for birds, but the fact is that where hedges occur they are usually the only points of vantage from which the birds can watch the movements of intruders. They afford birds of the crops, of the bunchgrass prairies, and of the roadsides, lookout stations which virtually

no bird disdains to use. The typical hedge birds which are usually found in the hedges themselves are the mockingbird, brown thrasher, field sparrow, mourning dove, Carolina chickadee, migrant shrike, cardinal and the black-billed cuckoo. Somewhat secondary to these are the bluebird, robin, Baltimore oriole, northern flicker, red-headed woodpecker, and the blue jay.

HYDROFYTIC THICKET ASSOCIATION.

In this vicinity virtually all the thickets of this plant association have been drowned since the opening of the Chicago drainage canal. Several of the plants which formed these thicket associations are still present in this region, but they are so mixt with parts of the tree associations that they no longer form an element in the description of the region. Formerly the *Salix-Cephalanthus* (Willow-Buttonbush) association was quite extensively distributed in this region, but at the present writing almost everywhere the willows grow, they form trees and the few button-bushes that remain are scraggly shrubs among the willows, where they are slowly being killed. The region around the hed of Lake Matanzas is a partial exception to this statement, for there this association is normal in structur, altho limited in distribution.

The birds that are usually characteristic of this association have adapted themselves to the changed conditions. This does not seem difficult, for the preferences of the summer birds of this region do not seem to differentiate between bottomland thickets and bottomland woods. Investigation of the very limited areas that approach the former conditions indicate that the birds that were most typical of this association were the song sparrow, indigo bunting, red-winged blackbird, tufted titmouse, Carolina wren, catbird, and the Northern yellow-throat.

THE BOTTOMLAND WOODS.

The bottomlands of this region are quite extensiv, consisting of the parts of the banks of streams and lakes, together with the "towheads" and "willow-islands" separating

some of them. Repeated high waters of long continued duration hav caused a great increase in the number and development of willows of the species, *Salix longifolia*, which has largely superceded the former lowland forest.

Virtually all of the normal undergrowth has been killed. When the bottomland becomes emerged in summer the ground is usually covered with a dense growth of composit, 1.0 to 2.5 meters high, the most common species of which are *Xanthium commune* (cocklebur), *Ambrosia trifida* (giant ragweed), *Solidago spp* (goldenrods), *Aster spp* and *Boltonia decurrans*. The bottomland woods are quite free from shrubby undergrowth as it cannot withstand the action of the ice, together with the continued submergence. In a few open places, however, there are small thicket-like areas composed of willow (*Salix longifolia*), *Adelia acuminata*, and much less frequently some straggly half ded buttonbush.

The bottomland woods are not very dense and the trees are usually leafy almost to the very base. Spiders are very abundant and their webs make dense tangles thruout the foliage. Small insect life is also very abundant, and in addition there is a wealth of molluskan forms.

The bottomland woods in the vicinity of Lake Matanzas partake much of the typical character of a bog, and necessitates special consideration because some of the members of its avifauna were found nowhere else in this region. The tree growth, which dominates the greater part of the bog except at the line of springs at the foot of the bluff, consists largely of soft maple, elm, ashes, birch (*Betula nigra*) and sycamor with dogwood, wild rose, buttonbush and willows as the principal shrubby growth. The courses of the little creeks that flow from the springs are markt by the growth of *Leersia*, one of the grasses, bordered by willows and buttonbushes.

Birds of these bottomland woods are fairly numerous and quite varied in species. Almost without exception they are insectivorous birds. The flycatcher family is the best represented with numerous wood pewees and phoebes, a smaller

number of crested flycatchers and a few kingbirds. The kingbirds are essentially marginal in their position in the willows. The wood pewees are interior birds, while the crested flycatcher and the phoebe partake somewhat of the character of each. The blackbird is second in importance and the vireo family is third. The red-winged blackbirds make their presence known at all hours of the day by their incessant "Kong-querree." Of the vireos the red-eyed and yellow-throated are rather scarce, but the warbling vireo is very abundant. Altho abundant it is ordinarily seldom seen, as it gleams in the dense foliage for the many insects that are present. It harmonizes exceedingly well with its background, but its presence can always be detected by its characteristic sweet song, which is kept up nearly all day long.

To this association may be accredited the warblers that remained here during the summer. Two warblers, the prothonotary and the Northern yellow-throat, were quite uniformly distributed over the bottomland wooded areas, altho the former was by far the more abundant. Three other species of warblers were localized in the Matanzas bog, and with the exception of one redstart in the Spoon river bottoms were seen nowhere else. These were the redstart, the Kentucky and the hooded warblers. As this bog harbored also the yellow-throat and the prothonotary, it contained the complete warbler list for the summer. The most abundant warbler — and almost the most abundant bird in the willows — was the prothonotary warbler, which finds a wealth of nesting sites in the many rotting willow stumps. These birds keep up a well nigh incessant chattering thruout the day. They also make their presence known by rapid darts from one tree to another, their orange to yellow colored heds and bodies appearing like gems in the green foliage. They quite often make excursions across the water during the course of which they usually fly but little above its surface. They are at their best when they are perchd at the end of a limb on a dead tree, when they stand out quite vividly against the blue background of sky. Toward

the end of July, just preliminary to their southward migration, these warblers deserted the willows, in which they had lived all summer, and flocked together in the oak woods. A very few individuals remained in the willows for about a week

SUMMER BIRDS OF THE BOTTOMLAND WOODS.

s Bluebird	f r very few
t Robin	f r very, very few
d Wood Thrush	n f r common
d Blue Gray Gnatcatcher	f r one record
d Carolina Chickadee	n f r fairly common
s Tufted Titmouse	n f r several
t White-breasted Nuthatch	n f r not many
t Parkman House Wren	n f r two pairs
d Carolina Wren	n f r very few
a Brown Thrasher	f r scarce
s Catbird	n?f r occasionally
d Redstart	n f r two or more pairs
d Hooded Warbler	n?f r one seen on different days
d Northern Yellow-throat	n f r few
d Kentucky Warbler	n?f r at least four birds
d Prothonotary Warbler	n f r very abundant
d Yellow-throated Vireo	n f r two pairs
d Warbling Vireo	n f r abundant
d Red-eyed Vireo	n f r few
s Bank Swallow	r several
d Tree Swallow	n f r many
s Indigo Bunting	n f r few
s Rose-breasted Grosbeak	n f r few
d Cardinal	n f r few to several
s Song Sparrow	n f r few
a English Sparrow	f r occasional flocks
t Goldfinch	r few
d Bronzed Grackle	n(f) r many
d Baltimore Oriole	n f r several
d Orchard Oriole	n f r few
d Red-winged Blackbird	n f r abundant
a Cowbird	r few
s Crow	n?f r few
s Blue Jay	f r few
s Northern Flicker	n f r few
d Red-bellied Woodpecker	n f r very few
d Red-headed Woodpecker	n f r abundant

d Hairy Woodpecker	n f r few
d Wood Pewee	n f r very abundant
d Phoebe	n f r common
d Crested Flycatcher	n f r several
d Kingbird	n f r few
ds Belted Kingfisher	r common
d Black-billed Cuckoo	f r few
d Yellow-billed Cuckoo	f r common
d Sparrow Hawk	n f r at least two pairs with young
t Marsh Hawk	r one record
d Mourning Dove	n f r common to abundant
t Solitary Sandpiper	f r one family noted along the margin in July
t Spotted Sandpiper	f r a few along the margin. (These two sand-pipers come within this association because with the reversal of successions caused by high water the mud flat is encroaching on the willows.)
s Green Heron	n f r marginal and common
s Great Blue Heron	n f r semimarginal and several
s Bittern	r one record
t Double-crested Cormorant	n r 32 individuals in 1910.

THE UPLAND FOREST ASSOCIATIONS. All of the upland woods in Mason County, in the vicinity of Havana are of one or the other of two plant associations, the black oak or the mixt forest associations. Together they cover quite a little of the region, particularly the ridges, with a moderately open growth of woods.

The black oak is the earlier stage in a genetic series. It is composed typically of black oak (*Quercus velutina*) and black-jack (*Quercus marilandica*), the latter being more frequently a marginal tree. The shrubby growth is very largely composed of the young trees of the two oaks and of a hickory. In addition there are a few normal shrubs, such as sumac (*Rhus canadensis illinoensis*), redroot (*Ceanothus americanus*), gooseberry (*Ribes gracile*) and blackberry (*Rubus spp*). This growth is largely confined to the margins and to the openings. The development of vines is slight and the

herbaceous growth is largely more or less xerofytic in natur.

Many of these black oak woods are giving place to a more mesofytic type of woods, to which the term "mixt forest" has been applied by Gleason.¹ The succession is evidenced by the inroad of hickories and vines, which giv proof of a more mesofytic soil, altho the tree growth may still retain about the same percentage composition as befor. This is because conditions are ripe for succession, but supercedance of the dominant species takes place after the death of the dominant species of the first association. This is taking place slowly, giving expression to a woods in which the trees are still largely typical of the black oak woods, while the undergrowth is distinctly of the mixt forest type.

MIXT FOREST. The forest association to which this term has been applied is well developpt, especially on some of the ridges near the Illinois River. It is a forest of five or six principal kinds of trees, of which as high as 50% may be black oak (*Quercus velutina*). Aside from this tree the principal trees are hickories (*Hicoria cordiformis* and *Hicoria glabra villosa*), hackberry (*Celtis occidentalis*), elms (*Ulmus americana* and *fulva*, bur oak (*Quercus macrocarpa*) and white oak (*Quercus alba*). The ground supports a luxuriant growth of vines, herbs and shrubs. The vines, Virginia creeper, bittersweet, poison ivy, and grape are very characteristic of the earlier stages of this association. Later the ground is coverd with more typical mesofytic plants.

Both of these two types of upland woods are characterized by quite a number of birds, which are not so exclusively insectivorous as those of the bottomland woods. Several of these are far more often heard than seen and but very few of the species are obtrusiv. There is comparatively little difference in the species list of each of these two associations as nearly every bird that occurs in one occurs in the other also.

¹Gleason, H. A. The Vegetation of the Inland Sand Deposits of Illinois, Bulletin, Illinois State Laboratory of Natural History, 9:135, 1910.

There may be, however, a decided difference in abundance of individuals in either association. This will be indicated in the table of species.

SUMMER BIRDS OF THE BLACK OAK FOREST ASSOCIATION.

t Robin	r uncommon or rare
d Wood Thrush	n f r fairly common
s Carolina Chickadee	f r few
t Tufted Titmouse	f r not many
d White-breasted Nuthatch	r common
t Brown Thrasher	r scarce
s Mockingbird	f r scarce
d Warbling Vireo	n f r common
d Cardinal	n f r few
d Towhee	n f r few
t Goldfinch	r few
s Bronzed Grackle	f r not very common
s Baltimore Oriole	f r few
d Crow	n f r scarce in this region in general
d Blue Jay	n f r few
d Wood Pewee	n f r common
s Crested Flycatcher	r scarce
d Northern Flicker	n f r very few
d Red-headed Woodpecker	n f r common
d Yellow-billed Cuckoo	f r few
d Broad-winged Hawk	n?f r two pairs
d Mourning Dove	n f r several
d Bob-white	n f r several

SUMMER BIRDS OF THE MIXT FOREST ASSOCIATION.

s Bluebird	r scarce
d Robin	f r not common
d Wood Thrush	n f r abundant
t Carolina Chickadee	f r scarce
t Tufted Titmouse	f r not many
d White-breasted Nuthatch	n f r abundant
t Brown Thrasher	r scarce
s Catbird	f r scarce
t Northern Yellow-throat	r scarce
t Yellow-throated Vireo	n f r one pair

d Warbling Vireo	n f r abundant
d Red-eyed Vireo	n f r scarce
d Scarlet Tanager	n f r few
t Indigo Bunting	r few
d Rose-breasted Grosbeak	n f r few
d Cardinal	n f r few
s Towhee	n f r few
t Goldfinch	r few
s Bronzed Grackle	r more or less common
d Baltimore Oriole	n f r common
d Orchard Oriole	n f r few
t Red-winged Blackbird	r not common
d Cowbird	eggs f r few
s Crow	f r scarce
d Blue Jay	n f r common
d Wood Pewee	n f r abundant
d Phoebe	n?f r few
d Crested Flycatcher	n?f r few
t Kingbird	r one pair
t Nighthawk	r very few
t Whippoorwill	r two or three
d Northern Flicker	n f r not many
t Red-bellied Woodpecker	n f r at least one family
d Red-headed Woodpecker	n f r common
d Downy Woodpecker	n f r one pair with young
d Hairy Woodpecker	f r very few
d Yellow-billed Cuckoo	f r few
d Red-tailed Hawk	f r one
d Mourning Dove	n f r several
t Bob-white	f r very few

In addition to the groups of birds which have been given above there are a few birds which can not well be included in any of them. Birds, such as the chimney swift, the nighthawk and, in this region, the goldfinch, are virtually never seen except as they are flying about in the air. The swallows likewise spend a great deal of their time in the air, flying about in search of food. The Mississippi kite is placed here on the basis of but one record.

The open dirt banks of the river form the physiographic basis for another grouping of birds, consisting of those birds which build their nests in such situations. In cases where several strata are exposed some are picked to the exclusion of others for

the tunnel, at the base of which is placed the nest. To this group belong the bank swallow and the kingfisher.

Still other birds are influenced in their distribution primarily by man. Most of such birds prefer to live near human habitations, while others seem to remain near dwelling places and, at least, tolerate man. In so far as was noticed during this summer the following birds might accordingly be classed as domesticated "d" or semidomesticated "sd."

d Robin
 sd Wood Thrush
 d Parkman House Wren
 d Catbird
 sd Mockingbird
 sd Warbling Vireo
 sd Rose-breasted Grosbeak
 d Cardinal
 d English Sparrow
 d Baltimore and Orchard Orioles
 sd Wood Pewee
 sd Northern Flicker
 sd Red-headed Woodpecker
 sd Yellow-billed Cuckoo
 sd Ruby-throated Hummingbird
 sd Blue Jay

GENERAL CONCLUSIONS.

Consideration of the foregoing data shows that the more extensive plant groups have associated with them certain birds which, as a group, are partial in their habitat preferences — in this region at least — to those plant associations.

Birds of the wooded areas of this part of Illinois are much more numerous, both in number of species and of individuals than those of the prairies.

Lowland woods are more plentifully and more diversely populated than upland woods.

Birds are far more restricted in their daily movements than one would at first think possible. While birds need not necessarily be confined to one plant association or closely allied

groups of plant associations, they are quite likely to be and most birds pursue all their summer life activities within the same plant formation.

In certain cases bird activity is one of the prime factors in causing plant succession which in turn is followed by a change in the character of the bird population. Such is obviously the case in the transition from the black oak to the mixt forest associations, in which the birds play the role of seed distributors of the vines and shrubs which hav given rise to a most prominent characteristic of the mixt forest.

Studies similar to this in restricted areas thruout the country and in every season of the year are necessary in order to obtain a clearer insight into avian ecology.

Systematic Array of Summer Birds of Havana, Ill.

	Prairie Province		DECIDUOUS FOREST PROVINCE									
	Bunchgrass Prairies	Prairie Swamps	Aquatic	Sand Strand	Mud Strand	Thickets		Woods			Bluff Face	Town
						Hedges and Orchards	Hyemal Thickets	Bottomland Woods	Black Oak Forest	Mist Forest		
1	2	3	4	5	6	7	8	9	10	11	12	
PIED-BILLED GREBE <i>Podilymbus podiceps</i>			d									
COMMON TERN <i>Sterna hirundo</i>			d									
BLACK TERN <i>Hydrochelidon nigra surinamensis</i>			d									
DOUBLE-CRESTED CORMORANT <i>Phalacrocorax a. auritus</i>			d					t				
RED-BREADED MERGANSER <i>Mergus serrator</i>			d									
MALLARD <i>Anas platyrhynchos</i>			d									
BLUE-WINGED TEAL <i>Querquedula discors</i>			d									
WOOD DUCK <i>Aix sponsa</i>			d									
LESSER SCAUP DUCK <i>Marila affinis</i>			d									
BITTERN <i>Botaurus lentiginosus</i>					d			s				
GREAT BLUE HERON <i>Ardea h. herodias</i>		d		d				s				
GREEN HERON <i>Butorides virescens</i>		s		d	d			s				
COOT <i>Fulica americana</i>					d							
WILSON'S SNIFE <i>Gallinago delicata</i>					d							
PECTORAL SANDPIPER <i>Pisobia maculata</i>				d	d							
SEMPALMATED SANDPIPER <i>Ereunetes pusillus</i>				d	d							
SOLITARY SANDPIPER <i>Helodromas s. solitarius</i>				d	d				t			
SPOTTED SANDPIPER <i>Actitis macularia</i>				d	d				t			
KILLDEER <i>Oxyechus vociferus</i>				d	d							
BOB-WHITE <i>Colinus v. virginianus</i>		s							d	t		
MOURNING DOVE <i>Zenaidura macroura carolinensis</i>		s				d		d	d	d		
MISSISSIPPI KITE <i>Ictinia mississippiensis</i>			d?									
MARSH HAWK <i>Circus hudsonius</i>								t				
RED-TAILED HAWK <i>Buteo b. borealis</i>										d		
BROAD-WINGED HAWK <i>Buteo platypterus</i>									d			
SPARROW HAWK <i>Falco s. sparverius</i>								d				

	1	2	3	4	5	6	7	8	9	10	11	12
TOWHEE <i>Pipilo e. erythrophthalmus</i>						t		d	s			
CARDINAL <i>Cardinalis c. cardinalis</i>						d		d	d		*	
ROSE-BREADED GROSBEAK <i>Zamelodia ludoviciana</i>						s		s	s		*	
INDIGO BUNTING <i>Passerina cyanea</i>			d			s	d	s	t			
DICKCISSEL <i>Spiza americana</i>		d	t			s						
SCARLET TANAGER <i>Piranga erythromelas</i>									d			
PURPLE MARTIN <i>Progne s. subis</i>			s									
CLIFF SWALLOW <i>Petrochelidon l. lunifrons</i>			d									
TREE SWALLOW <i>Iridoprocne bicolor</i>			d					d				
BANK SWALLOW <i>Riparia riparia</i>			d					s		d		
MIGRANT SHRIKE <i>Lanius ludovicianus migrans</i>						d						
RED-EYED VIREO <i>Vireosylva olivacea</i>								d	d			
WARBLING VIREO <i>Vireosylva gilva</i>						s		d	d	d	*	
YELLOW THROATED VIREO <i>Lanivireo flavifrons</i>								d		t		
PROTHONOTARY WARBLER <i>Protonotaria citrea</i>								d				
KENTUCKY WARBLER <i>Oporornis formosus</i>								d				
MARYLAND YELLOW-THROAT <i>Geothlypis t. trichas</i>		t						d	d	t		
HOODED WARBLER <i>Wilsonia citrina</i>								d				
REDSTART <i>Setophaga ruticilla</i>								d				
MOCKINGBIRD <i>Mimus polyglottos</i>		a				d		s			*	
CATBIRD <i>Dumetella carolinensis</i>						s	d	s	s		*	
BROWN THRASHER <i>Toxostoma rufum</i>		d				d		d	t	t		
CAROLINA WREN <i>Thryothorus l. ludovicianus</i>								d	d			
PARKMAN'S HOUSE WREN <i>Troglodytes aedon parkmani</i>									t		*	
SHORT-BILLED MARSH WREN <i>Cistothorus stellaris</i>			d									
WHITE-BREADED NUTHATCH <i>Sitta c. carolinensis</i>									t	d	d	
TUFTED TITMOUSE <i>Baeolophus bicolor</i>						s	d	s	t	t		
CAROLINA CHICKADEE <i>Penthestes c. carolinensis</i>						d		d	t	t		
BLUE-GRAY GNATCATCHER <i>Polioptila c. caerules</i>								d				
WOOD THRUSH <i>Hylocichla mustelina</i>								d	d	d	*	
ROBIN <i>Planesticus m. migratorius</i>		d	a	s		s		t	t	d	*	
BLUEBIRD <i>Sialia s. sialis</i>			a			s		s	s			

	1	2	3	4	5	6	7	8	9	10	11	12
YELLOW-BILLED CUCKOO <i>Coccyzus a. americanus</i>						s		d	d	d		*
BLACK-BILLED CUCKOO <i>Coccyzus erythrophthalmus</i>						s		d				
KINGFISHER <i>Ceryle alcyon</i>			d					ds			d	
HAIRY WOODPECKER <i>Dryobates v. villosus</i>						s		d		d		
DOWNY WOODPECKER <i>Dryobates pubescens medianus</i>						s				d		
RED-HEADED WOODPECKER <i>Melanerpes erythrocephalus</i>			s			d		d	d	d		*
RED-BELLIED WOODPECKER <i>Centurus carolinus</i>								d		t		
NORTHERN FLICKER <i>Colaptes auratus luteus</i>						s		s	d	d		*
WHIP-POOR-WILL <i>Antrostomus v. vociferus</i>										t		
NIGHTHAWK <i>Chordeiles v. virginianus</i>			s							t		
CHIMNEY SWIFT <i>Chaetura pelagica</i>			d									
RUBY-THROATED HUMMINGBIRD <i>Archilochus colubris</i>												*
KINGBIRD <i>Tyrannis tyrannus</i>	a		s			s		d		t		
CRESTED FLYCATCHER <i>Myiarchus crinitus</i>									d	s	d	
PHOEBE <i>Sayornis phoebe</i>			s	d				d		d		
WOOD PEWEE <i>Myiochanes virens</i>								d	d	d		*
BLUE JAY <i>Cyanocitta c. cristata</i>							t	s	d	d		*
CROW <i>Corvus b. brachyrhynchus</i>	s					s		s	d	s		
BOBOLINK <i>Dolichonyx oryzivorus</i>		d										
COWBIRD <i>Molothrus a. ater</i>							t	d		d		
RED-WINGED BLACKBIRD <i>Agelaius p. phoeniceus</i>		i						d	d	t		
MEADOWLARK <i>Sturnella m. magna</i>	s?	d										
WESTERN MEADOWLARK <i>Sturnella neglecta</i>	d											
ORCHARD ORIOLE c <i>Icterus spurius</i>								d		d		*
BALTIMORE ORIOLE <i>Icterus galbula</i>								e	d	s	d	*
BRONZED GRACKLE <i>Quiscalus quiscalus aenus</i>		s	s	s		s		d	s	s		
GOLDFINCH <i>Astragalinus t. tristis</i>							s	t	t	t		
VESPER SPARROW <i>Poocetes g. gramineus</i>		d					s					
LARK SPARROW <i>Chondestes g. grammacus</i>		d					s					
FIELD SPARROW <i>Spizella p. pusilla</i>							d					
ENGLISH SPARROW <i>Passer domesticus</i>		t							a			*
SONG SPARROW <i>Melospiza m. melodia</i>								d	s			